

# SUDAN

## Agriculture Value Chain Analysis

June 2020

**Agriculture Global Practice**  
**Finance, Competitiveness and Innovation Global Practice**



**WORLD BANK GROUP**

## Acknowledgements

This report was prepared by a World Bank Group team led by Imtiaz Alvi (Senior Agriculture Specialist) and Asta Bareisaite (Private Sector Specialist) and comprised Åsa Giertz (Senior Agriculture Economist), Heinz-Wilhelm Strubenhoff (Senior Private Sector Specialist), Jeren Kabayeva (Agriculture Specialist), Limya Abdelaziz Mohamed Ibrahim (Analyst), Maria D. Miller (Senior Private Sector Specialist), Abhinav Gupta (Agribusiness Consultant), Aman Khanna (Agribusiness Private Sector Development Consultant), Donald Larson (Senior Agricultural Policy Consultant), Fareed Hassan (Senior Economist and Consultant) and Saef Mustafa (Researcher and Consultant).

The team is grateful for the valuable guidance received from Holger A. Kray (Practice Manager, Agriculture Global Practice, Africa Region) and Niraj Verma (Practice Manager, Finance, Competitiveness and Innovation Global Practice, Africa Region). Critical guidance and support in the work with this report were also provided by Paavo Eliste (Lead Agricultural Economist), Samjhana Thapa (Senior Agriculture Economist), and Farbod Youssefi-Vash (Program Coordinator). The team is also grateful for the inputs received from the representatives of the Government of Sudan and other stakeholders met during the report preparation process.

Peer reviewers for this report were Chris Brett (Lead Agribusiness Specialist), Jean Saint-Geours (Senior Economist), and Sandra Broka (Senior Agriculture Economist).

## Table of Contents

Acknowledgements.....	ii
Abbreviations and Acronyms .....	vi
Executive Summary .....	1
Chapter 1: Introduction.....	9
Chapter 2: Agriculture as a Lever for Transformation .....	12
The context.....	12
The role of agriculture.....	17
Chapter 3: Challenges for Agricultural Development .....	25
Framework for assessment.....	25
Upstream - Resources for production are limited and subject to high risks .....	27
Midstream - Limited value addition and constrained domestic trading channels.....	29
Downstream - Distribution and logistics infrastructure is suboptimal.....	30
Enabling environment, support infrastructure, and services - Policy distortions limit upside..	30
Chapter 4: Prioritizing Value Chains for Affirmative Action .....	34
Chapter 5: Assessment of Prioritized Value Chains .....	36
Gum Arabic value chain.....	37
Gum Arabic in international and domestic markets .....	38
Gum Arabic marketing chain .....	41
Constraints along the gum Arabic value chain .....	44
Investment opportunities along the gum Arabic value chain .....	44
Sesame seeds value chain.....	46
Sesame in international and domestic markets.....	48
Sesame marketing chain .....	49
Constraints along the sesame seeds value chain.....	50
Investment opportunities along the sesame seed value chain.....	50
Horticulture value chain .....	51
Horticulture in international and domestic markets .....	54
Horticulture marketing chain.....	56
Horticulture price variation and competitiveness .....	58
Constraints along the horticulture value chain .....	60
Investment opportunities in the horticulture value chain .....	61
Livestock (meat) value chain .....	62

Livestock in international and domestic markets .....	64
Livestock marketing chain.....	68
Constraints along the livestock value chain .....	72
Investment opportunities along the livestock value chain.....	73
Dairy value chain .....	75
Dairy in international and domestic markets.....	77
Dairy marketing chain .....	77
Constraints along the dairy value chain.....	80
Investment opportunities along the dairy value chain.....	80
Constraints common to all five value chains .....	81
Chapter 6: Recommendations for policies and public investments .....	84
Overview .....	85
Challenges and recommendations .....	85
Addressing cross-cutting constraints.....	85
Public sector interventions: Research, production technology adoption, and supporting services .....	85
Private sector interventions: Market information and digital technologies.....	87
Building integrated supply chains through public-private collaboration .....	89
A summary of recommendations and a suggested time path .....	91
Short-term actions.....	91
Medium-term actions.....	91
Longer-term actions.....	92
Complementary policies and public investments.....	92
Conclusions .....	95
References.....	96
Abraham, Reuben. February 2007. Mobile Phones and Economic Development: Evidence From the Fishing Industry in India, <i>Journal of Information Technologies and International Development (Inform Tech Int Dev)</i> .....	96
Ding et al. 2017. From Ant Financial to Alibaba's Rural Taobao Strategy - How Fintech Is Transforming Social Inclusion, <i>The Digitalisation of African Agriculture Report 2018–2019</i> , 10.1016/B978-0-12-810441-5.00002-6 .....	97
Jensen, Robert 2007. The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector, <i>The Quarterly Journal of Economics</i> , 122 (30) ...	98
Muto, Mugumi and Yamano , Takashi, 2009. The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda, <i>World Development</i> , 37 (12) .....	98
Annex 1: List of Stakeholders Consulted .....	101

Annex 2: Agribusiness Deep Dive Methodology .....	103
Annex 3: The Methodology for the Prioritization of Agri-commodity Value Chains .....	106
Annex 4: Development Partner Programs in Agribusiness .....	112
Annex 5: Complementary Reports on Sudanese Value Chains.....	113

## Abbreviations and Acronyms

ACRE	Agriculture and Climate Risk Enterprise Ltd
AfDB	African Development Bank
AI	Artificial Insemination
ARC	Agricultural Research Corporation
CAADP	Comprehensive Africa Agriculture Development Program
CBS	Central Bank of Sudan
COVID-19	Coronavirus Disease 2019
CPA	Comprehensive Peace Agreement
CTC	Core Technical Committee
EBA	Enabling Business of Agriculture Index
EDLG	Export Development and Logistics Group
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO Statistical Database
FCI	World Bank Group's Finance, Competitiveness and Innovation Global Practice
FDI	Foreign Direct Investment
FNC	Forests National Corporation
FOB	Free-on-Board
FOGA	Fair Factory for Manufacturing and Packing Organic Gum Arabic
GAP	Good Agricultural Practice
GAPAs	Gum Arabic Producers Associations
GAC	Gum Arabic Company
GDP	Gross Domestic Product
ha	Hectare
HDI	Human Development Index
HIPC	Heavily Indebted Poor Country
IFAD	International Fund for Agricultural Development
INDC	Intended Nationally Determined Contribution
ISO	International Organization for Standardization
KACE	Kenya Agricultural Commodity Exchange
kg	Kilo Gram
LPI	Logistics Performance Index
MFD	Maximizing Finance for Development
MOA	Ministry of Agriculture
MOI	Ministry of Industry
MSMEs	Micro, Small, and Medium Enterprises
NAMA	Nationally Appropriate Mitigation Actions
NGO	Nongovernmental Organization
NHBPS	National Household Budget and Poverty Survey
PGC	Partial Guarantee Credit
R&D	Research and Development
RCA	Revealed Comparative Advantage

REDD+	Reducing Emissions from Deforestation and Forest Degradation and the Role of Conservation, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks in Developing Countries
SMEs	Small and Medium Enterprises
SPS	Sanitary and Phytosanitary
sq km	Square Kilometer
SRC	Sudan Rail Corporation
SSA	Sub-Saharan Africa
SSMO	Sudanese Standards and Metrology Organization
SUDNAIP	Sudan National Agriculture Investment Plan
TFP	Total Factor Productivity
UN	United Nations
UNCOMTRADE	United Nations International Trade Statistics Database
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Cooperation
US	United States
USD	United States Dollar
USDA	United States Department of Agriculture
WBG	World Bank Group
WTO	World Trade Organization

## Executive Summary

### The Context

**The new reform-oriented Transitional Government, formed on August 20, 2019, creates a unique window of opportunity in Sudan to spur economic growth, rebuilding and resilience.** The General Framework for the Program of Transitional Government adopted in December 2019 sets out 10 priorities for the Government. One of these priorities is focused on ‘addressing the economic crises and establishing the bases of sustainable development’ and includes, amongst others, ‘Developing and promoting productive sectors (agriculture, livestock, industry). The purpose of this study, therefore, is to provide a road map to develop and promote agriculture and livestock sectors as an important part of the Government’s priority of addressing the economic crises and establishing the bases of sustainable development. With natural endowments, sizeable existing base in the economy, direct impact on food security, and scope for rural and youth employment, the agriculture sector is an obvious choice for driving recovery and stability. Undertaking actions to encourage the already vibrant domestic private sector and attracting foreign private investments can limit the expenditure burden on the public sector’s dwindling financing.

**This study is complementary and aligned to previous analytical reports on agriculture sector development in Sudan,** including a recent World Bank report *Agribusiness SME Diagnostic in Sudan* and a European Union (EU) study focusing on job creation, as well as the ongoing World Bank *Sudan Agrifinance Diagnostic*. Specifically, the analysis builds on the World Bank *Sudan Agribusiness SME Diagnostic* prepared in June 2019, which focused on the opportunities and constraints for fostering entrepreneurship and SME growth in the agribusiness sector. Four of the five commodity value chains (with an exception of the dairy sector) that form the basis of this study were also key value chains identified in the SME diagnostic report. The 2019 EU Report (*Technical Assistance to the EU Delegation for Cooperation in Sudan: Jobs and Growth Compact for Sudan*) utilized its own criteria to prioritize key potential agriculture value chains to be developed in support of economic growth and job creation, in line with the EU sector priorities. These value chains included gum Arabic, livestock, oilseeds, and cotton. Although different in perspective and methodology, independent analyses from the SME and EU studies are highly complementary and both reports are drawn upon to guide this report’s conclusions and recommendations. In parallel, the *Sudan Agrifinance Diagnostic*, to be completed in June 2020, aims to assess the key constraints and opportunities in Sudan’s agriculture finance market and make recommendations to key stakeholders, with the overall goal of enhancing farmers’ and agricultural small and medium enterprises (SMEs) access to and use of suitable, competitive, and sustainable financial services.

**The work on this study was initiated in 2018 but was disrupted by the political unrest that engulfed the country from end 2018 to early 2020,** and the work had to be stopped as no mission or field work was possible in Sudan. With the formation of the Transitional Government in August 2019, gradually, unrest and violence subsided, and the overall political situation improved considerably. The research work was resumed, and a mission was carried out in March 2020 to complete the field work. However, the mission was limited to Khartoum as, due to security concerns, any travels to other regions were not possible. The analysis of the selected value chains was conducted by using key informant interviews (annex 1), a variety of literature, and independent analysis. A planned exercise to estimate current price margins captured by value-chain participants from farm gate to final consumer was disrupted by the Coronavirus Disease 2019



(COVID-19) pandemic. For some value chains, available price information is used to present indications of how price margins have changed over time. The quality of the analysis, however, varies by value chain.

## The role of agriculture in Sudan's economy

**Agriculture has long been a central part of Sudan's economy.** Agriculture is the foundation of livelihoods for the majority of the rural population in Sudan, and for many SMEs, because of its importance for food security and household welfare and as a source of export earnings. Always vital, the sector has taken on an increased importance following the secession of South Sudan in 2011. Agriculture's share of gross domestic product (GDP), which was estimated at 24 percent in 2011, increased to 31 percent in 2018. Similarly, labor's share in agriculture, which stood at 50 percent at the time of the secession of South Sudan in 2011, increased to 54 percent in 2012. Agriculture provides livelihood to approximately two-thirds of the population.

**Agriculture has regained its place as a key source of foreign exchange.** The loss of oil revenues in 2011 after the separation of South Sudan has been followed by a resurgence in agriculture's share in the country's exports, reaching 55 percent in 2019 (United Nations International Trade Statistics Database [UNCOMTRADE] data) and helping cushion some of the impact of the loss of oil revenues. This improvement has been mainly led by the good performance of major agricultural export commodities like livestock, sesame, gum Arabic, and cotton. For at least three of Sudan's key exports—sheep, goats, and gum Arabic—the ability to export in processed form presents significant upside potential. Overall, the agricultural trade balance remains negative due to the high food import bill, which mainly goes for imports of wheat and wheat flour, sugar, and animal oil (World Bank 2015).

## Cross-cutting challenges for agricultural development

**While there is considerable economic potential in Sudan, necessary investments in hard and soft infrastructure have long been insufficient or neglected to a point when it now constrains the business environment and restricts opportunities for sustainable growth in agriculture.** A complex web of interrelated policies is in place with the desired intent of controlling food prices (for example, wheat and fuel subsidies), protecting local business (for example, import bans on food items), maintaining food security (for example, export bans on sorghum), and limiting the impact of revenue losses from secession (for example, exchange rate controls), discouraging domestic and foreign private sector investments in agriculture. Even as sustained contributors to the economy, value chains in the agriculture sector thus remain basic and fragmented and lack integration. The key upstream, midstream, and downstream challenges for agricultural development can be summarized as follows:

### *Limited resource allocation, capacity, and infrastructure*

- **Overall resource allocation to agriculture remains constrained.** The low share of government budget spending on agriculture is aggravated by the limited access to international finance due to existing indebtedness with development partners which precludes access to international development finance. At the same time, economic isolation due to U.S. sanctions between 1997 and 2017 has constrained foreign direct investment (FDI). Actual annual government expenditures on agriculture accounted for under 3 percent of total public expenditures.

- **Research spending is meagre and erratic, while extension services are not inclusive.** Only under 5 percent of budgeted expenditure on research and development (R&D) between the ministries responsible for agriculture was actually utilized between 2011 and 2017.
- **A constrained ecosystem for agriculture inputs adversely affects productivity.** For example, average fertilizer use per hectare of cropland was 11.1 kg (2014), which places Sudan at 136th position among 160 countries.<sup>1</sup> The limited availability of foreign exchange further restricts access to quality inputs.
- **Veterinary control programs do not exist,** resulting in the inability to contain frequent outbreaks of major infectious diseases.
- **Limited capacity and infrastructure exist to confirm that international food safety and quality requirements are met.** There is a lack of certification bodies, regulatory infrastructure, and labs to test for compliance with industry quality standards and sanitary and phytosanitary (SPS) requirements of developed markets which significantly constrain participation in high-value exports.
- **Options for high-quality storage to stabilize incomes between seasons are limited, as are mechanisms to minimize post-harvest losses.** Organized storage capacity is concentrated at or near port with a large share being owned by the Government through the Agriculture Bank of Sudan.
- **Local distribution suffers from poor inland logistics.** There are a number of ports, including dry ports, free zones, railway stations, and highways, but only a limited supply of intermodal services exists.

### *Weak business environment*

- **Weak business environment for private sector investments in agriculture.** The country ranks low—171 out of 190 countries—on ease of doing business in the 2020 World Bank Doing Business Survey, slipping by 9 places compared to its 2019 ranking. Access to credit, trading across borders, protecting minority investors, and paying taxes are identified as major weaknesses. According to the Enabling the Business of Agriculture report (2019), with an aggregate score of 29.27, Sudan is far behind its neighboring countries Egypt and Ethiopia.
- **Domestic trade even in raw/unprocessed products is highly unorganized.** A large number of wholesale markets operate across the country for both livestock and crop trade, but the conditions of these markets remain wanting with lack of basic hygiene and infrastructure for key associated activities of handling, storage, packaging, and trade.
- **Scaled commercial processing is limited to select commodities leaving significant untapped opportunity for growth in revenues and jobs from value addition.** Sudan’s formal agro-industry is currently dominated by sugar, with some flour mills leaving high untapped potential in the processing of other agro-commodities like meat and oilseeds.
- **Production practices are outdated.** The largest irrigation system (the Gezira scheme) has underperformed, having suffered intermittently from funding shortfalls, capacity limitations

---

<sup>1</sup> According to the 2017 World Bank Enabling Business of Agriculture Index (EBA) performance on regulations to enable fertilizer use (rank 56/62).

of the managing entities, and ambiguous institutional arrangements. About 70 percent of the staple food is produced by smallholder farmers who are the most resource-constrained.

- **Limited access to reliable electricity.** In 2016, only 39 percent of Sudan’s population had access to electricity as compared to 43 percent in Sub-Saharan Africa and 98 percent in Middle East and North Africa.<sup>2</sup> Uninterrupted access to electricity is critical for the cost-effective development of agricultural value chains.
- **Access to land constraints.** Weak land markets and weak protections for land-use rights make land consolidation efforts risky for both investors and current land users and present significant reputational risk to donors. A lack of adequate land protection and planning is an overarching constraint in Sudan.

### *Climate change*

**Challenging agroclimatic conditions are accentuated by the effects of climate change.** The average annual rainfall in Sudan ranges from almost zero in the north of the country to almost 900 mm in the southern parts of South Darfur and South Kordofan and the eastern areas of Blue Nile. Intensive production is possible in irrigated areas or natural/manmade harvesting of run-off water, whereas rain-fed farming in the west, central, and eastern states, except for limited zones in the southeast and southwest, is highly uncertain. Crop productivity is further affected as climate change causes rainfall fluctuations and droughts and contributes adversely to the existing fragility.

### **Prioritizing agriculture value chains**

**With due consideration to the growth, rebuilding, and resilience agenda of the Transitional Government, in addition to cross-cutting agriculture sector analysis, this report assesses five select high-potential agricultural value chains, that is, gum Arabic, sesame seeds, livestock (meat), horticulture, and dairy.** This report’s emphasis on these five key commodity value chains reflects a consensus view, shared by the Government of Sudan and the World Bank, that accelerated growth in these five sub-sectors is achievable, sustainable in the long run, and catalytic for growth in the sector and the economy and that it would contribute toward ‘the second government priority of ‘addressing the economic crises and establishing the bases of sustainable development’.

- **Gum Arabic.** Sudanese gum Arabic sets quality standards for global markets, and the crop is an important source of foreign exchange earnings. Exports have grown following the end of the parastatal monopoly in 2009 and tax reductions. There is substantial potential to enhance productivity and exports and create job opportunities for the rural youth. There is also potential to add value by expanding domestic processing.
- **Sesame seeds.** Sudan produces high-quality sesame seeds and has a relative advantage in global markets because of its access to large and fast-growing import markets like China and Japan. Many smallholder farmers grow sesame seeds as a cash crop and could benefit from interventions that bolster demand and prompt productivity gains. Additionally, opportunities are present in job creation from processing.
- **Livestock (meat).** The livestock value chain is a key contributor to foreign exchange earnings of the country. The value chain provides opportunities for the development of the value of

---

<sup>2</sup> Sudan Agriculture Sector Overview, World Bank, 2018

production through value addition. This sector also provides livelihood to more than 50 percent of the Sudanese population, many of whom are part of pastoralist communities that could benefit by addressing challenges in this sector.

- **Horticulture.** Sudan has a relative advantage in the horticulture value chain because the geographical diversity in Sudan facilitates the cultivation of a wide variety of fruits and vegetables. Selected fruits like mangoes and bananas represent good potential for exports due to substantial volume of production. Competitiveness of this value chain, however, is severely compromised because of poor cold chain logistics and fragmented supply chains. Additionally, Sudan's incapability to comply with SPS requirements of advanced markets (especially Middle Eastern) also limits the competitiveness of the horticulture value chain.
- **Dairy.** Dairy production amounts to 4.5 million tons of milk of which 98 percent remains unprocessed and is sold loose although imports of processed dairy products is high and rising. Developing competitiveness in this sub-sector can support national finances substantially by substituting for imports of US\$100 million. The value chain presents high potential to boost smallholder livelihoods through milk processing due to a vast number of smallholders and pastoralists being involved in the dairy value chain activities. Additionally, development of the dairy value chain will contribute to nutrition security. This is because 15 percent of the daily nutrition needs of an average Sudanese is met through milk products.

## Unlocking investments in agriculture - recommendations

**The five value chains covered by this report offer opportunities to revitalize core components of Sudanese agriculture to catalyze growth in the sector.** Of course, the five value chains do not operate independently from the larger economy. As a consequence, the full impact of sub-sector reforms and investments recommended in this report will depend on how well the overarching constraints are addressed. Of special importance are steps needed to (a) achieve political stability and resolve regional conflicts; (b) achieve economic stability; (c) resolve foreign debt; (d) rejoin international markets and institutions, including membership in the World Trade Organization (WTO) and qualification for IDA; (e) strengthen investments in domestic institutions, infrastructure, and governance capacity; (f) address productivity gaps in staple crops; (g) improve land markets; and (h) improve the management of land and water resources. Even so, it seems likely that substantial progress in the five value chains can be had, while steady progress is made on addressing the set of overarching national and sector constraints.

**Broadly, constraints along the five value chains analyzed here stem from an underinvestment in public services, missing private investment, and the inherent difficulties of including dispersed smallholder producers into efficient supply chains.** The objectives of this report's recommendations are meant to lessen those constraints by improving plant and animal productivity, increasing the number of smallholders participating in formal markets, and addressing long-standing underinvestment in public services and private components of the five value chains.

**Given the severely constrained fiscal space, it will be critical to follow the MFD framework when designing solutions to address cross-cutting and sector-specific constraints in the agriculture sector in Sudan.** Specifically, the recommendations will differentiate between (a) opportunities for private sector financing: commercially viable investments that can be made with private sector financing only, (b) upstream reforms needed to address existing market failures and lift key enabling environment constraints to private sector investment, and (c) areas that require public investment for public or quasi-public goods.

**To this end, the report identifies the following recommendations:**

***Public sector interventions***

- (a) Investing in research - How Sudan's agricultural research program should be restructured goes beyond the scope of this report. Some specific recommendations, however, about how to start are given in the 2016 policy report (World Bank 2016);
- (b) Providing services - The Government is responsible for putting in place systems that improve plant and animal health, regulate agricultural inputs for safety and efficacy, and disseminate knowledge about production technologies built on scientific findings from agronomy and animal husbandry;
- (c) Helping farmers access more productive genetic material;
- (d) Disseminating knowledge about production technologies;
- (e) Leveraging digital technologies and partnerships with the private sector to deliver extension services;
- (f) Supporting producers' associations to resolve several constraints that prevent smallholders from adopting improved technologies and participating in input and output markets;
- (g) Improving land markets and land-use planning; and
- (h) Investing in gum Arabic to fight desertification and climate change.

***Opportunities for private sector solutions***

- (a) Addressing the information gap by employing mobile technology to lower the cost of acquiring price and market information;
- (b) Providing digital technologies to match buyers and sellers;
- (c) Providing resilient agricultural inputs, equipment, technologies, skills, and advisory and extension services for productivity enhancement; and
- (d) Providing in infrastructure, for example, investments in storage, cold chains, processing and value addition.

***Building integrated supply chains through public-private collaboration***

- (a) Enhancing standards and providing quality infrastructure through public-private partnership, while including smallholders;
- (b) Strengthening preexisting geographic clusters of agricultural activity to address multiple physical infrastructure challenges; and
- (c) Addressing access to credit constraints by introducing warehouse receipt systems, partial credit guarantee funds, mobile phone lending, and innovative insurance products to share risk.

**These recommendations are intended to serve as a starting point for in-depth dialogue between public and private sector stakeholders to define a road map for agriculture sector development in Sudan.** Further research will be required to fill in multiple data gaps and agree on sequencing, scale, and sources of investments. The report suggests the following sequence of actions, to serve as a starting point for a dialogue between the Government of Sudan, the private sector, and the donor community about how the recommendations in this report might be turned into actions:

### *Short-term actions*

- Establish a unit to collect and organize market information. Use the data to analyze costs along the five value chains and conduct benchmarking exercises.
- Establish a collaboration between the Government, the private sector, and donors to build up a digital catalogue of smallholder technologies, emphasizing good agricultural practices (GAPs). Survey the use of digital technologies to help deliver extension services in other countries and draw lessons.
- Build a focused library of current land-use practices based on satellite images and ground surveys.
- Begin a dialogue among stakeholders about potential corridors for migrating livestock herds.
- Evaluate the programs that support gum Arabic producer organizations and draw conclusions about whether the programs can be scaled and whether similar programs might be useful for dairy, livestock, sesame seeds, and horticulture.
- Evaluate the current warehouse and warehouse receipt program and determine whether the program can be expanded to other crops and other places.
- Evaluate hurdles to importing or domestically producing better seeds, planting materials, equipment, and technology.
- Evaluate the use of digital technologies to disseminate market information and match buyers and sellers based on domestic and international experiences.
- Evaluate the investments needed to conduct agricultural research and better manage plant and animal health based on domestic and international experiences.
- Begin a dialogue with stakeholders about public and private food safety and quality standards.
- Evaluate the efficacy of programs that use gum Arabic trees to promote environmental objectives.
- Analyze the regulatory environment for fertilizer, pesticides, and other chemical inputs.

### *Medium-term actions*

- Design and launch a program to disseminate price and market information via radio, newspapers, and collaborations with mobile carriers.
- Based on additional value chain analysis, begin a discussion with producers, processors, and other stakeholders about feasible SME clusters, incentives, and financing options. Based on the dialogue, develop a program to promote specific clusters that include smallholders in more fully integrated supply chains. Devise incentive programs to prompt investments in supply chain hardware and software. Expand warehouse receipt programs where needed and where economically feasible.
- Based on analytical results, begin to make investments in the Government's capacity to develop smallholder-focused research and deliver services. Develop programs that leverage technology and public-private partnerships to supplement government-provided research and extension services.

- In consultations with stakeholders and based on earlier analysis, establish livestock migration corridors where warranted.
- In consultations with stakeholders, evaluate land-use practices and outcomes, utilizing landscape approaches and drawing on international best practices.
- Examine land market institutions and, drawing on domestic and international experience, design a program to strengthen smallholder land rights, fairly adjudicate land disputes, and facilitate transparent land markets.
- Based on stakeholder dialogue, revise public food safety standards and facilitate the use of private standards. Introduce programs that help smallholders meet the new standards.
- Design and implement a program to reduce hurdles in importing the plants, animals, and equipment associated with better agricultural technologies.
- Design incentives, like challenge funds, to encourage private companies and nongovernmental organizations (NGOs) to offer digital services to help integrate buyers and sellers, help integrate smallholders in supply chains, help producers benefit from social and environmental impact premiums, and help extend credit and insurance markets.
- Based on earlier analysis and stakeholder dialogue, design and launch programs that use gum Arabic orchards to achieve environmental objectives where appropriate.
- Based on earlier analysis and stakeholder dialogue, design and implement a program to lessen the impacts of chemical inputs on people and the environment.

#### *Longer-term actions*

- Continue to invest in the Government's capacity to manage and monitor public expenditures.
- Continue to build the Government's capacity to deliver services in collaboration with partners.
- Strengthen land institutions and markets.
- Based on domestic and international experiences and stakeholder dialogue, build better protections for land and water resources.

## Chapter 1: Introduction

### Summary

- The agriculture sector is important for the growth, rebuilding, and resilience agenda of the new Transitional Government in Sudan.
- The analysis aims to identify promising market opportunities in the agribusiness sector and to present clear recommendations for the public and private sector interventions, following the Maximizing Finance for Development (MFD) agenda.
- This study builds on World Bank Sudan Agribusiness SME Diagnostic and is coordinated with Sudan Agrifinance Diagnostics.
- The research, initiated in 2018, was disrupted by the political unrest and the Coronavirus Disease 2019 (COVID-19) pandemic. The research was conducted through desk research, primary data collection, and stakeholder consultations.

1. **Sudan, the third largest country in Africa, is located between the Arab world to the north and Sub-Saharan Africa to the west and the south and flanked by the Red Sea to the east on the coast of which lies Port Sudan, its principal port handling the bulk of its external trade.** The north of the country is predominantly desert, while the south is mostly savannah. Geographically, historically, and culturally, the country sits at the crossroads between Sub-Saharan Africa and the Middle East and enjoys vast ethnic, cultural, geographic, and ecological diversity. An estimated population of 41.8 million in 2018 is dominated by the youth. Population density is the highest along the Nile River, which runs south to north and is also the country's most distinct geographical feature. Administratively, Sudan is divided into 19 states and Abyei areas with special administrative status, as they are considered to be simultaneously part of both the Sudan and South Sudan.

2. **The current political situation is relatively stable after an extended period of uncertainty, and the Transitional Government is moving forward on a reform program to spur economic growth, recovery, and resilience.** The Sudanese Revolution with nationwide street protests, which erupted in December 2018, resulted in a military coup d'état on April 11, 2019. Political anarchy led to economic collapse of the country, foreign reserves depleted, the currency exchange rate deteriorated, and economic growth took a nosedive. Sudan is a heavily indebted poor country (HIPC). Further, public protests against the military takeover led to Sudan's military council and opposition coalition representatives forming a Transitional Government on August 20, 2019 for a transition period of 39 months, leading to public elections.

3. **The General Framework for the Program of Transitional Government, adopted in December 2019, sets out the following 10 government priorities:**

- (a) Putting an end to war and building fair, comprehensive, and sustainable peace
- (b) Addressing the economic crises and establishing the bases of sustainable development
- (c) Combatting corruption and committing to transparency and accountability
- (d) Promoting public and private freedoms and safeguarding human rights



- (e) Ensuring the promotion of the rights of women in all areas and their equitable representation in the structures of governance
- (f) Restructuring and reforming the organs of the State
- (g) Establishing a balanced foreign policy that ensures the interests of Sudan
- (h) Supporting social welfare and development and preserving the environment
- (i) Enhancing the role of youth of both sexes and expanding their opportunities in all areas
- (j) Organizing the process of constitution making and the preparation for free and fair elections

4. **The second government priority of ‘addressing the economic crises and establishing the bases of sustainable development’ includes,** among others, ‘developing and promoting productive sectors (agriculture, livestock, industry); strengthening economic security, ensuring provision of food, and combatting poverty; developing and upgrading the livestock sector, providing veterinary services, preserving animal health, and improving the breeds; and enhancing the partnership with the private sector’.

5. **With due regard to the growth, rebuilding, and resilience agenda of the Transitional Government, this report examines the existing and potential competitiveness of Sudan’s agribusiness sector, especially high-potential agricultural value chains.** This assessment, which follows the Agribusiness Deep Dive Methodology<sup>3</sup> developed by the World Bank Group’s Finance, Competitiveness and Innovation (FCI) Global Practice, seeks to answer the following core questions which would contribute toward ‘developing and promoting productive sectors (agriculture, livestock, industry)’ as an important part of the second government priority of ‘addressing the economic crises and establishing the bases of sustainable development’:

- What are the promising market opportunities in the agribusiness sector?
- Development of which key sub-sectors can best balance private investment potential and anticipated development impact?
- What policy reforms and investments may be needed to maximize selected sub-sectors’ potential?
- Which specific markets can be competitively targeted by local firms and farmers, as well as foreign investors?

6. **This report complements other studies being undertaken within the World Bank Group, in the wider development partner ecosystem and the Government, intended to contribute to the nation’s transformation through the development of agriculture.** It builds on the World Bank Sudan Agribusiness SME Diagnostic prepared in June 2019, which focused specifically on the opportunities and constraints for fostering entrepreneurship and growth of small and medium enterprises (SMEs) in the agribusiness sector. The study combined desk research and in-country firm-level interviews to evaluate eight key parameters of the agribusiness entrepreneurship ecosystem: (a) geographically clustered growth-oriented SMEs; (b) SME capacity; (c) scalable, accessible, and viable markets; (d) scalable production potential; (e) access to finance; (f) infrastructure constraints; (g) regulatory constraints; and (h) clear, ready champions. Further, this report is prepared in coordination with the Sudan Agrifinance Diagnostic, to be completed in June 2020, that aims to assess key constraints and opportunities in Sudan’s agriculture

---

<sup>3</sup> See annex 2 for details.

finance market and make recommendations to key stakeholders on how to strengthen the market. The overall goal is to contribute to enhancing farmers’ and agricultural SMEs’ access to and use of suitable, competitive, and sustainable financial services. The diagnostic study is conducted as part of the World Bank’s financial sector support to the Government toward developing a national financial inclusion strategy for Sudan.

7. **Research methodology and COVID-19 adjustments.** The research was initiated in 2018 but was disrupted by the political unrest that engulfed the country from end 2018 to early 2020, and the work had to be stopped as no missions or field work was possible in Sudan. With the formation of the Transitional Government in August 2019, gradually, unrest and violence subsided, and the overall political situation improved considerably. The research work was resumed, and the first (and only) mission was carried out in March 2020. The field work was limited to Khartoum as, due to security concerns, any travels to other regions was not possible. The analysis of the selected value chains was conducted by using key informant interviews, a variety of literature, and independent analysis. The work was divided into two stages: (a) secondary research, which was conducted by studying literature review and relevant academic data and (b) primary research, which was conducted in Khartoum by interviewing the key stakeholders (annex 1), and interviews with internal World Bank Group experts.<sup>4</sup> A planned exercise to estimate current price margins captured by value-chain participants from farm gate to final consumer was disrupted by the COVID-19 pandemic. For some value chains, available limited price information is used to present indications of how price margins have changed over time. The quality of the analysis, however, varies by value chain.

**Table 1.1: Agriculture Value Chain Research Methodology**

Secondary Research	Primary Research
Data gathering through literature review to: <ul style="list-style-type: none"> <li>• Identify key value chains that can transform the agriculture sector in Sudan;</li> <li>• Study the identified value chains and the role of various value chain actors;</li> <li>• Develop standardized report framework;</li> <li>• Identify key constraints and opportunities for each value chain; and</li> <li>• Design appropriate research instruments for data collection, for example, interview questionnaires</li> </ul>	Collection of primary data in Khartoum in March 2020 to validate the hypothesis formulated based on secondary research: <ul style="list-style-type: none"> <li>• Primary interviews conducted with key stakeholders including processors, exporters, importers, trade associations, and Sudan’s government officials;</li> <li>• Stakeholder focus group discussion to support the findings and recommendations; and</li> <li>• Consultations with World Bank Group experts</li> </ul>

8. **This report is divided into six chapters.** *Chapter 2* provides an overview of the sector by laying out key opportunities and performance indicators. *Chapter 3* delves into the cross-cutting constraints and outlines limitations within each segment of the larger agricultural value chain ecosystem. *Chapter 4* presents the approach for selecting value chains for deeper assessment with a view to focus on and prioritize deployment of resources. *Chapter 5* identifies and assesses challenges and opportunities within each of the five selected value chains. Finally, *Chapter 6* synthesizes the preceding analysis across the sector and within value chains and provides recommendations for policy and institutional reforms as well as for public and private investments to unleash the agriculture sector’s potential.

<sup>4</sup> See annex 1 for a list of stakeholders interviewed.

## Chapter 2: Agriculture as a Lever for Transformation

### Summary

- The agriculture sector, with ample natural endowments, sizeable existing base in the economy, direct impact on food security, and scope for (especially rural) youth employment, is an obvious choice for the growth, rebuilding, and resilience agenda of the new Transitional Government of Sudan.
- Agriculture is the backbone of the Sudanese economy, generating one-third of gross domestic product (GDP) and having a labor share of more than 50 percent.
- Necessary investments in hard and soft infrastructure have long been insufficient or neglected to a point of constraining the business environment and restricting the opportunities for sustainable growth in agriculture and other sectors.
- Agricultural value chains in Sudan remain underdeveloped, fragmented, and inefficient with complex supply chains involving multiple actors from the formal and informal sectors, fluctuating product volumes, lack of standards, widespread variations in product quality, poor infrastructure, and limited access to market information.
- Sudan's agroecological characteristics are suitable for a wide variety of crop cultivation and animal husbandry. With under 23 percent of arable land being cultivated and yield level of most crops currently being lower than Sudan's own best in the past, the potential to raise production remains high.
- There is a considerable potential to increase value addition for processing. For at least three of Sudan's key exports—sheep, goats, and gum Arabic—the ability to export in processed form presents significant upside potential. Significant pricing upside and job creation can take place if value chains can be upgraded to export processed as against raw agricultural products.

### The context

10. **With per capita GDP of US\$977, Sudan is in the lower bracket of lower-middle-income countries and performs below its peers across several human development outcomes.** Human development indicators are low and Sudan's Human Development Index (HDI) value for 2018 is 0.507, which places it at 168 out of 189 countries and territories.<sup>5</sup> Children in Sudan can expect to attend 7.4 years of schooling, and the primary enrolment rate stands at 69 percent.<sup>6</sup> Similarly, malnutrition levels are higher than the average for peers (Figure 2.1), including elevated maternal and infant mortality. In 2014/15, the official estimates set the national poverty rate at 36.1 percent. In urban areas, poverty appears to have increased and is currently slightly higher than the rural poverty rate (37.3 percent and 35.5 percent in urban and rural, respectively) even as two-thirds of the population continues to be in the rural areas.<sup>7</sup> There are also marked spatial disparities in poverty incidence. Unemployment levels are high with the end of the oil

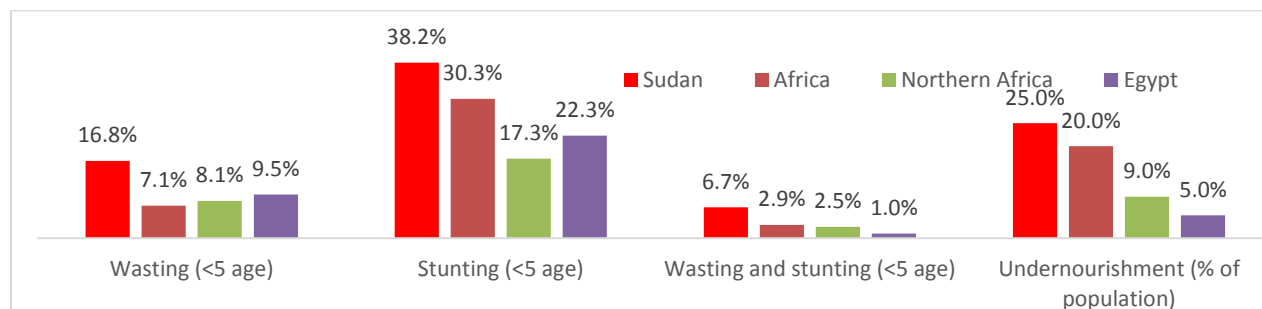
<sup>5</sup> United Nations Development Programme (UNDP), Human Development Report 2019, Inequalities in Human Development in the 21st Century: Briefing Note for Countries on the 2019 Human Development Report, [http://hdr.undp.org/sites/all/themes/hdr\\_theme/country-notes/SDN.pdf](http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/SDN.pdf).

<sup>6</sup> The regional average is 79.

<sup>7</sup> Mapping Poverty in Sudan, June 2019, World Bank.

economy, after South Sudan’s secession in 2011. The related decline in wage-earning jobs has hit urban workers especially hard (Global Nutrition Report, 2018; *Reuters*, January 2019; Table 2.1).<sup>8</sup>

**Figure 2.1: Malnutrition levels in Sudan**



Source: Global Nutrition Report, 2018; Reuters, January 2019

**Table 2.1: Key demographic parameters**

	Population Growth (2012-17 CAGR)	Share of population under 25 years (2018)	Unemployment (2018; %)
Sudan	2.4%	64%	12.7%
Sub-Saharan Africa	2.7%	62%	7.3%
Lower middle income	1.5%	42%	4.0%
World	1.2%		5.4%

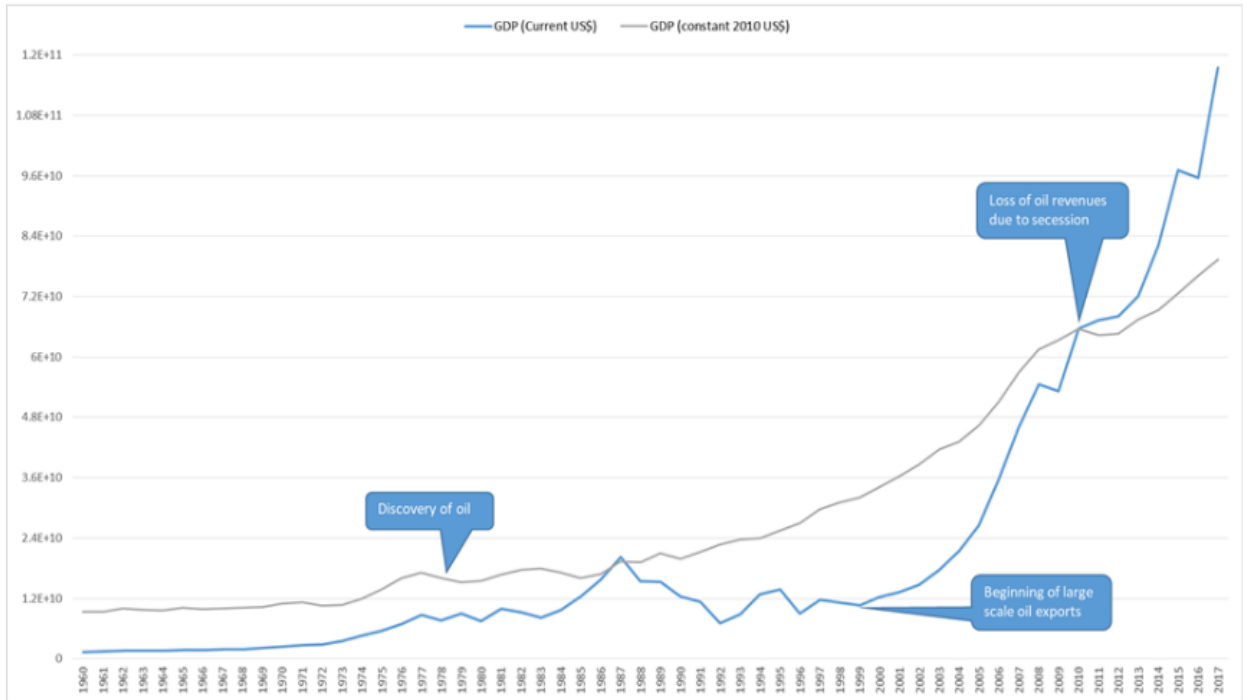
Source: World Bank Database.

11. **While there is considerable economic potential in Sudan, necessary investments in hard and soft infrastructure have long been insufficient or neglected to a point of constraining the business environment and restricting the opportunities for sustainable growth in agriculture and other sectors.** The discovery of oil in 1978 and the emergence of Sudan as a major oil exporter in 1999 contributed to a robust, albeit erratic, economic growth (Figure 2.2 and Figure 2.3). While oil revenues drove significant overall increases in consumption, foreign direct investment (FDI), and local investment, the sectoral and spatial spread of resources remained skewed. Investments in agriculture did not rise concomitantly even as subsidies consumed a large share of public spending and the sector remained the main employer. Regional redistribution of wealth took place to some extent but was poorly targeted, nontransparent, and insufficient. When it comes to overall agriculture spending, it was primarily at the federal level with the spending being low at the state level.<sup>9</sup> Regional and ethnic divides combined with economic and social inequities have contributed to persistent conflict and erratic progress.

<sup>8</sup> Sudan Financial Sector Assessment, World Bank, 2019.

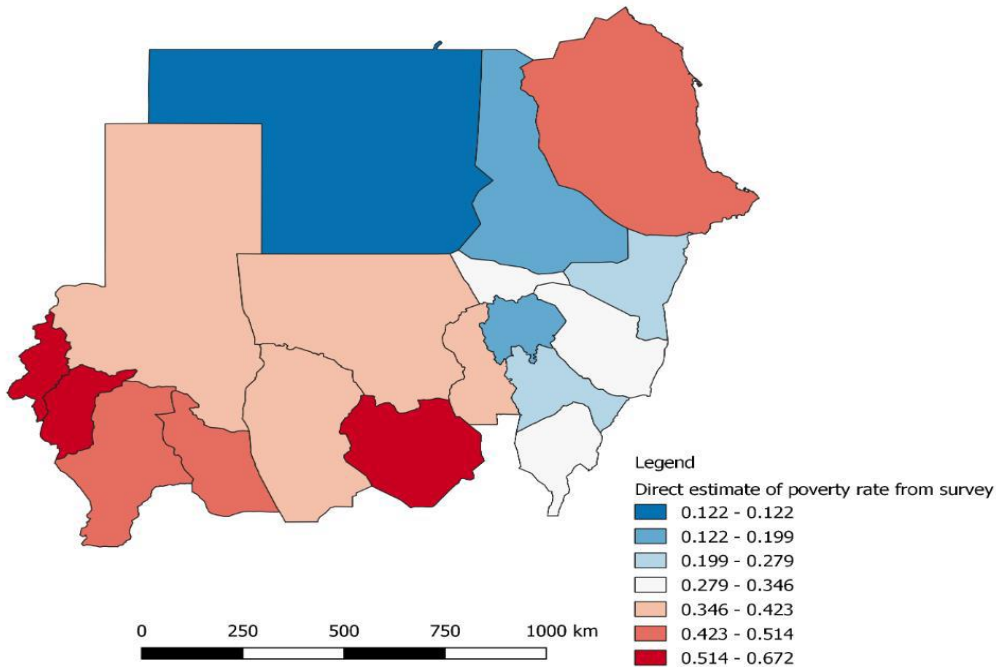
<sup>9</sup> Public Expenditure Review, 2007.

Figure 2.2: Sudan GDP growth with key milestones



Source: World Bank Database; World Bank Country Economic Memorandum (2015).

Figure 2.3: Sudan regional imbalances

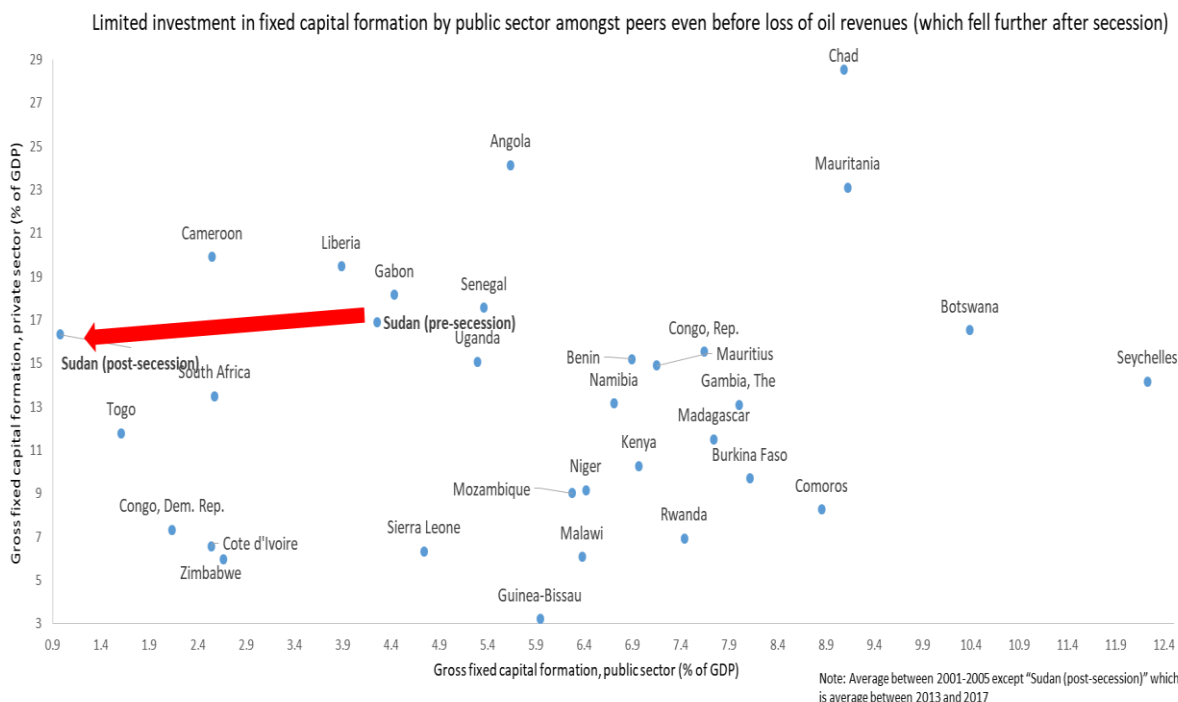


Source: World Bank 2019, Mapping Poverty in Sudan.

12. **Public investment plummeted after the loss of oil revenues (which comprised 61 percent of the total government revenues) pursuant to secession from South Sudan in 2011.** Even during the times of high government revenues driven by oil exports, Sudan lagged behind many of its peers in the contribution

of the public sector in capital formation (Figure 2.4). Volatility in oil revenues (which led to severe budget shortfalls in some years) combined with rising obligations stemming from decentralization and the Comprehensive Peace Agreement (CPA)<sup>10</sup> raised indebtedness and crowded out private credit. Against this backdrop, the loss of revenues from oil led to a situation where even the existing levels of investment (and expenditures<sup>11</sup>) were difficult to maintain.

**Figure 2.4: Low public investment, even during the oil boom, further reducing after secession**



Source: World Bank Database.

13. **Resource mobilization from non-oil sectors in the near/medium term and redistributive resource allocation in the medium/long term would be necessary for a return to stability.** While policy adjustments, fiscal austerity, and central bank financing have been carried out to absorb and correct the imbalance caused by the secession, a medium- to long-term solution will have to incorporate the diversification and expansion of revenue streams through the development of other (non-oil) sectors/exports and drawing in significantly larger quantum of private investments.

14. **With natural endowments, sizeable existing base in the economy, direct impact on food security, and scope for (especially rural) youth employment, the agriculture sector is an obvious choice for driving recovery and stability in line with the General Framework for the Program of Transitional Government.** Undertaking actions to encourage the already vibrant domestic private sector<sup>12</sup> and attracting FDI can also limit the expenditure burden on the public sector's dwindling financing. There is

<sup>10</sup> The CPA was signed in early 2005 marking the end of nearly four decades of civil war in Sudan. The CPA provided for significant shares of oil revenues to be transferred to the Government of South Sudan

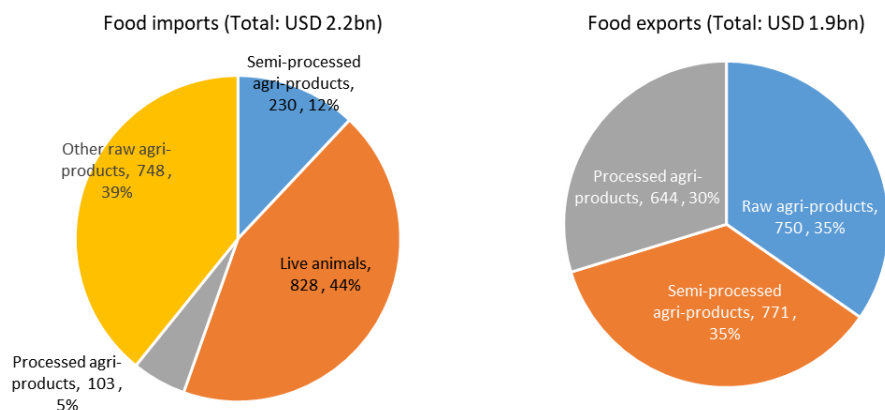
<sup>11</sup> Subsidies on fuel and wheat as high as 50 percent or more contributed to raising the budget deficit. Attempts to raise bread and fuel prices sparked sustained protests that have unseated the incumbent government and the country continues to reel under political instability.

<sup>12</sup> This is evidenced in the significantly greater contribution of Sudan's private sector to gross fixed capital formation compared to the contribution of the public sector (Figure 2.4).

some evidence to suggest that the GDP growth originating in agriculture is at least twice as effective in reducing poverty as the GDP growth originating outside the sector.<sup>13</sup> Sudan has underexploited the potential across agriculture and trade, presenting opportunities for value addition to drive job creation and entrepreneurship, particularly for the currently underserved and unemployed rural and young population.<sup>14</sup> Large tracts of land remain under low-productivity cultivation, and production of cereals is largely limited to subsistence production with low value addition. Even with a favorable geographic location, Sudan plays a limited role as a sub regional trade hub, being constrained by logistics investments, particularly intermodal transportation.

15. **Value chains in the agriculture sector remain underdeveloped and fragmented and lack integration.** A majority of food exports are unprocessed products while a majority of food imports are in a semi- or fully processed form (Figure 2.5). Agricultural markets in Sudan remain underdeveloped, fragmented, and inefficient with complex supply chains involving multiple actors from the formal and informal sectors, fluctuating product volumes, lack of standards, widespread variations in product quality, poor infrastructure, and limited access to market information. The lack and inadequacy of information, in particular regarding market data, represents a sizeable impediment to market access, especially for the country's numerous smallholder producers. This raises transaction costs significantly and reduces market efficiency.<sup>15</sup> Since many manufacturing activities in Sudan are closely linked to the agriculture sector, which provides the essential raw materials for the most important sub-sectors, such as sugar, food and beverages, textiles, and leather, the lack of development of an efficient agro-processing sector is a key constraint. The absence of close inter-sectoral links contributes to unintended consequences of policy interventions that favor one stage of an integrated value chain while ignoring the other stages.<sup>16</sup>

Figure 2.5: Import and export of agricultural products



Source: FAO; United Nations International Trade Statistics Database (UNCOMTRADE).

<sup>13</sup> [http://siteresources.worldbank.org/EXTGPAA/Resources/Agribusiness\\_eval.pdf](http://siteresources.worldbank.org/EXTGPAA/Resources/Agribusiness_eval.pdf).

<sup>14</sup> "It is well known that agro-industry normally has a much larger employment multiplier than other branches of the manufacturing sector because of the higher labor intensity of agriculture, especially for fruits and vegetables and other non-mechanized parts of agriculture." Sources: Food and Agriculture Organization of the United Nations (FAO) (<http://www.fao.org/3/y4890e/y4890e0a.htm>), World Bank ([https://ieg.worldbankgroup.org/sites/default/files/Data/DynamicsofRuralgrowthinBangladesh\\_Madhur%20Gautam.pdf](https://ieg.worldbankgroup.org/sites/default/files/Data/DynamicsofRuralgrowthinBangladesh_Madhur%20Gautam.pdf); <https://www.worldbank.org/en/publication/wdr2019>).

<sup>15</sup> Sudan National Agriculture Investment Plan (SUDNAIP).

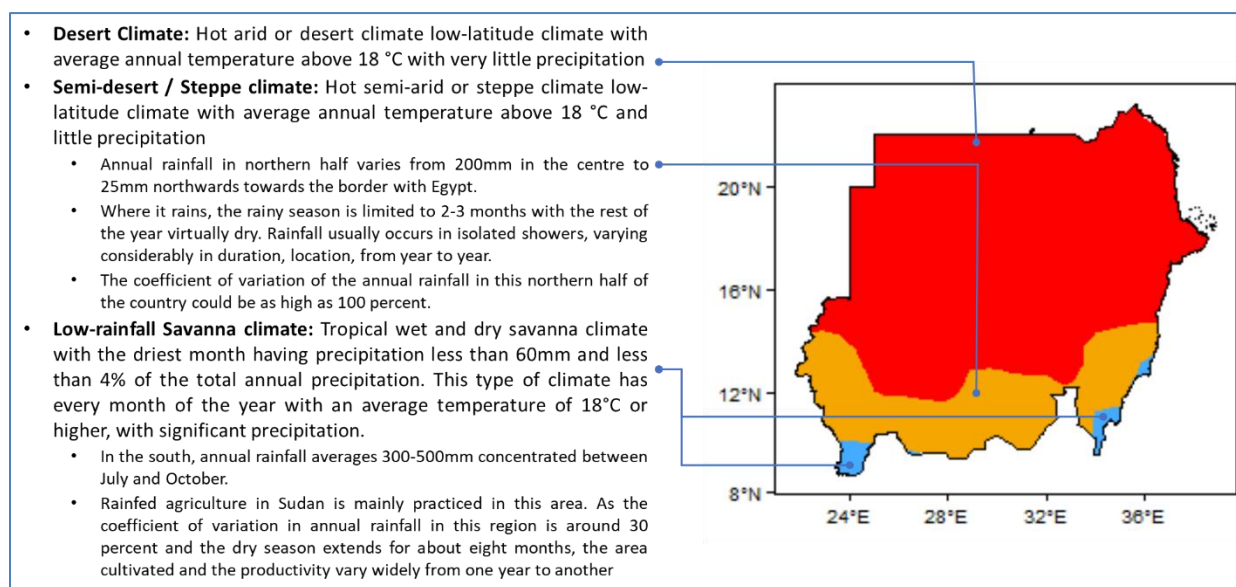
<sup>16</sup> Diagnostic Trade Integration Study, 2014.

## The role of agriculture

16. **Agriculture is the backbone of the Sudanese economy, generating one-third of GDP and having a labor share of more than 50 percent.** In 2000, agriculture's contribution to the GDP was estimated at 40 percent (expressed as a percentage of value added) with a labor share of about 60 percent. With the discovery and production of oil, the economic importance of agriculture decreased significantly. With the secession of South Sudan in 2011 and a drop of three-quarters of the oil output and two-thirds of foreign exchange earnings, agriculture has regained its economic prominence. Agriculture's share of GDP, which was estimated at 24 percent in 2011, increased to 33 percent in 2012. Similarly, labor's share in agriculture, which stood at 50 percent at the time of the secession of South Sudan in 2011, increased to 54 percent in 2012. Agriculture provides livelihood to approximately two-thirds of the population.

17. **Sudan's agroecological characteristics are suitable for a wide variety of crop cultivation, and animal husbandry with 74 million ha of cultivable land,<sup>17</sup> 110 million heads of animals, marine and freshwater fisheries resources, underground and surface water supplies, biodiversity, and genetic pool presents opportunities (Figure 2.6).**

Figure 2.6: Agroclimatic profile of Sudan



Source: FAO; Netherlands Enterprise Agency.

18. **Access to water resources from the Nile River and large irrigated areas** extending around the fertile Nile river valley enable intensive agriculture even though 90 percent of Sudan's area is classified as 'arid'<sup>18</sup> (Figure 2.7). Between 2009 and 2013, the largest share of agricultural GDP was derived from livestock production (47 percent), with large-scale irrigation (28 percent) being the second largest,

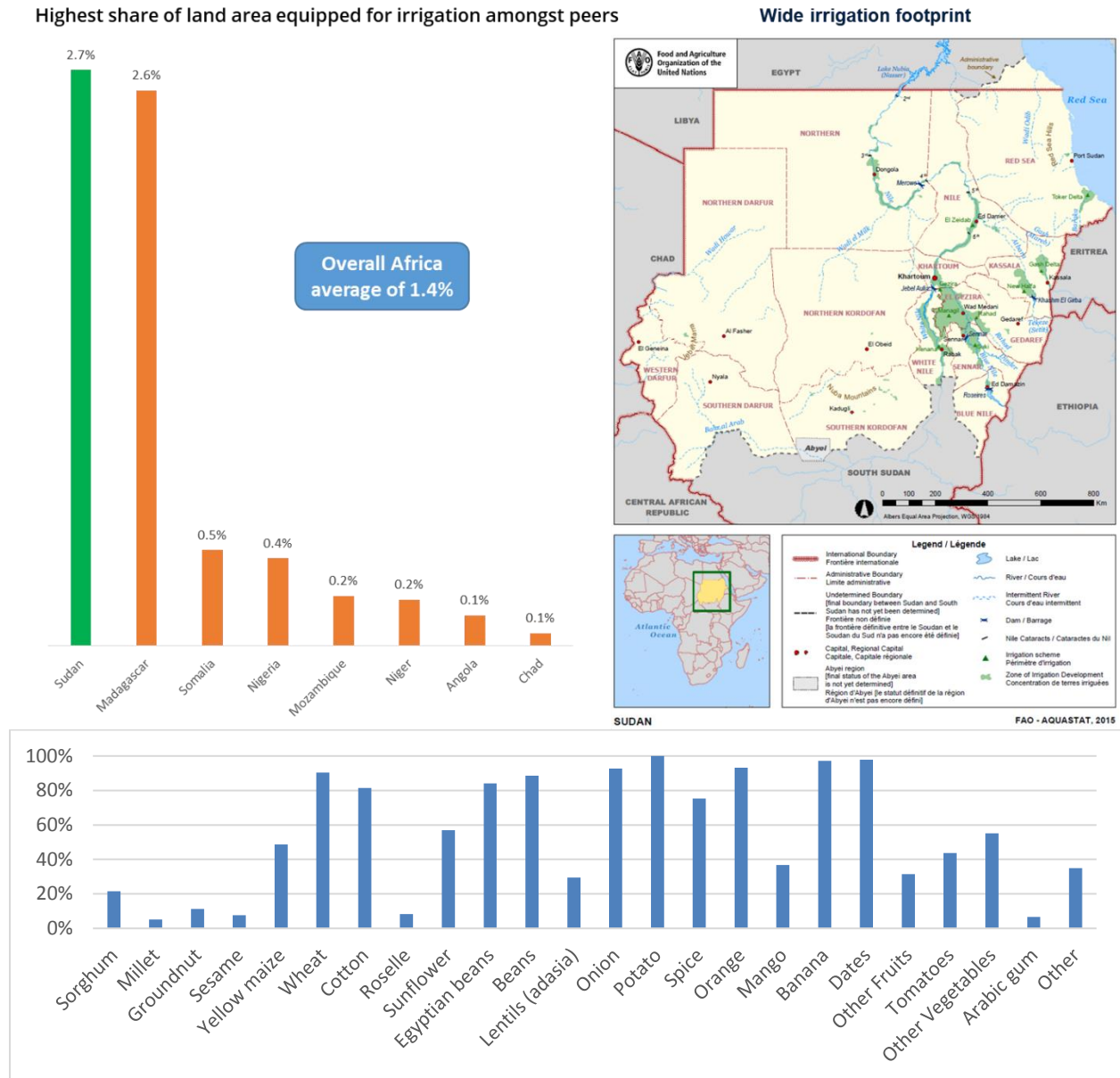
<sup>17</sup> Two-thirds of the irrigable area developed in Africa is between the three countries of Sudan, South Africa, and Madagascar. Yet, potentially 20 million ha of land could be brought under irrigation. Source: <https://agra.org/wp-content/uploads/2017/09/Final-AASR-2017-Aug-28.pdf>

<sup>18</sup> Defined as "having little or no rain; too dry or barren to support vegetation."



followed by traditional rain-fed farming (15 percent), forest products (7 percent), and semi-mechanized farming (3 percent).<sup>19</sup>

Figure 2.7: Coverage of irrigation in Sudan



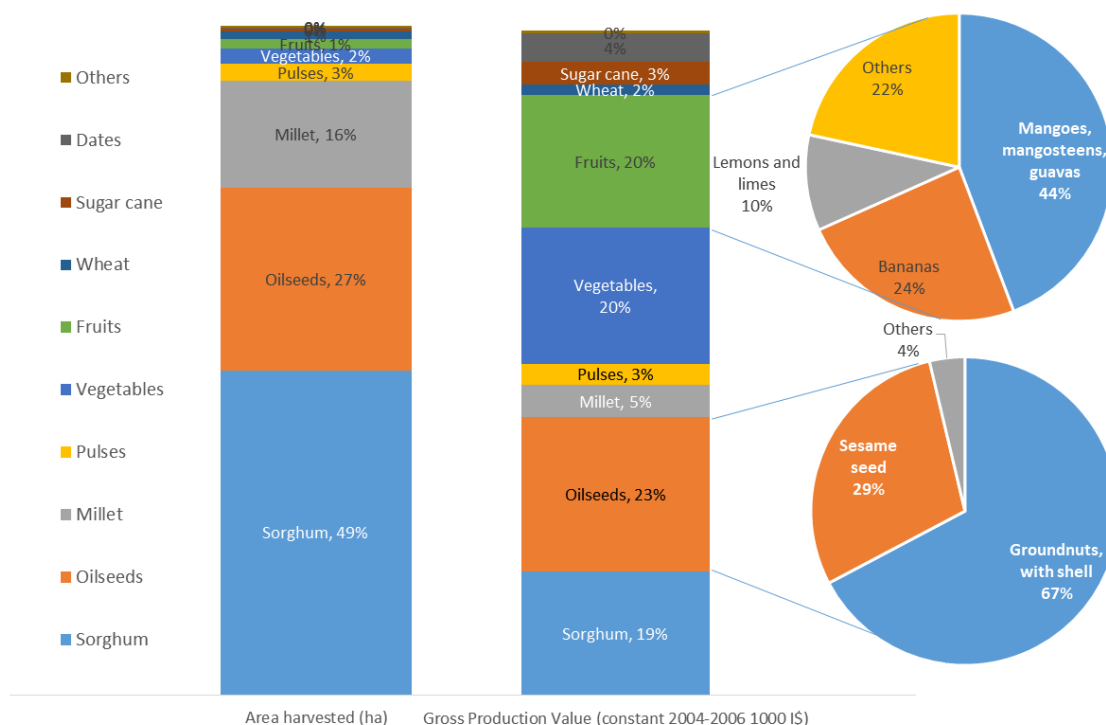
Source: World Bank 2019b; FAO.

19. **Sudan is home to a diverse basket of agriculture products, in some of which it has a unique advantage (Figure 2.8).** The country’s favorable location at the crossroads of Sub-Saharan Africa and the Middle East places it in greater proximity to some of the largest sesame importing countries (China, Iran, and Turkey) and meat (goat and sheep) importing countries (China, France, the Middle East, and the

<sup>19</sup> SUDNAIP

United Kingdom) compared to competing exporters. It had distinguished strength in gum Arabic,<sup>20</sup> a key input in food and industrial products worldwide. A wide basket of oilseeds—cottonseed, groundnut, sesame, and sunflower—also enables relatively better resilience against imports of cheaper oils (a dynamic being faced by all edible oil deficit countries that do not produce palm oil).

**Figure 2.8: Volume and value of agriculture commodities produced in Sudan**



Source: FAO Statistical Database (FAOSTAT); UNCOMTRADE; United States Department of Agriculture (USDA).

Note: The chart does not include another prime commodity—gum Arabic—on account of unavailability of accurate data. Value of gross production is compiled by multiplying gross production in physical terms by output prices at farm gate (FAOSTAT).

20. **There is a significant headroom for agricultural production growth.** With only under 23 percent of arable land being cultivated and yield level of most crops currently being lower than Sudan’s own best in the past, the potential to raise production remains high (Figure 2.9). While lack of prioritization during the oil boom may have contributed to a declining trend in productivity,<sup>21</sup> the better productivity levels of neighboring countries with similar natural resources indicate that improved resource allocation could potentially plug this gap<sup>22</sup> (Figure 2.10). As far as livestock is concerned, even as higher resource allocation to feeding programs, animal treatments, vaccinations and disease surveillance, and slaughter and

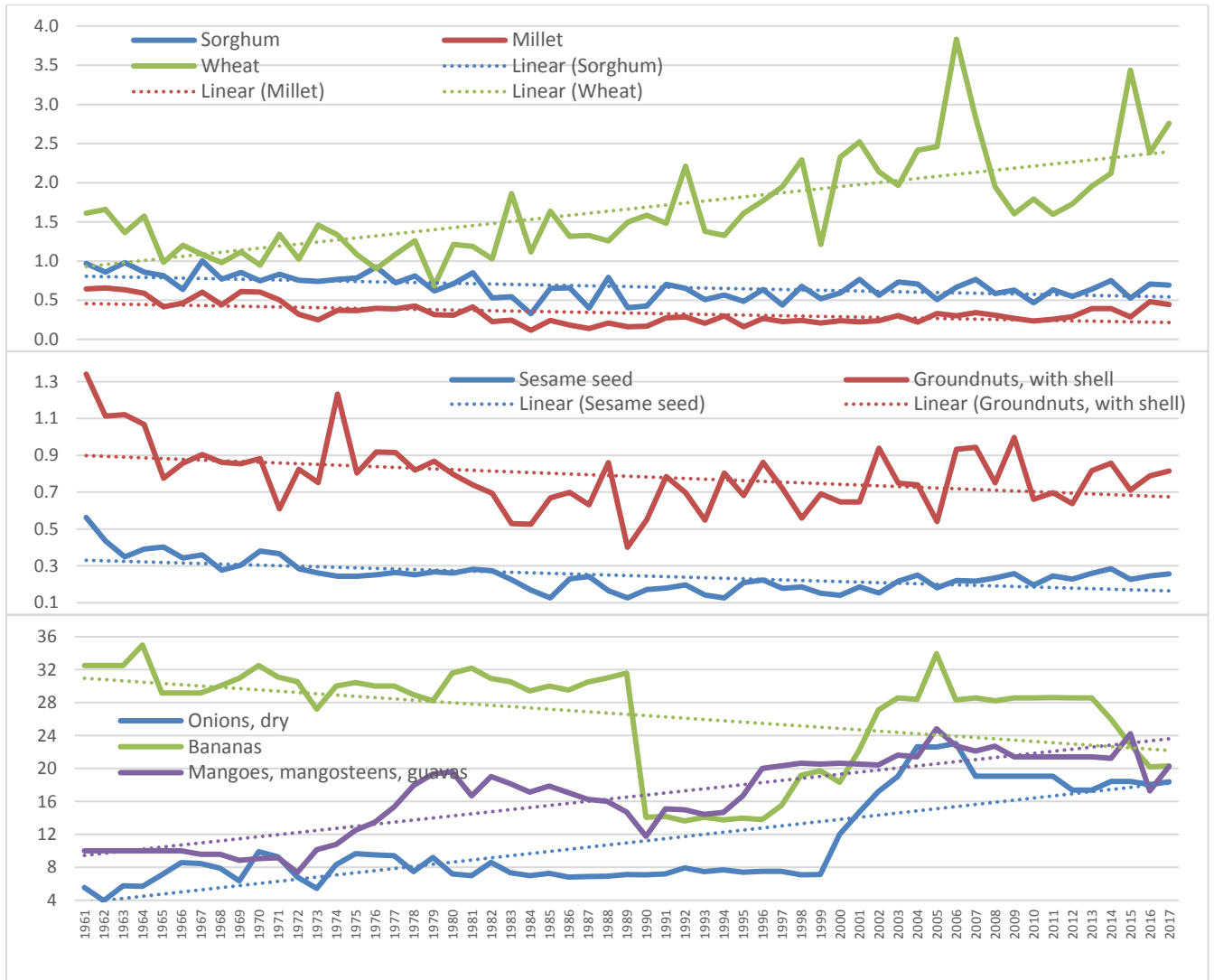
<sup>20</sup> The three largest exporters of crude gum Arabic are Sudan, which accounts for 66 percent of the total, Chad with 13 percent, and Nigeria with 8.5 percent, in 2014–2016. Source: FAOSTAT.

<sup>21</sup> Not only have farm yields fallen, a decline in Total Factor Productivity (TFP) to the extent of 20 percent has been seen since 2011. TFP—which measures differences in productivity that are not due to differences in use of inputs, but rather attributable to factors such as technological progress and efficiency in the conversion of inputs to outputs—is considered a more holistic measure of productivity as against farm yields alone. Source: Sudan: Improving the Quality of Public Expenditures in Agriculture, World Bank, 2017

<sup>22</sup> Yield gaps in various crops under irrigated conditions range from 50 percent to about 140 percent, while under rain-fed conditions these range from 200 percent to 500 percent. Source: FAOSTAT.

quarantine facilities<sup>23</sup> has already contributed to more than doubling of livestock exports in this period, the average livestock yield remains lower than the North and East African average.

Figure 2.9: Productivity trend in key crops



Source: FAOSTAT.

<sup>23</sup> Between 2010 and 2017, budget allocation to these programs increased four times.

Figure 2.10: Productivity benchmarking in key crops and livestock

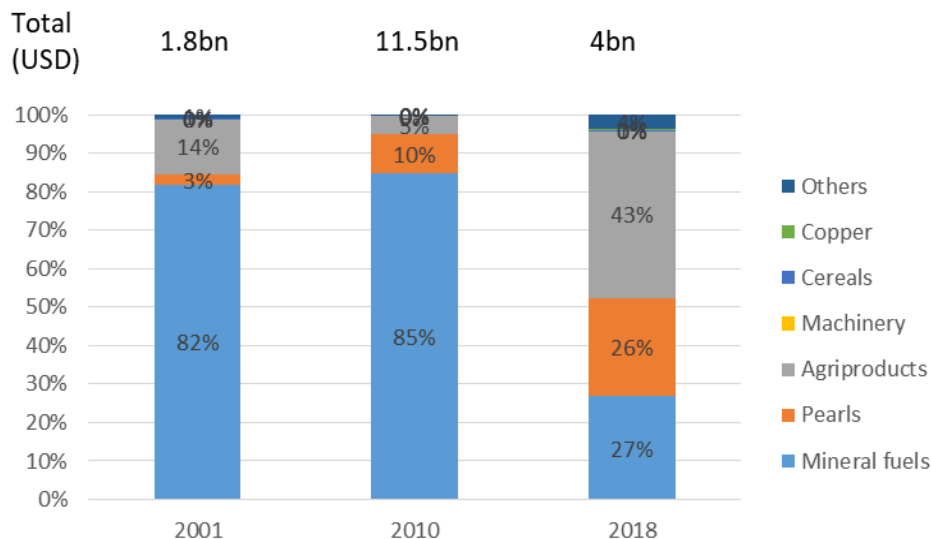
Yields		Sudan	N. Africa	E. Africa
Livestock (kg/Animal)	Milk, whole fresh cow	357	955	378
	Milk, whole fresh goat	62	59	66
	Milk, whole fresh sheep	23	30	41
	Meat, cattle	109	186	137
	Meat, sheep	16.3	16.4	11.4
	Meat, camel	275	271	219
Crops (MT/ha)	Sorghum	0.66	0.76	1.4
	Groundnuts, with shell	0.80	0.89	0.79
	Onions, dry	18	26	8
	Millet	0.40	0.40	1.3
	Bananas	24	33	8
	Mangoes, mangosteens, guavas	21	14	12
	Tomatoes	13.7	39	13.4
	Sesame seed	0.26	0.27	0.75
Wheat	2.5	2.6	2.5	

Source: FAOSTAT.

Note: Given fluctuating yields, data shown as average over five years (2013–17); N. Africa includes Algeria, Egypt, Libya, Morocco, Sudan, and Tunisia; E. Africa includes Burundi, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, Uganda, Tanzania, Zambia, and Zimbabwe.

21. **Agriculture has regained its place as a key source of foreign exchange in the last few years.** Though the share of agriculture in the country’s exports plummeted after the commencement of large-scale oil exports since 1999, the loss of oil revenues, after secession of South Sudan in 2011, has been followed by a resurgence in this share, arguably helping cushion some of the impact of the loss of oil revenues (Figure 2.11).

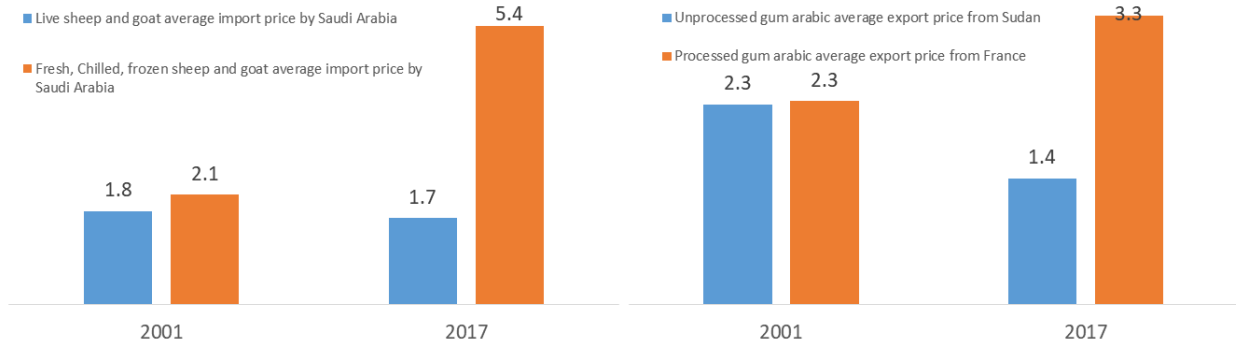
Figure 2.11: Share of agriproduct exports



Source: UNCOMTRADE.

22. **Increased agro-processing and trade can unlock much greater value from agriculture.** For at least three of Sudan’s key exports—sheep, goats, and gum Arabic—the ability to export in processed form presents significant upside potential. Significant pricing upside and job creation can take place if value chains can be upgraded to export processed as against raw agricultural products (Figure 2.12).

**Figure 2.12: Latent potential from processing**

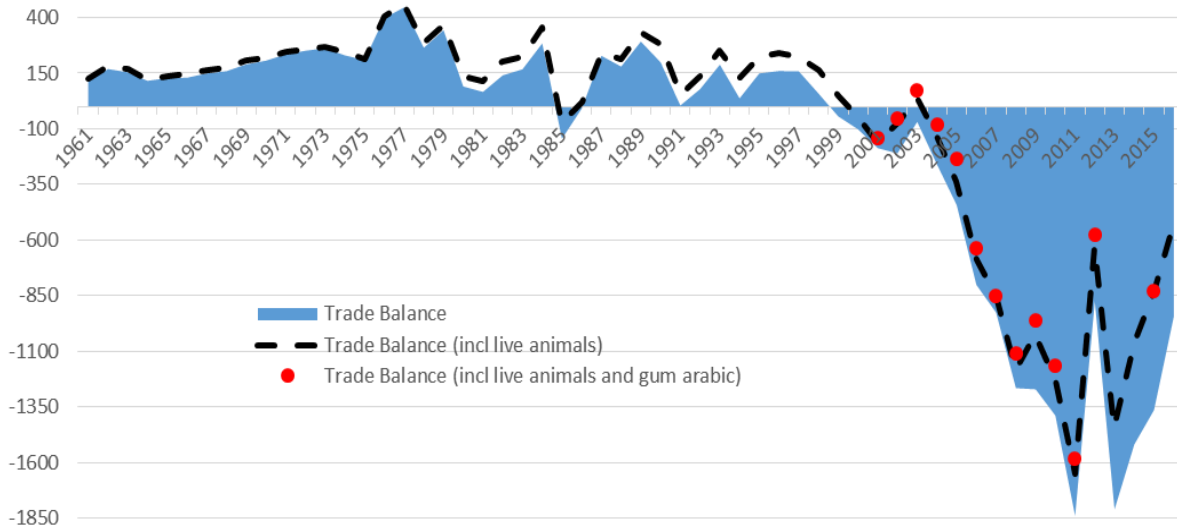


Source: FAOSTAT; UNCOMTRADE.

23. **Although trade deficit in agriproducts has improved significantly since secession (figure 2.8), there is scope to further narrow the deficit through value addition.** Improvement in the deficit has hitherto primarily been driven from export of primary commodities. During the period of the oil boom, trade deficit in agriproducts widened significantly. The disregard/underinvestment in agriculture is evident from the exponential growth in imports since 1999 (since when oil exports rose significantly) of finished/processed agriproducts even as exports of raw agriproducts rose incrementally. While imports of wheat, sugar, and beverages have reduced, sesame exports have declined. The rise in (unprocessed) gum Arabic and live animals has helped reduce the trade deficit (Figure 2.13 and Figure 2.14).

**Figure 2.13: Sudan’s agricultural trade trend in deficit**

Trade balance in agri-products ( USDmn 1961 to 2015)

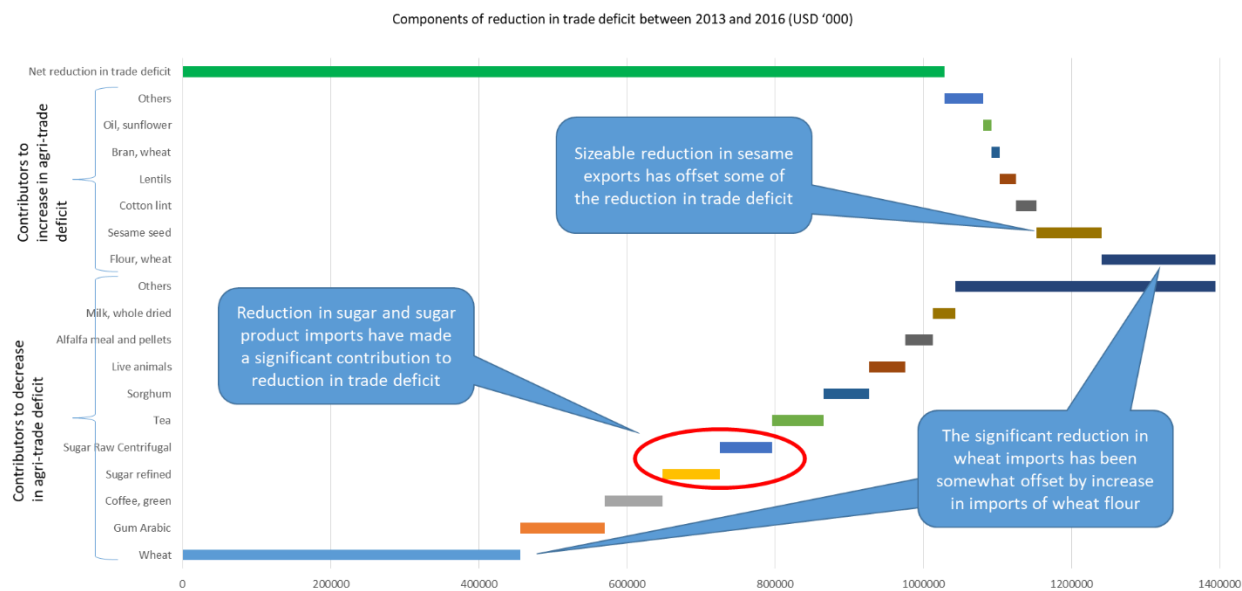


Source: FAOSTAT; UNCOMTRADE.

Note: In imports, key processed products include refined sugar, confectionery, milk products, edible oil, and processed horticulture products and key semi-processed products include wheat flour and crude edible oils. Raw products include wheat, paddy, sorghum for sowing; In exports, these include orange juice, processed pulses, and animal feed; shelled groundnuts, crude groundnut oil, and animal carcasses; and live animals, sesame, and gum Arabic, respectively; Data for 2011 should be disregarded. Since 2011 was the year of secession, reliability and

accuracy of reporting may be suspect. Directional conclusions in the report derive from observing data up to 2010 and 2012 onward.

**Figure 2.14: Key contributors to agri-trade deficit**



Source: FAOSTAT; UNCOMTRADE.

24. **A five-year National Agriculture Investment Plan (SUDNAIP) to achieve 6 percent annual growth for the agricultural sector by 2020 was developed by the Government of Sudan in 2015;<sup>24</sup> however, implementation and results in the sector have not been systematically monitored or measured.** The plan, which was prepared as a comprehensive document using several other earlier plans and programs,<sup>25</sup> has a concerted focus on value chain development, production, and productivity improvement while strengthening support services and food security. The Ministry of Agriculture (MOA) also developed ‘Comprehensive National Food and Nutrition Security Policies’ in 2014. The signing of multiple regional and bilateral agreements on trade and investment including an investment agreement focused on agriculture with Turkey in late 2018 presents opportunities to channel investments for realizing these opportunities. The agreement with Turkey envisages allocating thousands of square miles of Sudanese agricultural land for investment by Turkish companies. The presence of large diversified conglomerates in cultivation and semi-mechanized farming undertaken by medium to large farmers provides the opportunity for implementing improvements over large areas in a relatively short period. However, as of October 2019, there is no publicly available reporting on the progress made under these initiatives, or whether any results/outcomes were achieved. As mentioned earlier, according to the General Framework for the Program of Transitional Government, ‘developing and promoting productive sectors (agriculture, livestock, industry)’ is an important part of the second government priority of addressing the economic crises and establishing the bases of sustainable development.

<sup>24</sup> SUDNAIP, 2016–20

<sup>25</sup> The SUDNAIP was prepared using the following as reference documents: The Quarter Century Strategic Plan (2007–32), the Executive Programme for Agriculture Revival (2008–11), the Three-Year Crash Programme (2011–13), the Three-Year Economic Programme (2012–14), the Five-Year Programme for Economic Reform (2015–19), reports and guidelines of the Comprehensive Africa Agriculture Development Program (CAADP), the technical reports of 10 sub-sectoral groups after review and endorsement by a Core Technical Committee (CTC), and the Comprehensive National Food and Nutrition Security Policies.

25. **Finally, agroecological characteristics that permit production of a range of agriculture products,** including a few in which Sudan has differentiated advantages namely availability of water resources and visible potential to raise both the quantum of production and value addition on the existing base of production, provide strong reasons for an emphasis on agricultural investments.

## Chapter 3: Challenges for Agricultural Development

### Summary

- The evaluation framework for this report takes a holistic view of the sector, that is, tracing agriculture products flows (and the associated cash and information flows) from conception to final consumption—from input supply to production, post-production, processing, and distribution and marketing—to analyze cross-cutting ecosystem constraints for agricultural development in Sudan.
- Key upstream constraints include the following: resources for production are limited and subject to high risks; agroclimatic conditions are accentuated by the effects of climate change; research spending is meagre and erratic; extension services are not inclusive; and defective ecosystem for agriculture inputs and extension services adversely affects productivity.
- Primary midstream constraints include the following: limited value addition and constrained domestic trading channels; scaled commercial processing is limited to select commodities; and domestic trade is highly unorganized creating challenges for reliable, consistent, and quality supplies.
- Notable downstream constraints include the following: suboptimal distribution and logistics infrastructure, limited options for high-quality storage facilities to stabilize incomes between seasons, high post-harvest losses, poor inland logistics; and limited standards and quality infrastructure to conform to international food safety and quality and sanitary and phytosanitary (SPS) requirements.
- Constrained business enabling environment for agribusiness development includes the following: complex macro-economic context with high inflation, fiscal distortions, and currency devaluation; Sudan ranks low (171 out of 190 countries) in the 2020 World Bank Doing Business Survey, and 121 out of 160 countries on Logistics Performance Index (LPI); existing tariff and trade taxation policies create disincentives for exports; access to digital technology and electricity is limited; limited access to finance; access to land constraints due to weak regulatory and institutional framework; and the low share of government budget spending on agriculture further aggravated by the limited access to international finance.

### Framework for assessment

26. **Influencing the direction of agriculture sector development requires an understanding of a wide range of factors that all agriculture products<sup>26</sup> depend upon.** Tracing the flow of agriculture products from their conception up to final consumption and identifying key activities that take place along this path enables a holistic view of these factors and how each of them influences development and economic outcomes. The framework developed for the analysis in this report (Figure 3.1) undertakes this process at two levels: (a) across the spectrum of agriculture products to recognize cross-commodity factors and (b) for specific selected agriculture products.<sup>27</sup> While this process ensures coverage of factors intrinsic or

---

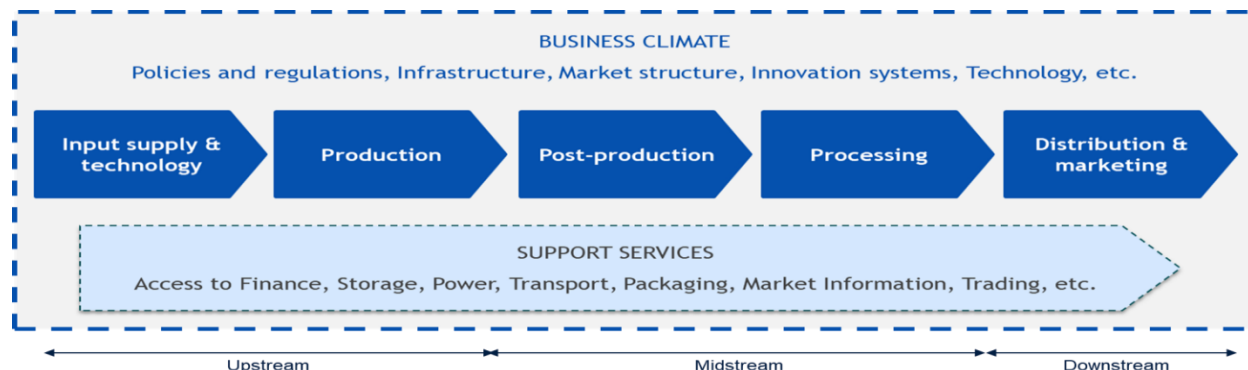
<sup>26</sup> Agriculture products can be broadly grouped into foods, fibers, fuels, and raw materials. Food classes include cereals (grains), vegetables, fruits, oils, meat, fish, milk, fungi, and eggs. Fiber classes include cotton, wool, and silk. Fuels include ethanol, produced from corn, sugarcane, or sorghum. Raw materials include products like rubber and oil palm among others. Source: <https://www.thebalancesmb.com/what-is-an-agricultural-product-2538211>.

<sup>27</sup> The methodology for selection is described in Chapter 4: Prioritizing Value Chains for Affirmative Action.



related to the products, many external factors that are not directly concerned with the products also influence outcomes. Examples of such factors include the overall business environment elements for the functioning of any business such as the availability of and access to enabling infrastructure like roads and electricity, finance, logistics, market information, and so on.

Figure 3.1: Analysis framework



27. **Tracing agriculture products flows (and the associated cash and information flows) from conception to final consumption requires a value chain approach.** It begins with *input supply* which includes, inter alia, seeds/root stocks/other forms of planting material that provides the basic raw material for germination<sup>28</sup> in addition to materials that enhance productivity and/or reduce waste/damage like fertilizers and pesticides respectively. Well-functioning agriculture ecosystems ensure the affordable access to these inputs for farmers through deep and wide distribution systems that can reach the materials from scaled and efficient production units to individual farmers. Well-funded research that continuously improves the quality and effectiveness of these materials with experimentation and knowledge collaborations with international research agencies are intrinsic to such ecosystems. In the case of livestock, instead of seed, feed that ensures animals stay healthy/free of diseases and provide for human nutrition comprise a core input. *Production* (cultivation in the case of crops and animal husbandry in the case of livestock) of agriculture products in such system is characterized by clear titles of land, appropriate mix of labor and mechanization for various activities from land preparation to harvesting and availability of financial products to smoothen cash flows at one end (credit) and set-off risks at the other end (insurance). *Post-production* activities in such systems like harvesting, handling, cleaning, consolidation, grading, sorting, transport, storage, and *processing* have transparent, reliable, and affordable access for farmers to services and infrastructure for these activities, post-harvest finance, and price hedging facilities. Many evolved systems also provide for a common marketing platform for spot sale, future/forward sale that offers the ability to enter into transparent and fair out-grower contracts and/or long-term/committed offtake arrangements. Such systems also have conditions for scaled and integrated players between the farm and market, prevalence of and adherence to process and product standards, availability of quality technical skills for handling and packaging, and so on. Finally, *distribution and marketing* in evolved systems provide for an established system of standards and grades for quality and food safety. The market structure provides a range of competing options for producers with lead firms

<sup>28</sup> Germination is the process by which an organism grows from a seed or similar structure. The most common example of germination is the sprouting of a seedling from a seed of an angiosperm or gymnosperm. Source: <https://en.wikipedia.org/wiki/Germination>.

and/or SMEs engaged in value addition and trade. Elements of regulation, policy, and taxation are simple to understand and provide for a level playing field, transparency and consistency.

## Upstream - Resources for production are limited and subject to high risks

28. **Challenging agroclimatic conditions are accentuated by the effects of climate change.** Average annual rainfall in Sudan ranges from almost zero in the north of the country to almost 900 mm in the southern parts of South Darfur and South Kordofan and the eastern areas of the Blue Nile. While intensive production is possible in irrigated areas or natural/manmade harvesting of runoff water, rain-fed farming in the west, central, and eastern states, except for limited zones in the southeast and southwest, is highly uncertain.<sup>29</sup> Crop productivity is further affected as climate change causes rainfall fluctuations and droughts and contributes adversely to the existing fragility. A key reason for the high volatility in yields of sorghum and millet is the greater prevalence of cultivation of these commodities in the traditional rain-fed ecosystems that are more subject to climate risks (World Bank 2019b) (Figure 2.9). A rise in desertification, deforestation, frequent drought and floods, unpredictability of weather conditions, and rainfall exacerbate existing communal challenges due to increased competition between pastoralists and farming communities for access to water, land, and pasture.

29. **Secession of South Sudan in 2011 deprived Sudan of a disproportionately greater share of agriculture resources.** Besides causing heavy reduction in oil revenues, the separation led to an increase in the share of 'arid' area from 65 percent to 90 percent. Similarly, while the livestock population fell by only 28 percent, the range and forest resources on which livestock depend fell by 40 percent. The stock remained high in per capita terms, but herd sizes for cattle, sheep, and goats fell 25–30 percent in the two years following secession.

30. **Research spending is meagre and erratic, while extension services are not inclusive.** Under 5 percent of budgeted expenditure on research and development (R&D) between the ministries responsible for agriculture was actually utilized between 2011 and 2017 (Table 3.1). Previous World Bank analysis concluded "traditional farming is starved of support. Most of the relatively meagre research budget is spent on irrigated farming, and very little public expenditure is devoted to the livestock subsector ...." (World Bank 2016, p. 28). The same report notes that Sudan's plant breeding program is underfunded and understaffed (World Bank 2016, p. 161). A recent public expenditure review draws similar conclusions (World Bank 2018a). Delivery of livestock and fishery extension services is limited to the Government and does not appear to be contributing to any significant increases in productivity.<sup>30</sup> Further, veterinary control programs do not exist, resulting in the inability to contain frequent outbreaks of major infectious diseases.<sup>31</sup> In general, livestock productivity is low due to disease and parasites; suboptimal breeding; poor herd management practices; reduced access to traditional range resources, stock routes, and crop residues; insufficient water sources; and overgrazing of remaining rangelands.<sup>32</sup> Expenditure on extension is relatively concentrated on the under-10 percent area that is irrigated.

---

<sup>29</sup>

<https://reliefweb.int/sites/reliefweb.int/files/resources/Sudan%2520Quasi%2520Crop%2520and%2520Food%2520Supply%2520Assessment%2520Report-Jan%25202012.pdf>.

<sup>30</sup> Diagnostic Trade Integration Study, 2014.

<sup>31</sup> "Dairy Quick Scan Sudan," The Friesien, a Dutch dairy development company, 2016.

<sup>32</sup> FAO.

**Table 3.1: Trend in expenditures to R&D, total and per respective ministry, SDG (2011–17)**

	2011	2012	2013	2014	2015	2016	2017
Ministry of Water Resources, Irrigation and Electricity - Actual	0	0	0	1,144,000	2,055,000	—	0
Budgeted	700,000	2,900,000	2,900,000	3,400,000	7,000,000	9,570,000	0
Ministry of Animal Resources - Actual	0	0	3,800,000	0	13,104,440	0	0
Budgeted	3,000,000	10,970,000	29,000,000	35,000,000	87,000,000	87,000,000	150,000,000
<b>Total actual expenditure</b>	—	—	—	<b>4,944,000</b>	<b>15,159,440</b>	—	—

Source: Sudan Agriculture Public Expenditure Review, 2018 (based on data from the Ministries of Animal Resources and of Water Resources, Irrigation, and Electricity, 2018)

Note: No information on expenditure to R&D available from the Ministry of Environment and Natural Resources and the MOA.

31. **A constrained ecosystem for agriculture inputs adversely affects productivity.** With 90 percent of land area being arid, frequent conflicts arise as the pressure on available land rises with population growth. This is due to decreasing pasture as a result of drought and desertification, the expansion of crop areas, shortage of cattle routes, and reduced access to water for animals. Even in irrigated or more fertile areas like the River Nile state, only about 40 percent of farmers use improved seeds with as low as 1 percent of farmers using fertilizers in arid states like North Kordofan. Overall, average fertilizer use per hectare of cropland was 11.1 kg (2014), which places Sudan at the 136th position among 160 countries.<sup>33</sup> Strict control and monitoring of fertilizer imports by the Government which take place only through licensed importers raises supply uncertainties (World Bank 2015). About 85 percent of animal resources depend on pastoral systems of production, which render the provision of services and the transfer of technology needed for improvement difficult. The limited availability of foreign exchange restricts veterinary imports, feed additives, and other essential inputs for the livestock sub-sector. Sudan has the lowest renewable internal freshwater resources per capita at 102 m<sup>3</sup> compared to 3,900 m<sup>3</sup> for Sub-Saharan Africa and 549 m<sup>3</sup> for Middle East and North Africa. As far as seeds are concerned, though the private sector is permitted to enter the market, it has to contend with the absence of an organized, established network of agro-dealers to sell products in local markets. While farmers growing cash crops can still afford and access better seeds and inputs, those growing staple food products like sorghum and millet have to contend with declining yields (World Bank 2019b) (Figure 2.9). Even as multiple feed mills exist, the majority are either small/informal in scale or a part of large integrated business houses.

32. **Production practices remain archaic for the most part.** The Gezira Scheme—one of the largest irrigation schemes in the world—has underperformed, having suffered intermittently from funding shortfalls, capacity limitations of the managing entities, and ambiguous institutional arrangements. About 70 percent of staple food is produced by smallholder farmers who are the most resource-constrained among all farmers, and 85 percent of the livestock population is part of the traditional pastoralist system,<sup>34</sup> at the mercy of the country’s climatic conditions. A low-input/low-output system and limited concern for sustainable land management have resulted from the lack of policy incentives for intensive agriculture

<sup>33</sup> According to the 2017 World Bank Enabling Business of Agriculture Index (EBA), performance on regulations to enable fertilizer use rank 56/62.

<sup>34</sup> Pastoralism is an economic activity involving the care of herds of domesticated livestock. In its traditional forms, it is either practiced as the main mode of subsistence or combined with agriculture. Source: <https://www.encyclopedia.com/history/latin-america-and-caribbean/belize-history/pastoral-systems>.

facilitated by low rent leases granted by the Federal Government in rain-fed mechanized areas (World Bank 2019b). The low rent leases have meant cheap access to land, allowing unlimited horizontal expansion. Commercial crop production has remained relatively concentrated in the eastern part of the country around the irrigated areas. Farmer producers' associations exist but are severely constrained in their capacity to improve production and marketing practices and leverage collective bargaining power,<sup>35</sup> which in turn arises from the lack of resources for training and extension services.

## Midstream - Limited value addition and constrained domestic trading channels

33. **Although agro-processing activity is widespread, scaled commercial processing is limited to select commodities leaving significant untapped opportunity for growth in revenues, jobs, and entrepreneurship, especially for the youth from value addition.** Sudan's formal agro-industry is currently dominated by sugar, with some flour mills, and leaves high untapped potential in processing of other agro commodities like meat and oilseeds. Very limited organized processing of meat takes place with a few large slaughterhouses<sup>36</sup> catering to exports. The ratio of the share of GDP from agribusiness to the share of GDP from primary agriculture for Sudan is about 0.41 percent compared to 1.15 percent for Egypt and Kenya indicating the low levels of value addition being undertaken.<sup>37</sup> Private sector presence is extensive in primary processing but is limited to low levels in secondary processing.<sup>38</sup> Besides a few large conglomerates, a high contribution of SMEs in agribusiness is in bakery,<sup>39</sup> confectionary, edible oils processing,<sup>40</sup> animal feed,<sup>41</sup> livestock rearing and transport, meat and poultry processing,<sup>42</sup> fresh fruits and vegetable packaging and transport,<sup>43</sup> fruits and vegetable processing,<sup>44</sup> cotton ginning, gum Arabic processing and exports, and agricultural inputs distribution.<sup>45</sup>

34. **Domestic trade even in raw/unprocessed products is highly unorganized creating challenges for reliable, consistent, and quality supplies required not only by the export market but also by domestic urban markets.** A large number of wholesale markets operate across the country for both livestock and crop trade, but the conditions of these markets remain wanting with a lack of basic hygiene and infrastructure for key associated activities of handling, storage, packaging, and trade.<sup>46</sup> With the high transaction costs associated with purchasing from many individual farmers, most processors and

---

<sup>35</sup> "Final Project Design Report - Integrated Agricultural and Marketing Development Project," International Fund for Agricultural Development (IFAD), 2017.

<sup>36</sup> There are two categories of slaughterhouses, domestic and export. In Sudan, there are about 201 operational slaughterhouses, 11 of which are for export and 190 of different grades and slabs and other slaughtering with no facilities at all, slaughtering directly on the ground. Only 4 out of those 11 slaughterhouses are estimated to be functioning. Source: "Red Meat Value Chain," Livestock Marketing and Resilience Program, Ministry of Animal Resources, Government of Sudan, 2018.

<sup>37</sup> Only 8.1 percent of total agro-food exports are semi-processed or processed. Source: World Development Report, 2008; FAOSTAT.

<sup>38</sup> Primary processing is the conversion of raw materials to food commodities. Milling is an example of primary processing. Secondary processing is the conversion of ingredients into edible products; this involves combining foods in a particular way to change properties. Baking cakes is an example of secondary processing. Source: <https://scs.si/joomla/images/Food%20processing.pdf>.

<sup>39</sup> Estimated 4,200 micro, small, and medium enterprises (MSMEs) in Khartoum.

<sup>40</sup> Estimated 250 processors around the country.

<sup>41</sup> Estimated 27 forage manufacturing plants.

<sup>42</sup> Estimated 3–4 medium to large companies in meat processing, with numerous smaller butcheries and processors around the country and an estimated 20 leather tanneries around the country.

<sup>43</sup> Five fruit-exporting SMEs identified in a recent agribusiness SME diagnostic study.

<sup>44</sup> Juices, jams, and other shelf-stable products, such as canning.

<sup>45</sup> Agribusiness SME Diagnostic, World Bank, 2018.

<sup>46</sup> Agribusiness SME Diagnostic, World Bank, 2018.

supermarkets, however, still use these traditional wholesale markets and depend on the existing supply chains for products from the rural areas when they source locally.<sup>47</sup> It is also why they often source as much as they can from imports.

## Downstream - Distribution and logistics infrastructure is suboptimal

35. **Options for high-quality storage facilities to stabilize incomes between seasons are limited, as are mechanisms to minimize post-harvest losses.** Organized storage capacity is concentrated at or near the port with a large share being owned by the Government through the Agriculture Bank of Sudan. A limited number of warehouses have raised siding or are served directly by rail. Most warehouses have fixed working areas with no platforms that would assist in receiving and dispatching cargoes. A large part of organized storage capacity is also owned by the United Nations (UN) agencies, international nongovernmental organizations (NGOs), and the Sudanese Red Cross, while commercial entities have different structures, varying from small warehouses to large fabricated warehouses for specific cargoes. Given the sizeable imports of wheat, silo facilities for storage of wheat are available near the port though primarily owned and controlled by a single large milling company.<sup>48</sup>

36. **Local distribution suffers from poor inland logistics.** There are a number of ports, including dry ports, free zones, railway stations, and highways, but only a limited supply of intermodal services exists. For example, although globally the railways are the preferred mode for long-haul transport, weak intermodal logistics service and poor maintenance of locomotives does not allow the railways to compete with transport by truck.<sup>49</sup> While large firms such as the ones in the oil industry may be able to invest in building their own facilities to secure their supply chain, most of the agri-businesses in Sudan cannot afford to invest in costly transport and logistics infrastructure out of their own resources.<sup>50</sup>

37. **Sudan has limited capacity and infrastructure to confirm that international food safety and quality requirements are met.** There is a lack of certification bodies, regulatory infrastructure, and labs to test for compliance with industry quality standards and sanitary and phytosanitary (SPS) requirements of developed markets which severely constrains participation in high-value exports. Overall, capacity to meet international market requirements on product safety and disease control is constrained.

## Enabling environment, support infrastructure, and services - Policy distortions limit upside

38. **Policy actions in response to the drastic fall in oil revenues have constrained the business environment.** Declining oil revenues combined with subsidies on fuel and wheat as high as 50 percent or more have led to a widening of the budget deficit. Fuel price increases have adversely affected logistics costs, and the rising cost of utilities has contributed to further reduction in the already low competitiveness of processing besides increase in cost of production in irrigated areas. In addition, exchange rate controls have eroded the competitiveness of the external sector, slowed down domestic production, and delayed economic recovery. Increasing money supply in response to covering budget deficits served to debase the currency and raise inflation to 81.6 percent in March 2020 from 71.4 in the

---

<sup>47</sup> According to the 2017 World Bank EBA performance, Sudan's rank on 'access to markets for agriculture goods' (61/62) is poor.

<sup>48</sup> "Logistics Capacity Assessment," Sudan, April 2019.

<sup>49</sup> Poor performance of the Sudan Rail Corporation (SRC) has led to an increasing shift of traffic to road even for long-distance movement. Source: Diagnostic Trade Integration Study, 2008.

<sup>50</sup> Diagnostic Trade Integration Study, 2014.

previous month. The Sudanese pound on the official market was devalued from SDG 52 per U.S. dollar in February 2020 to SDG 55 per U.S. dollar in March 2020, while on the informal market, it depreciated from SDG 97 per U.S. dollar in January 2020 to SDG 125–130 per U.S. dollar in February/March 2020. Further, the high sorghum (a staple) price volatility is attributed to the high susceptibility to trade policies including export bans, closure of borders, and currency devaluation. Sporadic food import bans imposed with an intent to support currency and lower budget deficit have created uncertainty for investors and consumers alike.

39. **A complex web of interrelated policies is in place with the desired intent of controlling food prices (for example, wheat and fuel subsidies), protecting local business (for example, import bans on food items), maintaining food security (for example, export bans on sorghum), and limiting the impact of revenue losses from secession (for example, exchange rate controls).** While reform of some policies—particularly food and fuel subsidies<sup>51</sup>—has been under way,<sup>52</sup> the adverse immediate impact on the population has led to frequent social unrest in addition to the persistent ethnic and sub regional conflicts. All this has severely affected the investor confidence and maintained the unfavorable positioning of Sudan as a highly risky investment destination, despite the lifting of U.S. sanctions in late 2017. That Sudan still remains on the United States’ ‘list of state sponsors of terrorism’, and the recent political turmoil, adds to this perception.

40. **The country ranks low—171 out of 190 countries—on the ease of doing business in the 2020 World Bank Doing Business Survey, slipping by 9 places compared to its 2019 ranking.** Access to credit, trading across borders, protecting minority investors, and paying taxes are identified as major weaknesses. According to the Enabling the Business of Agriculture report (2019), with an aggregate score of 29.27, Sudan’s performance is far behind neighboring countries included in the study, that is, Ethiopia 46.12 and Egypt 47.06. The report found Sudan to have better regulatory framework in the areas of agriculture food trade (58.41), plant protection (40), and registering machinery (50.14), while in the other areas measured by the report, it performs below the regional average (see graph). Notably, the report found significant gaps in areas such as register fertilizer and water. In livestock—a new indicator added to the report— Sudan received a score of 25.<sup>53</sup> Strict control and monitoring of foreign exchange outflow make international transactions and procurement of critical inputs like equipment and fertilizers cumbersome.

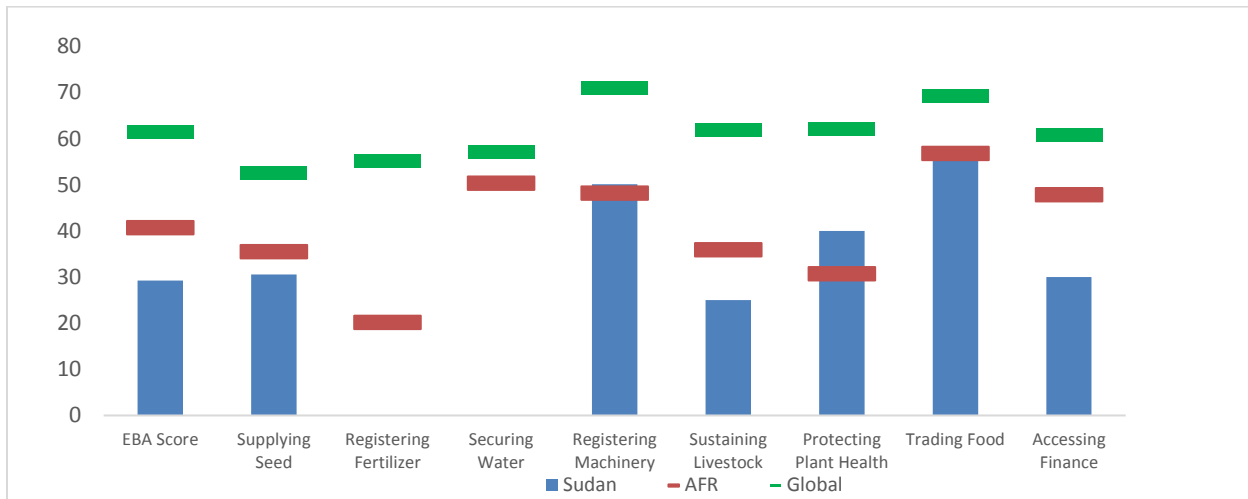
---

<sup>51</sup> Fuel Subsidy Reform in Sudan: An Assessment of the Direct Welfare Impact on Households, World Bank, June 2019.

<sup>52</sup> <https://www.aa.com.tr/en/africa/sudan-president-pledges-economic-reforms-amid-protests/1347722>;  
<https://www.reuters.com/article/us-sudan-economy/sudan-pm-announces-strict-austerity-in-emergency-economic-reforms-idUSKCN1MY1PG>.

<sup>53</sup> World Bank 2019, Doing Business in Agriculture 2019: Sudan Country Profile:  
<https://eba.worldbank.org/content/dam/documents/eba/SDN.pdf>.

Figure 3.2: Sudan - EBA Scores



Source: Based on World Bank 2019c

41. **Poor trade performance is evidenced in a low score on the LPI.**<sup>54</sup> Sudan ranks 121 out of 160 countries on the LPI, with a lower score than relevant regional and income-group averages (score of 2.4 versus 2.5 for Sub-Saharan Africa, 2.6 for lower-middle-income nations worldwide, and 2.8 for Middle East and North Africa). Cost of logistics is estimated to be equivalent to 25–35 percent of GDP compared to ~10–15 percent for middle- and high-income countries and ~15–20 percent for low- and lower-middle-income countries. As outlined earlier, while there are several ports, including dry ports, free zones, railway stations, and highways, a limited supply of intermodal services exists, and many of these require significant upgrading.

42. **The general tariff along with the imposition of additional border duties or para tariffs results in Sudanese businesses having high levels of protection.** The existing tariff and trade taxation policies create disincentives for exports. The issues with customs and trade regulations and tax administration are the top problems identified by 22 percent and 21 percent, respectively, of firms interviewed in World Bank Enterprise Surveys (2014). Sudan’s simple average tariff and trade-weighted tariff rates of 20 percent and 22 percent, respectively, are among the highest in the world and are substantially higher than most countries in Africa and the Middle East.<sup>55</sup>

43. **Access to digital technology and electricity is limited.** Sudan lags its regional neighbors in mobile phone subscriptions; most households subscribe to mobile phone services, and a small but growing share of the population has internet access. In 2018, mobile cellular subscriptions in Sudan were 72 per 100 people as compared to 82.4 in Sub-Saharan Africa and 99.9 in Middle East and North Africa. Similarly, in 2017, 31 percent people were using the internet as compared to 25.4 percent in Sub-Saharan Africa and 51.2 per cent in Middle East and North Africa. Easy access to digital technology can help mitigate

<sup>54</sup> The LPI is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI 2018 allows for comparisons across 160 countries. It is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics ‘friendliness’ of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries where they trade and experience of the global logistics environment. Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work.

<sup>55</sup> World Bank Enterprise Survey 2014, Sudan Country Profile 99350

transaction and processing costs in important ways. Similarly, in 2016, only 39 percent of Sudan's population had access to electricity as compared to 43 percent in Sub-Saharan Africa and 98 percent in Middle East and North Africa.<sup>56</sup> Uninterrupted access to electricity is critical to the cost-effective development of agricultural value chains.

44. **Access-to-land issues prevent investment in agriculture.** Fragmented land markets and weak protections for land-use rights make land consolidation efforts risky for both investors and current land users and present significant reputational risk to donors. Strong land institutions provide a role for governments to manage land use, while protecting private statutory and customary property rights and facilitating transparent land sales and rentals. In Sudan, there is a history of opaque government interventions in allocating property rights and sharp disputes over land use, often centered on poorly defined customary rights (ElHadary, Eltayeb, and Obeng-Odoom 2012).

45. **Historically, poor availability of credit has limited local investment.** Risk perception (along with poor business environment) also limits external investment. The primary source of investment capital is thus limited to existing relatively large private players (by virtue of their internal accruals and better leverage for external finance available from existing capital). With limited ability of smaller players to obtain external finance, the private sector landscape has become dichotomous with large businesses at one end and very small/informal setups at the other leaving no space for them to grow in a much-needed SME sector.

46. **While large businesses have better access to finance, smaller businesses are underserved.** In Sudan, supported with directives and encouragement from the Central Bank of Sudan (CBS), lending to agriculture is among the highest in Sub-Saharan Africa (19 percent in 2017 having risen from 10 percent in 2010 compared to single digits in almost all other Sub-Saharan African economies). Nevertheless, with the share of microfinance at only 5 percent, availability of credit to micro entrepreneurs including agriculture appears to be limited. With limited international banking networks, export finance is particularly difficult to obtain. According to a recent World Bank Assessment of the Financial Sector (April 2019), most of the financing portfolio goes to large corporates including in agriculture. Household financing (consumer, mortgage, and other) represents only 2 percent of total financing, with the remaining portfolio going to enterprises, including state-owned, SMEs (including financing to state and local government), and microenterprises. Even though the CBS has allocated credit lines to agriculture and provided capital support to banks focusing on agriculture, the outflow to agriculture SMEs is limited.

47. **Overall resource allocation to agriculture remains constrained.** The low share of government budget spending on agriculture is aggravated by limited access to international finance due to existing high indebtedness with development partners which precludes access to international development finance. At the same time, economic isolation due to the U.S. sanctions between 1997 and 2017 has constrained FDI. Actual annual government expenditures on agriculture accounted for under 3 percent of total public expenditures between the responsible ministries, thus far from reaching the 10 percent of total expenditures that Sudan has committed to under the CAADP.<sup>57</sup>

---

<sup>56</sup> Sudan Agriculture Sector Overview, World Bank, 2018.

<sup>57</sup> The CAADP is Africa's policy framework for agricultural transformation, wealth creation, food security and nutrition, economic growth, and prosperity for all. It champions reform in the agricultural sector, setting broad targets, including 6 percent annual growth in agricultural GDP, and an allocation of at least 10 percent of public expenditures to the agricultural sector. (<https://www.un.org/en/africa/osaa/peace/caadp.shtml>).



## Chapter 4: Prioritizing Value Chains for Affirmative Action

### Summary

- Constrained public resources necessitate a sharp focus on value chains that present the greatest potential for economic and development impact while being capital-efficient to support the growth, rebuilding, and resilience agenda of the Transitional Government.
- An extensive exercise was carried out in a phased manner to prioritize the most promising value chains, that is, building a master list of sub-sectors and their respective commodity groups based on a literature scan and discussions with industry experts and shortlisting to 10 value chains by focusing on the value of production: dairy, livestock, sesame, gum Arabic, horticulture, sorghum, groundnut, sugarcane, wheat, and cotton. The priorities of the new Transitional Government was a key determinant in the narrowing down to 5 value chains: gum Arabic, sesame seeds, livestock (meat), horticulture, and dairy.
- The list of value chains prioritized in this report is consistent with the promising value chains highlighted in a recent World Bank report on agribusiness SME diagnostic in Sudan and an EU study focusing on job creation, despite differences in objectives and methodology.

48. **With extremely limited public investment capacity and constrained access to development finance, the importance of appropriate policy actions by the Transitional Government to attract private investments is paramount to realize its priority of ‘developing and promoting productive sectors’ for ‘addressing the economic crises and establishing the bases of sustainable development’.** With limited budget, the Government’s main tool to influence investment is through policy action. Policy-induced private investment can set in motion a virtuous cycle of increased productive investment that can in turn, over the medium term, boost government revenues from tax collections on corporate profits. Even with large existing private sector presence, the current fragile political situation and weak business environment for agriculture value chains are preventing Sudan from fulfilling its full potential in agriculture.

49. **Constrained resources also necessitate a sharp focus on value chains that present the greatest potential for economic and development impact while being capital efficient.** To optimize efforts, maximize return on investments, create jobs, and remain focused on the highest impact opportunities, an analytical exercise was undertaken to prioritize agri-commodity value chains on which an immediate and early focus is expected to yield the highest impact.

50. **Based on a literature scan and discussions with industry experts, the master list of sub-sectors and their respective commodity groups was determined.** The predominant criteria for the determination of the master list was the existing level of production, supplemented with some additions based on discussions with industry experts who highlighted the potential for the niche commodities separately included (annex 3).

51. **The first step in the prioritization involved shortlisting to a manageable set of 10 value chains<sup>58</sup> by focusing on the value of production.** The commodities that ranked highest in terms of value of production as captured by the FAO were then put through a detailed analytical exercise involving agreed criteria suited to the ultimate objective of delivering rapid and far-reaching impact on Sudan’s economy.

---

<sup>58</sup> Accounting for about 80 percent of the total value of agriculture production.

Based on the methodology explained in annex 3, at stage one, 10 commodities—dairy, livestock, sesame, gum Arabic, horticulture, sorghum, groundnut, sugarcane, wheat, and cotton—were selected.

52. **The priorities of the new Transitional Government were taken into account to further prioritize among the ten shortlisted value chains.** Following consultations with the Government counterparts including the Ministries of Agriculture, Animal Resources and Fisheries, and Finance and Planning and several development partners resulted in the report’s focus on the five commodities of gum Arabic, sesame seeds, livestock (meat), horticulture, and dairy.

53. **The list of value chains prioritized in this report is consistent with the promising value chains highlighted in a recent World Bank report *Agribusiness SME Diagnostic in Sudan* and a European Union (EU) study focusing on job creation, despite differences in objectives and methodology.** Four of the five commodity value chains that form the basis of the SME diagnostic report were also key value chains identified by the SME report. The one exception, dairy, was also considered by the SME team; although, the report concludes, “Assessments of the factors above may have identified dairy as a great opportunity. However, if the country does not have reliable roads and cold chains, there is no use investing in upscaling dairy without addressing this fundamental binding constraint” (World Bank 2019c, 131). The 2019 EU Report (Technical Assistance to the EU Delegation for Cooperation in Sudan: Jobs and Growth Compact for Sudan) utilized three criteria to prioritize key potential agriculture value chains to be developed in support of economic growth and job creation, in line with the EU sector priorities, as follows: (a) the selected value chain should reflect the importance given to that particular value chain in the strategic plans and annual budgets of the Government of Sudan; (b) the value chain should provide the opportunity to help in the structural transformation of the economy by moving it from low- to high-level productivity sectors, to achieve higher employment; (c) the value chain activities should be taking place in a wider context related to achieving inclusive growth and environmental sustainability. Based on these criteria, four value chains were selected as a priority. These value chains are gum Arabic, livestock, oilseeds, and cotton. Annex 5 provides further details about the two reports.

54. **Having identified the priority value chains, it is also important to highlight that the development of specific commodity value chains can have (or require) adjacent impacts on other value chains that are not selected in this exercise and cut across political boundaries since production locations are typically located at distances from concentrated centers of consumption in urban areas.** For example, the development of the livestock value chain will necessarily require some level of assessment of the maize value chains since maize is a core input<sup>59</sup> for livestock feed which in turn will rise in importance as the pastoral system shifts toward more organized livestock rearing systems. It is, therefore, important to recognize that the specific value chain analysis must be complemented with the larger assessment of the agribusiness ecosystem to ensure the most suitable policies can be implemented and project interventions designed.

---

<sup>59</sup> <https://www.feedipedia.org/node/556>.

## Chapter 5: Assessment of Prioritized Value Chains

### Summary

- Gum Arabic. Sudanese gum Arabic sets quality standards for global markets. Sudan is the largest producer of gum Arabic in the world, and the crop is an important source of foreign exchange earnings. There is a substantial potential to enhance productivity and exports and create job opportunities for the rural youth. There is also potential for value addition by upgrading domestic processing.
- Sesame seeds. Sudan produces high-quality sesame seeds and has a relative advantage in global markets because of its access to large and fast-growing import markets like China and Japan. Many smallholder farmers grow sesame seeds as a cash crop and could benefit from investments that bolster demand and prompt productivity gains.
- Livestock (meat). The livestock value chain is a key contributor to foreign exchange earnings of the country, especially live animals and meat export to Saudi Arabia, Arab countries, and the Middle East. The value chain provides opportunities for the development of the value of production through value addition.
- Horticulture. Sudan has a relative advantage for the cultivation of a wide variety of fruits and vegetables for export markets, due to the geographical diversity. Selected fruits like mangoes and bananas represent good potential for exports due to substantial volume of production. Competitiveness of this value chain, however, is severely compromised because of low productivity, poor cold chain logistics, and fragmented supply chains.
- Dairy. Dairy production amounts to 4.5 million tons of milk of which 98 percent remains unprocessed and is sold loose although imports of processed dairy products are high and rising. Developing competitiveness in this sub-sector can support national finances substantially by substituting for annual imports of US\$100 million. The value chain presents opportunities to boost smallholder livelihoods through milk processing due to a vast number of smallholders and pastoralists being involved with the dairy value chain activities.
- The key emerging points are that most of the value chain players are small-size businesses with limited knowledge, exposure, and skills to compete in the domestic and export markets. Value chains suffer from low productivity, underdeveloped input and output markets, substandard processing, lack of modern technology, substandard inland logistics, poor quality and safety standards, lack of traceability and certification, inflation, and exchange rate fluctuations.
- There are several short-, medium-, and long-term investment opportunities for the private sector and public-private partnerships in all value chains for improved productivity, integrated supply chain development, improved processing, value addition, capacity building, testing, and compliance and certification for quality assurance for premium export markets. It would require close coordination between the Government and the private sector for policy, regulatory, and market reforms and public sector investments/public-private partnerships in logistics, utilities, and services for domestic and export markets.

55. This section of the report assesses the importance and potential of five value chains, gum Arabic, sesame seeds, livestock, horticulture, and dairy to serve as a focus for the development of Sudanese agriculture sector toward the growth, rebuilding, and resilience agenda of the Transitional Government.

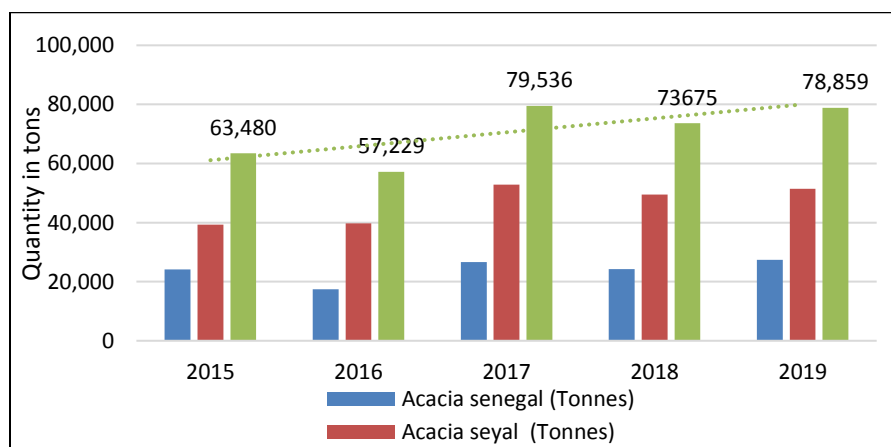
The section looks at the prevailing market conditions for each sub-sector and examines the factors that constrain growth. The findings of this section serve as a basis for a set of recommendations in chapter 6, aimed at mitigating growth constraints through policy changes and public investments. Based on the selection criteria discussed earlier, growth in the selected value chains is expected to generate positive spillovers for farming households, value chain players, the agricultural sector, and the general Sudanese economy.

## Gum Arabic value chain

56. **Sudan is the world’s largest producer of raw gum Arabic, which is mostly produced in the poorest areas of the country.** Gum Arabic, a dried sap from *Acacia senegal* and *Acacia seyal* trees, is a cornerstone of rural livelihoods in Sudan. It is a natural emulsifier and is used throughout the world in food, confectionary, beverages, pharmaceutical, cosmetics, printing, photosensitive chemicals, ink, pyrotechnics, textiles, paper, paints, and adhesives. Its use was boosted after it was considered by CODEX as a food additive and approved for being prebiotic (classification E414). Sudan contributes to over 80 percent of the gum production worldwide. Gum Arabic production registered a 24 percent increase from 2015 to 2019, and total production increased from 63,480 tons to 78,859 tons (Figure 5.1).

57. **Sudan produces two varieties of gum Arabic—Acacia Senegal Gum (Gum Hashab) and Acacia Seyal Gum (Gum Talha).** Gum Hashab is designated as hard gum, whereas Gum Talha is referred to as friable gum. Production volume of Gum Talha increased considerably during the last three decades due to its increasing demand in the dairy industry (Table 5.1). Gum Hashab is widely used as an ingredient in artificial sweeteners, and its demand did not grow considerably due to the increased awareness among the consumers about the harmful health effects of sugar-related products. Processing of gum Arabic comprises three main steps: (a) cleaning and drying, (b) kibbling, and (c) spray-drying.

Figure 5.1: Gum Arabic production from 2015 to 2019



Source: Sudan Gum Arabic Board.

Table 5.1: Gum Arabic production from 2015 to 2019

	Gum Hashab	Gum Talha
Uses	Confectionary and medical industry	Dairy products (yogurt)
Production area	Sandy terrain, Kordofan, and Darfur	Muddy terrain, southern Sudan
Production in tons (1992)	220,000	3,000

	Gum Hashab	Gum Talha
Production in tons (2015)	241,940,000	392,860,000
Production in tons (2019)	273,810,000	514,780,000
Price per ton (2019)	US\$2,400	US\$711

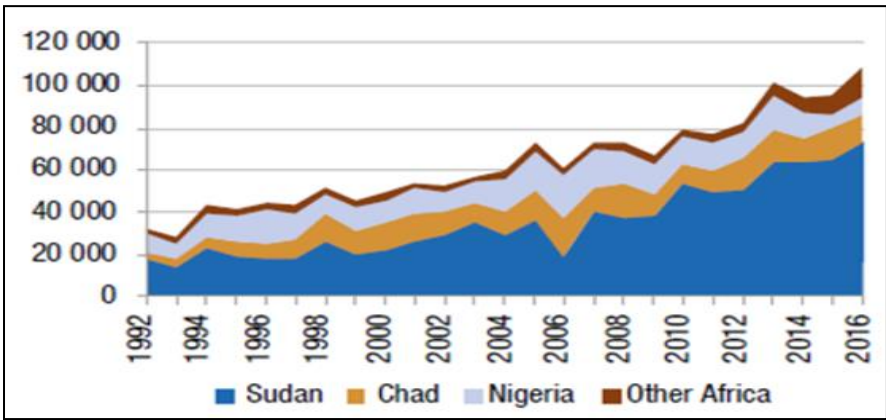
Source: Sudan Gum Arabic Board.

58. **Gum Arabic is a key sector for employment and poverty alleviation in rural Sudan and contributes 15–25 percent to the household income.** The Government’s Five-Year Program for Economic Reform (2015–19) declared the development of gum Arabic belt as a strategic objective of the plan. The gum Arabic belt covers a large area, with production dominated by small-scale poor traditional farmers, and is the main source of local livelihoods and food security. The belt extends across the poorest 13 of Sudan’s 18 states.<sup>60</sup> For example, Central Darfur state recorded a high poverty rate of 67.2 percent as compared to the national poverty rate of 36.1 percent (National Household Budget and Poverty Survey [NHBPS] 2014–15). Similarly, in Central and West Darfur and South Kordofan, every two in three people were poor, followed by East and South Darfur. Gum Arabic belt, with an area of 520,000 km<sup>2</sup>, accounts for 28 percent of land area, one-fifth of population (mostly poor), and two-thirds of livestock.

**Gum Arabic in international and domestic markets**

59. **Sudan has been the leading global exporter of gum Arabic for a long while, followed by Chad and Nigeria (Figure 5.2).** Gum Arabic accounted for 66 percent of Sudan’s total exports. In 2018, export of 78,859 tons of gum Arabic largely to France, India, and the United States generated a revenue of US\$117.3 million. After liberalization of the gum Arabic sector, exports of unprocessed and semi-processed gum Arabic increased from an annual average of 35,000 tons in 1992–94 to 80,000 tons in 2017–19.

Figure 5.2: Major exporters of raw gum Arabic (1992–2016)



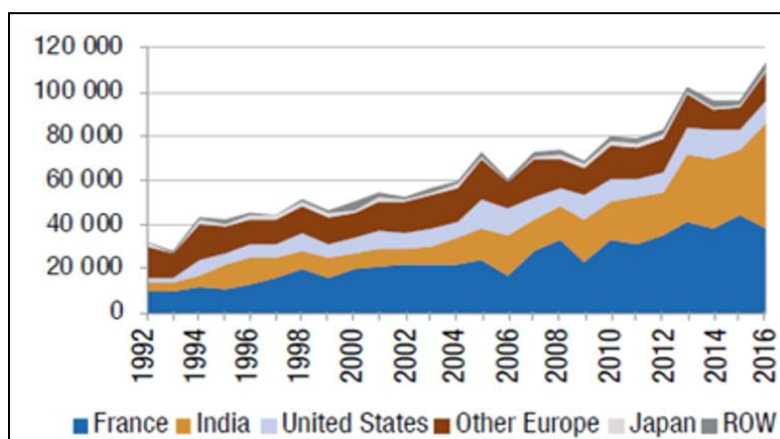
Source: United Nations Conference on Trade and Development (UNCTAD).

60. **Gum Arabic export to a few countries indicates a highly concentrated export market.** The largest importing country is France that accounted for nearly half of the total export, followed by the United States (14 percent) and India (12.2 percent) in 2019 (Figure 5.3). Over time, French import of Sudanese

<sup>60</sup> These states are North Kordofan, South Kordofan, West Kordofan, North Darfur, South Darfur, West Darfur, East Darfur and Central Darfur, Gadarif, Kassala, Sennar, Blue Nile, and White Nile.

gum Arabic increased from one-third to one-half of the total gum export. The other importers include Germany and the United Kingdom (Table 5.2).

Figure 5.3: Major importers of raw gum Arabic (1992–2016)



Source: Sudan’s Custom Authority

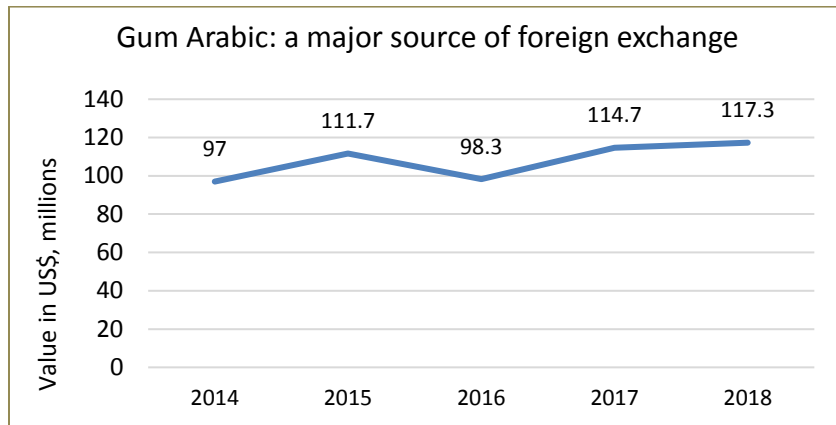
Table 5.2: Major importers of gum Arabic, 2019

Ranking	Countries	Exports (US\$)	Percentage
1	France	52,101	49.3
2	United States	14,934	14.1
3	India	12,932	12.2
4	Germany	10,105	9.6
5	United Kingdom	7,913	7.5
6	China	2,702	2.6
7	United Arab Emirates	2,649	2.5
8	Japan	1,527	1.4
9	Belgium	546	0.5
10	Greece	239	0.2
Total		<b>102,274</b>	<b>100.0</b>

Source: Sudan’s Customs Authority.

61. **Gum Arabic export steadily increased over two decades and increased from 59,733 tons in 2014 to 76,394 tons in 2018.** The export earnings increased from US\$97 million in 2014 to US\$117.3 million in 2018 (Figure 5.4).

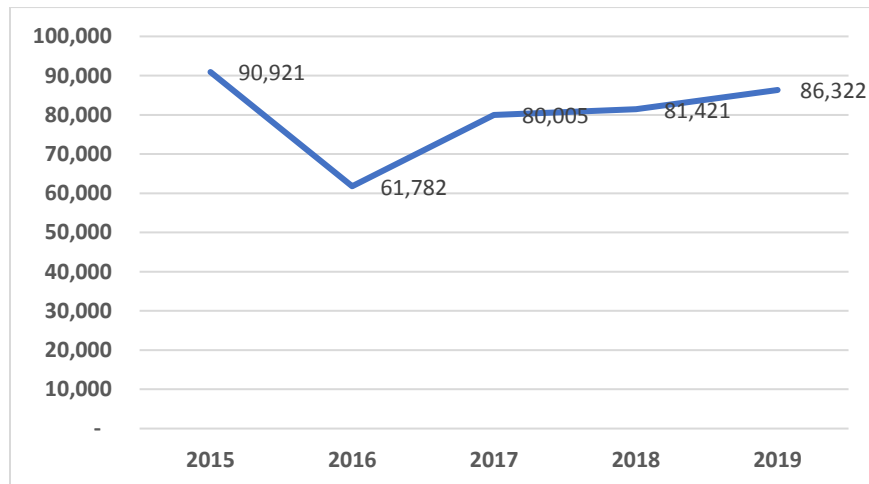
Figure 5.4: Sudan's export earnings through gum Arabic (2014–18)



Source: CBS annual reports.

62. **Gum production volumes fluctuated due to weather conditions and other factors such as availability of financing.** The fluctuation in gum Arabic production has led to varying quantities exported and unstable export proceeds (figure 5.5).

Figure 5.5: Sudan gum Arabic production in metric tons



Source: CBS annual reports.

63. **Many private companies are licensed to export gum Arabic and are typically exporting gum Arabic in raw/unprocessed form.** Almost all gum Arabic players are small-scale except 10 gum Arabic processors who fall under the category of medium-size and 4 are relatively large-size operations (Box 5.1). The processing companies, especially large-size establishments, have the potential to play an important role in the further development of gum Arabic value chain linked to the global market. The companies have established partnerships with the gum Arabic producers, and they finance mobile water tanks, tools, and packing materials required for the production of gum Arabic and pay premium prices to the producers by eliminating middlemen.

#### Box 5.1: Key Sudanese private sector players in gum Arabic

**Afritec**, established in 2008, has set up a gum Arabic processing factory (kibbling) in Sudan in collaboration with a French company Nexira International. The operations include collection, cleaning, and primary processing of gum Arabic.

**Nopec Co.** is dedicated to the purchase, production, and export of gum Arabic. It has established a processing factory in Khartoum, in collaboration with an international company 'Alland and Robert'.

**DAL Group**, a prominent Sudanese company, is engaged in several sectors including gum Arabic. In 2017, the group opened the largest gum Arabic spray-drying factory in Sudan, with a capacity of 5,500 tons of gum Arabic powder, which is valued at approximately US\$37 million. The company has established strong links with small producers of gum Arabic and provides them with equipment such as tractors and pays premium rates for gum Arabic.

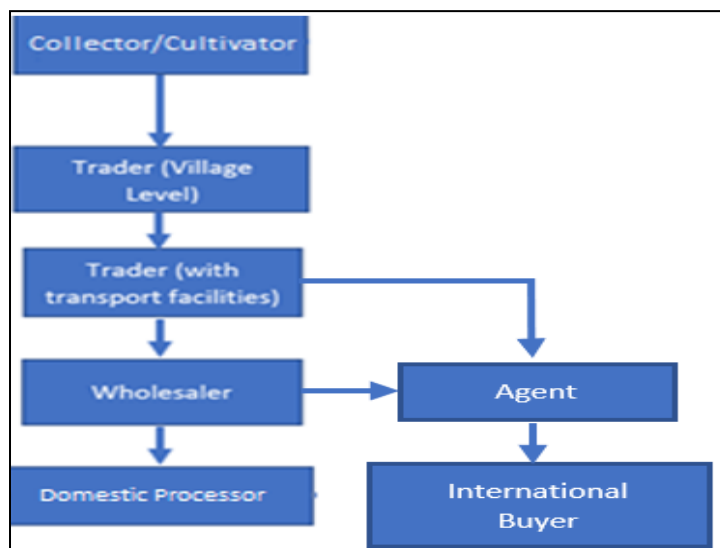
**Fair Factory for Manufacturing and Packing Organic Gum Arabic (FOGA)** purchases raw gum from producers and sells it in international markets after cleaning and packaging. The company pays due consideration to environmental issues and provides training and support to small producers.

64. **Domestic consumption of crude gum increased from 500 tons in 2008 to 10,000 tons in 2014.** The consumption was notably fueled by industrial demand from the domestic beverages and confectionary sectors (United Nations Conference on Trade and Development 2018).

### Gum Arabic marketing chain

65. Beside producers, there are several actors in the gum Arabic value chain who influence price, production, and productivity. The actors include gum Arabic tappers (with specialized skills in tapping the tree), collectors, traders, middlemen, raw gum exporters, and gum processors/exporters.

Figure 5.6: Value chain map of gum Arabic



66. **Producers.** Gum Arabic is produced predominantly by small farmers in the gum Arabic belt. As, the farmers give priority to household food security by growing sorghum or millet, they collect gum Arabic as a cash commodity only during the off-season. Gum Arabic farmers operate in remote areas with limited access to finance, markets, and agricultural inputs—such as fertilizer, technology, and implements—and



advisory and extension services. By applying traditional methods, they collect, clean, dry, bag, and deliver raw gum to a point of sale. Tapping of gum Arabic trees is carried out during the dry season. While recently, an improved implement cleaver (Sounki) has been introduced for tapping, the adoption rate is very low and the use of traditional small axe is most prevalent. Poor post-harvest techniques (collecting, cleaning, drying, use of plastic sacks, and means of storage) lead to hardening and clumping of the gum. As a result, the gum quality deteriorates, and it becomes hard for processing. Producers sell gum as raw, green natural gum, ideally through official channels (auction markets) but often through middlemen.

67. **Gum Arabic Producers Associations (GAPAs).** The Government used to monopolize the gum Arabic trade through the Gum Arabic Company (GAC). In June 2009, however, the Government revoked the monopoly rights held by GAC and liberalized the sub-sector. With assistance from the World Bank and IFAD, 130 GAPAs were established to strengthen gum producers and enhance their marketing and bargaining powers and provide them with access to credit and extension services.<sup>61</sup>

68. **Village merchants exist at the village level and undertake small-scale transactions.** They purchase gum Arabic directly from gum producers or from weekly mobile markets (*umduarwar*). Some traders provide cash, seeds, tools, and basic commodities (water, sugar, tea, and so on) to the producers to get by during the off-season and in return buy gum Arabic at a predetermined price which is usually lower than the market rate. A local committee administers the rural market with the services of an administrative officer, cashiers, market supervisors, and guards. The markets are small and mostly unfenced without any administrative buildings. The village traders sell gum to merchants at the weekly market or nearby town market.

69. **City merchants are present in intermediate markets which are in relatively large towns.** Some of them are self-financed, and others act as representatives of the main dealers in major cities. The intermediate market usually comprises a fenced yard, administrative office with staff, conventional balance to weigh gum, supervisors and cashiers, and so on.

70. **Agents and wholesale traders.** Wholesale traders and agents of large exporters operate in the auction markets. Elobeid and Elnuhood crops markets are considered the largest auction markets in Sudan, while other important central markets are in Damazin, Sinnar, Gadarif, and Port Sudan. The traders organize cleaning, grading, packing, and transportation of gum for auction to other markets.

71. **Processers.** Gum Arabic is mostly exported raw. Recently, some processing activities have started to process raw gum into the forms required at different stages of product manufacturing. The processing, comprising kibbling (making uniform kibble-size gum pieces), granulating, spray-drying, and powdering, increases the gum price considerably. Out of a total of 25 licensed industries, only 10 companies have kibbled gum-processing plants. Kibbling, however, requires a low degree of processing and does not give the highest value added. The real gain in terms of value added in processed gum Arabic is the spray-dried gum.

72. **Sudanese gum exporters are typically agents of international importers.** Exporters of raw gum carry out light processing comprising cleaning, sorting, grinding, and grading to ensure that gum container shipments meet international quality standards.

---

<sup>61</sup> Policy changes undertaken through the project led to the removal of market barriers in the sector, including abolishing 13 of 18 taxes and removing the monopoly concessions entrusted to the Gum Arabic Council on the trading and export of raw gum. These measures have led to noticeable efficiency improvements in marketing and higher prices for producers.

73. **While information on gate prices was difficult to collect, gum Arabic prices at major regional markets were available**, including Elnuhood (West Kordofan state), Elobeid and Umrawaba (North Kordofan state), and Gedarif (Gaderif state). Table 5.3 shows prices recorded in Elnuhood during 2019–20. Due to rising inflation and exchange rate, however, the real price of gum Arabic has reduced (Table 5.3). More importantly, the regional market prices represent a fraction of free-on-board (FOB) prices as reported in Table 5.4.

**Table 5.3: Hashab Gum prices per kantar<sup>62</sup> in Elnuhood, North Kordofan**

Date	Price per kantar (SDG)	Price per kantar (US\$)=price in SDG/exchange rate
10/12/2019	5,020	5,020/100=US\$50
1/2/2020	4,510	4,510/110=US\$41
1/4/2020	4,670	4,670/120=US\$39
1/7/2020	4,665	4,665/120=US\$39
1/9/2020	4,665	4,665/130=US\$36
1/13/2020	5,000	5,000/140=US\$36
1/21/2020	5,800	5,800/150=US\$38

Source: Republic of Sudan, Ministry of Industry and Trade, Sudanese Trade Post Planning, Research and Development Department 2014–20 (in Arabic).

**Table 5.4: Percentage FOB price received by gum Arabic producers**

Date	FOB price (MT/US\$)	Gate price (MT/US\$)	Gate price/FOB (%)
2010	2,000	987	49
2011	2,200	1,148	52
2012	3,700	1,850	50

Source: Ministry of Trade and Industry of Sudan, “Revitalizing the Sudan Gum Arabic Production and Marketing Gum Arabic Value Chain Analysis” Final Report, April 2011.

74. **Cost competitiveness of crude gum agents was higher than that of domestic gum processors due to margin considerations and foreign exchange fluctuations.** International buyers prefer to purchase crude gum than processed (kibble) gum as they do not want to compromise on the processing margins. Kibble gum price is usually US\$100–150 higher than the price of crude gum per metric ton. Further, Sudanese exporters of raw gum Arabic usually take a risk and quote lower than the market price to the buyers with a hope that they would be compensated by gaining high returns due to foreign exchange fluctuations. In contrast, the gum processors must cover their processing costs and do not take risk by offering lower-than-market prices. As a result, several of them could not compete and 17 kibble gum-making factories were shut down as of May 2020.

<sup>62</sup> Kantar is unit of weight used in several Arab/Mediterranean countries including Egypt, Jordan, Syria, Lebanon, Cyprus, Morocco, Tunis, Sudan, Turkey, UAE, Saudi Arabia. It is roughly equal to 100 pounds (lbs.), but varies across countries

## Constraints along the gum Arabic value chain

75. The stakeholders identified the following key constraints which need to be addressed to realize the full potential of the gum Arabic value chain. The constraints common to all five value chains are summarized at the end of this chapter:

- **Limited research and development.** The budget allocated to universities and research centers for gum Arabic research and development is dismally low. Applied research, therefore, on tapping and gum production at farm level takes place at a very limited scale.
- **Lack of qualified extension workers.** The Forests National Corporation (FNC) extension services are limited and can cover only a fraction of the gum production areas. The extension workers lack the required knowledge and skills for gum Arabic production enhancement.
- **Lack of adequate technology.** The inefficient traditional tapping method, for instance, and gum cleaning and drying practices need to be replaced with improved and safer technology and practices.

## Investment opportunities along the gum Arabic value chain

### *Productivity enhancement and employment generation*

76. **Gum Arabic productivity is low, but there is a significant potential for improvement.** The average gum yield per tree per season is low around 300 grams due to limited fertilizer use; lack of support services; and constrained access to technology, markets, and finance. According to the Agricultural Research Corporation (ARC), gum yields could be increased by 47–60 percent, with good management and improved tapping methods.<sup>63</sup> Post-harvest losses could be curtailed by improved drying, sorting, packing, and storage. According to the Gum Arabic Council, the annual production levels of current gum Arabic trees could be increased to about 200,000 tons.

77. **There exist investment opportunities in productivity enhancement and quality improvement of gum Arabic.** The traditional tapping and collection methods (a) are strenuous and compromise the health and safety of the gum collectors, (b) negatively affect the productivity of gum tree, (c) contaminate the collected gum, and (d) adversely affect the sustainability of gum plantation. Investments could be targeted toward incorporating adequate mechanization technologies in tree tapping and collection, cleaning, sorting, and packing of crude gum to improve the quality and volume of the crude gum produced.

78. **Investments in gum Arabic productivity enhancement would generate employment opportunities in the ecosystem that produces, washes, dries, grades, bags, and sells gum in local markets.** It would increase smallholders' household income and food security, strengthen their livelihoods, and help them graduate out of poverty. Over time, gum Arabic production could become a permanent economic activity in which producers are engaged on a full-time basis.

### *Value addition and export earning*

79. **Sudanese gum Arabic is of the finest quality and serves as a quality standard in the international market.** Gum Arabic produced in the Kordofan region is well known for its superior quality and is used as a reference point to determine the prices of gum Arabic in the international market. There are good

---

<sup>63</sup> Policy Note - Export Marketing of Gum Arabic from Sudan, March 2007, World Bank.

prospects for enhancing export due to consistent supply of high-quality gum at competitive prices. The supply of Sudanese crude gum is expected to increase in line with the increase in global demand at 0–5 percent annually (CBI 2018). It presents both short- and long-term investment opportunities in the gum Arabic value chain and increases export earning manifold.

80. **Due to limited processing, Sudan forgoes considerable value-added benefits by exporting its products in the form of raw materials rather than in processed form.** Sudan has not been able to transform from a raw gum exporter to a globally competitive manufacturer that has the capacity for value addition, direct and indirect employment, and higher export earnings. In fact, Sudan imports processed gum from Western Europe to meet its growing domestic demand.

81. **There is a considerable value addition potential, that is, produce spray-dried powder that will increase Sudan’s share of value-enhanced gum Arabic products.** Spray-drying of gum Arabic is at a nascent stage in Sudan. It is performed by only two companies: the DAL Group produces spray-dried gum for its own industrial products, while the other company supplies spray-dried gum exclusively to its partner company in Germany. The DAL Group has a limited capacity of 5,500 tons per year, out of a global average of 70,000 tons produced annually. Most buyers, like Coca-Cola and Pepsi, purchase spray-dried gum from Europe due to quality considerations and have long-term contracts to ensure uninterrupted supply. No other Sudanese company has so far ventured into spray-drying processing of gum Arabic, despite its high sale price. There exist long-term investment opportunities in high-grade processing to cater to the growing domestic market and tap into the growing demand of processed gum in Arab countries, the Middle East, and Africa.

82. **Nevertheless, it would require additional public sector/public-private investments in the provision of proper infrastructure and services;** road and transport network; reliable electricity and water supply; access to finance, housing, education, and health to gum Arabic producers; and incentives to the processing sector to promote high-quality processing of raw gum locally.

83. **Besides higher export earnings, investments in gum Arabic will have a multiplier effect on the local economy in creating direct and indirect jobs and entrepreneurial opportunities in gum Arabic processing,** road and transport infrastructure expansion, housing, and provision of utilities and services.

### *Environmental benefits*

84. **Development of the gum Arabic value chain will not only promote economic development through higher incomes and increased employment, but also promote synergies with natural resource management and climate change mitigation in line with the government agenda of ‘establishing the basis of sustainable development’.** The gum Arabic belt lies within the semiarid zone and low-rainfall woodland savannah, in the area classified as one of the most vulnerable regions regarding desertification and land degradation. Environmentally friendly development of the belt would help combat desertification and promote climate change adaptation (Sustainable Development Goals 13 and 15). Gum trees can make a significant contribution to climate change adaptation by curtailing evapotranspiration of crops and pastures, reducing wind speed, and lowering the temperature through the shade they provide. The trees, spread over large areas, also sequester significant amounts of CO<sub>2</sub> and have the capacity to fix nitrogen in the air through the nitrogen-fixing bacteria in their root systems.<sup>64</sup> It would, therefore, serve the national policy objectives and international climate change commitments of Sudan,

---

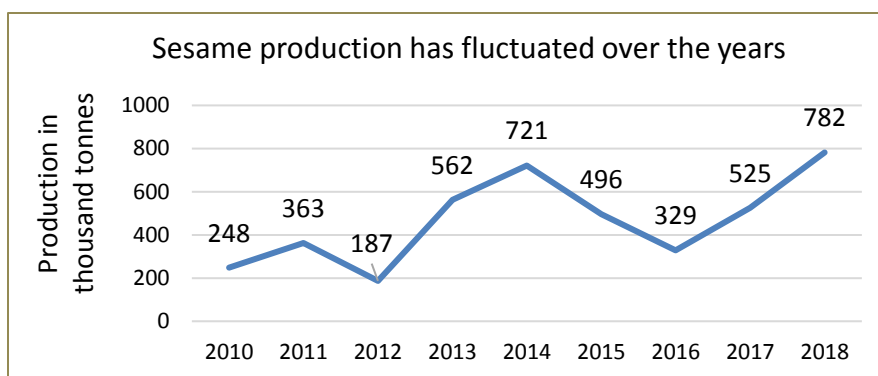
<sup>64</sup> Green Climate Fund: Concept Note: GAMS - Gum for Adaptation and Mitigation in Sudan 2015.

including the Intended Nationally Determined Contribution (INDC), National REDD+<sup>65</sup> strategy, and the Nationally Appropriate Mitigation Actions (NAMA).

## Sesame seeds value chain

85. **Sesame seeds, a major cash crop in Sudan, was cultivated on over 2.77 million ha of land in 2017.** In 2018, Sudan produced 782,000 tons of sesame seeds, which amounted to approximately 10.3 percent of the total sesame seeds production worldwide (Figure 5.7). Sudan is the fourth largest producer of sesame seeds worldwide after Myanmar, India, and China (United Nations Industrial Development Organization 2017). About 77 percent of the area devoted to sesame seed farming is in three states of El-Gedarif, North Kordofan, and Blue Nile. El-Gadarif state is well known for producing premium-quality sesame seeds. The state has been referred to as the country's breadbasket, producing 62,000 tons of sesame seeds in 2016–17. The majority (80 percent) of sesame fields in Sudan are relatively large and occupy around 2 ha in area. Sesame seeds production in Sennar and North Kordofan is, however, dominated by smallholder farmers (World Bank 2019d).

Figure 5.7: Sesame seeds production in Sudan (2010–18)



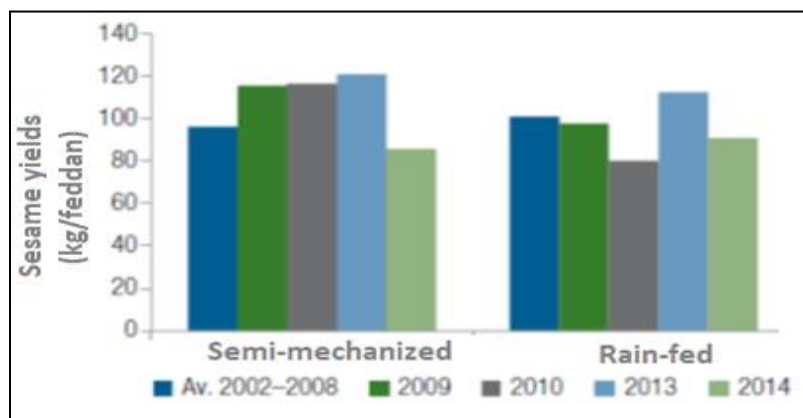
Source: [www.ceicdata.com](http://www.ceicdata.com).

86. **Sesame seed production in Sudan is categorized into two types of farming: semi-mechanized rain-fed farming and traditional rain-fed farming.** The traditional rain-fed farming produces 38 percent of the total production. Traditional rain-fed farming of sesame seeds occupies considerable acreage and is mostly practiced by smallholder farmers. Where the system of production is rain-fed, poverty levels are high, far exceeding the national average poverty ratio. On the other hand, semi-mechanized rain-fed farming produces 62 percent of the country's sesame seeds. Semi-mechanized rain-fed farming is generally practiced by large farmers and companies with large investments.<sup>66</sup>

<sup>65</sup> REDD+ refers to "Reducing emissions from deforestation and forest degradation and the Role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries."

<sup>66</sup> The investments increase the operational capacity of farmers and large companies and allow them to increase the area of production.

Figure 5.8: Sesame yields in mechanized and rain-fed areas



Source: World Bank 2019d.

87. **The sesame seeds produced in Sudan are classified into two types, based on physical appearance, that is, white sesame seeds and red sesame seeds.** The higher-quality white sesame seeds have 40–46 percent oil content, are considered more refined, and are used for direct consumption. The lower-quality red sesame seeds contain 50–52 percent oil content and are processed domestically, either crushed for oil with byproduct sesame cake (for animal feed), or sold to processors of a sweet confectionary product ‘Tahniah Halwa’. Red sesame seeds make up about 50 percent of the ingredients for ‘Tahniah’ by volume. Production of ‘Tahniah’ presents good opportunities for post-harvest value addition through dry cleaning, shelling, water cleaning, roasting, grinding, mixing with other ingredients, packaging, and distribution of red sesame seeds (World Bank 2019d).

88. **Sesame oil is produced primarily from red sesame seeds.** Three types of edible oil extractors are being used in Sudan: the traditional manual (camel-driven) oil extractors, small-motorized oil extractors, and large-capacity oil extractors. Many traditional small- and medium-scale oil crushers/extractors are in Kordofan. Lack of electricity is a major concern for millers. In localities where electric power or diesel engines are available, small mechanical extractors are being used. Modern manufacturers with higher processing capacities extract oil using specialized machines. Some supplement their products by purchasing raw oil extracted through traditional methods. Large oil producers and refineries are in Khartoum, and a few are located in other cities, with the overall daily processing capacity exceeding 5,000 tons. The byproduct—sesame seeds cakes—is sold to animal feed manufacturers, who blend it with other ingredients. Small quantities of seeds cakes are also exported.

89. **Sudan’s yield of sesame seeds is relatively low and fluctuates under both mechanized and traditional rain-fed production systems.** This is largely due to the low availability of water and fertilizer. In 2015, average yield for sesame seeds was 259 kg/ha (283 kg/ha in mechanized systems and 253 kg/ha in traditional systems), whereas in case of Nigeria and China, respective yields were 500 kg/ha and 1,200 kg/ha (Table 5.5). Sudan’s sesame seed productivity is estimated to be 18 percent that of China, 27 percent that of Ethiopia, and 51 percent that of Nigeria. Further, most farmers are smallholders who lack the infrastructure for storage, leading to high rates of post-harvest losses. The harvested sesame seeds are stored on ground which causes contamination with sand and other impurities.

Table 5.5: Sesame yields of various countries

Country	Yield (kg/ha)
China	1,200

Country	Yield (kg/ha)
Ethiopia	750
Myanmar	580
Nigeria	500
India	422
Sudan	259

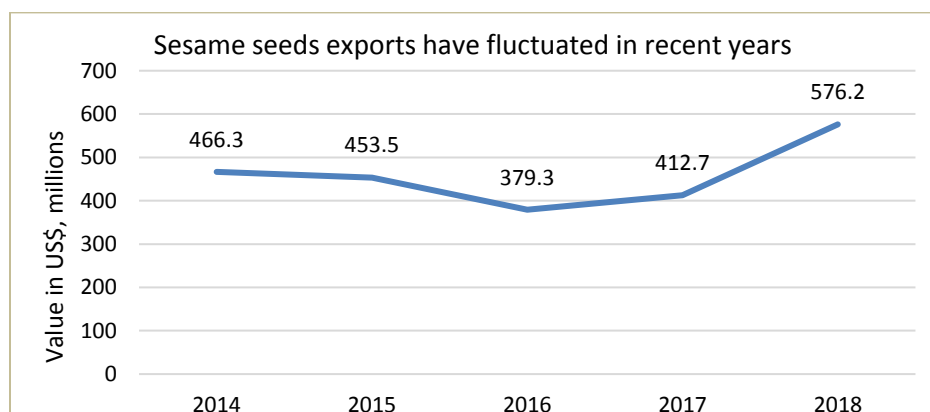
Source: Getahun Bikora, Oilseed Production and Marketing Situation in Ethiopia, Ministry of Trade, November 14, 2015, U.S. Department of Agriculture; World Bank data; and FAOSTAT.

90. **Support is required to increase productivity and reduce post-harvest losses in the sesame seeds value chain.** Improved inputs including quality seed, appropriate fertilizer use, and increased access to irrigation facilities can help farmers increase productivity, which would stabilize the yearly fluctuations in production volumes of sesame seeds. Moreover, support at the postproduction level (that is, provision of proper storage infrastructure/facilities) can help minimize post-harvest losses (World Bank 2019c).

### Sesame in international and domestic markets

91. **Sesame seed is an important export cash crop for Sudan.** The country exports more than two-thirds of the production, and the remaining one-third is either processed or lost due to deficient infrastructure and poor links with the processing sector. Sudan exported 550,000 tons and 704,000 tons of sesame seeds worth US\$412 million and US\$576 million, respectively, in 2017 and 2018 (Bank of Sudan annual reports). White sesame is exported as grain. The lower-quality red sesame is processed domestically. The export quantities of raw sesame seeds exceed the export quantities of processed sesame seeds (oil), and Sudan, therefore, does not fully benefit from the export potential of sesame oil. In fact, Sudan became a net importer of edible oil importing annually 253,186 tons of edible oil with an import bill of US\$230 million in 2017.

Figure 5.9: Sudan's sesame exports in US\$, millions (2014–18)



Source: "Economic and Financial Statistical Review," CBS, 2019.

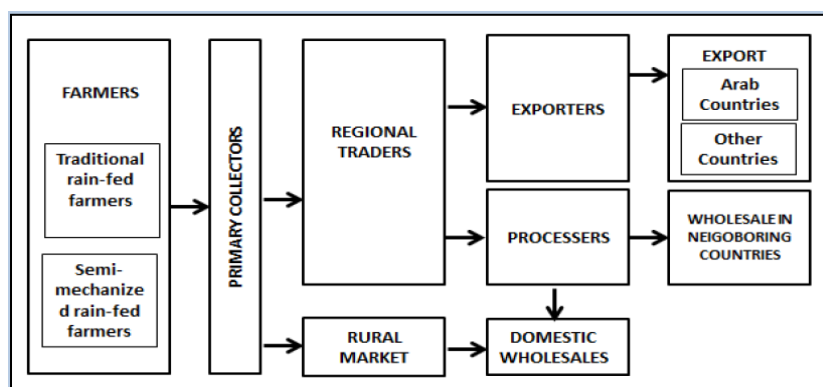
92. **The main markets for Sudan's sesame seeds include the Middle East and China.** Global demand for sesame seems to be increasing with the rapid growth of consumption in China and India. Currently, global trade of sesame seeds is valued at US\$2.8 billion. The top five sesame-importing countries are China, Japan, Turkey, South Korea, and Vietnam, with China accounting for 30 percent of global imports. Sudan has exported sesame seeds to over 75 total destinations since 1990. In 2013, the Middle East accounted for 51 percent of all sesame exports, and China for 27 percent. The major markets for white sesame seeds export include Algeria, Greece, Morocco, Poland, Tunisia, and Turkey. China is a major

importer of red sesame seeds produced in Sudan, for oil extraction, which provides a stable market for the Sudanese exporters. There exist, however, major markets of sesame seeds such as Japan, Malaysia and the United States that have not been penetrated yet, due to the low quality of the sesame seeds and Sudan’s inability to comply with SPS standards.

## Sesame marketing chain

93. **There exist several small-scale actors in the sesame seeds value chain**, including farmers, traders at different administrative levels (village, district, state, and national), transporters, small-scale and large-scale processors, and exporters. Growers typically sell their seeds within two or three weeks after harvest to a village collector or trader. Village traders take and sell the purchased sesame seeds to intermediate traders in the regional markets, who in turn collect larger quantities and sell them to the wholesaler, processor, or exporter. In several cases, processors and exporters have direct agents to purchase sesame seeds at the local or intermediate markets. Large commercial farmers usually have direct purchase agreements with the wholesalers, processors, and exporters. Only a small percentage of sesame growers (large commercial farmers) have storage facilities to store their produce and wait to fetch better prices. Additionally, there exist some institutions that play an important role in the sesame seeds marketing. These institutions include the Ministry of Agriculture and Forestry (MOAF), the Ministry of Industry (MOI), ARC, and Sudanese Standards and Metrology Organization (SSMO), industry stakeholder associations, and international organizations and NGOs (United Nations Industrial Development Organization 2017).

Figure 5.10: Value chain map of sesame seeds in Sudan



Source: United Nations Industrial Development Organization 2017.

94. **Most exporters and processors are in the capital city Khartoum and Port Sudan.** In these cities, exporters screen, clean, and bag sesame seeds into 50 kg sacks. The bagged sesame seed is then packed into 20 MT and 40 MT containers which are transported to the shipping lines for transport to the export destinations (United Nations Industrial Development Organization 2017).

95. **The sesame seed processing sector is dominated by 2–3 large corporations operating in the capital Khartoum, while SMEs serve rural areas.** The two large ‘Tahnia’ manufacturing companies are based in Khartoum and have their own distribution networks. The SMEs manufacturing ‘Tahnia’ serve the rural and small urban markets. There is a growing demand of ‘Tahnia halwa’ in rural areas and small towns. ‘Tahnia’ produced by SMEs is distributed through wholesalers in large plastic buckets, mostly unbranded because quality packaging is expensive for SMEs and import restrictions limit their ability to access better packaging. Despite the product being highly desired by domestic consumers, price sensitivity and high



operational costs limit the scalability of local markets, resulting in mostly subsistence-level entrepreneurship by the SMEs (World Bank 2019d).

### Constraints along the sesame seeds value chain

96. The sesame value chain faces several constraints beginning with production and extended through exports. Besides the issues common to all value chains, the specific key challenges identified by the stakeholders are summarized as follows:

- **Inappropriate use of pesticides.** Sudanese farmers have limited pesticide knowledge, and unsuitable use of pesticides lowers the quality of sesame seeds. According to an ARC analysis on the pesticides used by sesame farmers in the field, 5 out of 10 commonly used pesticides were not suitable for sesame cultivation.
- **Lack of quality seeds and poor agricultural practices.** Farmers have limited knowledge about the value of improved seeds and good agricultural practices (GAPs). Most farmers still use traditional seed varieties, which result in low productivity. There are hardly any active inputs providers for oil seeds in the rain-fed areas and smallholder farmers have limited opportunities to access improved seeds, fertilizers, pesticides, and so on. Improved varieties of sesame seeds are mostly imported and are expensive for smallholder farmers to buy. The growers lack GAPs, that is, efficient crop management methods, pest control measures, and pre- and post-harvesting practices. The situation in the irrigated sector is relatively better as private suppliers provide the required inputs to a certain extent.

### Investment opportunities along the sesame seed value chain

#### *Productivity enhancement, value addition, and employment generation*

97. **The competitiveness of raw sesame seeds in terms of quality and consistency of supply to the domestic market is positive, while the competitiveness of sesame seed processing in terms of quality is low.** There is a regular supply of sesame seeds in the local market, and there exist no major constraints aside from the usual seasonal limitations. More than 90 percent of sesame seeds production enters the local market for consumption and export. The competitiveness of sesame seeds processing in terms of quality is low. The sesame seeds processing is mostly carried out on a small scale by SMEs. Uneven supplies of sesame seeds, poor infrastructure, limited access to the latest processing equipment, and a lack of quality packaging material reduces the quality and output of sesame seed processing in Sudan.

98. **Investment opportunities exist in sesame seeds productivity and quality enhancement through provision of quality seeds;** timely supply of appropriate fertilizer and pesticide; advisory and extension services; and post-harvest handling including collection, sorting, safe packing, warehousing, and safe transportation to markets.

99. **Investments in sesame seed productivity enhancement and value addition (processing and oil extraction) will create employment and increase household income,** food security, and entrepreneurship opportunities along the entire value chain including agri inputs supply chain, road and transport network improvement, processing, oil extraction, sorting, grading, packaging, and marketing

### *Quality enhancement, certification, and export earning*

100. **Sudanese sesame seeds are not competitive in the premium global markets in terms of cost and quality.** The high-quality sesame seeds are often sold at discounted prices to markets (with less-stringent quality standards) like China, as the sesame seeds exporters face several challenges in accessing the premium markets, that is, the EU, Japan, and Korea, in part due to noncompliance with SPS standards and regulations. The key limitations are (a) producers' limited knowledge regarding SPS standards of importing countries; (b) poor agronomic practices for harvesting, post-harvesting, transporting, and storage that lead to contamination with mycotoxin-producing fungi (in particular aflatoxins), pests, and rodent infestations; and (c) limited or no vertical connection along the value chain to monitor product safety at each stage of the value chain (United Nations Industrial Development Organization 2017).

101. **Investment opportunities lie in strengthening the sesame value chain to fulfill the required quality standards for global markets.** Weak SPS measures, inadequate post-harvest handling, lack of laboratory facilities, and inadequate regulatory control impede the export of sesame seeds export. Investment opportunities exist in developing forward and backward links to improve SPS compliance along the value chain, and building the capacity of value chain actors to meet SPS requirements, especially for premium markets, is critical for increasing export revenues.

102. **Sesame seed processing for oil extraction presents medium- to long-term investment opportunities.** The medium- to long-term investment opportunities exist in upgrading/increasing the output capacity of existing processing plants and setting up new sesame seed processing plants with the latest equipment and technology. Further, medium-term investments could also be targeted toward value addition for bakery and confectionary items that will improve the quality of these items and increase the income for the sesame seeds processors (World Bank 2019c).

103. **Organic certification and branding of sesame value chain present long-term investment opportunities.** Organic certification, traceability, and branding of sesame seeds will result in higher income for the value chain actors due to certified export quality of sesame seeds, and ability to tap into the premium markets like the EU and the United States. It would also contribute toward the Transitional Government's agenda of 'establishing the bases of sustainable development'.

104. **The investments will enable Sudan to market high-quality sesame seeds and sesame oil to the premium markets,** generate skilled jobs and higher incomes in the sesame export supply chain, and enhance export earnings manifold by tapping into new markets in the Middle East, Arab countries, and Africa.

### **Horticulture value chain**

105. **Sudan has a substantial potential for horticulture production due to climatic variation and availability of fertile land and water.** Sudan produces fruits free of chemicals—that is, apple, banana, citrus, dates, grapes, guava, mango, pineapple, strawberries, sweet tomato, oranges, watermelon—and vegetables including cucumber, eggplant, okra, onion, potato, pumpkins, and tomato. Production and consumption of fresh fruits and vegetables is increasing in the country due to increased urbanization, more awareness about the nutritive value of horticulture crops, and relatively high returns for producers. The productivity levels are, however, low and the increase in production is primarily due to an increase in the production area.

106. **While hardly any reliable information is available about the share of horticulture in GDP and employment, it is apparent that the sector is performing below potential.** The economic impact of horticulture is substantially limited compared to the actual potential. It is due to less attention accorded to horticulture compared with cash crops like cotton, peanuts, and staple food grains like sorghum and wheat. Production of vegetables and fruits was 3,993,000 tons and 3,650,000 tons, respectively, in 2015. According to an estimate, the horticulture cultivation area increased from approximately 409,000 ha in 2012 to 899,000 ha in 2016, but due to substantial increases in the total cultivated area during 2012–16, the proportion of horticulture cultivated area was reduced from 4.5 percent to 2.9 percent (Table 5.6). Nevertheless, it is hard to obtain reliable data on the horticulture cultivation area and production.

**Table 5.6: Horticulture cultivation area**

Area	2012	2013	2014	2015	2016
Total cultivated area (m ha)	17.30	21.30	16.70	22.80	18.10
Fruits %	1.22	0.48	0.39	0.37	0.35
Vegetables %	0.62	0.70	0.70	0.80	0.90
Fruits and vegetables % of total area	4.50	2.30	2.70	2.10	2.90

Source: Calculated based on the data from the CBS and Central Bureau of Statistics.

107. **The geographical diversity in Sudan is suitable for cultivation of a wide variety of fruits and vegetables.** Horticulture crops are primarily cultivated in the irrigated areas and also in the rain-fed areas with high rainfall, that is, the southern states. While vegetables are grown in all regions of Sudan, the noteworthy states are Blue Nile, Kassala, Khartoum, Gezira, Northern, River Nile, and White Nile. In case of fruits, the prominent states are Darfur for orange and guava, Gezira and Kassala for banana, Northern for dates, and Sennar and South Kordofan for mango (Table 5.7).

**Table 5.7: Major horticulture crops production states**

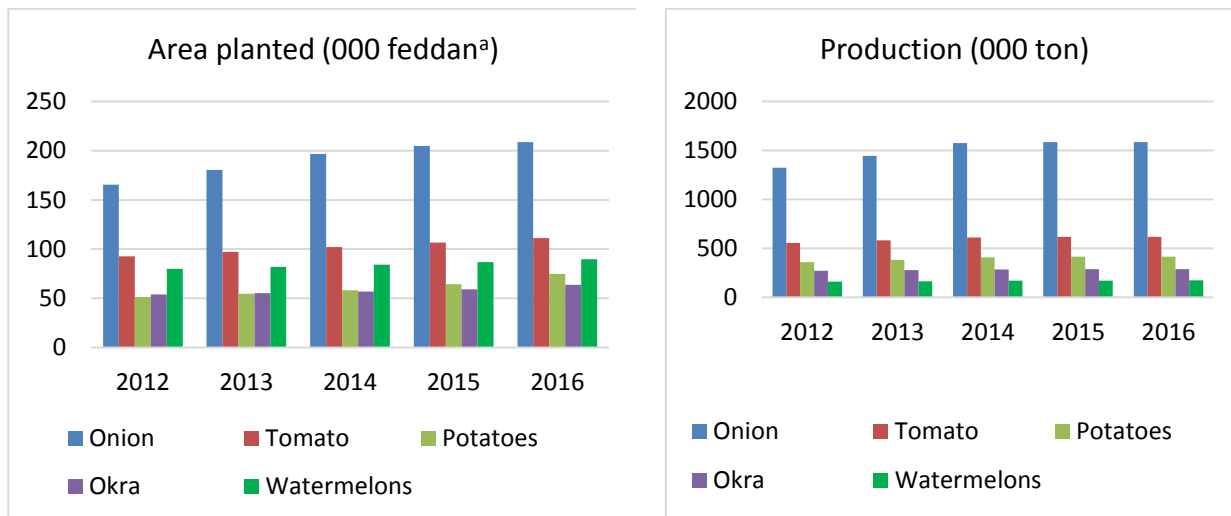
Crop	State
<b>Vegetables<sup>a</sup></b>	
Eggplant	Gezira, Khartoum, Northern, and River Nile
Okra	Khartoum, Northern, River Nile, Sennar, and White Nile
Onion	Kassala, Khartoum, Northern, River Nile, and Sennar,
Potato	Darfur, Khartoum, Northern, River Nile, and Sennar,
Tomato	Blue Nile, Gezira, Kassala, Khartoum, Northern, River Nile, and White Nile
<b>Fruits</b>	
Banana	Blue Nile, Gezira, Kassala, Khartoum, and Sennar
Dates	Northern and River Nile
Grapefruit	Northern
Mango	Khartoum, Northern, Southern Kordofan, and Western Darfur
Orange	Darfur, Northern, River Nile, and Western

Note: a. According to Sudan Ministry of Agriculture, tomato and watermelon are categorized as vegetables.

108. **Onion is the most cultivated horticulture crop, followed by tomato and potato.** The area planted with onions was the largest compared to other horticulture crops. Onions accounted for 69,500 ha

compared to 38,800 ha for tomatoes and 33,500 ha for watermelons. By 2016, the onion and tomato cultivation area increased to over 84,000 ha and 46,600 ha, respectively, while okra and potato cultivation areas increased slightly. Onion production levels increased from less than 1.2 million tons in 2011 to more than 1.5 million tons in 2014 (Figure 5.11).

Figure 5.11: Area planted and volume of vegetables production

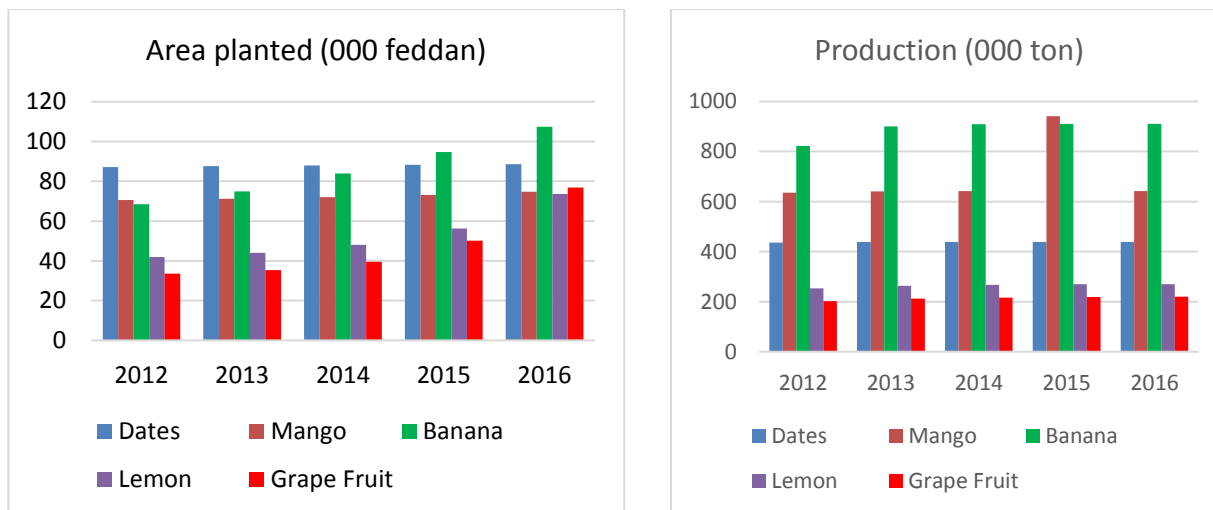


Source: Constructed based on data from Central Bureau of Statistics.

Note: a. 1 feddan = 0.42 ha.

109. **Dates, bananas, and mangoes are the major fruits cultivated in terms of production volume and acreage.** In 2016, banana was planted on 45,000 ha, followed by dates on 37,000 ha and grapefruit on 32,000 ha. Banana cultivation area and production increased significantly from 822,000 tons in 2012 to about 910,000 tons in 2016. Likewise, mango production also multiplied from 620,000 tons in 2012 to 941,000 tons in 2015 and was ranked no. 1 in terms of production volume (Figure 5.12). The existing mango varieties are rich in fiber content and are not suitable for processing of mango pulp. To overcome this, Sudan has started to import new improved mango varieties from South Africa.

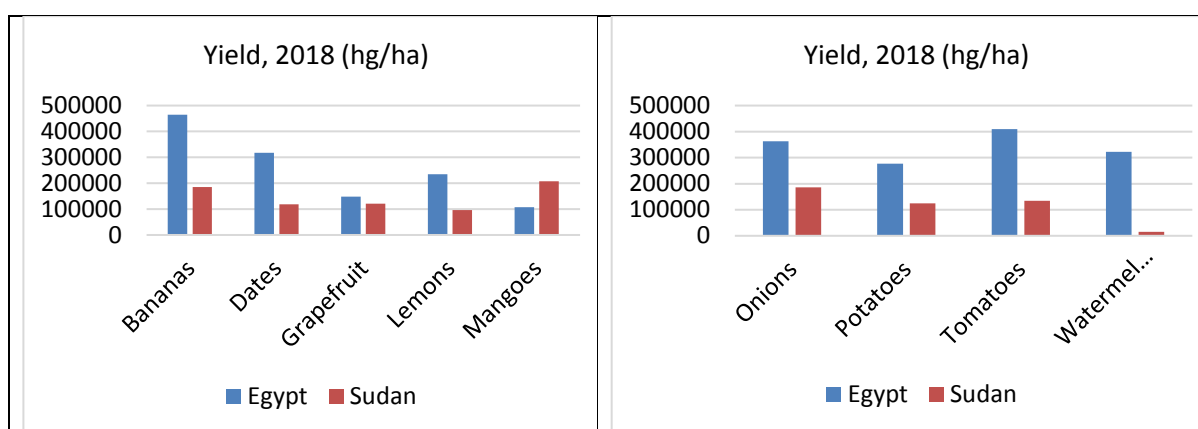
Figure 5.12: Area planted and volume of fruits production



Source: Constructed based on data from Central Bureau of Statistics.

110. **Low horticulture yield levels.** Yield levels of Sudan’s major horticultural products, except mango, are substantially low as compared to the corresponding yield levels in Egypt (Figure 5.13). Growers, in many cases, adopt low-input, minimal-risk, low-output strategies. While, they have the traditional know-how on how to act upon the local climatic conditions and mitigate risks for crop failure, they lack the required practical knowledge on agronomic issues. The usage of own propagated seeds or plants is prevalent, and application of fertilizer and pesticides is low. The knowledge, skills, and experience about horticulture cultivation and management appear to be lacking, that is, soil preparation, nutrient needs and fertilizers, recognition and prevention of pest and diseases, planting systems and planting depths, crop maintenance and pruning, and harvest and handling techniques to prevent damages to the produce.

Figure 5.13: Yield levels of Sudan’s major horticultural products



Source: Constructed based on data from FAOSTAT.

## Horticulture in international and domestic markets

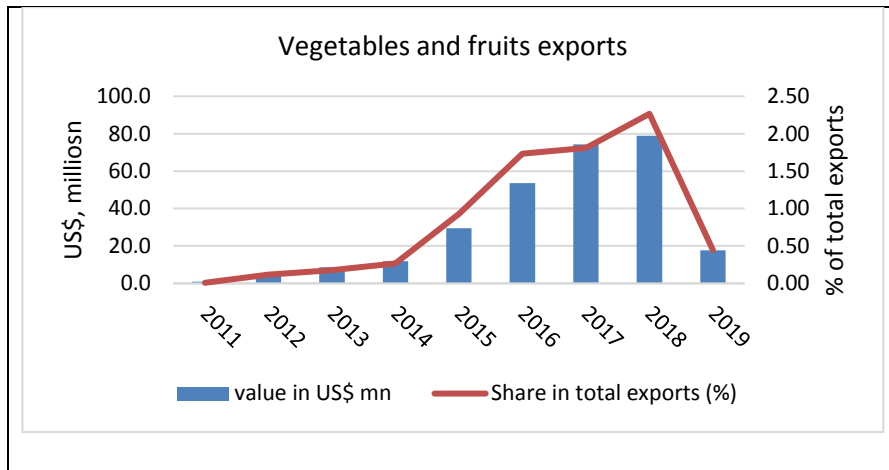
111. **Horticulture exports increased from less than US\$1 million to US\$79 million from 2011 to 2018.** The horticultural share in the total exports increased from negligible in 2011 to about 2.3 percent in 2018, though it declined in 2019 due to the nationwide political unrest, violence, and economic meltdown (Table 5.8). Export of horticulture products is, however, considerably low as compared to the production volumes. Sudan’s global share in horticultural produce remains negligible and is limited to a few export markets dominated by vegetables (Figure 5.14). Sudan entered the horticulture export market in 2005, and 15 years later, its global share is less than 0.01 percent and less than 1 percent of Africa’s horticultural exports. The main export markets are the Gulf and Arab countries (Table 5.8). There are no reliable data available on the levels of domestic consumption of Sudanese horticulture products.

Table 5.8: Sudan’s share in international horticultural products trade

Fruits and vegetables exports (US\$, millions)	2012	2013	2014	2015	2016	2017
Vegetables	4.10	2.40	5.50	19.70	43.10	66.20
Fruits	0.60	6.10	6.30	9.80	10.50	8.10
Total	4.70	8.50	11.90	29.40	53.60	74.30
Sudan's share in world's fruits and vegetables exports	0.01	0.00	0.02	0.04	0.05	0.04
Sudan's share in Africa's fruits and vegetables exports	0.30	0.10	0.30	0.70	1.00	0.60

Source: Calculation based on the data from Sudan Central Bureau of Statistics and FAOSTAT.

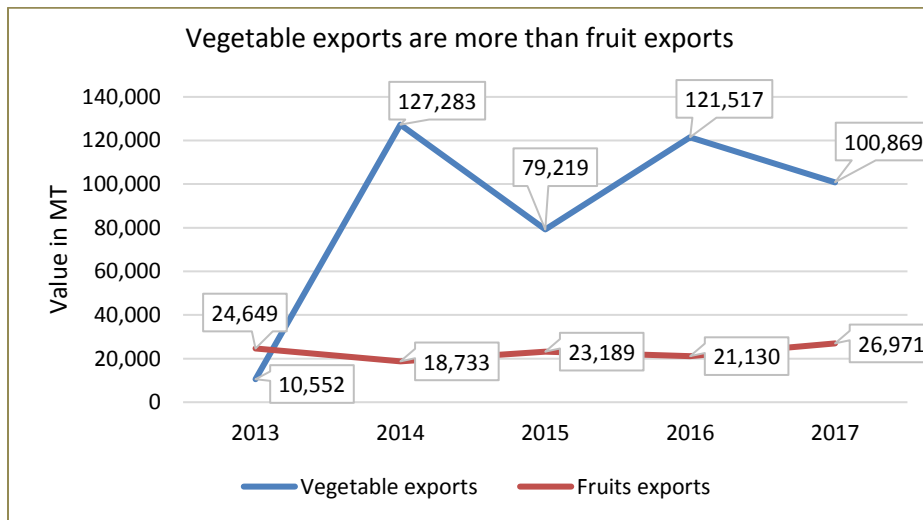
Figure 5.14: Horticultural exports



Source: Calculation based on the data from the CBS and Central Bureau of Statistics.

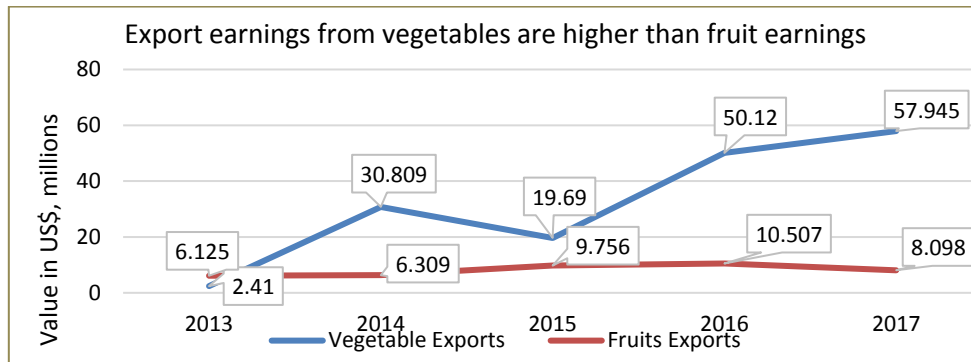
112. While in 2013, fruit export volumes were higher than vegetable export volumes, in five years, export of vegetables increased from 10,552 MT to 100,869 MT from 2013 to 2017. The export of fruit crops has shown a marginal improvement from 24,649 MT in 2013 to 26,971 MT in 2017 (Figure 5.15). Similarly, in the corresponding period, vegetables export earnings increased from US\$6.125 million to US\$57.945 million whereas fruit export revenues increased from US\$2.41 million to US\$8 million (Figure 5.16)

Figure 5.15: Horticulture export in MT (2013–17)



Source: Appendix 16-A, page 232 of 57th Annual Report of the CBS, 2017.

Figure 5.16: Horticulture export earnings in US\$, millions (2013–17)



Source: Appendix 16-A, page 232 of 57th Annual Report of the CBS, 2017.

## Horticulture marketing chain

113. **Vegetables and fruits are transported and sold primarily by small-scale farmers and traders to consumers and distributors through different arrangements.** The horticultural sector in Sudan is characterized by a fragmented production structure. Vegetable and fruit markets appear to be disorganized and deficient in the required infrastructure and services and with weak management, if any. Local authorities sometimes intervene in allocating spaces, charging fees, and imposing food safety measures. Early in the morning, small horticulture producers bring their produce to the nearby market and sell it in an open auction usually at very low prices. Relatively large or commercial horticulture producers directly deal with traders/wholesalers and sell their produce at low price at their farms or at the horticulture markets. Wholesalers/traders bring their purchased produce to the horticulture markets in big cities and sell it to retail distributors and consumers. There were significant differences between the sale prices received by farmers at the farm gate/horticultural markets and the price paid by retail sellers and final consumers.

114. **Seasonal price fluctuation of horticulture crops.** The prices were usually high during the off-season due to limited production volumes and supply shortages. For instance, the price of tomatoes fluctuated greatly, ranging from US\$0.05 per kg during the season up to US\$5 during the off-season. Due to a lack of cold storage infrastructure, the producers do not have many choices and must sell their produce at the market offer price. The post-harvest losses in the horticulture value chains are estimated at about 60 percent, which hamper the supply of products and cause price fluctuations.

115. **Limited cold storage infrastructure is the major reason for the post-harvest losses of perishable horticulture produce.** Post-harvest losses happen throughout the supply chain, including 28 percent losses at the production stage, 10 percent at handling and storage, 34 percent at preparation and packing, 8 percent at distribution, and 20 percent at the consumption stage. The horticulture markets, except for some central markets in Khartoum, lack the necessary infrastructure; services, and hygiene practices for maintaining the freshness, moisture, taste, and texture; sorting, packaging, and safe keeping; and transportation of horticulture products such as exhibition sheds, loading and unloading platforms, and sorting and packaging facilities. The quality of Sudanese horticulture produce is, therefore, not competitive. The availability of cold storage transport trucks (reefers) and cold storage equipment is limited, due to import restrictions and regulatory constraints. In Gezira state, for example, the installed cold storage capacity only caters to 5 percent supply of perishable products, and in several states, there exist no commercial cold storage facilities (World Bank 2019d).

116. **Poor post-harvest practices and lack of processing facilities limit competitiveness of horticulture produce against imported produce.** While Sudan produces large volumes of vegetables and fruits at very low prices during the harvest season and represents a huge potential for commercial processing, the major share of the produce is sorted manually and sold unclean in low-quality packing at local markets for domestic consumption. Supermarkets in large cities like Khartoum reported consistent problems with the quality of fresh fruits and vegetables being supplied domestically and have a preference for imported fruits and vegetables. Even in higher-end markets, the quality of local produce was notably poor, with splits on tomatoes, black spots on bananas and other fruits, fly attacks on mangoes, and bruises on melons due to poor packaging and handling.

117. **Lack of processing facilities.** Horticulture producers have limited access to the processing facilities. The horticulture processing sector faces challenges in procuring quality producer/raw material for processing. In several cases, products like canned tomato paste, fruit juices, and marmalade are being prepared from cheap, imported concentrates. A few large-scale processing facilities situated in Khartoum seem to comply with the food safety standards.

118. **Some SMEs<sup>67</sup> involved in horticulture processing are successfully competing against imports,** and their locally processed products compete well against the imported juices, jams, confectionary products, and baked goods from Turkey and the Gulf states. The imported products are limited to large or upscale supermarkets in Khartoum. Table 5.9 shows the volume of jams and juices/soft drinks produced in Sudan during 2012–16.

**Table 5.9: Sudan’s processed horticultural products**

Product	2012	2013	2014	2015	2016
Jams (tons, thousands)	16	10	18	—	14
Juices and soft drinks (liters, millions)	720	882	859	455	434

Source: Sudan Central Bureau of Statistics.

119. **Several SMEs and Individuals are involved in vegetables and fruits export business,** but no reliable data are available about the number and size of the exporting companies. The key large-size market player in the processing and export of horticulture products is the Export Development and Logistics Group (EDLG). The company has two horticulture export centers in the country with an installed processing capacity of 30 tons per hour and 50 tons per hour, respectively. Further, the company has an installed capacity of 300 tons per day for the processing of tomatoes into tomato paste.

120. **The Sudanese Centre for the Sterilization of Horticultural Exports was established in 2013, to increase horticulture exports.** The first of its kind in Africa and the Middle East, set up by the EDLG, the center is dedicated to the post-harvest handling, packing, and export of fruits and vegetables according to the GLOBALG.A.P. standards. Approval provided by the Jordanian Agricultural Quarantine qualified the company to export Sudanese horticultural products around the world. The center primarily exports bananas, dates, grapefruit, green beans, green lemons, mangoes, onions, and watermelons. The center uses vapor heat treatment to ensure that quarantine pests, such as eggs and larvae of melon flies and

<sup>67</sup> No data is available on the number and capacity of horticulture processing firms, but number of SMEs are known in the domestic market of producing fruit jams, juices, tomato paste and other products.



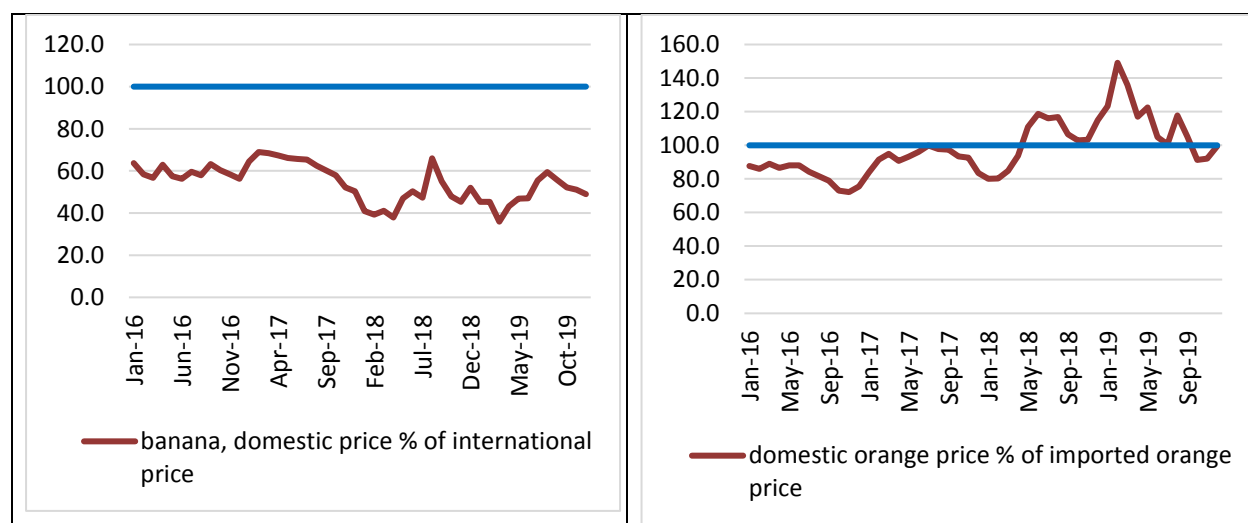
oriental fruit flies (which originate in tropical regions) have been sterilized and are incapable of growing and multiplying in the importing country.

## Horticulture price variation and competitiveness

121. **While some Sudanese horticulture products have competitive prices, others have been facing tough competition from imports.** For example, due to relatively low production costs, good quality, and yearlong production, Sudanese banana prices remained 30–65 percent below the international banana prices during 2016–19. This indicates that a competitive export market exists for Sudanese banana (Figure 5.17) According to some Sudanese banana exporters, banana export can fetch 50–300 percent higher prices than in the domestic market, depending on the time of year (World Bank 2019d).

122. In contrast, local oranges have been facing tough competition in the domestic market from imported orange. Despite significant currency depreciation, prices of domestically produced oranges are not competitive against the prices of imported orange. Local orange prices from being 20–30 percent lower than the prices of imported orange during 2016–17 became 15–40 percent higher in some months of 2019, although this ratio has been volatile (Figure 5.17).

Figure 5.17: Local and international prices comparison of select Sudanese fruits



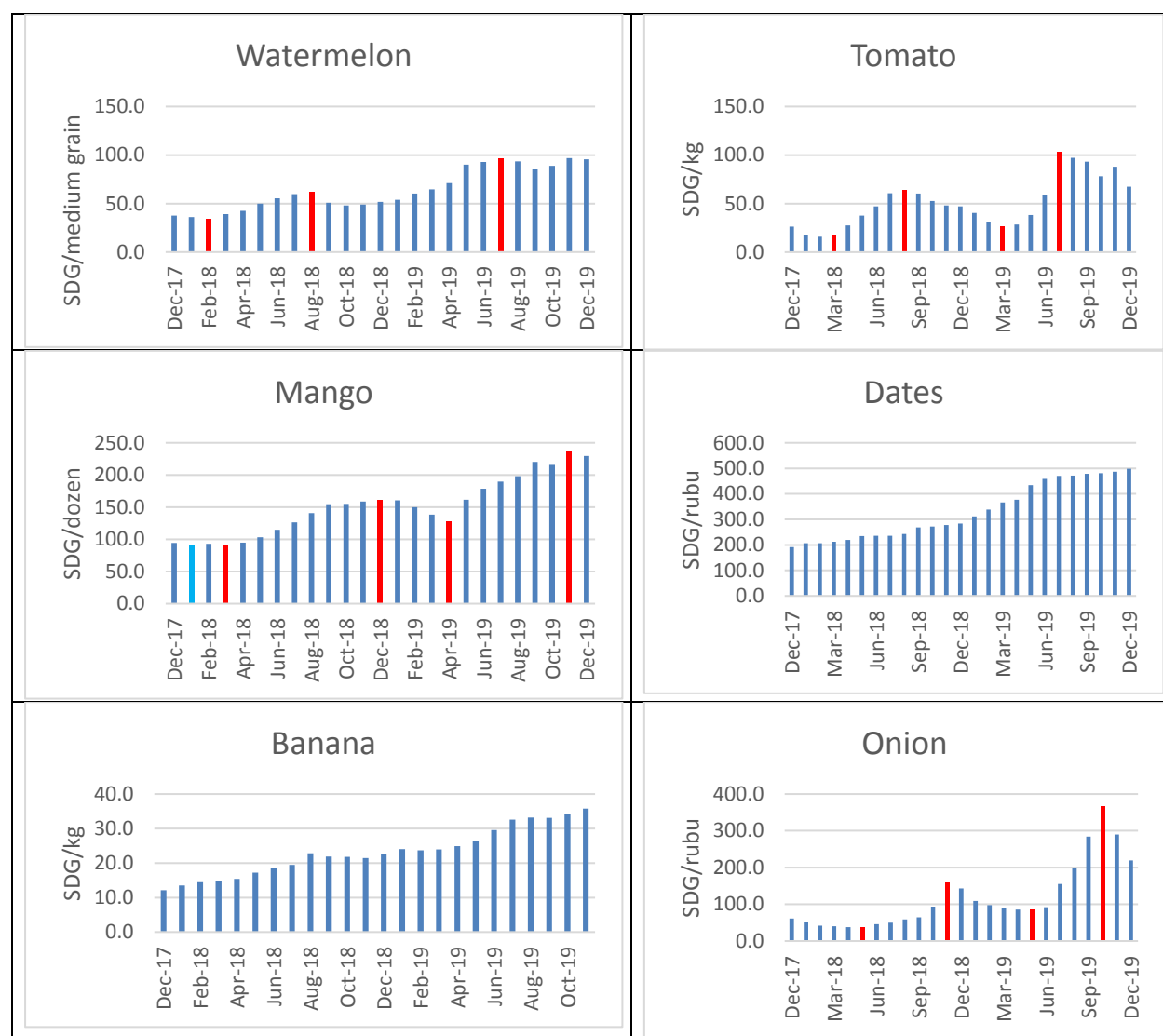
Source: Constructed based on data from CBS and World Bank Commodity Prices.

123. **While seasonal price variation in horticulture commodities is a significant challenge for producers, it offers potential investment opportunities.** Although no acceptable seasonality price analysis has been carried out to estimate seasonal price gaps of horticulture products, a simple representation of some Sudanese horticulture products indicates that prices fluctuate greatly throughout the year, following a marked seasonal pattern (Figure 5.18). For example, for watermelons, the difference between the lowest price during the season and the highest price in the off-season exceeded 50 percent of the high production season price in 2018 and 75 percent in 2019. In case of onions, the variation ratio exceeded 330 percent in 2018 and 2019. However, for horticulture crops that are produced throughout the year, that is, banana and nonperishable commodities like dates, this difference is low (Figure 5.18).

124. The seasonal variation compounded by the difficulties in transportation and cold storage and lack of processing lead to significant reduction in production incentives during certain periods as farmers struggle to sell their vegetables and fruit produce. On the other hand, it offers investment opportunities

in cold storage and processing. For example, in Gizera state, a recent investment in cold storage has proved to be a highly profitable business with high demand from farmers (World Bank 2019c).

**Figure 5.18: Seasonal price variation of select Sudanese horticultural products**



Source: Constructed based on data from the CBS.

125. **Price difference between local and export horticulture products.** A comparison of the average export price of select horticulture crops at Khartoum airport with the average selling price in Arab countries shows that noteworthy margins exist, for example, mango (25 percent), watermelon (29 percent), and grapefruit (90 percent).

**Table 5.10: Prices of select Sudanese horticulture products (2015)**

Product	Price in US\$ per ton	
	At Khartoum airport	Average selling price in importing Arab countries
Mango	1,333	1,950
Watermelons	266	624
Grapefruit	773	1,750

Product	Price in US\$ per ton	
	At Khartoum airport	Average selling price in importing Arab countries
Onion	333	430
Cost of transportation to Arab region (land)	165	—
Cost of transportation to Arab region (air)	240	—
Fees	40	—

Source: Ministry of Industry and Investment, Khartoum state.

### Constraints along the horticulture value chain

126. The stakeholders identified the following major horticulture-related production, processing, and marketing constraints which limit further growth and diversification of the horticulture sub-sector. The issues common to all five value chains are described at the end of this chapter.

127. **Production constraints.** Increasing horticulture production in Sudan is constrained by many factors including the following:

- **Land ownership issues.** For fruits production which requires long-term investment, security of land ownership is very important. Security of land rights is known to be problematic in Sudan.
- **Poor harvesting practices.** Farmers generally lack the essential and practical knowledge and techniques for fruit harvesting to ensure good quality, texture, and size. Further, horticulture farming in greenhouses, especially for the off-season is extremely limited in Sudan.

128. **Processing and marketing constraints.** Sudan’s horticultural sector is constrained by limited post-harvest services including the following:

- **The producers have limited market information and access.** It results in lower income for the producers and decreases their capacity to invest in improved farming technologies.
- **Limited investment in sorting, cleaning, packaging, and processing business.** Traders engaged in harvesting, packaging, labeling, storage, transportation, and trading of produce lack the required knowledge, skills, equipment, and infrastructure for delivering fresh quality produce to the consumer.
- **Lack of traceability and certification systems.** Sudan is unable to penetrate premium horticulture markets like the United States and the EU due to the risk of contamination and the absence of essential information, that is, production region, date of handling, quality assurance certificate, batch number, and laboratory testing data. As a result, the risk of contamination prevails.

**Box 5.2: Challenges in the banana value chain**

Several challenges prevented Sudan from tapping into the banana export market. Competitiveness was reduced due to an absence of suitable export cultivars, large-scale banana plantations for economies of scale, and water and land management experts. Banana exports from Sudan are considered risky due to a lack of overland refrigerated logistics and refrigerated sea transport. Finally, aggregation in sufficient quantities for profitable exports is a challenge due to a lack of producer groups and working capital constraints for SME packers and exporters.

## Investment opportunities in the horticulture value chain

### *Productivity enhancement, processing, and employment generation*

129. **Short- to medium-term investment opportunities exist in creating an enabling environment for the horticulture value chain actors.** The introduction of high-quality seeds and planting material, as well as local production of hybrid seeds, agricultural inputs, and technology for producers and increased information and links with the market, capacity building, and skills enhancement to reduce post-harvest losses including collection, sorting, packing, safe storage, and transportation would increase productivity and supply, and lay the groundwork for developing an integrated horticultural supply chain. Developing such a supply chain would require supportive government policies and public sector investments/public-private partnerships for improving logistics, road network and transportation system, advisory and extension services, and improved access to credit.

130. **Processing and preservation of horticulture crops present medium-term investment opportunities.** Given the high post-harvest losses due to limited cold storage infrastructure, investment opportunities in medium term exist in integrated cold supply chain, which is critical for increasing shelf life of fresh fruits and vegetables, and processed horticulture products. Currently, imported concentrates are used to prepare tomato paste (canned), fruit juices, and marmalades, and investment opportunities exist to substitute imported concentrates. The horticulture processing sector has growth potential in the domestic market as well. While local consumers seem to favor imported products in terms of quality, fluctuating supply of imported products due to intermittent import restrictions, currency instability, and limited consumer spending power present good opportunities for domestic production to keep up with or replace imported food products altogether in certain categories (World Bank 2019d).

131. **Investments including public-private partnerships will enhance horticulture productivity and will have a value-chain-wide multiplier effect to create direct and indirect jobs,** higher incomes, and business opportunities in horticulture inputs supply chain; collection and storage of horticulture produce; grading, packaging, and transportation; cold supply chain; processing; financial services; and market information. Further, they will enhance household food security, dietary diversity, and nutritional value of food.

### *Export supply chain development and export earnings*

132. **The potential for horticulture commercial farming and processing is substantial.** Given the vast natural endowment for the production of horticulture crops, Sudan could develop into a major horticultural exporting country. The performance of the horticulture sector in the export market is below potential due to high post-harvest losses, dearth of modern storage, shortage of processing facilities, no traceability, and lack of SPS standards. As most Sudanese vegetables are produced in winter, from November to March, there exists a potential opportunity to fill the seasonal demand gap in Europe, provided the exported produce complies with the EU SPS standards.

133. **Proximity to export markets and huge production potential for a wide variety of horticulture crops present medium- and long-term opportunities to develop a competitive export sector.** Investment opportunities exist in the production of several horticulture commodities as cash crops, that is, onion, carrot, tomato, sweet pepper, eggplant, sweet potato, and Galia melon. Demand for these cash crops is increasing, especially in the European countries, and the development of these value chains would enable Sudan to tap into the premium horticulture markets. The horticulture sector would need significant

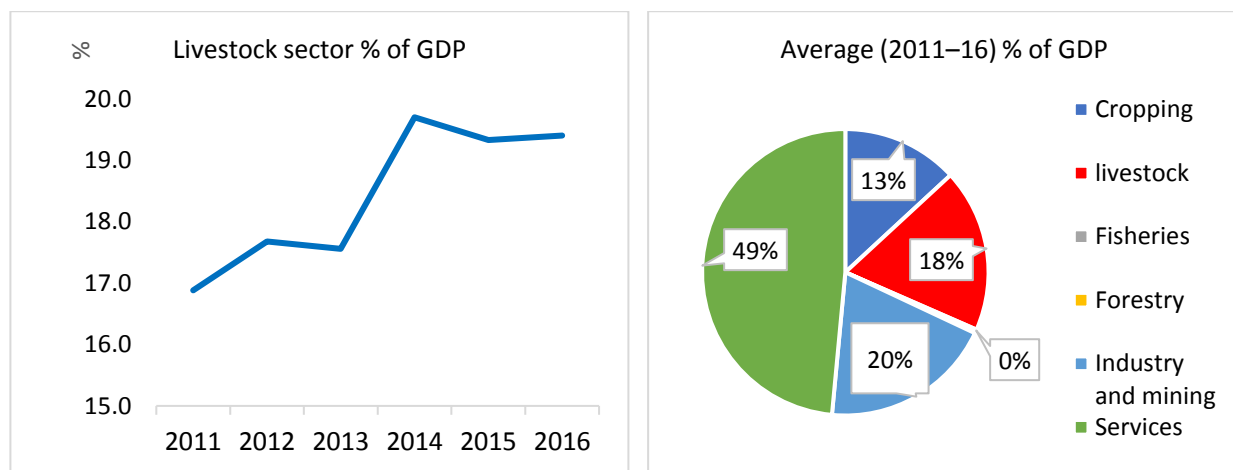
investments in the medium and long terms and quality personnel to be able to manage large-scale plantations to fuel a competitive export industry.

134. **Targeted investments in the horticulture export supply chain will create opportunities for skilled jobs and increased incomes in commercial farming;** quality check and control according to SPS requirements of export markets; horticulture cold supply chain, sorting, packaging, and storage; and horticulture processing and would enable Sudan to enter premium horticulture markets and earn valuable foreign exchange.

## Livestock (meat) value chain

135. **The livestock sector continues to play a key role in Sudan’s economy.** The livestock sector’s contribution to Sudan’s GDP increased from 16.9 percent in 2011 to 19.4 percent in 2016 (Figure 5.19). In addition to meeting the domestic meat demand, the livestock sector contributes significantly to Sudan’s foreign exchange earnings.

Figure 5.19: Livestock sector’s role in Sudanese economy



Source: Constructed based on data from the CBS.

136. **Livestock production is an important source of livelihood for at least 26 million Sudanese people, particularly in rural areas (World Bank 2019b).** Ownership of livestock is widespread in rural Sudan, and around 5 percent of rural households identified animal husbandry as their main source of livelihood in 2014. The poverty rate was found to be lower among those engaged in animal husbandry as compared to those engaged in crop farming but higher than the poverty among those engaged in non-agriculture activities. However, the households engaged in agriculture, either crop farming or raising livestock, have the highest rates of poverty among households classified by livelihoods.

137. **Nomadic pastoralism is largely practiced for livestock production in Sudan.** The pastoral system based on extensive livestock production in rangeland environment and on livestock mobility is the dominant system of production due to the presence of extensive natural rangelands. The productivity of the pastoral livestock system, however, remains low as it involves the constant movement of livestock from one place to another.<sup>68</sup> It makes them more muscular and less fattened which, in turn, reduces the

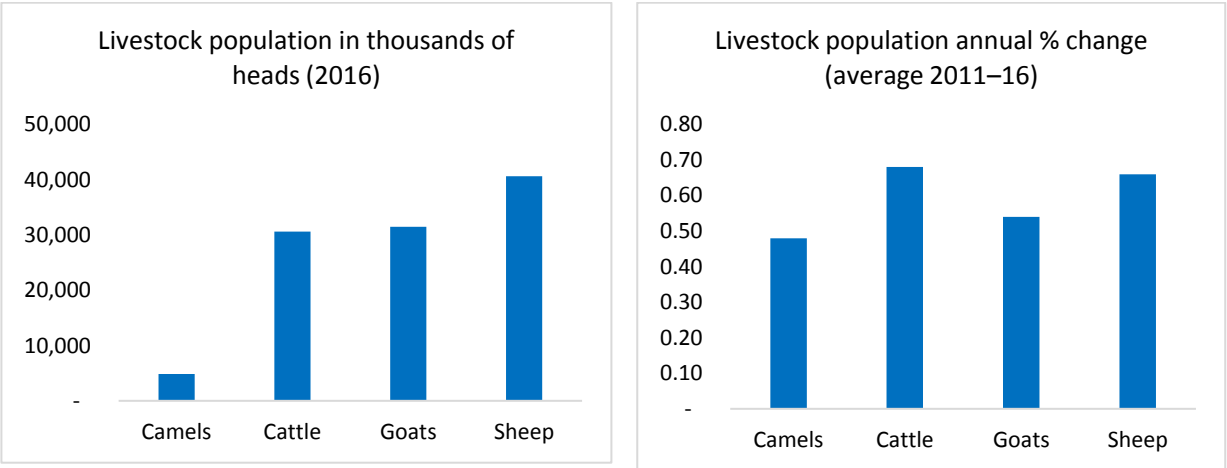
<sup>68</sup> The pastoralists move around the country with their herds in response to weather conditions and fodder availability. The rainy season in Sudan lasts from June to September, and fodder is generally available till mid-January. From September to

quality of the meat produced (World Bank 2019d). In central and eastern Sudan, livestock production is based on an agropastoral system of production where both livestock and crop production are practiced. Small-scale livestock raising exists at a limited scale, which is a traditional village-based system where a few heads of goats, sheep, or cattle are kept, with goats more common than other types of livestock. The main sources of feed in this system are grazing of rangeland and fallow land and along irrigation canals, as well as house waste and crop residue (World Bank 2014b).

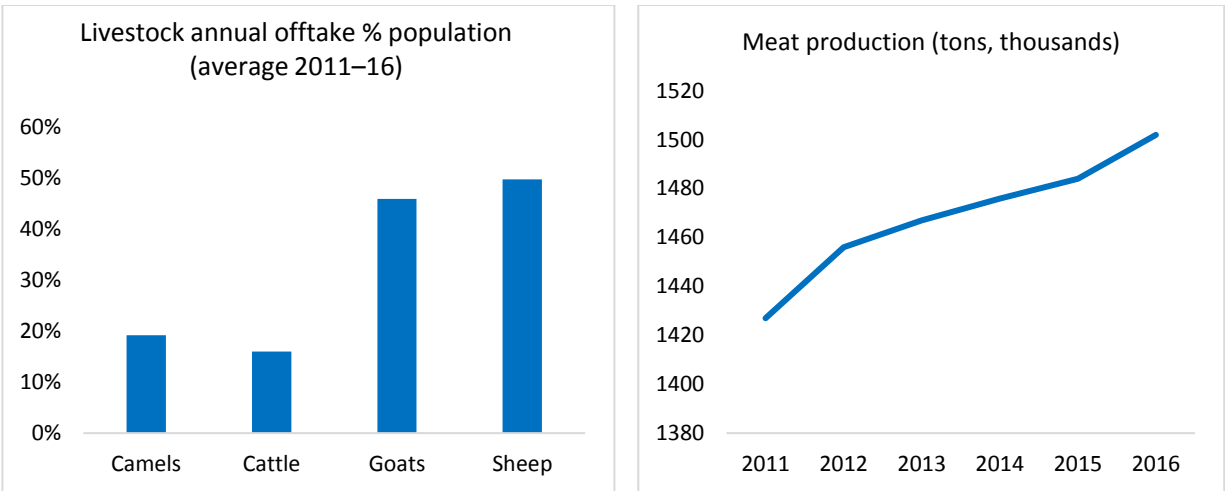
138. **Sudan maintains some of the largest and growing livestock inventories in Africa.** It has the second largest livestock inventory in Africa, after Ethiopia. Cattle, sheep, goats, and camels are the foremost livestock raised in Sudan. As compared to cattle, sheep and goats are more commercially oriented and sold in larger numbers, whereas owning a cattle herd is considered a status symbol in the society.

139. **Sheep (40.896 million) tops the list of number of live animals in Sudan with 31.489 million cattle, 32.032 million goats, and 4.895 million camels in 2019.** The highest population of cattle, sheep, goat, and camel is, respectively, found in South Kordofan, West Kordofan, North Darfur, and South Kordofan. The livestock population has been regularly growing over time. Despite the significant offtake from Sudan’s livestock population in 2011, with the secession of South Sudan, a positive growth rate was reported for all major types of livestock during 2011–16 (Figure 5.20). The annual offtake from Sudan’s livestock population has also been significant, on average 19 percent of camels, 46 percent of goats, 50 percent of sheep, and 16 percent of cattle during 2011–16. Meat production increased from around 1,250,000 tons in 2011 to 1,500,000 tons in 2016 (Figure 5.20).

Figure 5.20: Sudan livestock production



January, the pastoralists graze their livestock in the areas where they reside; post-January, the pastoralists start to move toward the south of Sudan in search of water and nutritive fodder.



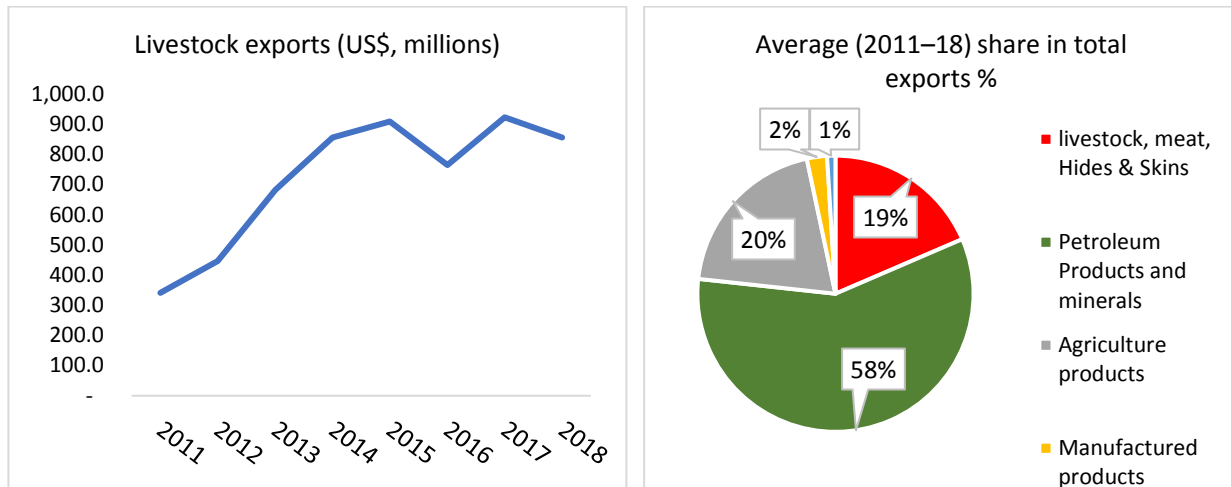
Source: Constructed based on data from Sudan Ministry of Animal Resources, Information Centre.

140. **In comparison to live animals, Sudan’s livestock (meat) processing sector is relatively small and caters to the domestic demand of meat.** Meat production has a strong growth potential due to rising urbanization and increased consumer demands in the country. Widely practiced, the traditional way of producing meat is through livestock slaughtering and selling fresh meat. Currently, there are many slaughterhouses, small butcheries, and processors that serve the domestic market as well as three or four medium- to large-scale meat processing companies.

### Livestock in international and domestic markets

141. **Livestock is a major export commodity of Sudan.** Livestock products are the second largest non-oil export after gold and accounted for 20 percent of export value in 2014. Livestock exports have rapidly become an important part of Sudan’s foreign trade and reached a total export of US\$855.8 million in 2018, from around US\$341.1 million in 2011. During the same period, livestock sector exports on average accounted for 19 percent of Sudan’s total exports (Figure 5.21). Sudan exports live sheep and goats to Saudi Arabia, live cattle and camels to Egypt, live camels to Libya, and hides and skins to several countries including China, Ethiopia, Saudi Arabia, Turkey, United Arab Emirates, and the United Kingdom. In 2018, 63 percent of all live animal exports were to Saudi Arabia; 34 percent to Egypt; 2 percent to Qatar; and a minor share to Bahrain, Kuwait, and Lebanon.

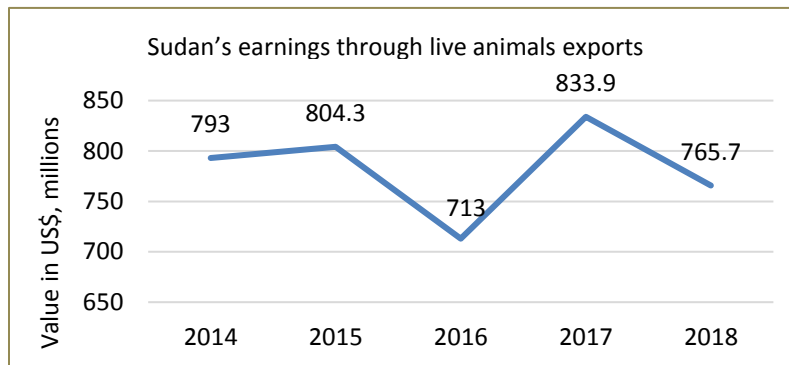
Figure 5.21: Sudan livestock exports (2011–18)



Source: Constructed based on data from the CBS annual report, various issues, and the CBS unpublished national income data.

142. **Meat export is less prominent.** From 2013 to 2019, out of the total livestock exports, 66 percent were live sheep, 16.7 percent live camels, 8.2 percent hides and skins, 5 percent meat, 2.9 percent live cattle and goats, and 1.2 percent others including bones, horns, livers, offal, and race camels. In 2017, Sudan exported US\$833.9 million worth of live animals, whereas only US\$61.1 million worth of meat was exported (Figure 5.22 and Figure 5.23) (World Bank 2019e).

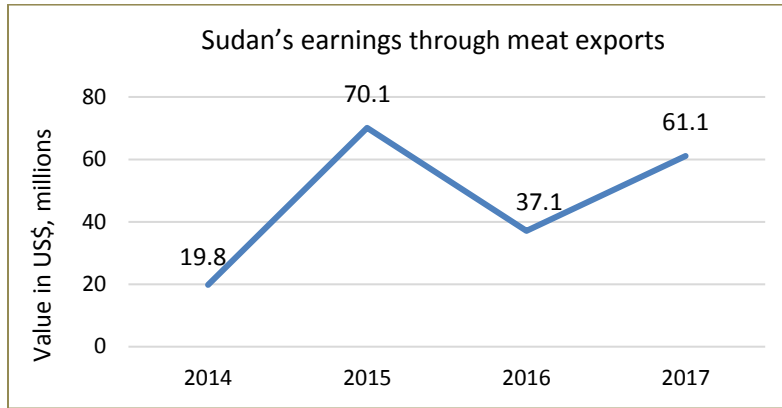
Figure 5.22: Sudan live animals export in US\$, millions (2014–18)



Source: Economic and Financial Statistical Review, CBS, 2019.



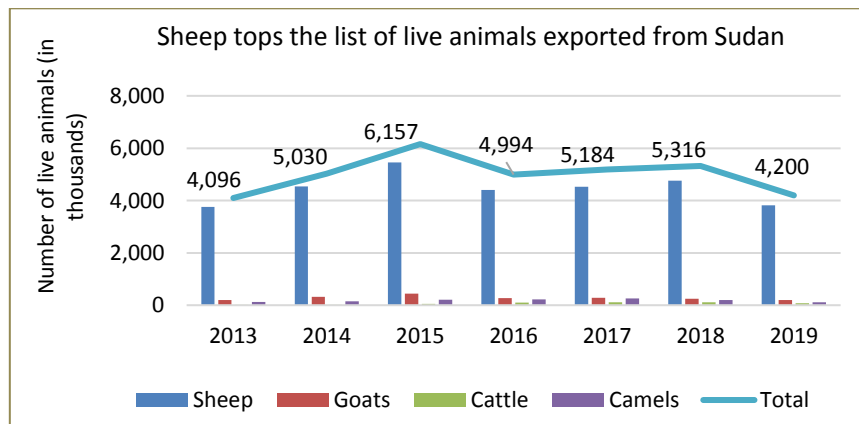
Figure 5.23: Sudan meat export in US\$, millions (2014–18)



Source: CBS.

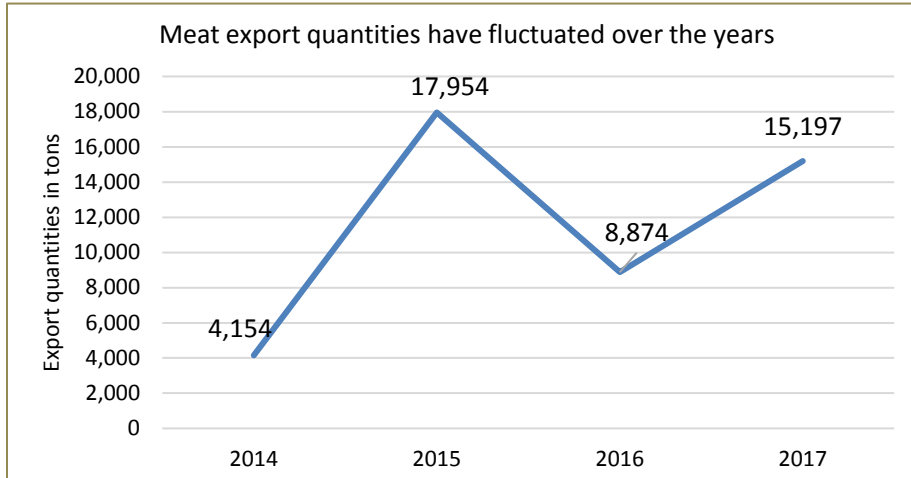
143. **Sheep and camel exports have been remarkably high and increasing.** In 2018, before the eruption of the political unrest which affected exports in 2019, approximately 5 million live sheep were exported (Figure 5.24). Saudi Arabia (63 percent) and Egypt (34 percent) are the major importers of Sudanese live animals (Figure 5.26). Despite considerable variations among yearly export figures, meat exports experienced an overall increase of 4,154 tons in 2014 to 15,197 tons in 2017 (Figure 5.25). The variations in meat export have been due to animal health issues as Saudi Arabia and the Middle Eastern countries imposed a ban on Sudanese meat import in 2016; unsupportive tax policies and rates; and exchange rate policy and fluctuations. Worldwide, Sudan’s share in sheep exports has increased from 16 percent in 2011 to 32.8 percent in 2015, though it declined to 21.7 percent in 2017. Sudan’s global share of live camel export increased from 10.7 percent in 2011 to 76.7 percent in 2016, though it declined to 57.9 percent in 2017. Similarly, Sudan’s share in the export of live goat and cattle has increased to around 15 percent which is low compared to the export share of sheep and camel (Figure 5.26).

Figure 5.24: Sudan’s share in international livestock markets



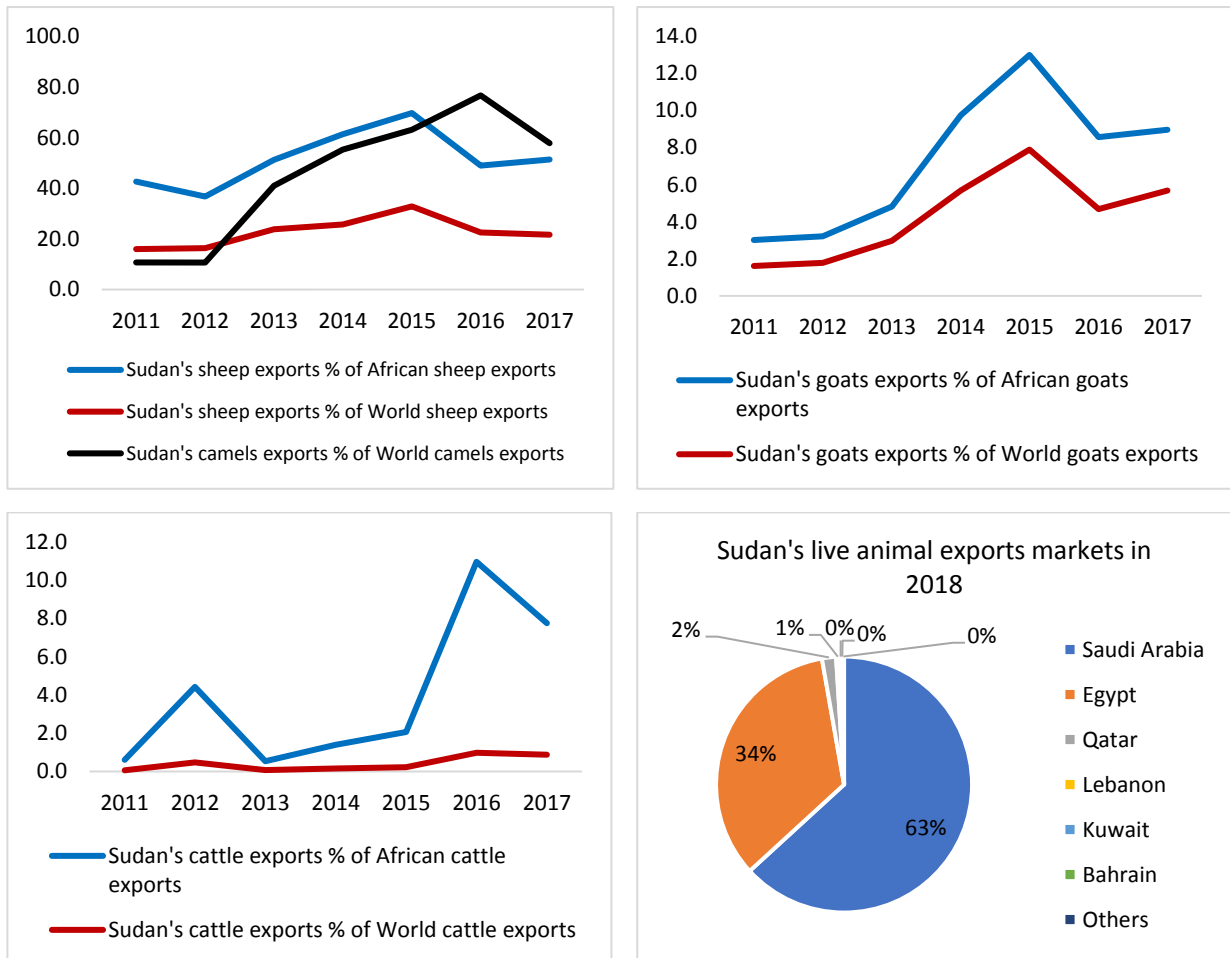
Source: Federal Ministry of Animal Resources Reports, 2019.

Figure 5.25: Sudan meat export (2014–19)



Source: CBS Annual Report.

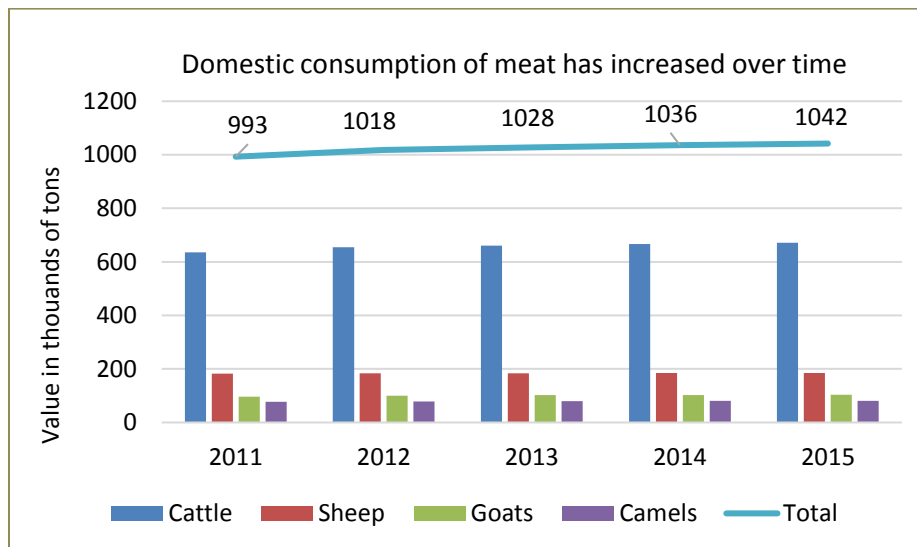
Figure 5.26: Sudan's share in international livestock markets



Source: Constructed based on the data from FAOSTAT and the CBS.

144. **Local demand of meat is high and consistent.** The domestic meat markets are free to operate without any strong competition from imports, as there is a government ban on the import of processed meat. There is a surplus production of meat which offers opportunities for export and value addition. In 2015, the domestic meat consumption was estimated to be about 1 million tons, which was a little over half of the domestic production (Figure 5.27) (World Bank 2019e).

Figure 5.27: Sudan local consumption of meat (2011–15)



Source: Federal Ministry of Animal Resources Reports.

### Livestock marketing chain

145. **The livestock marketing system in Sudan is complex and involves many small-scale players.** The livestock value chain comprises pastoralists, smallholder farmers, local traders, brokers, domestic meat processors, and exporters both private and semi-governmental entities. The pastoralists/smallholder farmers sell livestock to local traders, mostly present at the village level. Local traders transport the purchased livestock to the major livestock markets and sell it to brokers. The brokers then sell the livestock to the domestic meat processors and exporters. According to an estimate in 2017, in Sudan, there were 186 exporters comprising 122 exporters of live animals and 64 exporters of meat including companies, commercial firms, and licensed individuals. Of the 122 live animal exporters, there were 53 exporters of sheep, 16 of goats, 2 of cattle, and 51 of camels. Among the 64 meat exporters, there were 22 exporters of sheep meat, 20 of beef, 18 of goat meat, and 4 of camel meat (Red Meat Value Chain Report, 2018).

146. **Slaughterhouses and veterinary quarantine for meat export.** A total of nine medium-size export slaughterhouses operate with a total capacity (unchanged from 2011 to 2016) of 648,000 heads and nine slaughterhouses with a total capacity of 310 tons of cattle meat (1,700 heads) and 110 tons of sheep meat (11,000 heads) per day (Table 5.11).

Table 5.11: Export slaughterhouses and quarantine capacity in thousands

	2011	2016
Export slaughterhouses (number)	9	9
slaughterhouses capacity (sheep, ton/day)	110	110
slaughterhouses capacity (cattle, ton/day)	310	310
Veterinary Quarantines (number)	13	13

	2011	2016
Veterinary Quarantines (capacity, 000 head)	648	648

Source: Sudan Ministry of Animal Resources, Statistical Bulletin.

147. **Significant price differences and fluctuations exist between local and main markets.** As can be seen in Table 5.12, there were significant differences between the prices of live animals in local markets in livestock production areas in Sennar, Elobaied, Madany, and Rabak compared to the prices in the main market in Omdurman where a large share of livestock production was sold for domestic consumption and export. For sheep, the price difference has been low and declining, and prices in the production areas were closer to 95 percent of the main market price. For cattle, prices in the production areas were significantly lower than in the main market, and the difference was widening (ratio of prices in Sennar market to the main market declined from 88 percent in 2011 to 76 percent in 2015). Camel price difference was significantly low in Madany compared to Omdurman. As goats were purchased mainly for consumption in the production area with limited share in export, its prices remained relatively high in the production areas.

**Table 5.12: Local market price as % of main market price (Omdurman)**

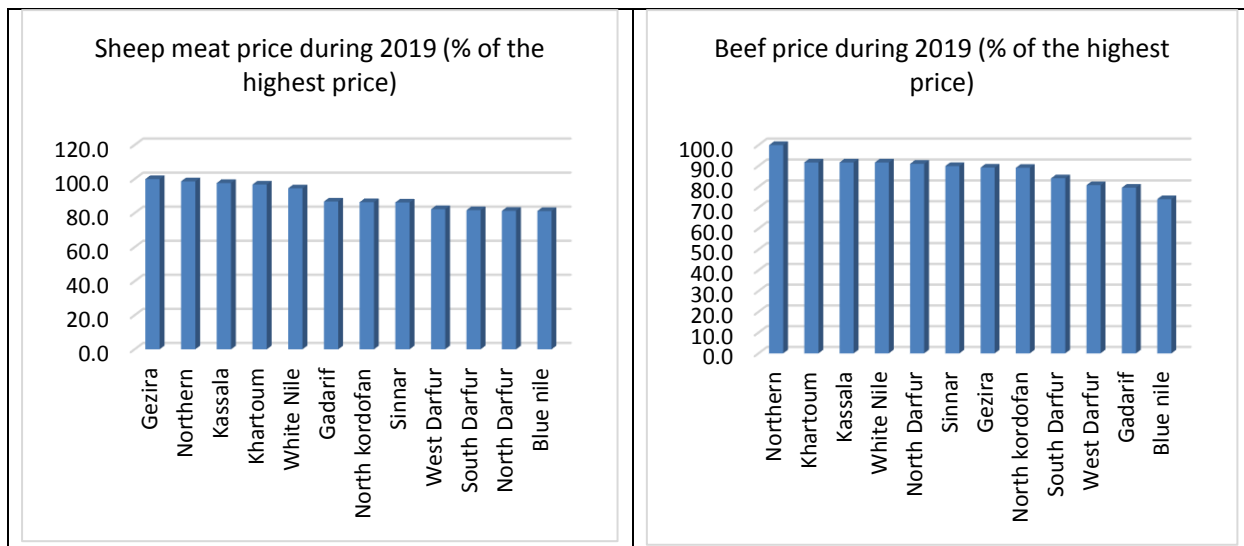
Livestock	2011	2012	2013	2014	2015
<b>Camels</b>					
Omdurman	85	98	86	68	97
Sennar	76	96	136	77	108
Elobied	116	102	94	70	95
Madany	63	51	44	31	57
Rabak	101	90	130	31	—
<b>Sheep</b>					
Sennar	95	97	87	95	93
Elobied	78	81	86	93	79
Madany	98	79	94	168	90
Rabak	67	68	82	84	—
<b>Cattle</b>					
Sennar	88	77	77	72	76
Elobied	93	86	74	65	65
Madany	92	91	81	96	95
Rabak	58	84	70	50	—
<b>Goats</b>					
Sennar	111	96	111	95	104
Elobied	94	69	119	106	192
Madany	107	70	119	97	101
Rabak	78	72	104	137	—

Source: Ministry of Animal Resources, Statistical Bulletins.

148. **Meat prices also differ significantly across the states of Sudan.** Sheep meat price varies significantly across the Sudanese states. For example, in Blue Nile state, it is 20 percent lower compared to the highest prices in Gezira and Northern states. Beef price also varies across the states with the lowest price in Blue Nile and the highest price in Northern state followed by Khartoum (Figure 5.28). Regional differences in meat prices could be attributed to many factors including size of animal population, commercialization of production, distance to main markets and processing centers, distance to the port and national border, transportation costs, local demand, local charges and fees, as well as quality of the meat. Data show that in 2019, prices were low in Blue Nile, Darfur, Sennar, and North Kordofan—these

are the least developed states with high share of livestock population and limited processing capacities and located far from the port and main markets. Data also show that, in 2019, prices were higher in Khartoum, Gezira, White Nile, Kassala, Gedarif, and Northern states—these are relatively developed states with less livestock population and closer to processing centers and the port.

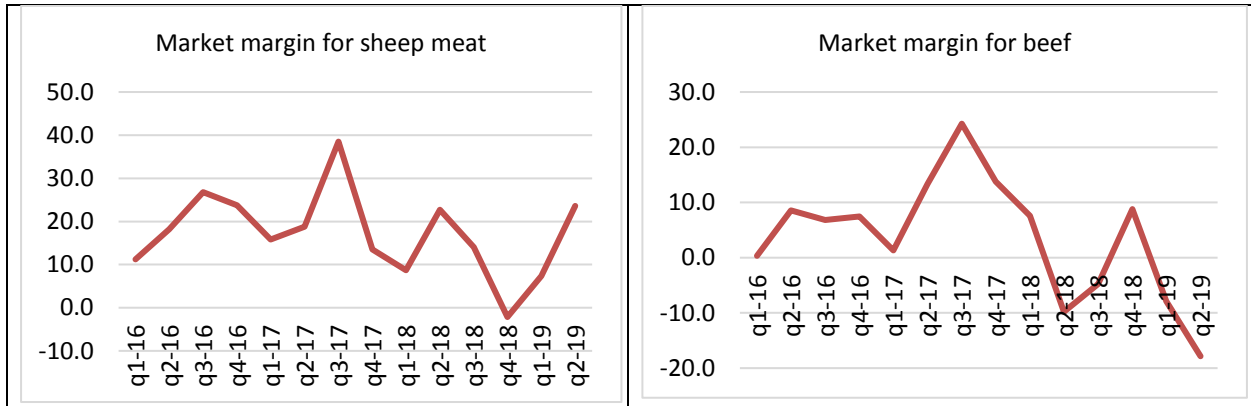
Figure 5.28: Market prices in different states in Sudan



Source: constructed based on data from CBS.

149. **There are significant meat price differences between producer and retail prices.** Average consumer prices of sheep meat continued to exceed the producer prices with an average market margin of 17 percent, but they were highly volatile and fluctuated between 49 percent to negative levels during 2016–19. The same applies to local beef prices. Toward the end of 2018 and the first half of 2019, consumer prices appeared to have been less than producer prices, and retailers incurred losses (Figure 5.29). Many factors could lead to such fluctuations in market margins including internal and external economic factors. In Sudan, it is due to market distortions and business interruptions in exports, processing, and domestic distribution which influence consumer prices more than producer prices. The economic crisis and political instability that continued for most of 2018 and 2019 affected processing, distribution, and exportation of live animals and meat significantly. In some cases, live animal and meat were sold at relatively lower retail prices when export was interrupted. The market has also been distorted by the interventions of governmental and semigovernmental companies.

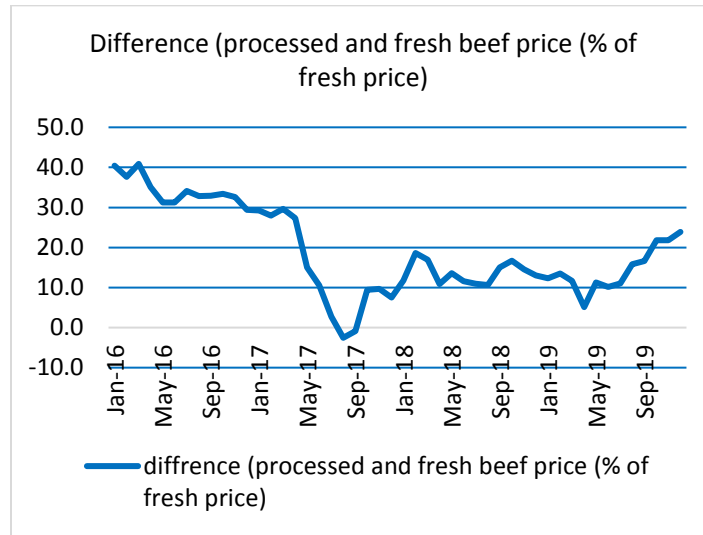
Figure 5.29: Market margins for Sudanese meat



Source: Constructed based on data from the CBS.

150. **There is also fluctuation between the prices of fresh and processed meat.** As meat processing is still limited, it has witnessed declining market margins during 2016–19. With high inflation and economic difficulties, consumers seem to have shifted from high-price processed meat to low-price fresh meat. However, meat processors may have benefitted from interrupted exports to procure cheaper fresh meat thus resulting in improved market margin during 2018 and 2019 (Figure 5.30).

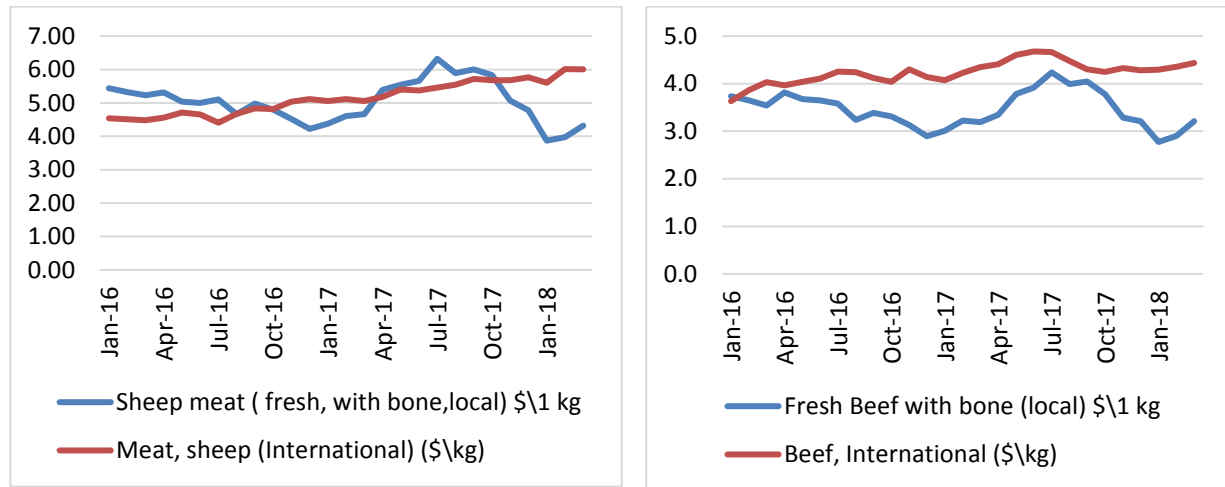
Figure 5.30: Differences between processed and fresh beef



Source: Constructed based on data from the CBS.

151. **As the Sudanese pound continues to depreciate and the international meat prices continue to rise, domestic meat becomes more competitive.** In 2016, domestic sheep meat price was 20 percent higher than the international sheep meat price. With the rising international price and currency depreciation, in 2018, domestic sheep meat became 30 percent cheaper as compared to the international meat price. The interruption of live animal and meat exports during 2016 may have further contributed to the falling domestic price of sheep meat. Domestic beef price is usually less than the international beef price. While over time, the international beef price has been increasing, the local beef price remained equivalent to the international beef price in 2016, and currently, it is almost 40 percent lower (Figure 5.31).

Figure 5.31: Domestic and international meat price comparison



Source: Constructed based on data from the CBS and World Bank estimates.

Note: Parallel market exchange rate is used to convert local prices in SDG to U.S. dollar.

152. **Export prices of Sudanese livestock are distorted.** No systematic data were available on the export prices of Sudanese livestock. As a result of large and increasing differences between official exchange rate and parallel market rates and due to official exchange rate policies, which required selling export earnings to the Government at official rate, there has been significant underreporting and under-invoicing. In several cases, the exporters did not retain export earnings, and some used livestock export as a channel to transfer money out of the country. Further, livestock export business has been distorted by the heavy involvement of military/state-owned and semi-governmental entities. The price premium, however, for exported live animals compared to domestic sales was on average 30 percent, indicating additional export opportunities (World Bank 2019e)

### Constraints along the livestock value chain

153. **Sudan's potential to be a major producer and exporter of livestock products to traditional trading partners in the Middle East and globally is not yet realized.** During consultations, in addition to the issues common to all value chains, the stakeholders identified the following constraints:

- **Government policies.** There is a lack of government policies regarding research and extension, input supply, processing, and export of processed meat.
- **Livestock production constraints.** Productivity in the sub-sector is low as production is dominated by subsistence rather than commercial production. Most producers rely on local breeds, which lowers relative productivity and increases cost. Nevertheless, these local breeds are also in great demand in importing countries. Degradation of rangelands has exacerbated the conflict over land between pastoral groups and farmers, especially in Darfur, and many animal migration transport routes are blocked by allocations of land to mechanized farming. Realizing the potential for growth requires investments in conflict resolution, rangeland management including provision of water, and increase of technical inputs in modern livestock management (World Bank 2014b, 2015).
- **Lack of quality feed.** Most of the livestock is raised on low-quality feed. The available saturated (alfalfa and sorghum) feed lacks protein and essential nutrients necessary for

livestock fattening. The saturated feed generally contains aflatoxins which are carcinogenic in nature and makes the meat unfit for human consumption. The awareness and economic benefits of using concentrated feed among the pastoralists is considerably low.

- **Limited veterinary services.** Sudan's administrative and technical capacity to provide extension and veterinary services, especially to pastoral and agropastoral livestock is limited. There is a shortage of skilled human resources to provide veterinary services. Sudan's veterinary staff tends to move to Gulf countries in search of better employment opportunities because of low salaries of veterinary staff in the country.
- **Limited knowledge and information.** Systematic information is missing for different types of livestock products, including costs of production, input prices, productivity, output prices in different locations (farm gate, local markets, and main markets), export prices, and cost of transportation. This information is vital to better understand the sector and plan for its development. Investment in building the livestock sector database will be important for transforming the sector. In its evaluation of SME opportunities, a World Bank Group team listed 'unreliable and inconsistent access to export market information on the part of traders, slaughterhouses, and exporters' as a major constraint for the industry (World Bank 2019e, 114).

## Investment opportunities along the livestock value chain

154. **The Transitional Government of Sudan has identified value addition in the livestock sector as a high priority.** A shift from exporting live animals to processed meat is an important economic target of the Government. The Ministry of Animal Resources recognizes the strategic importance of the livestock sector in the economy and aims to develop it on a priority basis. The primary goal is to increase production, productivity, and export of livestock as well as to substitute imports of livestock products.

### *Domestic livestock market*

155. **Livestock (meat) is competitive in the domestic market.** The locally produced and processed meat products are generally price competitive in Sudan, because of its large pastoral livestock system that ensures a steady supply of livestock<sup>69</sup> and low input cost associated with domestic meat production. The consistency of quality and supply is, however, low. The supply of quality meat is limited because of poor meat processing and packaging practices. Supply of quality meat is also affected due to the short shelf life and underdeveloped cold chain infrastructure in Sudan.

156. **The domestic meat demand is increasing, and it presents short- to medium-term investment opportunities.** There are enough indications that meat consumption in Sudan is on the rise with a potential to progressively shift toward more formalized and higher-quality market in the medium term with the right policy support. Retailing and meat processing for the local market could present short-term investment opportunities. Slaughterhouses and cold chain infrastructure could help fulfil the local demand in the medium to long term. An integrated slaughterhouse and cold storage facilities present some good investment opportunities of around US\$3 million. Investments could also be initiated to improve services along the livestock pastoral route in North Kordofan (warehouses, storage anchors, mobile vet clinics, and so on). The estimated capital required for improving these services is around US\$5 million. (World Bank 2019e).

---

<sup>69</sup> The supply is disrupted if there is an outbreak of disease that affects livestock.



157. **Investments in the domestic meat supply chain will create jobs and business opportunities in livestock inputs supply chain,** feed production and distribution, veterinary services, slaughterhouses, and cold supply chain and enhance household protein intake and nutritional health.

### *Export meat value chain*

158. **The Sudanese livestock sector offers significant opportunities for commercial livestock farms, exports of surplus livestock, and value-added processing of meat.** Nevertheless, the potential of livestock (meat) marketing to drive the economic development in Sudan has not been appropriately explored. The current livestock population in Sudan is considered a natural resource rather than an economic resource. Animal-based food product is one of the fastest-growing sectors of the food industry in Africa, which creates a major demand-side opportunity for Sudan's livestock processing sector. Sudan has a wealth of livestock and is well placed to identify policies and technical support to tap the full potential of its livestock (meat) processing sector. Currently, the potential meat export markets in African countries such as Algeria, Angola, Gabon, Côte d'Ivoire, and Nigeria remain unexplored by Sudan. Sudan has prospects to take a sizeable share of these markets and can also maximize its livestock exports to Egypt, Jordan, Saudi Arabia, and other Gulf countries.

159. **Sudan's competitiveness, however, of processed meat in international markets is low due to quality issues.** Several countries imposed import bans on Sudanese processed meat products due to Sudan's noncompliance to SPS standards. Its processed meat exports fluctuate, and while Sudan is a major exporter of live animals, its export of processed meat is limited. Sudan is unable to compete with other suppliers in exporting processed meat to the Gulf region. The low competitiveness in meat is due to a lack of zonal freedom from diseases, shortage of integrated slaughterhouses, absence of modern export facilities, inability to meet export quality standards, and a limited number of certified exporters of processed meat in Sudan.

160. **The lack of internationally accredited slaughterhouses, underdeveloped cold chain infrastructure, and lack of technical knowledge impede the exports of processed meat.** Several countries imposed import bans in 2008 on Sudanese processed meat products due to Sudan's noncompliance to SPS standards. Nevertheless, the sector recovered and registered more than US\$670 million in profits in 2013. More recently, in October 2019, Saudi Arabia banned Sudanese livestock imports due to quality issues.

161. **Long-term investment opportunities exist in meat exports.** The processed meat sector currently faces several challenges regarding poor quality of slaughterhouses, logistics, and meat produced in the country. These factors impede the growth of processed meat exports. Improving animal traceability and quality certification could promote processed meat exports in the medium and long terms including establishment of slaughterhouses according to international standards, setup of new processing facilities, and development of cold chain infrastructure.

162. **The investments in livestock (live and meat) export value chain will have a sizeable multiplier effect on the livestock sector and create direct and indirect specialized and skilled jobs and entrepreneurial opportunities in livestock inputs supply chain,** commercial livestock farming, animal husbandry, road infrastructure, integrated cold supply chain and slaughterhouses, meat processing, and quality control and assurance for export markets.

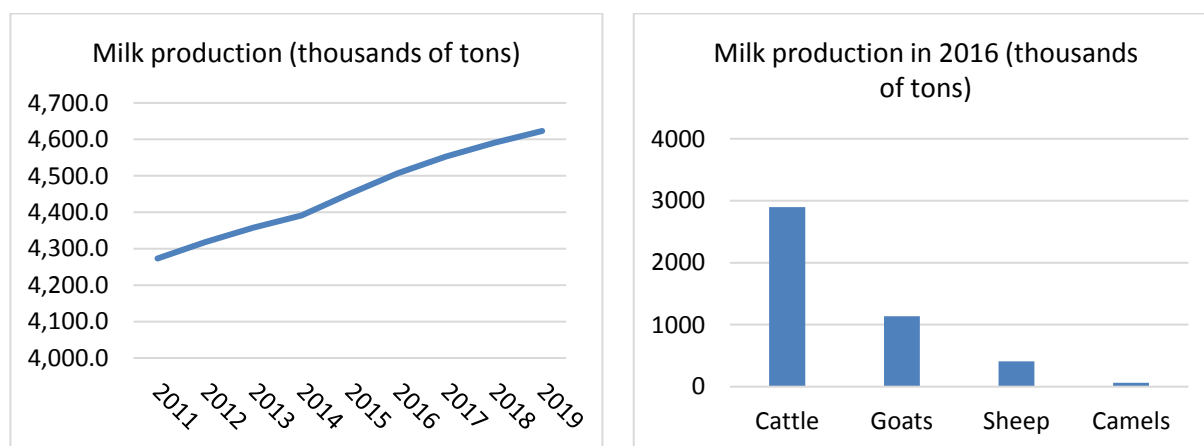
## Dairy value chain

163. **Dairy production contributes significantly to the livelihood of a large segment of the Sudanese population.** Ownership of livestock is widespread in rural Sudan, and milk production is one of the key factors for keeping animals. Milk is predominantly produced and processed by nomadic pastoral and seminomadic agropastoralism systems. Milk production is considered one of the most important activities carried out by women in rural Sudan. It is a source of significant cash income for households, besides its significant contribution to the nutrition of rural and urban communities. The dairy value chain is a priority sector for the Government due to a large livestock population and an increasing opportunity for import substitution.

164. **Although Sudan maintains some of the largest and growing livestock inventories in Africa, milk production is below its peers.** According to official estimates, dairy production was 4.6 million tons in 2019, with an average growth of 1 percent annually (CBS). In contrast, the Sudanese Businessmen and Employers Federation estimated dairy production to be at 7 million tons in 2015. While the dairy sector is very dynamic in Kenya, Sudan still depends on imports to meet the domestic demand for milk despite having twice as many cattle as Kenya.

165. **The dairy sector in Sudan is underdeveloped.** While milk is primarily produced in a traditional mode, modern commercial dairy farms are also developing. Commercial dairy farms exist around urban centers, and new investments have made it competitive with the traditional milk producers and distributors. While milk production is increasing, it is still far from meeting the local demand. Overall milk production increased from 4.3 million tons in 2011 to about 4.62 million tons in 2019. Cow milk accounts for the largest share (64 percent) of total milk production, followed by goat milk (25 percent), and the contribution of sheep and camel milk is relatively small (Figure 5.32). The increased production can be attributed to the growth in Sudan's livestock population in general and to some extent to the emergence of commercial dairies. According to the Ministry of Animal Resources, cattle population increased from 2.96 million heads in 2011 to 3.14 million heads in 2019, and goats increased from 3.06 million heads to 3.2 million heads during the same period.

Figure 5.32: Milk production in Sudan

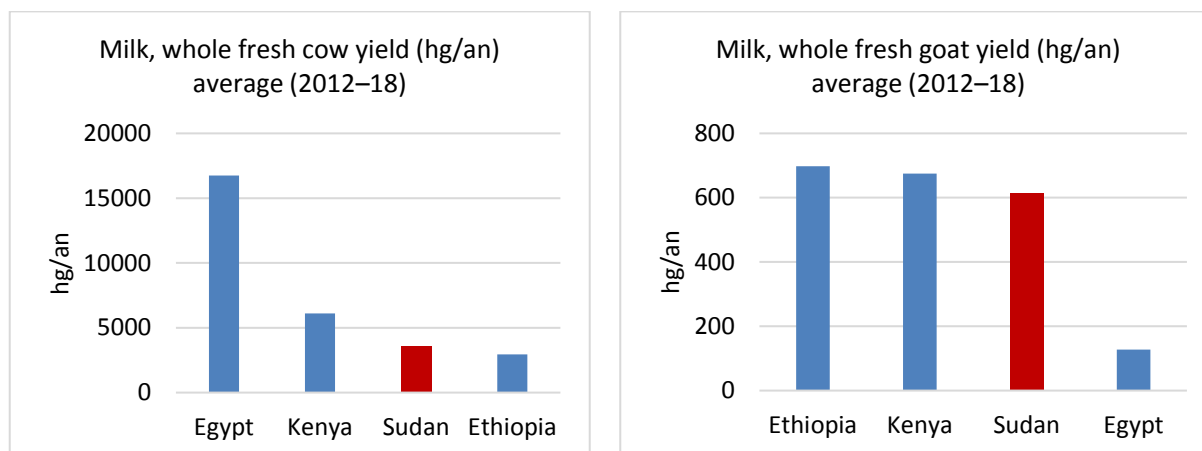


Source: Constructed based on data from Sudan Ministry of Animal Resources.

166. **Sudan's milk yield level is low despite the efforts to match the regional yield levels.** Some Sudanese cattle breed such as Kenana and Butana have high milking potential, whereas milking potential

of remaining breeds such as Baggara is low. In general, cow milk yield in Sudan is low as compared to Egypt and Kenya, while it is slightly above the yield levels in Ethiopia. Sudanese goat milk yield is above the Egyptian yield but below the yield levels in Ethiopia and Kenya (Figure 5.33). Efforts were made to improve the milk yield through introduction of high-yielding breeds like Holstein and Norwegian Red. Recently, the Government and producers' associations imported 770 heads of goat breeds from Turkey to improve goat milk production.

Figure 5.33: Milk yield levels in Sudan



Source: Constructed based on data from FAOSTAT.

167. **Most of the livestock raised in the country is fed on low-quality feed.** Smallholder dairy farmers mostly graze their cattle on communal pastures or pay a fee to landowners, who allow them to feed their cattle on the landowners' cropland. The naturally available feed lacks protein content which is important to increase milk productivity. The commercial feed available in Sudan is mostly saturated feed (low in protein content consisting of alfalfa and sorghum) which is not as effective in improving milk productivity as the concentrated feed. There are only a few (3–4) companies that produce quality concentrated feed. The commercial farms have contractual arrangements with these feed-producing companies and procure most of the produced feed. The remaining concentrated feed is sold through auctions.

168. **Lack of cold chain infrastructure results in limited shelf life of dairy products.** Even the large dairy farms (with 1,000 heads of cattle) have no milk cooling facilities. Lack of cooling facilities forces milk producers to be located near milk processors and consumers.<sup>70</sup> It also forces the farmers that are located far from the processing facilities to increase the shelf life of milk by turning it into cheese and other milk products.

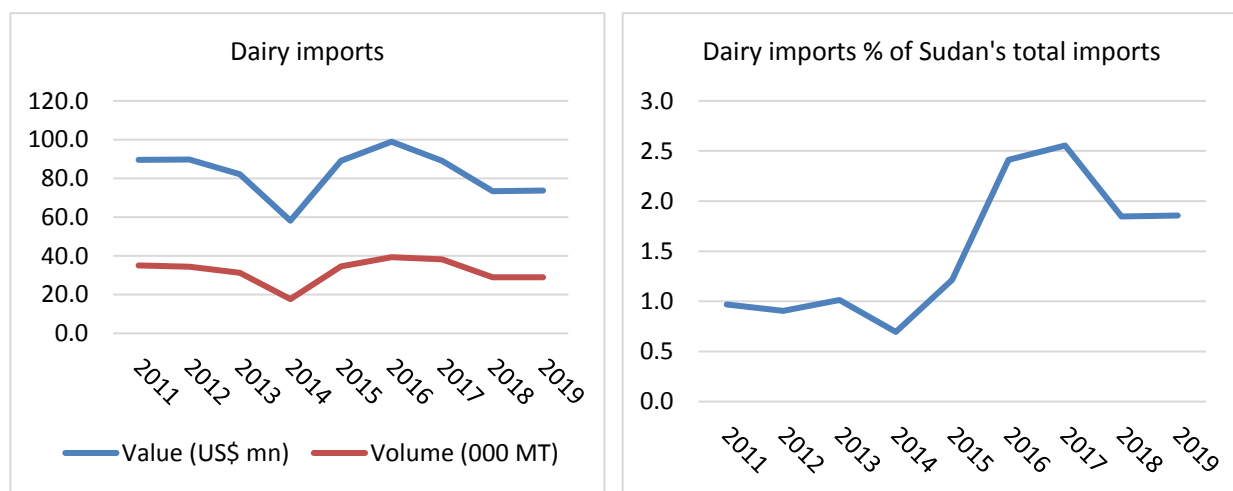
169. **Although Sudan started modernization of milk processing in the 1960s, for most part, milk processing is traditional.** One Babanusa Dairy was opened in 1969 and ran out of business in 1980. At the time, it was one of the largest commercial dairies in East Africa and the Middle East. According to the Ministry of Animal Resources, currently, 80 percent of the milk is processed in traditional processing units in the nomads' system in villages; the main products are white cheese, braided cheese, and ghee. The traditional processing system is prevalent across the country, especially in White Nile, Gezira, Sennar, Darfour, Kordofan, and Blue Nile states.

<sup>70</sup> Milk produced at the farm in the morning is quickly supplied to the milk shops until early afternoon due to a lack of milk cooling facilities. At the milk bars, the milk must be heated to increase its shelf life for selling it to the consumer.

## Dairy in international and domestic markets

170. **Sudan relies on the international market and imports sizeable volumes of dairy products to meet the increasing domestic demand.** Between 2011 and 2019, Sudan imported on average 32,000 tons of dairy products worth US\$83 million. The dairy products' share in Sudan's total imports has increased from 1 percent in 2011 to around 2.6 percent in 2018, though it declined to 1.9 percent in 2019 (Figure 5.34). This implies an increasing financial burden on the already deteriorating external balance.

Figure 5.34: Sudan's dairy imports



Source: Constructed based on data from the CBS.

## Dairy marketing chain

171. **Dairy marketing in Sudan is primarily traditional with a large number of small-scale players,** including smallholders and pastoralists, small traders, traditional processors, milk distributors, and a few modern producing and processing plants. Surplus milk produced by smallholder farmers in remote areas is sold to local traders who transport it to the urban areas where milk is sold to the local milk shops, restaurants, hotels, houses, and dairy processors. The dairy processors sell their produce in the local markets and supermarkets. A few large commercial dairy farms collect, produce, process, and distribute milk and dairy products through their own supply chains.

172. **Several modern milk processing companies operate with large performance differences.** Out of a total of 15 dairy companies, with capacity ranging from 10 tons to 800 tons, located in the urban centers in Khartoum, Gezira, Kordofan, and River Nile, only 6 are functional. Some large milk processing plants operate their own modern large-scale dairy farms with imported high-productive Holstein Friesians dairy cattle, modern high-capacity milking equipment, and climate-controlled cattle housing. They prefer to procure milk from their own or select commercial dairy farms usually with 100+ cows. CAPO, the largest dairy in the country, for instance, has its own modern dairy farm of 6,600 cattle; it also purchases milk from other dairy farms and runs a network of 22 milk collection centers, of which 60 percent are located in the greater Khartoum area. CAPO uses advanced dairy farming practices including artificial insemination (AI) techniques for breeding, milking machines for the cattle, milk cooling facilities, cold chain infrastructure for transport, and so on.

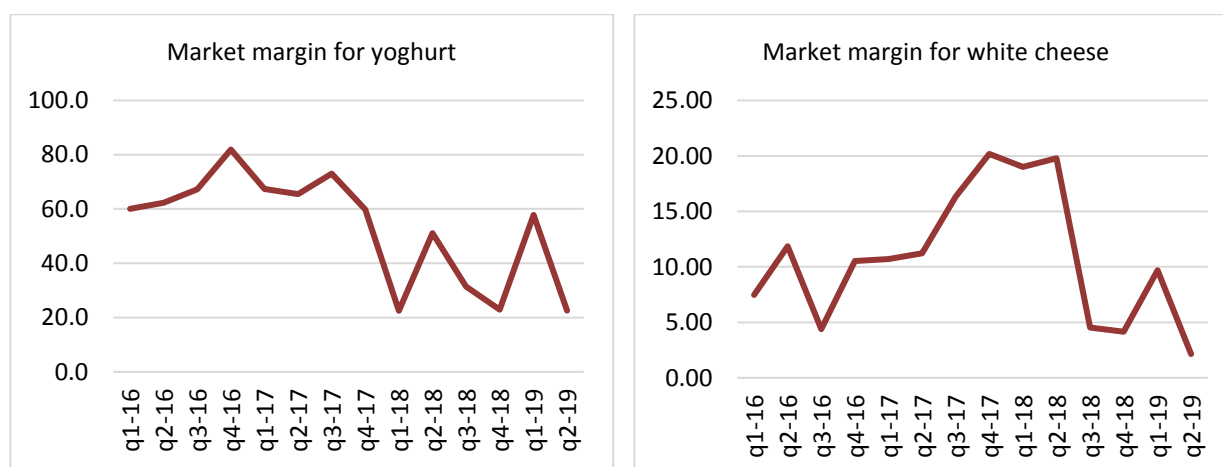
173. **Due to high demand, dairy is a seller-driven market.** In the face of limited milk supply, milk sellers have a leverage over buyers in determining milk price due to a huge demand of milk and dairy products.

Major milk processing companies like CAPO offer six months advance payments to milk sellers to ensure a steady supply of fresh milk. The advanced payments ensure that the milk producers do not sell their milk to buyers offering more attractive prices.

174. **There is a considerable variation in the milk prices in the production areas and in urban centers as well as between fresh and processed milk.** Being a perishable item, due to lack of appropriate means for safe keeping, storage, and transportation, in rural areas, milk is either wasted or sold at very low prices, especially during rainy and harvest seasons. While milk production is high, only limited quantities are processed or reach nearby urban centers.

175. **Market margins for dairy products in Sudan have been volatile during the last few years.** Market margins for yogurt have declined significantly from 80 percent in the last quarter of 2016 to 22.5 percent in the second quarter of 2019, with notable fluctuations, while the market margin for white cheese has fluctuated between 4.4 percent in the third quarter of 2016, 20 percent in 2017 and early 2018, and then sharply declined to 2 percent in 2019 (Figure 5.35). Fluctuations in dairy market margins might be due to fluctuation in the supply of fresh milk. Milk production is usually high in the third and fourth quarters of the year, that is, at the end of the rainy season and crop harvest season, while access to milk production areas becomes difficult in the second quarter of the year. Cheese producers benefit from low milk prices during high milk production season.

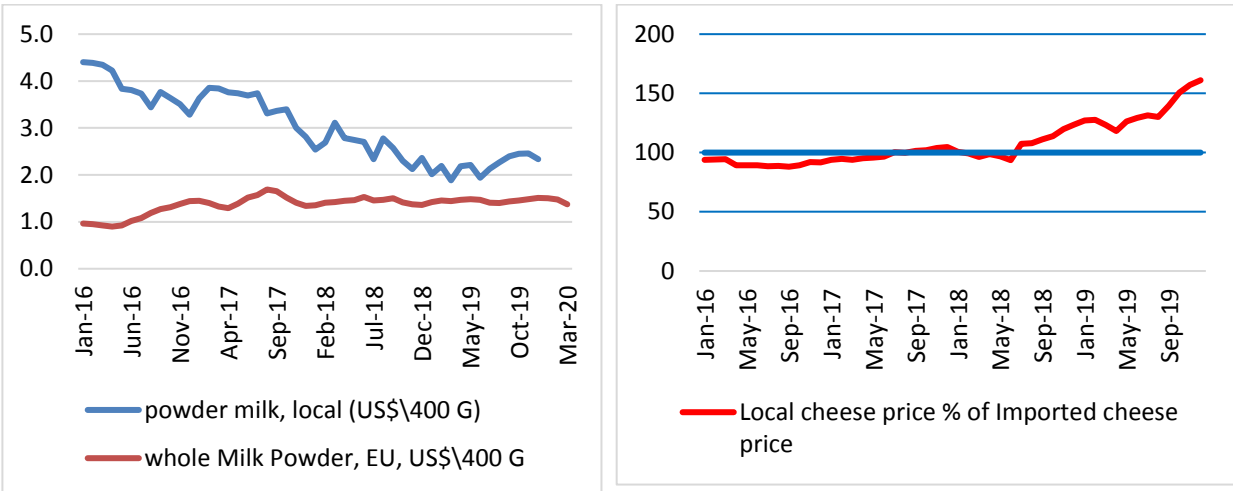
Figure 5.35: Market margins for yoghurt and cheese in Sudan



Source: Constructed based on data from the CBS.

176. **Competitiveness of Sudan’s domestically produced powder milk improved with the currency devaluation and rise of international prices.** With the exchange rate devaluation, domestic prices of powdered milk (converted to U.S. dollar) have declined significantly during 2016–19, while international price of powdered milk slightly increased during the same period. Domestically produced white cheese was cheaper than the imported white cheese until the end of 2017. Due to a significant drop in the international white cheese price during 2018–19, the price of domestically produced white cheese exceeded the price of imported cheese, although since then, it has been declining due to exchange rate devaluation (Figure 5.36).

Figure 5.36: Prices of domestic and imported dairy products

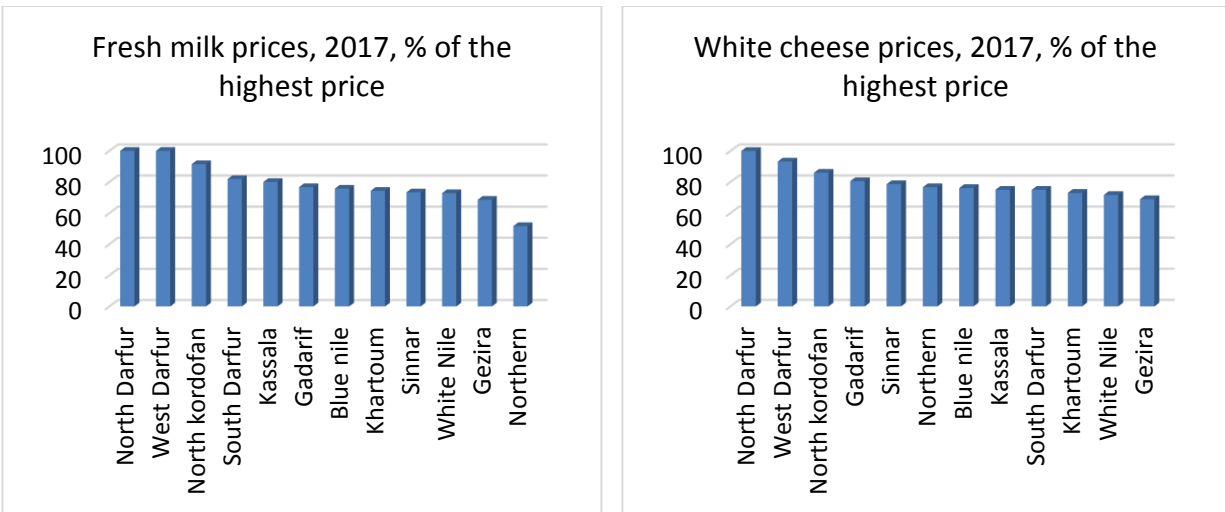


Source: Constructed based on data from the CBS and World Bank.

Note: Parallel market exchange rate is used to convert local prices in Sudanese pounds to U.S. dollar.

177. **Fresh milk and white cheese prices vary across Sudanese states.** Data show that prices of both fresh milk and white cheese were higher in North Darfur and North Kordofan. These states have relatively low shares of cattle population. Meanwhile, prices were low in White Nile, Gezira, and Blue Nile—the states with relatively high share in cattle population. Some states like Khartoum and Northern states exhibit lower prices despite a low share in cattle population, due to a higher rate of commercialization of dairy production in those states (Figure 5.37).

Figure 5.37: Fresh milk and white cheese prices in Sudanese states



Source: Constructed based on data from the CBS.

## Constraints along the dairy value chain

178. According to the stakeholders, in addition to the constraints common to all value chains, the dairy industry in Sudan faces some specific challenges, including the following:

- **Production constraints.** Pastoralists and smallholders mostly use traditional breeds with low milk yield and production. The key issues are low levels of knowledge and skills, lack of vaccination and disease control, natural grazing with low milk-producing fodder, low feed supply, and low mechanization. Cattle are hand-milked even at the dairy farms with over hundred milking cows. Dairy farms lack milk cooling facilities for safe keeping of milk. Forage conservation techniques like silage and haylage making are not practiced as year-round zero grazing system is the most common feeding practice. Only small amounts of roughage are home grown. Cattle are kept in paddocks with roofs for shade which with temperatures rising above 40°C are not suitable for the animals, and decrease their milk production capacity.
- **Regulatory constraints.** Ineffective regulations and weak organizational structure for enforcement and compliance with food quality and safety standards have hampered the evolution of the dairy sector into a competitive sector. For example, sale of loose (untreated) milk, which is considered unfit for human consumption, is prevalent. Similarly, import of packaging and labeling materials for the dairy sector is considerably delayed due to ill-defined and bureaucratic import procedures and tariffs.

## Investment opportunities along the dairy value chain

179. **The dairy sector has been identified as a good investment opportunity that would contribute to the nutrition security of the country.** The widening gap in supply and demand of dairy products can be minimized by increasing the production of dairy products in the country. About 15 percent of the daily nutrition needs of an average Sudanese are currently met through milk products. However, the whole dairy chain infrastructure must change to fulfil the growing demand of the Sudanese consumer for high-quality affordable dairy products (Netherlands Enterprise Agency 2016).

180. **Currently, the competitiveness of dairy products in terms of cost, quality, and consistency of supply to the domestic market is negative.** The dairy product prices are high and comparable to the dairy product prices in Europe. Similarly, the competitiveness of dairy products in terms of quality is negative. The milk produced in Sudan is generally of low quality due to (a) aflatoxins-contaminated feed (sorghum and alfalfa cake) provided to the cattle, (b) high doses of antibiotics given to cattle that reach their bloodstream and ultimately contaminate the milk making it unsafe for human consumption, (c) high bacterial counts due to unhygienic milking practices, and (d) dairy products not stored and transported by maintaining the required temperature, leading to poor quality and contamination. In terms of supply, the competitiveness of dairy products is negative. While milk supply is regular, supply infrastructure is deficient, time-consuming, and expensive. It fails to meet the local demand. Hence, Sudan is forced to import dairy products to fulfill the local demand.

181. **Including smallholder producers.** Experiences from other countries show how small milk producers can be included in supply chains that improve milk safety and quality. In Pakistan, small-scale producers, owning 1–5 cows, accounted for 75 percent of milk production. This segment of the market produced milk for home consumption and sold surplus milk for processing or in local markets. Animal

productivity was low as was the quality of milk sold for processing. A separate segment of the market sold high-quality milk to supermarkets and other high-end markets.

182. In 2014, the International Finance Corporation introduced an Advisory Service project in partnership with Nestlé to improve smallholder productivity and milk quality in Pakistan. Specifically, the project focused on enhancing the capacities of Nestlé’s own extension team, working with farmers, and providing them with technical support on a daily basis. Support was given for practices that improved basic food safety and hygiene practices and production techniques that improved animal productivity, including improved breeding practices based on AI (IFC 2014).

183. **Given the vast livestock resources and rapidly increasing demand for quality milk and dairy products, there are short-, medium-, and long-term investment opportunities in dairy production and processing that could create employment and business opportunities along the entire dairy value chain, reduce the dairy import bill, and redress poverty of small milk producers through increased incomes.** Short-term investments can be targeted to improve infrastructure facilities for dairy value chain actors, for instance, setting up of (a) outlets to provide milk equipment, (b) modern housing systems for cattle, and (c) milk cooling facilities to increase the shelf life of dairy products. Further, 98 percent of the milk produced in Sudan is sold loose (unprocessed) and only 2 percent of milk produced is processed. Medium-term investments can be targeted to set up new dairy processing facilities and develop cold chain infrastructure to procure necessary fresh milk from producers that are situated far away from the processing facilities.

## Constraints common to all five value chains

184. The productivity level and processing standards of the five value chains are considerably low when compared with the neighboring countries as well as with those countries that Sudan competes with in the international markets in specific value chains. The key constraining factors applicable to all five value chains are listed below, mirroring many of the ecosystem-wide constraints listed in chapter 3:

- **Limited availability and use of quality seeds and planting materials, particularly faced by sesame seeds and horticulture value chains.** Locally produced seeds are of low quality while imported quality seeds are very expensive. There are a limited number of nurseries for seed multiplication. Public sector allocation for R&D of improved quality seeds is very limited. Producers, therefore, use traditional low-yield seed varieties and planting materials.
- **Agriculture input supply system is weak and fractured.** Agriculture inputs such as fertilizer, pesticides, sprinklers, and implements are in short supply and expensive (out of the reach of smallholder farmers and producers). Local production of agricultural inputs is very limited, and for most part, inputs (quality seed, fertilizer, pesticides, and implements) are imported at a higher cost, consume a lot of time, and are not available in remote rural areas.
- **Lack of farmer/producer training, advisory, and extension services.** Farmers have limited knowledge, understanding, skills, and exposure to GAPs. There exists a lack of essential and practical knowledge on soil preparation, nutrient seeds, fertilizers, and recognition and prevention of pests and diseases. For most part, producers rely on traditional production methods and technologies, and adoption of high-yielding varieties and modern production methods is limited. For example, proper techniques are not applied for horticulture harvesting to ensure good quality, texture, and size. Further, horticulture farming in greenhouses, especially for the off-season is extremely limited in Sudan. Farmer



cooperatives and associations are weak, are restricted to a few states, and provide limited inputs and services to producers. Public sector-led advisory and extension services are wanting with a limited outreach and irregular follow-up. The private sector advisory services are limited to contract and commercial farmers who cultivate and supply produce exclusively to select processors such as DAL group in dairy and gum Arabic.

- **Access to financial services.** Agriculture financial services are limited to irrigated and mechanized rain-fed areas, with very limited presence in the traditional rain-fed areas where gum Arabic, sesame seeds, livestock, dairy, and horticulture crops are produced in large quantities. The Government annually allocates and prioritizes agriculture finance for priority crops like sorghum, wheat, and cotton. As a result, hardly any financial products are available for the rest of the agricultural sector and value chains. Producers—primarily smallholder farmers—for most part are without access to formal credit and rely on local money lenders and village traders with high interest rates. The village traders monopolize the produce at a low predetermined price before the harvest (known as *Selam* financing system).
- **Poor post-harvest handling.** Post-harvest knowledge, training, skills, and required equipment and facilities are deficient and expensive for small-scale producers. Losses and contamination levels are, therefore, high as poor harvesting methods, sorting, drying, packaging, and storage incur considerable wastage and damages to the produce. Producers, collectors, and traders often use/reuse old bags/package materials that might have been used for fertilizer, chemicals, and other commodities. The trucks carrying the produce are not properly covered and are exposed to weather shocks, that is, high temperature, rain, dust storms, and so on.
- **Power shortages.** Many production areas, for example, for gum Arabic, livestock, and dairy, are either not connected with the power grid or electricity supply is highly unreliable with long power outages. Use of a generator, for those who could afford it, depends upon availability of diesel which is in short supply and getting expensive as the Government is withdrawing petroleum subsidies; it is a major constraint for post-harvest handling, warehousing, and cold storage.
- **Lack of cold chain infrastructure.** Integrated cold supply chain infrastructure backed up by uninterrupted electricity supply especially for livestock (meat), dairy, and horticulture—a must for export markets—is grossly underdeveloped. The prevalent hot weather, poor post-harvest handling technologies, and a deficient road and transport system limit consistent supply of value chains resulting in price volatility in the markets. Cold chain facilities are limited to the capital, Khartoum, far away from the horticulture production areas.
- **Lack of modern technology.** With the exception of large-scale processors, for most part, value chain processing in Sudan is based on outdated technologies which are inefficient, wasteful, and not able to produce quality products for the domestic market, let alone for export. For example, Sudan is unable to tap into premium meat markets like the United States and EU as it lacks the modern technology, that is, vacuum packaging and shock freezing which increase the shelf life of processed meat products by 6–8 months.
- **Poor inland logistics.** The road and transport network in Sudan is underdeveloped, old, and expensive due to high maintenance and running costs. Parts of rural Sudan are difficult to access as no paved roads exist. Chronic fuel shortages and increasing fuel prices have severely restricted regular transportation of agriculture produce to domestic markets. Logistics and cargo for export are limited. The Port of Sudan is currently not working at full

capacity (only 1 out of 3 cranes is working), which increases the loading time and considerably delays export shipments.

- **Weak market infrastructure.** Along the value chains, supplies and produce change hands several times between the initial point of purchase and the final point of sale. Village, mobile, and intermediate markets are characterized by poor connectivity, weak communications, poor infrastructure, and deficient services. Even at the higher level of a value chain, that is, regional markets with relatively better information, markets do not have the adequate market infrastructure, services, and management. The markets suffer from the absence of clear rules and regulations that organize trading and define the rights and responsibilities of stakeholders. The markets, for most part, do not have a functional market information system, banking, transportation, and storage facilities. For example, a lack of market information and multiple fees and charges imposed by local authorities lead to farmers selling their produce at low prices to the village traders which diminishes their incentive to take gum Arabica as their primary source of income.
- **Weak quality control for domestic markets.** Based on the limited information available about the overall food safety standards and value chain-specific safety standards, it appears that regulatory safety standards require a thorough review for domestic and export markets. The public sector lacks the financial resources, testing equipment, human resources, and logistics to enforce safety standards and ensure compliance.
- **Lack of knowledge, regulatory framework, and service provision for quality control for the export market.** There is a dearth of awareness and understanding and weak institutional capacity in meeting the specific SPS requirements of each value chain for exports markets. For instance, while a national standard on sesame seeds was developed in 2015 by the SSMO, the implementation plan is spotty. The SSMO issued a standard on the maximum levels of mycotoxins in sesame seed (SDS2928:2005), but enforcement is not consistent. Similarly in the case of meat, the lack of internationally accredited slaughterhouses and technical knowledge and limited animal screening at slaughterhouses impede the exports of processed meat.
- **Lack of traceability and certification systems.** Essential information such as production region, date of handling, quality assurance certificate, batch number, and laboratory testing data cannot be traced due to the absence of a traceability and certification system developed along the value chain for export markets.

## Chapter 6: Recommendations for policies and public investments

### Summary

**The recommendations are intended to serve as a starting point for in-depth dialogue between public and private sector stakeholders to define a road map for agriculture sector development in Sudan.** Further research will be required to fill in multiple data gaps and agree on sequencing, scale, and sources of investments. The report suggests the following sequence of actions, to serve as a starting point for a dialogue between the Government of Sudan, the private sector, and the donor community about how the recommendations in this report might be turned into actions:

- **Adopting the MFD framework.** Given the severely constrained fiscal space in Sudan, it will be critical to follow the MFD framework when designing solutions to address cross-cutting and sector-specific constraints in the agriculture sector in Sudan.

#### **Prioritizing public sector interventions**

- Investing in agricultural research, improving land markets, and land-use planning
- Providing services that improve plant and animal health, regulate agricultural inputs for safety and efficacy, and disseminate knowledge about production technologies built on scientific findings from agronomy and animal husbandry
- Helping farmers access more productive genetic material and disseminating knowledge about production technologies
- Leveraging digital technologies and partnerships with the private sector to deliver advisory and extension services.

#### **Opportunities for private sector solutions**

- Addressing the information gap by employing digital technologies to lower the cost of acquiring price and market information and to match buyers and sellers
- Providing resilient agricultural inputs, equipment, technologies, skills, and extension services for productivity enhancement
- Providing infrastructure, for example, investments in storage, cold chains, processing, and value addition.

#### **Building integrated supply chains through public-private collaboration**

- Enhancing standards and quality infrastructure provision through public-private partnership, while including smallholders
- Addressing access to credit constraints by introducing warehouse receipt systems, partial credit guarantee funds, mobile phone lending, and innovative insurance products to share risk
- **Complementary policies and public investments.** Addressing political risks, macroeconomic risks, and weak institutions will be critical to maximize the returns to the proposed investments in the agriculture sector. These include efforts to build political stability and conflict resolution; complete macroeconomic reforms; reintegrate into the global economy and rejoin global markets through bilateral trade agreements and World Trade Organization (WTO) membership; reduce public debt; strengthen institutions and improve governance capacity; and protect natural resources.

## Overview

185. **The recommendations set out in this section focus on the objective of revitalizing key sub-sectors of Sudan’s agricultural sector for “addressing the economic crises and establishing the bases of sustainable development” as outlined in the General Framework for the Program of the Transitional Government, following the MFD approach.** Given the severely constrained fiscal space, it will be critical to follow the MFD framework when designing solutions to address cross-cutting and sector-specific constraints in the agriculture sector in Sudan. Specifically, the recommendations will differentiate between (a) opportunities for private sector financing: commercially viable investments that can be made with private sector financing only, (b) upstream reforms needed to address existing market failures and lift key enabling environment constraints to private sector investment, and (c) areas that require public investment for public or quasi-public goods.

186. **Broadly, the public actions and investments highlighted in this section are designed to improve crop and animal productivity, bring smallholders into formal supply chains in greater numbers, lower transaction costs along each of the five value chains, and remove food quality and safety deficiencies that preclude them from high-value markets and reduce their value in secondary markets.** Doing so is expected to boost producer incomes, stimulate investment and growth for SMEs, generate economic growth and employment beyond the five sub-sectors, boost trade and export earnings, improve food safety, and reduce poverty.

187. **The remainder of this section is organized in the following way.** The next section, “Challenges and recommendations” addresses cross-cutting constraints for agriculture value chain development in Sudan. The section titled “A summary of recommendations and a suggested time path” suggests a trajectory for implementing the report’s recommendations. A subsequent section “Complementary policies and public investments” looks at economy-wide and sector-wide conditions that affect all five value chains. A final section concludes.

## Challenges and recommendations

### Addressing cross-cutting constraints

188. This section addresses cross-cutting constraints for agriculture value chain development in Sudan. Addressing these constraints is expected to boost smallholder productivity and build more inclusive, more efficient, and better integrated supply chains. On the whole, the recommendations focus on building the capacity of the Government to provide services that the private sector cannot; incentives to encourage the private sector to build missing components of current supply chains; and ways that establish partnerships between the Government, the private sector, and NGOs to accomplish both goals.

### Public sector interventions: Research, production technology adoption, and supporting services

189. **Public interventions are needed to boost productivity enhancement, especially for smallholder farms and pastoralists’ herds.** As outlined in chapters 3 and 5, despite favorable conditions, crop and animal productivity in Sudan falls far short of its potential and lags productivity levels in neighboring

countries. Choices farmers make about the production technologies they use constrain on-farm productivity. The Government can improve productivity as follows:

- **Investing in research.** As discussed in chapter 3, relative to neighboring countries, public investment in agricultural research is low (World Bank 2016). How Sudan's agricultural research program should be restructured goes beyond the scope of this report. Some specific recommendations, however, about how to start are given in the 2016 policy report (World Bank 2016).
- **Providing improved services.** The Government is responsible for putting in place systems that improve plant and animal health, regulate agricultural inputs for safety and efficacy, and disseminate knowledge about production technologies built on scientific findings from agronomy and animal husbandry. An important first step to lowering technology adoption costs is to reduce the cost and increase smallholder access to improved genetic material. This can be done by streamlining the process of importing improved seeds, seedlings, and breeding animals and by supporting the private farms and nurseries that produce them domestically.
- **Disseminating knowledge about production technologies can spur adoption and prompt productivity gains.** There is substantial evidence that adopting new technologies for food and cash crops can result in reductions in poverty and improvements in nutrition and spur growth in rural communities (Larson, Muraoka, and Otsuka 2016). Government support to traditional extension services in Sudan has been low, as have been the delivery of extension services to smallholder farmers. The Government can build up its capacity to deliver needed services by reallocating budget resources and relying on the private sector when possible. The Government can partner with private extension services to reach underserved areas and rely on private and community veterinarians to support public animal health objectives.
- **Using digital technologies to disseminate information that helps farmers boost productivity.** With the growth in mobile services, other governments have turned to mobile technologies to provide advisory services, and these experiences could be replicated in Sudan. For example, Aker (2011) lists 11 programs in developing countries designed to deliver information about production techniques. Of the programs, 10 relied on radio or mobile phones (voice or SMS); only 1 used the internet. Such systems can be highly effective. For example, Avaaj Otalo is an experimental farm management service that sends weekly content about weather, pest management strategies, and other relevant information to households in 40 villages in India. Cole and Fernando (2016) report that 80 percent of the app's users experienced average yield gains of 26 percent over two years. Another example is e-Diary Lanka, a service linked to a mobile app and to touch screen kiosks located across Sri Lanka. The platform provides dairy farmers with information about animal health and access to veterinary services, and the platform also provides information about milk prices, feed suppliers, and bank loans. Qiang et al. (2011) report that e-Diary improved farmer income by US\$262 per dairy calf.
- **Supporting producers' associations.** Potentially, producer groups can help resolve several constraints that prevent smallholders from adopting improved technologies and participating in input and output markets. Associations can also provide economies of scale that reduce the cost of acquiring inputs and selling outputs and are better positioned to obtain and disseminate accurate price and marketing information. Associations can also be a conduit for credit as discussed later. Past programs to support gum Arabic producers via

associations have proved successful. For example, the World Bank provided support to 100 GAPAs on a pilot basis, about 10 percent of all GAPAs in Sudan (World Bank 2012). The program proved successful and adjacent communities voiced strong interest in the program. Subsequently, an AfDB project funded support to an additional 200 GAPAs, with a focus on women and youth (AfDB 2018). Should results continue to prove successful, this type of support could be further expanded. In the case of dairy, as the experience of Pakistan discussed in chapter 5 shows, the creation of supported producer associations can create a way for smallholder producers to enter modern supply chains.

- **Improving land markets and land-use planning.** Sustained productivity depends on the proper management of the natural resources that support agriculture. A lack of adequate protection and planning is listed as an overarching constraint for five subsectors that are the focus of this report. Earlier policy reviews emphasize the need for a strengthening of land institutions that recognize and protect customary land rights and address long-standing grievances over land ownership and claims and “to create an enabling environment for implementing a well-balanced mix of investment to realize the potential of large- and small-scale agriculture.” (World Bank 2016, 80). Efforts are also needed to improve and use migration corridors to sustain livestock rangelands. A systematic plan for using land resources should provide a guiding framework for land markets. Lessons from other countries show that successful land policies are built on a recognition of existing rights; an emphasis on voluntary transfers; transparency; and thorough review of economic, social, and environmental viability (Deininger 2011).
- **Investing in gum Arabic to fight desertification and climate change.** History, and lessons from other countries, show that gum Arabic can contribute to a broader program to protect natural resources. In Sudan, there is a tradition of using gum Arabic cultivation to manage soils. Often, acacia cultivation is rotated with crop cultivation: aging acacia gardens are cleared for sorghum, sesame, millet, or groundnuts and later replanted with acacia trees restoring soil fertility in preparation for a new cycle of crop cultivation (United Nations Conference on Trade and Development 2018). Further, planting acacia trees in large tracts of land can prevent desert encroachment and potentially reclaim desert land. The idea behind it was the African Union’s Great Green Wall project. Launched in 2007, the pan-African effort sought to battle desertification and land degradation, while improving livelihoods across the Sahel region by planting acacia trees. The World Bank and the Global Environmental Fund are supporting the Government of Mauritania’s participation (United Nations Conference on Trade and Development 2018). Currently, FAO and the FNC are looking to use Green Climate Fund resources to extend the Green Wall Project in Sudan (GCF 2019).

### Private sector interventions: Market information and digital technologies

190. In addition to the private sector investment opportunities under each value chain identified in chapter 5, additional investment opportunities in addressing cross-cutting issues are as follows:

- **Addressing the information gap by employing mobile technology to lower the cost of acquiring price and market information and match buyers and sellers.** A systemic lack of information about prices limited the analytic scope of this report and showed up repeatedly as a constraint in the five value chains. The dispersed smallholder basis of agriculture in Sudan is especially vulnerable to poor information about prices and market opportunities.

The livestock value-chain analysis in chapter 5 highlighted inconsistencies in reported livestock prices, and the horticulture analysis emphasized difficulties in obtaining market information too. Poor information about prices and markets lead to higher search costs, less competition, and information asymmetries that increase risks and shift bargaining power that often disadvantage producers. By itself, increased use of mobile phones should reduce hurdles to price and market information. In general, mobile phones facilitate traditional marketing chains, lowering the costs of getting goods from farms to spot markets or factory gates. More sophisticated digital platforms can create virtual marketplaces but require internet connectivity. Evidence from other developing countries, including countries in Africa, shows that the variance of spatial prices falls as mobile phone use becomes more commonplace. Mobile phones can expand and complement existing interpersonal networks to speed information flows by reducing the costs associated with geographic distance (Aker, Ghosh, and Burrell 2016; Jensen 2007). Further, the impacts are often the greatest for hard-to-store commodities, like fish in India (Abraham 2007) and bananas in Uganda (Muto and Yamano 2009). Examples from other countries show that the private sector is willing to invest to build out private internet-connected networks to secure supplies and sell inputs to geographically dispersed farmers. One example, India's eChoupal initiative, is an integrated digital platform connected to a network of village kiosks, a system built by the India Tobacco Company, which the company uses to streamline its own procurement of agricultural products from a geographically dispersed set of smallholder producers (Kumar 2004). Another example is from China, where Alibaba created a network of Taobao Rural Service Centers, often located in convenience stores, where trained villagers help rural customers access the Alibaba network to purchase goods and sell agricultural products (Ding et al. 2017).

- **The Government can take additional positive steps to complement private sector investments.** The Government can lower the barriers to market and price information by promoting the build-out of telecommunications infrastructure in rural areas and extending access to the internet. The Government can also directly distribute the price information it collects. For example, radio shows have been shown to be effective at distributing price information (Aker 2011). Moreover, research shows that women are less disadvantaged when market information is delivered by radio and television services (Huyer 2016; Ragasa 2014).
- **The Government and donors can also encourage NGOs and the private sector to experiment with digital technology applications that match buyers and sellers.** Lessons from other countries show that, in some instances, the private sector will invest in platforms that connect input suppliers to farmers or aggregate the purchase of farm outputs. In other cases, digital technologies are launched as experiments by mission-focused businesses or non-profits. The Government can play a supporting role by promulgating rules that protect farmers while encouraging innovation through challenge funds.
- **Digital technologies can lessen the cost of tracing systems.** Keeping track of data is a crucial component of integrated supply chains, a task well suited to digital technologies. Managing supply chains is important to many firms for managing costs, to limit reputational risks, and, for some, to document claims of social or environmental impact. In turn, several firms provide systems that integrate protocols and tracing hardware that can be adapted to specific uses. An example is the 3S Sustainable Cashew Supply Chain, a system designed to deliver cashews to suppliers that meet stated environmental standards (Abell et al. 2019);

Azevedo et al. 2019). The underlying system can be customized across multiple set private standards and can operate across multiple countries.

## Building integrated supply chains through public-private collaboration

191. **Enhancing standards and quality infrastructure provision through public-private collaboration.** Standards set out the criteria used to judge whether the agricultural products meet regulatory rules about quality and safety, or criteria set out in private contracts. Because the criteria are hard to observe and expensive to test for, products are often deemed acceptable if protocols designed to ensure contractual criteria are followed. Standards and protocols are non-rivalrous goods, some public and some private. For example, the food safety and quality standard ISO 9000 is public, while SQF 2000 is private (Henson and Reardon 2005). Protocol systems are often based on quasi-public guidance materials; examples include hazard analysis and critical control point systems and GAP systems (Caswell, Bredahl, and Hooker 1998; Fulponi 2006). Importantly, supermarkets and fast-food restaurants set their own quality and safety standards, and having the capacity to meet those standards can bring economic rewards to farmers and agribusinesses and bolster export earnings. Working together, the Government and the private sector can build standards and protocols to improve the quality and safety of the five commodities covered by this report.

192. **The need to include smallholders.** Conversely, an inability to meet rising food safety standards can also create obstacles that exclude poor smallholders, so steps must be taken to include them (Henson and Jaffee 2008; Asfaw, Mithöfer, and Waibel 2009; Rodrik 2018). As the example of dairy shows, producer associations offer one way of accomplishing that goal. In the case of horticulture, smallholders can work with processors and exporters.

193. **Premiums for social and environmental impact.** There is a growing market for commodity products that are perceived as generating social and environmental benefits, and evidence suggests smallholder producers can benefit from such markets (Giovannucci and Ponte 2005). To be credible, claims of impact require certification of some sort, often set by organizations like Fair Trade and the Smithsonian Migratory Bird Center. A growing number of NGOs provide support for farm-to-market tracing systems that result in certifications.

194. **Clustering to address weaknesses along physical supply chains.** All value chains are constrained by a lack of public and private investments in physical supply chains. Poor roads, limited port capacity, limited cold storage facilities, and unreliable power all stand in the way of profitable expansion of each value chain. One solution, recommended and explained by the recent SME diagnostic report (World Bank 2019c), is to build up public and private infrastructure in preexisting geographic clusters of agricultural activity. The report identifies sesame seeds, livestock, and horticulture as value chains that would benefit from this strategy. A clustering of agribusinesses could also lessen the cost of providing needed technical support to small emerging agribusinesses. Specific recommendation regarding specific value chains are given in the sections below. The SME report's suggested locations for clustered agribusiness hubs include horticulture in Sennar and Geziras states; livestock in North Kordofan, Darfur, and Sennar states; gum Arabic in North Kordofan; sesame in Sennar, Gadarif, and White Nile states; and oilseed processing in Khartoum, Geziras, and North Kordofan.

195. **An example in North and West Kordofan.** Consistent with the goal of geographic clustering, a recently approved project by the AfDB (Sudan Agricultural Value Chain Development Project) will build or repair 266 km of rural access roads in North and West Kordofan. The project will also finance 12



warehouse facilities in 12 locations in the regions to store gum Arabic, sesame seeds, and other products (AfDB 2018). The strengthening of infrastructure in the region potentially enhances investment opportunities for services and value-added processing identified by the SME diagnostic, for example, producing spray-dried material in emulsions or encapsulations, adding functionality and higher margins for exports (World Bank 2019c, 117).

196. **Addressing access to credit constraints.** A lack of credit constrains investments in equipment and land improvements on farms and is partly responsible for a lack of investments in storage, cold chains, and processing. In this, Sudan's experience is not uncommon. Covariate systemic risks make it difficult for traditional banks to profitably lend to farmers and agribusinesses. In other sectors, micro-lending institutions can be effective in lending to high-risk individuals, using small short-term loans and small-group liability. Nevertheless, standard micro-finance lending approaches are also not well suited to agriculture because of the same reasons that limit bank lending: covariate weather risks are high, and lending is seasonal with significant time gaps between expenditures and sales. Cross-country experience suggests several approaches that have proved more successful.

197. **Warehouse receipts.** Warehouse receipt systems are primarily a mechanism to facilitate credit, using commodity inventories as collateral. In the system, a special class of warehouses are certified based on physical and financial criteria. After establishing that the commodity matches quality standards, the certified warehouses issue transferable receipts (warrants), which serve as nearly riskless collateral. If a loan issued against a receipt is not repaid in time, lenders can claim the stored inventories associated with the receipt. Warehouse receipt laws allow lenders to claim the inventories without going to a claims court, and because the stored commodities are of a standard grade, the lending receipt can sell the warrant at market rates without the need to take physical possession of the commodity. Because the loans are of low risk, warehouse receipt lending can provide low-cost working capital to agribusinesses and thereby lower value-chain transaction costs. Additionally, warehouses can become a point of sale into spot and forward markets, thereby allowing farmers to address price and counterparty risks (Giovannucci, Varangis, and Larson 2000). The already mentioned warehouse project includes a component to create the legal foundation for warehouse receipt lending (AfDB 2018). Once in place, the Government might consider expanding such systems to other value-chain clusters.

198. **Partial credit guarantee funds.** Another approach is to directly address the underlying problem of risk through a partial guarantee credit (PGC) fund. Recognizing that the risk to a lender of a loan to farmers or agribusinesses is higher than loans to other sectors, the fund lowers the lenders risk by taking on a portion of the default risk. Because transaction costs are high, PGCs work better for loans with larger farms, agribusinesses, and financially sound producer groups. The Government and donors might consider PGCs to promote missing private sector investments crucial to value chains and as an instrument to promote agribusiness clusters.

199. **Mobile phone lending.** A promising but unproven set of technologies is designed to provide credit to smallholders. The most direct methods use data captured from mobile banking apps to devise credit scores that become the basis of lending. For example, in Kenya, the telecom company Safaricom, in partnership with the Commercial Bank of Africa, offers a credit and saving product to its M-PESA mobile phone users. Safaricom usage determines initial loan eligibility; subsequent loans are based on performance. Disbursements and repayments are managed in M-PESA. Governments can help foster this type of lending by putting in place the proper regulatory environment for mobile banking.

## A summary of recommendations and a suggested time path

200. This section of the report is meant to serve as a starting point for a dialogue between the Government of Sudan, the private sector, and the donor community about how the recommendations in this report might be turned into actions and the sequence of those actions.

### Short-term actions

- Establish a public entity to collect and organize market information. Use the data to analyze costs along the five value chains and conduct benchmarking exercises.
- Establish a collaboration between the Government, the private sector, and donors to build up a digital catalogue of smallholder technologies, emphasizing GAPs. Survey the use of digital technologies to help deliver extension services in other countries and draw lessons.
- Build a focused library of current land-use practices based on satellite images and ground surveys and begin a dialogue among stakeholders about potential corridors for migrating livestock herds.
- Evaluate World Bank and AfDB programs that support gum Arabic producer organizations and draw conclusions about whether the programs can be scaled and whether similar programs might be useful for dairy, livestock, sesame seeds, and horticulture.
- Evaluate the existing warehouse and warehouse receipt program and determine whether the program can be expanded to other crops and other places.
- Evaluate hurdles to importing or domestically producing better seeds, planting materials, and equipment.
- Evaluate the use of digital technologies to disseminate market information and match buyers and sellers based on domestic and international experiences.
- Evaluate the investments needed to conduct agricultural research and better management of plant and animal health based on domestic and international experiences.
- Begin a dialogue with stakeholders about public and private food safety and quality standards.
- Evaluate the efficacy of programs that use gum Arabic trees to promote environmental objectives.
- Analyze the regulatory environment for pesticides and other chemical inputs.

### Medium-term actions

- Based on additional value chain analysis, begin a discussion with producers, processors, and other stakeholders about feasible SME clusters, incentives, and financing options. Based on the dialogue, develop a program to promote specific clusters that include smallholders in more fully integrated supply chains. Devise incentive programs to prompt investments in supply chain hardware and software. Expand warehouse receipt programs where needed and where economically feasible.

- Design and launch a program to disseminate price and market information via radio, newspapers, and collaborations with mobile carriers.
- Based on analytic results, begin to make investments in the Government's capacity to develop smallholder-focused research and deliver services. Develop programs that leverage technology and public-private partnerships to supplement Government-provided research and extension services.
- In consultations with stakeholders and based on earlier analysis, establish migration corridors where warranted.
- Based on stakeholder dialogue, revise public food safety standards and facilitate the use of private standards. Introduce programs that help smallholders meet the new standards.
- Design incentives, like challenge funds, to encourage private companies and NGOs to offer digital services to help integrate buyers and sellers, help integrate smallholders in supply chains, help producers benefit from social and environmental impact premiums, and help extend credit and insurance markets.
- Design and implement a program to reduce hurdles to importing the plants, animals, and equipment associated with better agricultural technologies.
- Examine land market institutions and, drawing on domestic and international experience, design a program to strengthen smallholder land rights, fairly adjudicate land disputes, and facilitate transparent land markets.
- Based on earlier analysis and stakeholder dialogue, design and implement a program to lessen the impacts of chemical inputs on people and the environment.
- Based on earlier analysis and stakeholder dialogue, design and launch programs that use gum Arabic orchards to achieve environmental objectives where appropriate.
- In consultations with stakeholders, evaluate land-use practices and outcomes, utilizing landscape approaches and drawing on international best practices.

### Longer-term actions

- Continue to invest in the Government's capacity to manage and monitor public expenditures.
- Continue to build the Government's capacity to deliver services in collaboration with partners
- Strengthen land institutions and markets.
- Based on domestic and international experiences and stakeholder dialogue, build better protections for land and water resources.

### Complementary policies and public investments

201. **Many of the public and private investments identified in this report can directly benefit the selected five value chains.** However, each value reviewed here suffers from transaction costs that stem from high transport costs, high information costs, and risk premiums originating in political risks, macroeconomic risks, and weak institutions. Based on the findings of earlier World Bank analysis,

including the Sudan Agricultural Transformation and Natural Resource Management Strategy (World Bank 2016), Sudan Agriculture Public Expenditures: An Initial Overview (World Bank 2019a), and the Sudan Agribusiness Sector Overview (World Bank 2018b), near-term progress in the following key areas would substantially increase the probable impacts of policies and investments targeting the selected five value chains.

202. **Political stability and conflict resolution.** Analysts note that conflict, fragility, and governance challenges have thwarted Sudan's economic progress and could weaken the impacts of proposed policy changes and investments recommended in this report (Hassan and Ibrahim 2020). The protracted war that resulted in South Sudan's secession was soon followed by conflicts in other peripheral regions, including the two states of South Kordofan and Blue Nile, the three states of Eastern Sudan, and the five states of Darfur in the west, which together comprise nearly half the area of Sudan and more than 40 percent of its population. Prospects for resolving long-standing grievances improved with the formation of a new Transitional Government following the overthrow of the 30-year authoritarian regime of former President Al-Bashir in August 2019, after peaceful protests spread across Sudan in April 2019. The new Transitional Government has set achieving a lasting peace with armed struggle movements as one of its primary initial goals.

203. **Economic stability.** In recent years, Sudan's economy has struggled with inflation and its currency has lost value. The problems have accelerated in recent months. As with political instability, macroeconomic challenges can undermine the types of private sector responses needed to match public actions recommended in this report. The parallel exchange rate has depreciated by nearly 200 percent since January 2019, and inflation rose from 57 percent to 64 percent between December 2019 and January 2020. After modest growth, the economy shrank by 2.3 percent and 2.5 percent in 2018 and 2019, respectively. Constrained by fuel and agriculture input shortages, the agriculture sector contracted by 1.5 percent in 2018. Falling revenue has contributed to a widening fiscal gap, which reached nearly 8 percent of GDP in 2018, and early estimates suggest that the gap widened further in 2019. The deteriorating economy has exacerbated existing levels of poverty and malnutrition. Trade balances have turned negative, which heightens currency shortages. The magnitude and persistence of unemployment among the youth threatens stability and social cohesion (Hassan and Ibrahim 2020). Currently, uncertainty about the value of the Sudanese pound and constraints on capital flows appear to be affecting important domestic commodity prices, like livestock and gum Arabic, because exporters use the commodities to transfer money out of the country.

204. **Full reintegration into the global economy - overcoming a legacy of sanctions and isolation.** In 1997, the United States imposed sanctions, charging that the Al-Bashir Government had supported international terrorism by harboring known terrorists, including Osama Bin Laden; backed rebel movements in Ethiopia, Eritrea, and Uganda; and violated human rights during conflicts in the South and in Darfur (World Bank 2016, 39.) Others, including the EU and the UN imposed sanctions as well. During this period, progress toward Sudan's membership in the WTO, which began in 1994, also stalled. Separately, plaintiffs, including survivors and family members, sought punitive damages from the Government of Sudan for its role in the bombing of U.S. embassies in Kenya and Tanzania, and attacks on the USS Cole in Yemen. In May 2020, the U.S. Supreme Court confirmed that authorized plaintiffs could seek and win punitive damage in U.S. courts (Farrick 2020). The combination of events limited Sudanese exports, reduced foreign investment in the country, and led to economic isolation.

205. **A path toward reducing foreign debt.** The Transitional Government is actively working to have the country removed from the United States List of State Sponsors of Terrorism and to settle plaintiff

lawsuits following the Supreme Court ruling, which stand as obstacles to Sudan's efforts to reducing its foreign debt. The debt is estimated at US\$65 billion, which is significantly greater than the country's 2018 GDP of US\$41 billion (World Bank 2016). Policy reform impacts associated with this report's policy recommendations will be hampered if austerity programs linked to debt resolution hamper the needed public investments.

**206. Rejoining global markets through bilateral trade agreements and WTO membership.** The Government has also held discussion with the WTO, including a visit by the chair of the organization's Sudan Accession Committee to Khartoum in January, to reactivate Sudan's membership application (WTO 2020b). Currently, the Government is working to revise nearly 150 laws to bring the country's trade policy in line with WTO requirements. In addition, the Government has signed bilateral trade agreements with six countries (Brazil, China, India, Japan, and Nigeria), and negotiations are under way with another five trading partners (Canada, EU, Kenya, the United States, and Ukraine). An expanding set of trade opportunities would allow Sudan to take advantage of new markets for the five commodity groups analyzed in this report.

**207. Reducing value-chain transaction costs by strengthening institutions and infrastructure, governance capacity, and institutions.** As discussed in chapter 3, the country ranks low on general indicators on ease of doing business globally and among its regional neighbors. Sudan also falls behind other developing countries in the overall ranking for national policies that affect agricultural productivity and agribusiness. Sudan's legacy of underinvesting in infrastructure also results in high transport and logistical costs; Sudan ranks 121 out of 160 countries according to the World Bank's LPI. Access to electricity can be limited as well. Several of the investment and policy recommendations address, within specific value chains, a legacy of past regulatory shortcomings and public investment. That said, although Sudan lags regional neighbors in mobile phone subscriptions, most households subscribe to mobile phone services, and a small but growing share of the population has internet access. As discussed later, digital technologies can help mitigate transaction costs in important ways. In turn, a reduction in transaction costs along each of the five value chains can enhance the impact of policy changes and public investments.

**208. Increasing governance capacity.** As noted earlier, responsibility for public expenditures and policy making for agriculture is shared among four ministries: The Federal Ministry of Animal Resources, the Ministry of Water and Irrigation, the Ministry of Environment, and the Ministry of Agriculture. Earlier World Bank reports, including the World Bank's comprehensive review of past agricultural policies, criticized what was perceived as a lack of coordination on policy making and execution (World Bank 2016). A 2018 Agricultural Public Expenditure Review was incomplete because the Ministry of Agriculture failed to provide data requested by the review and data provided by other ministries were incomplete (World Bank 2018a). The incomplete expenditure data provided to the team pointed to poor budget execution and a neglect of public investments in productivity-enhancing research and extension. Many of the recommendations in this report depend on the ability of the Government to execute policy and manage allocated budgets.

**209. Protecting natural resources.** Finally, past policy reviews highlight the need for Sudan to formulate a comprehensive framework to manage its remarkable natural resources. Specifically, the report concludes, "(t)he strategic challenge for economic development in Sudan is to maintain and even augment natural capital (in physical and value terms) while investing in the produced, human, and social capital that is also needed to achieve sustainable development. Similarly, the challenge for developing a robust agricultural strategy is to integrate the long-term value of land and forest resources in setting objectives for the sector and designing policies to achieve them." (World Bank 2016, 132). Landscape

approaches to analysis and land-use planning can be useful components of an effort to better manage and protect land and water resources in Sudan.

## Conclusions

210. Chapter 5 lays out a convincing case that opportunities for growth are available in the five key value chains covered by this report. Hurdles to growth are present as well, which leave the value chains characterized by low crop and animal productivity and supply chains plagued by poor information flows, high transaction costs, and inadequate investments in storage and transport that reduce the quality, safety, and value of commodities as they move from farm to domestic consumers and export markets.

211. Constraints at the macro and sector levels make resolving subsector constraints along the five value chains more difficult; however, the prospect of lifted sanctions, a reduction in conflict, and WTO membership will create new opportunities for the five subsectors as well. Largely, problems along the value chains stem from an underinvestment in public services, missing private investments, and the inherent difficulties of including dispersed smallholder producers in efficient supply chains.

212. Building adequate capacity in agricultural research and the tools needed to manage plant and animal health services will take time, although there may be opportunities to enlist the private sector, too. Digital technologies can certainly help improve the dissemination of information about market conditions and production technologies. A comprehensive land-use plan is needed to protect Sudan's abundant natural resources; however, in the short run, attention should be given to establishing migration corridors to support the county's pastoralist livestock sector and reduce regional conflicts. Potentially, market incentives to establish and meet private quality and food safety standards can supplement the country's current limited ability to enforce SPS standards.

213. Incentives will likely be needed to prompt adequate private sector investments in the physical buildings and equipment, software systems, and human skills that are needed to better integrate supply chains and to influence the build-out of clusters. Public investments in infrastructure will be needed as well. Hopefully, as value chains grow, input markets, especially for seeds, planting materials, fertilizers, and feed, will grow in tandem.

214. Fully incorporating smallholder producers will remain a challenge. Working with existing producer associations and supporting the formation of new ones can help. Innovative digital technologies, which link farmers to input providers and buyers, show promise as ways to overcome well-known hurdles to productivity and better-integrated and more efficient supply chains. The Government and donors should consider finding ways to support similar innovation efforts in Sudan.

## References

- Abell, Thomas, Marijn Ambrosius, Jennifer van den Berg, Thijs van den Broek, Hans van Hooff, and Anne Merel Tolsma. 2019. "Accelerating CGIAR'S Digital Transformation: A High-level Assessment of Digital Strategy across CGIAR." CGIAR Project Steering Committee, Washington DC.
- Abraham, Reuben. February 2007. Mobile Phones and Economic Development: Evidence From the Fishing Industry in India, *Journal of Information Technologies and International Development* (Inform Tech Int Dev)
- AfDB. 2018. Sudan-Agricultural Value Chain Development Project. African Development Bank, Abidjan, Côte d'Ivoire, available at <https://www.afdb.org/en/documents/document/sudan-agricultural-value-chain-development-project-avcdp-103399>.
- Aker, Jenny C. 2011. "Dial 'A' for Agriculture: A Review of Information and Communication Technologies for Agricultural Extension in Developing Countries." *Agricultural Economics* 42 (6).
- Aker, Ghosh, and Burrell. 2016. The promise (and pitfalls) of ICT for agriculture initiatives, *Agricultural Economics*, The journal of International Association of Agricultural Economists, 47 (S1) and <https://doi.org/10.1111/agec.12301>
- Asfaw, Solomon, Dagmar Mithöfer, and Hermann Waibel. 2009. "EU Food Safety Standards, Pesticide Use and Farm-level Productivity: The Case of High-value Crops in Kenya." *Journal of Agricultural Economics* 60 (3).
- Azevedo et al. 2019. The Influence of Collaboration Initiatives on the Sustainability of the Cashew Supply Chain, *The Journal of Sustainability* 10(6)
- Caswell, Julie A., Mary E. Bredahl, and Neal H. Hooker. 1998. "How Quality Management Metasystems Are Affecting the Food Industry." *Applied Economic Perspectives and Policy* 20 (2).
- CBI (Centre for Promotion of Imports from Developing Countries) 2018. Exporting Gum Arabic to Europe.
- Central Bureau of Statistics. 2014. Multiple Indicators Cluster Survey (MICS). Khartoum, Sudan.
- Central Bureau of Statistics. 2019. Indicators from the 2014/15 National Household Budget and Poverty Survey (NHBPS). Khartoum, Sudan.
- Cole, S. A., and A. Fernando. 2016. "'Mobile'izing Agricultural Advice: Technology Adoption, Diffusion and Sustainability." Harvard Business School Finance Working Paper 13-047. Boston, Harvard Business School.
- de Groot, Nico, and Karin Bleijlevens. 2017. East Sudan Horticultural Study.
- Deininger, Klaus. 2011. "Challenges Posed by the New Wave of Farmland Investment." *The Journal of Peasant Studies* 38 (2).

- Ding et al. 2017. From Ant Financial to Alibaba's Rural Taobao Strategy - How Fintech Is Transforming Social Inclusion, The Digitalisation of African Agriculture Report 2018–2019, 10.1016/B978-0-12-810441-5.00002-6
- ElHadary, Yasin, Abdalla Eltayeb, and Franklin Obeng-Odoom. 2012. "Conventions, Changes, and Contradictions in Land Governance in Africa: The Story of Land Grabbing in North Sudan and Ghana." *Africa Today* 59 (2): 59–78.
- Farrick, Ryan J. 2020. "Supreme Court Says Sudan Must Pay Punitive Damages in Embassy Attack Lawsuits." *LegalReader.com*, May 20, 2020. Available at: <https://www.legalreader.com/supreme-court-sudan-damages-embassy-lawsuits/>.
- Federal Ministry of Agriculture and Forestry. 2020. *Agricultural Statistics (in Arabic)*. Khartoum, Sudan.
- Federal Ministry of Agriculture and Forestry. 2016. *Sudan National Agriculture Investment Plan (NAIP) 2016–2020*. Khartoum, Sudan.
- Fulponi, Linda. 2006. "Private Voluntary Standards in the Food System: The Perspective of Major Food Retailers in OECD Countries." *Food Policy* 31 (1).
- GCF (Green Climate Fund). 2019. *Gum for Adaptation and Mitigation in Sudan: Enhancing the Adaptive Capacity of Local Communities and Restoring the Carbon Sink Potential of the Gum Arabic Belt - Expanding Africa's Great Green Wall*. Green Climate Fund. Incheon, South Korea. Available at: <https://www.greenclimate.fund/sites/default/files/document/20620-gum-adaptation-and-mitigation-sudan-enhancing-adaptive-capacity-local-communities-and.pdf>.
- GLOBALG.A.P. 2015. "The Sudanese Center for the Sterilization of Horticultural Exports Joins GLOBALG.A.P. as a Supplier Member." Retrieved from [www.globalgap.org](http://www.globalgap.org): <https://www.globalgap.org/ja/news/The-Sudanese-Center-for-the-Sterilization-of-Horticultural-Exports-Joins-GLOBALG.A.P.-as-a-Supplier-Member/>.
- Giovanucci, Daniele, Panos Varangis, and Donald F. Larson. 2000. "Warehouse Receipts: Facilitating Credit and Commodity Markets." Available at SSRN 952596.
- Giovanucci, Daniele, and Stefano Ponte. 2005. "Standards as a New Form of Social Contract? Sustainability Initiatives in the Coffee Industry." *Food Policy* 30 (3).
- Hassan, Fareed, and Limya Ibrahim. 2020. "Sudan: Political, Economic and Social Context" A background paper prepared as input to Sudan Agriculture Value Chain Report. The World Bank Group. Washington, DC.
- Henson, Spencer, and Steven Jaffee. 2008. "Understanding Developing Country Strategic Responses to the Enhancement of Food Safety Standards." *World Economy* 31 (4).
- Henson, Spencer, and Thomas Reardon. 2005. "Private Agri-food Standards: Implications for Food Policy and the Agri-food System." *Food Policy* 30 (3).



- Huyer, Sophia. 2016. "Closing the Gender Gap in Agriculture." *Gender, Technology and Development* 20 (2).
- IFC (International Finance Corporation). 2014. Enterprise Survey, Sudan Country Profile 99350
- IMF (International Monetary Fund). 2020. Sudan: Article IV Consultation. Country Report No. 20/72, March 2020, IMF, Washington D.C.
- Jensen, Robert 2007. The Digital Divide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector, *The Quarterly Journal of Economics*, 122 (30)
- Kumar, Richa (2004), 'e-Choupals': A Study on the Financial Sustainability of Village Internet Centers in Rural Madhya Pradesh', *Information Technologies and International Development*, 2(1)
- Larson, Donald F., Rie Muraoka, and Keijiro Otsuka. 2016. "Why African Rural Development Strategies Must Depend on Small Farms." *Global Food Security* 10 (2016): 39–51.
- Ministry of Trade and Industry of Sudan. 2011. Revitalizing the Sudan Gum Arabic Production and Marketing Gum Arabic Value Chain Analysis - Final Report.
- Munyua, Hilda, Edith Adera, and Mike Jensen. 2009. "Emerging ICTs and Their Potential in Revitalizing Small-scale Agriculture in Africa." *Agricultural Information Worldwide* 2 (1).
- Muto, Mugumi and Yamano, Takashi, 2009. The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda, *World Development*, 37 (12)
- Netherlands Enterprise Agency. (2016). Dairy Quick Scan Sudan.
- Qiang, C.Z., Kuek, S.C., Dymond, A. and Esselaar, S. 2011. Mobile applications for agriculture and rural development, ICT Sector Unit, Washington DC: The World Bank,
- Ragasa, Catherine. 2014. "Improving Gender Responsiveness of Agricultural Extension." In *Gender in Agriculture*, Springer, Dordrecht.
- Rodrik, Dani. 2018. "New Technologies, Global Value Chains, and Developing Economies." ESifo Working Paper, No. 7307, Center for Economic Studies and Ifo Institute (CESifo), Munich.
- United Nations Conference on Trade and Development. 2018. Commodities at a Glance - Special Issue on Gum Arabic.
- United Nations Industrial Development Organization. 2017. Upgrading the Sudanese Sesame Seeds Value Chain.
- World Bank. 2012. Sudan - Revitalizing the Sudan Gum Arabic Production and Marketing Project: Restructuring: Main Report (English). Washington, DC: World Bank.

- World Bank. 2013. Interim Strategy Note (FY2014-2015) for the Republic of Sudan. Washington, DC: World Bank Group, World Bank.
- World Bank. 2014a. Sudan: State-Level Public Expenditure Review: Meeting the Challenges of Poverty Reduction and Basic Service Delivery. Washington D.C.: World Bank Group. World Bank.
- World Bank. 2014b. Sudan Poverty Assessment: Benchmarking Strategies That Reduce Poverty and Boost Shared Prosperity, Report No. AU8544. Washington D.C.: World Bank Group. World Bank.
- World Bank. 2014c. Full Poverty Assessment: Benchmarking Poverty Measurement and Strategies to Reduce Poverty and Boost Shared Prosperity in Sudan- Republic of the Sudan. World Bank Group. World Bank.
- World Bank. (2014d), Sudan Diagnostic Trade Integration Study Update. World Bank, Washington, DC.
- World Bank. 2015, Sudan Country Economic Memorandum: Realizing the Potential for Diversified Development. World Bank, Washington DC.
- World Bank. 2016. The Sudan Interim Poverty Reduction Strategy Paper Status Report: A joint World Bank Group and Ministry of Finance and Economic Planning Assessment. Washington DC: World Bank Group. World Bank.
- World Bank. 2017. Promoting SME Growth in Agribusiness: Diagnostic Toolkit, 2017. Washington, DC: The World Bank Group.
- World Bank. 2018a. Sudan Agriculture Public Expenditure Review. Washington, DC: World Bank Group, World Bank.
- World Bank. 2018b. Additional Financing for the Horticulture Development Project. World Bank Group, Washington, DC. Available <http://documents.worldbank.org/curated/en/655871527084584453/pdf/ITK425962-201804231007.pdf>.
- World Bank. 2019a. Poverty and Inequality, 2009–2014. Washington, DC: World Bank Group, World Bank.
- World Bank. 2019b, Agricultural Productivity and Poverty in Rural Sudan.
- World Bank. 2019c. Enabling the Business of Agriculture 2019
- World Bank. 2019d. Diagnostic Report on SMEs in Agribusiness in the Republic of Sudan.
- World Bank. 2019e. Removing Barriers to Expansion and Diversification of Livestock Export Trade in Sudan.
- World Health Organization. 2010. Sudan’s Health Profile. WHO, Geneva, Switzerland.

WTO (World Trade Organization). 2020. "Food, Animal, and Plant Products: How Safe Is Safe." Geneva, World Trade Organization. Available at:  
[https://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/agrm4\\_e.htm](https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm4_e.htm).

WTO. 2020b. "WTO Accessions Newsletter 99." Geneva, World Trade Organization.

## Annex 1: List of Stakeholders Consulted

Gum Arabic	Type	Organizational name	Contact person
1	Exporter	GAC	Mr. Hisham Hassan
2	Exporter	Elrifabi Gum Arabic Processing Factory	Mr. Mohamed Suliman
3	Exporter	Acacia Agricultural Co Ltd	Mr. Shamsudeen Hussain
4	Exporter	Topnoch company	Mr. Murtada Mohammed
5	Processor	The Khartoum Gum Arabic Processing Co Ltd	Mr. Shafi Mohamed Riaz
6	Processor	Afritec Sudan	Mr. Hisham Yagoub
7	Exporter	Abourgeila Meat Products Plant	n.a.
<b>Meat</b>			
8	Exporter	Adderwish for Meats & Livestock	n.a.
9	Processor	Aal Alderwish for Projects Services Co.	Mr. Babiker Alderwish
10	Processor	Alrai Meat Processing Company	n.a.
11	Exporter	Leno Gulf Sudan	n.a.
<b>Sesame</b>			
12	Exporter	Abnaa Sayed Elobied Agro Export	n.a.
13	Processor	Versace International for Trading and Investment Co Ltd	Mr. Mohammed Almonta
<b>Horticulture</b>			
14	Exporter	Khartoum Horticultural Exports Company	Mr. Elamin Ali Ahmed
15	Exporter	Abnaa Sayed Elobied Agro Export	n.a.
16	Processor	CAPO brand (DAL group)	n.a.
17	Distributor	Fresh	n.a.
18	Distributor	Afra Mall Supermarket	n.a.
19	Distributor	Al-Barlom/Abu Difaa Mall (small/medium supermarket)	n.a.
20	Importers	Abna Alneel Factory for packing industrial foods	n.a.
<b>Dairy</b>			
21	Importers	Metro Markets	n.a.
22	Processor	CAPO brand (DAL group)	n.a.
23	Processor	Premier Food Products	n.a.
<b>General</b>			
24	Government of Sudan	Ministry of Agriculture and Forestry	Minister and Secretary
25	Government of Sudan	Ministry of Livestock	Minister and Secretary
26	Multilateral	Country Director, IFAD	Mr. Tarek Ahmed
27	Multilateral	FAO	Mr. Babagana Ahmadu
28	Private sector	Chief Executive Officer, Quality House	Mr. Ibrahim A/Baker Elsiddig Ibrahim
29	Union of Chamber of Commerce/National Chamber of Exporters	Deputy Secretary General	Mr. Ayman Mohamed Elsheikh

<b>Gum Arabic</b>	<b>Type</b>	<b>Organizational name</b>	<b>Contact person</b>
30	Chamber Union of Chamber of Commerce/National Chamber of Exporters	Vice President of Exporters	Mr. Mohamed. S. M. Kheir
31	Union of Chamber of Commerce/National Chamber of Exporters	Finance Secretary	Mr. Mamoun Ibrahim Gaili
32	Union of Chamber of Commerce/National Chamber of Exporters	Executive Manager	Mr. Mohamed Hassan A. Gader (Kaboshia)
33	Arab Organization for Agriculture Development	Director General	Prof. Ibrahim Adam Ahmed El-dukheri
34	Japan International Cooperation Agency	Project Formulation Advisor	Mr. Eriko Nagano
35	AfDB	Senior Country Economist	Mr. Yousif M. A Bashir Eltahir
36	Siddig Mohamed Kheir Trading Enterprises	General Manager	Mr. Mohamed. S. M. Kher

## Annex 2: Agribusiness Deep Dive Methodology

The FCI Global Practice has developed the Agribusiness Deep Dive Methodology to support countries in understanding their competitive position and inclusive growth options in agribusiness and map out the constraints and opportunities for private sector investment. This methodology has been implemented by FCI's Markets and Technology team in numerous countries over the past five years. The methodology consists of two phases: (a) an Agribusiness Sector Diagnostic and (b) an Agribusiness Sub-sector Diagnostic that are implemented over the course of 10 weeks.

The driving question when pursuing agribusiness development is to understand which markets could be competitively targeted by local firms and farmers. This entails (a) exploring what is currently produced and what *could be* produced based on a careful exploration of offtake demand and market trends and (b) determining on which markets these products could competitively be sold. Competitive pressure and premiums for quality will vary depending on the product and the market, which implies meeting specific requirements (for example, cost, quality, and consistency) all along the value chain. The following two-phase approach of the Agribusiness Deep Dive has been designed to answer these questions.

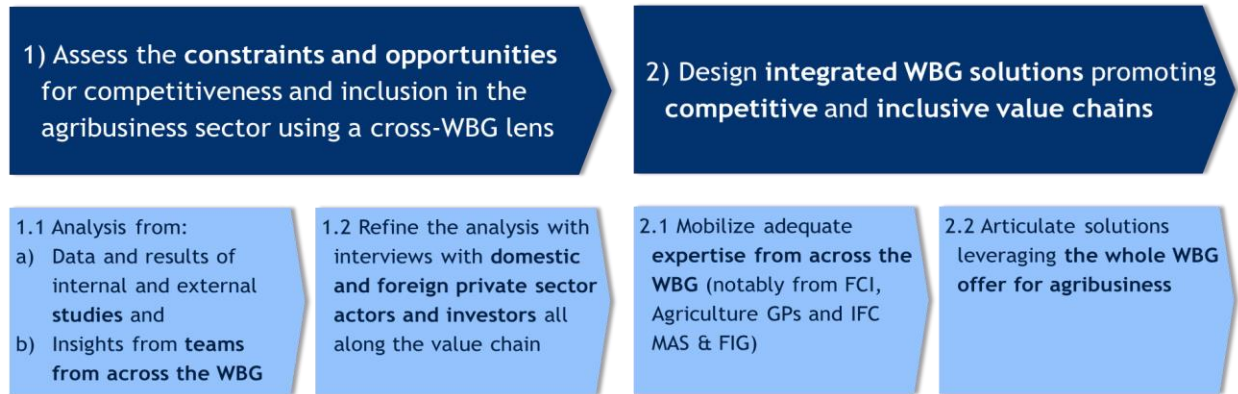
### **Phase I of the Agribusiness Deep Dive assesses the overall agribusiness environment in the country and seeks to understand the main challenges and opportunities for private sector investments.**

During Phase I, the team consults experts from across the World Bank Group and often talks to domestic and foreign private sector actors and investors all along the value chain to (a) assess the performance of the whole agribusiness ecosystem (that is, from the overall business climate as it pertains to agribusiness, to the efficiency of value chains and quality of market links, to the availability of support services); (b) identify agribusiness sub-sectors that best balance investment potential and anticipated development impact; and (c) identify integrated World Bank Group solutions promoting competitive and inclusive value chains and implementing policy and investment reforms needed to succeed in targeted agribusiness investor outreach following an MFD<sup>71</sup> approach (Figure A2.1). Due to political uncertainty as well as travel and security constraints that were in place for the large part of 2019, the team has postponed the majority of stakeholder interviews to the next phase of the assessment.

---

<sup>71</sup> MFD is the World Bank Group's approach to systematically leverage all sources of finance, expertise, and solutions to support developing countries' sustainable growth. In embracing the Sustainable Development Goals, countries' resource needs surpass their own budgets and available donor funding. Meeting the Sustainable Development Goals demands that we find solutions to crowd in all possible sources of finance, innovation, and expertise to meet this challenge. The World Bank Group institutions work in concert to help countries transform sectors to reduce poverty and inequality and support growth. We do this by improving the enabling environment, developing regulatory conditions, building capacity, putting in place standards, financing a first mover or innovator, and reducing risks.

Figure A2.1: Phase I of Agribusiness Deep Dive Methodology



**Phase II of the Agribusiness Deep Dive assesses the specific constraints and opportunities for investments in two or three specific sub-sectors.**

The specific sub-sectors are identified jointly with the client from the short list of promising market opportunities identified in Phase I.

Once sub-sectors have been chosen using data collected under Phase I, the team gathers additional data through both a desk review and an in-country visit to fill in the gaps. In particular, the team meets with private sector stakeholders to analyze each sub-sector’s performance for benchmarking the sub-sector’s competitive advantages, current/potential market performance (based, in particular, on import/export price parity calculations), conditions in the enabling environment, and potential development impact.

Using the analysis of each sub-sector, the team then outlines an MFD approach by identifying (a) private sector financing - commercially viable investments that can be made with private sector financing only, (b) upstream reforms and market failures - reforms that would lift key enabling environment constraints to private sector investment and support supply chain connectivity for efficient and inclusive value chains, and (c) public investment for public or quasi-public goods - activities and investments in areas such as infrastructure and farm extension (where not linked to functioning supply chains).

Figure A2.2: Approach under MFD

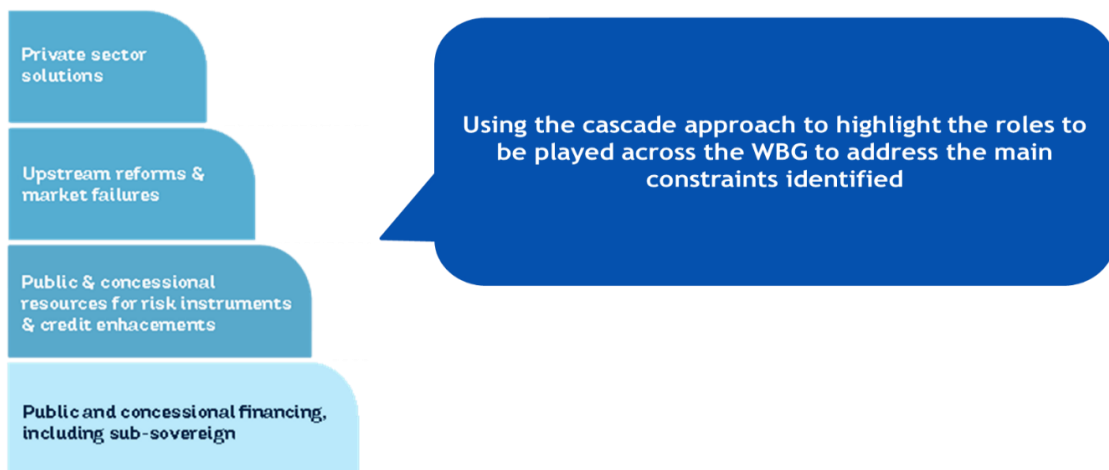
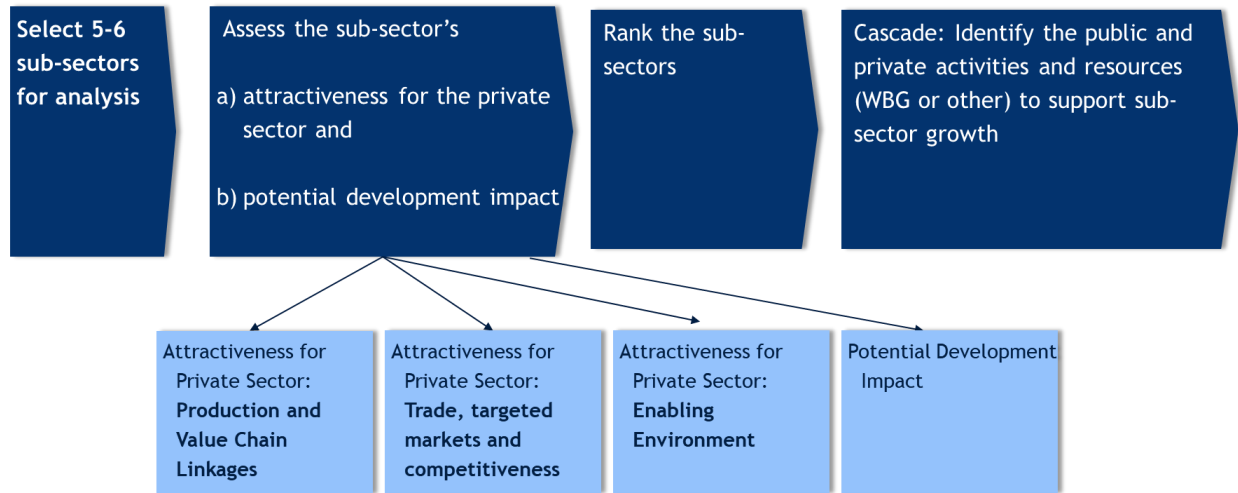


Figure A2.3: Phase II of Agribusiness Deep Dive Methodology





### Annex 3: The Methodology for the Prioritization of Agri-commodity Value Chains

The *raison d'être* for any project by a development partner is to deliver *economic prosperity* for the nation that *percolates down to the poor*. It is, therefore, important to measure and account for the direct economic and development impact of interventions, independently of each other. Though it can be argued that economic and development impacts go hand-in-hand, this is often not observed to be the case, at least in the near to medium term—the ‘trickle-down effect’ of direct economic impact to the poor/smallholders can be slow or even nonexistent.

For this assessment, value chains were, therefore, prioritized based on three primary criteria, each with a set of related sub-criteria. The three primary criteria included ‘economic impact’, ‘development impact’, and ‘feasibility’ (ease of implementation).

At a first level of analysis, the ‘economic impact’ criterion, with a weightage of 50 percent, was used to assess the existing and potential level/scale of importance of the sub-sector for the country’s economic prosperity. It is, therefore, indicative of the likely scale of impact that World Bank Group interventions in the sub-sector could have directly on the economy. Measures that are used for assessment on this criterion included

- Existing economic impact: Volume and value of current production, value of current exports, productivity/competitiveness gap (revealed comparative advantage, farm yields, and so on) (30 percent weightage) and
- Potential economic impact: Growth in above, value and growth in global and regional trade, and value of imports (20 percent weightage).

**The ‘development impact’ criterion, with a weightage of 50 percent, was then used** to assess the existing and potential level/scale of importance of the sub-sector for the country’s poor. It was, therefore, indicative of the likely scale of impact that interventions in the sub-sector could have directly on the poor. The value chain interventions to be identified are intended to create value for the economy and ensure that this value is also distributed to impoverished populations engaged in agriculture commodity value chains. For interventions to create impact on the poor at scale, commodity value chains engaging relatively higher numbers of impoverished populations with opportunities for jobs and entrepreneurships will make sense. At the same time, those commodity value chains that—even while not having high existing scale—demonstrate potential for future growth would be useful to target to leverage this potential to deliver impact. Similarly, interventions in commodity value chains that witness the greatest share of impoverished populations will ensure that development spend is more directly driving inclusion. Measures that are used for assessment on these criteria therefore include

- Existing development impact (30 percent weightage):
  - Number of livelihoods involved (number of poor/smallholder farmers and number of existing jobs in sub-sector)
  - Contribution of sub-sector to nutrition requirements of the poor
- Potential development impact: Share of poor/smallholders among all producers and ‘multiplier’ impact on jobs in the sub-sector (20 percent weightage).

The ‘do-ability’ (ease of implementation) criterion was applied at the second level—after scoring based on the above criteria—on the top few prioritized sub-sectors. This criterion was used to account for practical considerations within the respective sub-sector’s value chain and external environment which may limit or enhance impact of interventions. Measures used for assessment on this criterion include

- Existing donor activity (can World Bank Group be ‘additional’?) and
- Alignment with the Government’s stated priorities:
  - Level of success in previous interventions in sub-sector (indicative of presence of ‘showstoppers’ that may arise from ‘uncontrollable’ factors like political economy),
  - Likelihood of being able to demonstrate ‘quick wins’ (for example, any known interventions that have not been undertaken but very likely to influence positively), and
  - Potential for developing value addition activities downstream in the value chain, particularly through private investment.

**Table A3.1: Master list of agriculture value chains in Sudan**

Food Grains	Vegetables	Livestock
Cereals	Onions, dry	Meat
Sorghum	Tomatoes	Eggs
Millet	Okra	Chicken
Wheat	Potatoes	Sheep
Rice (paddy)	Cucumbers and gherkins	Goat
Maize	Yams	Cattle
Pulses	Eggplants (aubergines)	Camel
Cowpeas	Sweet potatoes	Dairy
Broad beans	Carrots and turnips	Cow milk
Chickpeas	Cabbages and other brassicas	Goat milk
Other beans	Cauliflowers and broccoli	Sheep milk
Horticulture	Beans, green	Camel milk
Fruits	Spices	Others
Mangoes, mangosteens, and guavas	Garlic	Gum Arabic
Bananas	Chilies and peppers, green	Sugarcane
Dates	Chilies and peppers, dry	Cotton lint
Lemons and limes	Oilseeds	Wool, greasy
Grapefruit (including pomelos)	Groundnuts	Honey, natural
Oranges	Sesame seed	
Watermelons	Sunflower seed	
Melons and other (including cantaloupes)	Melon seed	
Pumpkins, squash, and gourds	Cottonseed	
Pineapples	Castor oil seed	
Cardamom		
Commodity group	Commodity subgroup	Commodity

**Table A3.2: Condensed narrative for selection rationale from shortlisted value chains**

Sub-sector	Rationale for sub-sector prioritization
Dairy	<i>Economic impact.</i> Dairy production amounts to 4.5 million MT of milk of which 98 percent remains unprocessed and is sold loose even as imports of processed dairy products is high and rising.

Sub-sector	Rationale for sub-sector prioritization
	<p>Developing competitiveness in this sub-sector can support national finances substantially by substituting imports to the tune of around US\$100 million growing at 14 percent annually.</p> <p><i>Development impact.</i> A vast number of smallholders and pastoralists are involved in this value chain which presents high potential for job creation—a priority of the Transitional Government of Sudan—through processing. Further, with 15 percent of daily nutrition needs of an average Sudanese being met through milk products, development of the value chain will contribute to nutrition security.</p> <p><i>Do-ability/ease of implementation.</i> This value chain has not received much current or past focus by other donors (except as part of overall livestock and rural development projects). It aligns well with the Government’s priorities as outlined in the SUDNAIP, and the sector provides high scope for downstream job creation and private investment in processing.</p>
Livestock	<p><i>Economic impact.</i> As a key contributor to foreign exchange earnings,<sup>72</sup> this value chain provides a robust base for development both in terms of quantity and value of production through processing and value addition. With high existing competitiveness<sup>73</sup> even with high productivity gap, the headroom for growth is immense.</p> <p><i>Development impact.</i> Livestock provides livelihood to more than 50 percent of the Sudanese population, many of whom are part of pastoralist communities that could benefit by addressing the challenges in this sector.</p> <p><i>Do-ability/ease of implementation.</i> The strong alignment with the Transitional Government priorities and potential for private investment for value addition through processing besides the relatively limited donor activity make this value chain suitable for targeted action.</p>
Sesame	<p><i>Economic impact.</i> Sudan produces high-quality sesame seeds and has a relative advantage in global markets because of its proximity and accessibility to fast-growing import markets like Japan and China. Strong advantages arise due to the trade links with the largest and fastest growing importers like Japan and China. A high potential to raise yields<sup>74</sup> provides opportunity for increasing Sudan’s share in the global sesame market.</p> <p><i>Development impact.</i> A wide footprint of smallholder farmers and high potential for raising yields in addition to job creation from processing, targeting this value chain for the development of value-added exports, can deliver significant benefits. With a competitive advantage that has sustained despite low yields, raising productivity could be transformational. Reversal of the recent trend of falling exports deserves attention especially since not many existing or past programs have given prioritized attention to this value chain.</p> <p><i>Do-ability/ease of implementation.</i> The sub-sector provides high potential for private sector-led value addition in production of oil and other derivatives. The SUDNAIP also places this sub-sector on high priority, making it aligned with government priorities.</p>
Gum Arabic	<p><i>Economic impact.</i> Sudanese gum Arabic sets quality standards for global markets, and the crop is an important source of foreign exchange earnings. Sudan’s competitive advantage in gum Arabic is well known.<sup>75</sup> Exports have grown following the end of the parastatal monopoly in 2009 and tax reductions. There is tremendous potential to raise its contribution to the economy by moving up the value chain into exports of processed gum Arabic.</p> <p><i>Development impact.</i> Large numbers of smallholders harvest gum Arabic though job creation from value addition will require significant investments to overcome established strength of existing European processors. In line with the General Framework for the Program of Transitional Government, however, this value chain offers considerable opportunities for livelihoods to poor farmers and job opportunities for the youth.</p>

<sup>72</sup> To the tune of almost half a billion U.S. dollars growing at 8 percent annually.

<sup>73</sup> Competitiveness here is measured using the ‘Revealed Comparative Advantage (RCA)’ indicator.

<sup>74</sup> Sesame yields in Sudan are less than 25 percent of that in some of the currently largest producing countries of sesame.

Source: FAOSTAT.

<sup>75</sup> RCA of 756.

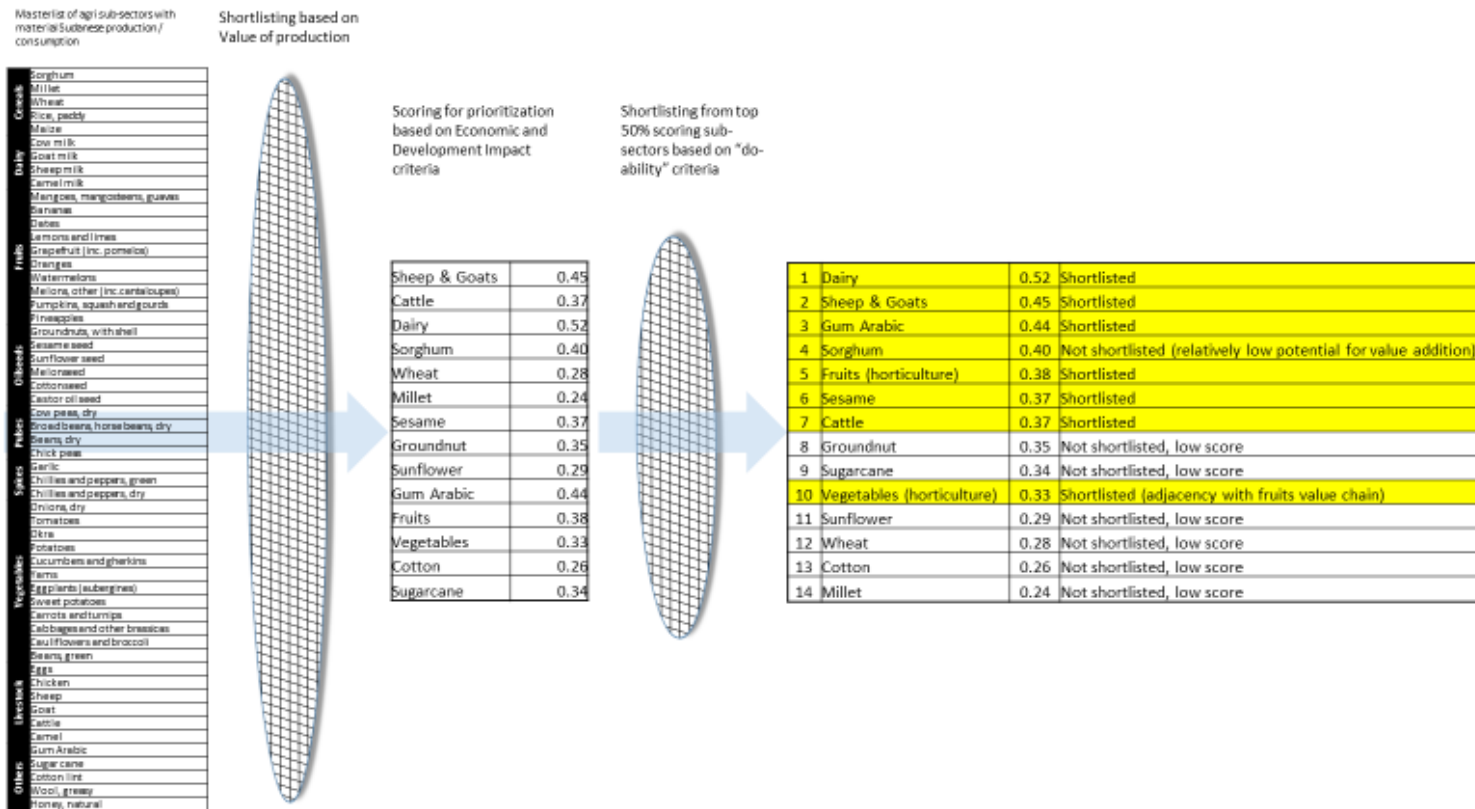
Sub-sector	Rationale for sub-sector prioritization
	<i>Do-ability/ease of implementation.</i> However, this forestry product is already a focus of many past, present, and planned future development projects which may limit the additionality of further interventions (See annex 4 for a list of other ongoing development partner projects in agribusiness).
Horticulture	<p><i>Economic impact.</i> Sudan enjoys relative advantage in the horticulture value chain because of the geographical diversity and climatic variation. This value chain represents good potential for exports. Competitiveness,<sup>76</sup> however, is severely compromised on account of poor cold chain logistics and fragmented supply chains. The compromised ability to comply with phytosanitary requirements of advanced markets particularly in relation to larger competitors servicing the same (especially Middle Eastern) markets, like India, limits upside.</p> <p><i>Development impact.</i> A large number of producers are involved. Geographical and climatic diversity offer significant potential to increase horticulture production and productivity. Horticulture offers potential opportunities for jobs along the entire value chain.</p> <p><i>Do-ability/ease of implementation.</i> The sub-sector has not received much attention from the Government and development partners. This value chain provides high potential for private sector-led value addition to meet the increasing domestic demand and tap into the export markets.</p>
Sorghum	<p>The second highest absolute value of production (after dairy) provides a large base on which even incremental improvements will create impact. As the single largest contributor to the nutrition requirements of an average Sudanese, sorghum's importance as a food security crop is undisputed. With a vast majority of farmers, especially smallholders, involved in cultivation of sorghum, the development impact of interventions in this value chain is also high.</p> <p>However, <i>compared to other value chains</i>, the potential for value addition and job creation in processing and trade is relatively limited.</p>
Groundnut	<p>Groundnut and its products (oil and cake) are sizeable contributors to the economy and the nutrition requirements of the population. However, Sudan's unique advantage in the increasingly competitive global export market is relatively lesser.<sup>77</sup> While the value chain remains very important for the country, particularly in conjunction with other oilseed value chains, a deeper study of the value chain has been excluded from this report in the interests of maintaining focus and utilizing resources optimally.</p>
Sugarcane	<p>Having turned into a net importer of sugar from earlier being a net exporter, this value chain is of high importance for the country. However, in the Government's strategic investment plan, this value chain does not find a mention in the prioritized list. In the interests of ensuring strong alignment with the Government's strategic agenda, this value chain is not selected for deeper study.</p>
Wheat	<p>With imports of over half a billion U.S. dollars, the importance of wheat as a value chain is very high. However, competitiveness in wheat cultivation is very limited and expanding production involves important trade-offs with other cash crops that could arguably better utilize the limited available irrigated areas.</p>
Cotton	<p>While cotton has been a traditionally strong cash crop in Sudan, it was not prioritized in this assessment to align with the more urgent priority of nutrition security.</p>

<sup>76</sup> RCA < 1.

<sup>77</sup> A range of factors explain the limited competitiveness of groundnut in the domestic, regional, and international markets. These include subscale production and strict rules on grades and standards, which African producers often find difficult to meet. Poor post-harvest practices also create challenges in the form of *aflatoxin* (a carcinogenic substance) contamination that develops when groundnuts are not handled appropriately after harvest. The groundnut oil trade has also been gradually reducing since the early 1980s as cheaper palm oil has displaced it significantly. Source: <http://www.icrisat.org/PDF/757.pdf>.



Table A3.4: Summary of prioritization approach



Source: constructed based on several report and documents

## Annex 4: Development Partner Programs in Agribusiness

Table A4.1: Representative list of Development Partner programs in Agribusiness in Sudan

No.	Project Name	Amount (USD)	Donor
1	Integrated Agriculture Marketing Development Project	26,000,000	IFAD
2	Butana Integrated Rural Development Program	38,000,000	IFAD
3	Seed Development Project	10,070,000	IFAD
4	Livestock Marketing and Resilience Program	40,000,000	IFAD
5	Supporting the Small Scale Traditional Rain-fed Producer in Sinnar State	13,540,000	IFAD
6	Enable Youth Program	30,000,000	AfDB
7	Drought Resilience and Sustainable Livelihood Program	45,000,000	AfDB
8	Feed Security and Capacity Building for Smallholders	6,600,000	EU
9	Reduction of Illegal Migration	2,500,000	EU
10	Support to Agriculture Research Corporation	3,900,000	World Bank
11	Quarantine and Meat Health Project	30,000,000	China
12	Support to National Research Centre for Pesticide Control	3,300,000	JICA
13	Capacity Building for Rice Production	3,000,000	JICA
14	Reducing Carbon Emissions	1,300,000	UNDP
15	Desert to Power Project	4,500,000	UNDP
	<b>Total</b>	<b>257,710,000</b>	

Source: constructed based various reports and documents

In addition, the AfDB launched an Agriculture Value Chain Development Project in mid-2018, which includes a focus on gum Arabic and potato value chains.

## Annex 5: Complementary Reports on Sudanese Value Chains

### Sudan agribusiness SME diagnostic (World Bank 2019)

Methodologically, the SME diagnostic relies on the World Bank's Agribusiness Diagnostic Toolkit, which has been deployed in multiple countries, including Sierra Leone and Tanzania (World Bank 2017). In contrast to this report, the toolkit does not focus on farmers, but rather looks at value chains from the perspective of upstream SMEs, including agro-processors, agribusiness input suppliers, and service providers. The analysis draws conclusions about opportunities for growth for SMEs based on nearby market opportunities, for example, whether processing capacity is sufficient to meet local demand, and whether synergies can be found among geographically concentrated commodity sectors. The analysis is also designed to flag constraints that explain why opportunities for expansion go unrealized.

The analysis encompasses quantitative and qualitative assessments and is driven by a series of interviews among private sector participants and public officials. For the report on Sudan, an in-country diagnostic mission took place in October 2018. "The mission included one-on-one and group consultative meetings with 61 different stakeholders across three cities (Khartoum, Wad Madani, and El Obeid), representing government, the private sector (including agro-processing firms ranging in size from micro firms to large corporates, as well as supermarkets, offtakers, and distributors), donors and NGOs, business support agencies, market service providers (logistics and transport companies, inputs distributors, etc.), universities, and financial institutions. The diagnostic mission comprised a team of consultants that included expertise in food product development and distribution, sales and marketing, agribusiness growth consulting, and general private sector development approaches, along with local expertise." (World Bank 2019, 10).

Specifically, the toolkit "evaluates eight key parameters of the agribusiness entrepreneurship ecosystem: (1) Geographically clustered growth-oriented SMEs; (2) SME Capacity; (3) Scalable, Accessible, and Viable Markets; (4) Scalable Production Potential; (5) Access to Finance; (6) Infrastructure Constraints; (7) Regulatory Constraints; and (8) Clear, Ready Champions." (World Bank 2019, 9). The final product of the analysis (step 8) includes a short list of SME firms where investments and policy interventions would catalyze growth.

Table A5.1 taken from the report summarizes the evaluation team's findings. Four of the five commodity value chains that form the basis of this report were also key value chains identified by the SME report. The one exception, dairy was considered by the SME team; although, the report concludes that "Assessments of the factors above may have identified dairy as a great opportunity. However, if the country does not have reliable roads and cold chains, there is no use investing in up-scaling dairy without addressing this fundamental binding constraint" (World Bank 2019, 131).

Because of the differences in perspective and methodology, as well as the overlapping, independent analyses from the SME mission and from this report are highly complementary and both reports are drawn upon to guide this report's conclusions and recommendations.



**Table A5.1: Agribusiness opportunity sectors by geographic focus**

<b>Sector</b>	<b>Geographic location of clusters</b>
Sesame production and whole seed exports	Production all over the country; clusters in Sennar, Gadarif, South Kordofan, North Kordofan, and White Nile states
Processed sesame (confectionary)	2–3 larger companies with national distribution (and export potential) in Khartoum. Numerous small (under 20 employees) highly localized companies in rural areas close to sesame production (Gadarif, Geziras, and North Kordofan)
Cotton production and small-scale ginning	Cotton production in Geziras, Sennar, and Northern (Wadi Halfa region) states; small-scale ginning clusters in Geziras and northern states
Edible oils processing (sunflower, sesame, cottonseed, and groundnut)	23 medium-size cottonseed oil processors in Khartoum. In North Kordofan, a cluster of about 60 edible oil processing SMEs. Smaller clusters in Geziras state.
Fresh fruits and vegetables	All over the country. Production for banana and mango exports strongest in Sennar and Geziras. Between 5 and 10 companies in the whole country that are successfully exporting fresh fruit.
Shelf-stable processed food products	National distribution in supermarkets in Khartoum and Port Sudan. Outside of major urban areas, processing is small and highly localized. Omdurman industrial sector has many SMEs in shelf-stable production. Wild honey production is centered in Darfur.
Poultry	Khartoum is the largest cluster, serving 85% of the country. 1 abattoir in North Kordofan; 4 poultry farms in North Kordofan; 3 poultry farms in Geziras state.
Livestock and processed meat	Livestock (sheep, camel, cattle, and goats) trading, production, and transport hubs in North Kordofan, Darfur, East Nile, and Sennar states. Largest livestock market in Africa in Omdurman. 2 or 3 meat processing companies in Khartoum.
Gum Arabic	Production/processing heavily clustered in North Kordofan state.
Agricultural inputs distribution	Cross-cutting. Distribution points present in major cities near agricultural production, for example, Wad Madani (Geziras), El Obeid (North Kordofan), Sennar (Sennar state), and Nyala (South Darfur).

Source: World Bank 2019d.

## **Technical assistance to the EU Delegation for Cooperation in Sudan: Jobs and Growth Compact for Sudan**

The 2019 EU Report utilized three criteria to prioritize key potential agriculture value chains to be developed in support of economic growth and job creation, in line with the EU sector priorities. The criteria included the following: (a) the selected value chain should reflect the importance given to that particular value chain in the strategic plans and annual budgets of the Government of Sudan; (b) the value chain should provide the opportunity to help in the structural transformation of the economy by moving it from a low- to high-level productivity sectors, to achieve higher employment; and (c) the value chain activities should be taking place in a wider context related to achieving inclusive growth and environmental sustainability. Based on these criteria, four value chains were selected as a priority. These value chains are gum Arabic, livestock, oilseeds, and cotton. The EUs selection criteria for the three value chains covered by this report are listed in Table A5.2:

**Table A5.2: EU's analysis of criteria for selecting the value chains for interventions**

	<b>Synergy with government plans</b>	<b>Opportunity to promote economic transformation and creates more employment</b>	<b>Bringing inclusive growth and environmental sustainability</b>
Gum Arabic	<p>1) Development of the gum Arabic belt is a strategic objective in The Five Years Program for Economic Reform 2015–19 as an export crop.</p> <p>2) It serves the objectives of the climate commitments of Sudan, including the INDC, National REDD+ strategy, and the NAMA.</p>	<p>1) There are good opportunities to expand its market and link it with a global value chain as CODEX considers it prebiotic.</p> <p>2) Gum yields could increase by 47–60%, with good management and improved tapping methods.</p> <p>3) Prospect for further processing into spray-dried powder to add value which upgrades the value chain from low level to high level of productivity.</p>	<p>1) Producers are small-scale poor traditional farmers mostly from the poorest areas of Sudan (traditional rain-fed areas) and conflict-affected areas. Gum has the potential of including them in growth and wealth redistribution.</p> <p>2) Gum Arabic resource lies within the semiarid zone and low-rainfall woodland savannah, one of the most vulnerable regions regarding desertification and land degradation. Its development will combat desertification and support climate change adaptation (Sustainable Development Goals 13 and 15)</p> <p>3) Women could greatly benefit from this sector. Sudan Multi-Donor Trust Fund and IFAD-funded Gum Arabic Project trained many women. Women are key players in the GAPAs scheme, constituting about 30% of all of the members.</p>

	<b>Synergy with government plans</b>	<b>Opportunity to promote economic transformation and creates more employment</b>	<b>Bringing inclusive growth and environmental sustainability</b>
Livestock	<p>1) Development of livestock is a strategic objective in the Five Years Program for Economic Reform 2015–19 to increase export of meat instead of live animals.</p>	<p>1) Opportunity to shift from exports of live animals to meat. This will unleash high potential of the manufacturing of different products of livestock (meat processing, shoes, and leather products) with considerable gains to SMEs generating high level of employment and supplying large firms with semi-processed inputs in addition to supporting services.</p>	<p>1) The bulk of all livestock production comes from small pastoralists and agropastoralists, who will be included in development and distribution of wealth.</p> <p>2) Improvement in livestock-dependent livelihoods help ensure a peace dividend as competition over natural resources between farmers and nomadic population is a root cause of the conflict in the country.</p> <p>3) Improving value chain interventions will tackle issues of land tenure, land degradation, provision of water, and all factors contributing to land degradation.</p>
Oil seeds	<p>1) Development of oil seeds is a strategic objective in the Five Years Program for Economic Reform 2015–19 for import substitution and further for export promotion.</p> <p>2) Increase edible oil production from 280,000 tons to 360,000 tons.</p>	<p>1) Potential of increased output as a result of yield increase and transforming it to edible oil and fodder for import substitution and export promotion of high-value products, generating more employment and promoting SMEs.</p>	<p>1) Most producers are smallholders who will be included in growth and wealth redistribution particularly conflict-affected population in western Sudan and the vulnerable population in eastern Sudan.</p> <p>2) Allows for more women participation, who represent 49% of the farmers in the irrigated sector and 57% in the rain-fed traditional sector.</p> <p>3) Increased yields and value added improve suitability of production by halting horizontal expansion and reduce land degradation and forest clearance.</p>

Source: EU 2019.