Food and Agriculture Organization of the United Nations

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ZAMBIA'S SOYA BEAN VALUE CHAIN ANALYSIS AND STRATEGY DESIGN 2024 – 2033

Training Zambian farmers in sustainable soya bean practices to boost yields.

ZAMBIA'S SOYA BEAN VALUE CHAIN ANALYSIS AND STRATEGY DESIGN 2024 – 2033

supported by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO)

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ASTA AGRIFOOD SYSTEMS TRANSFORMATION ACCELERATOR

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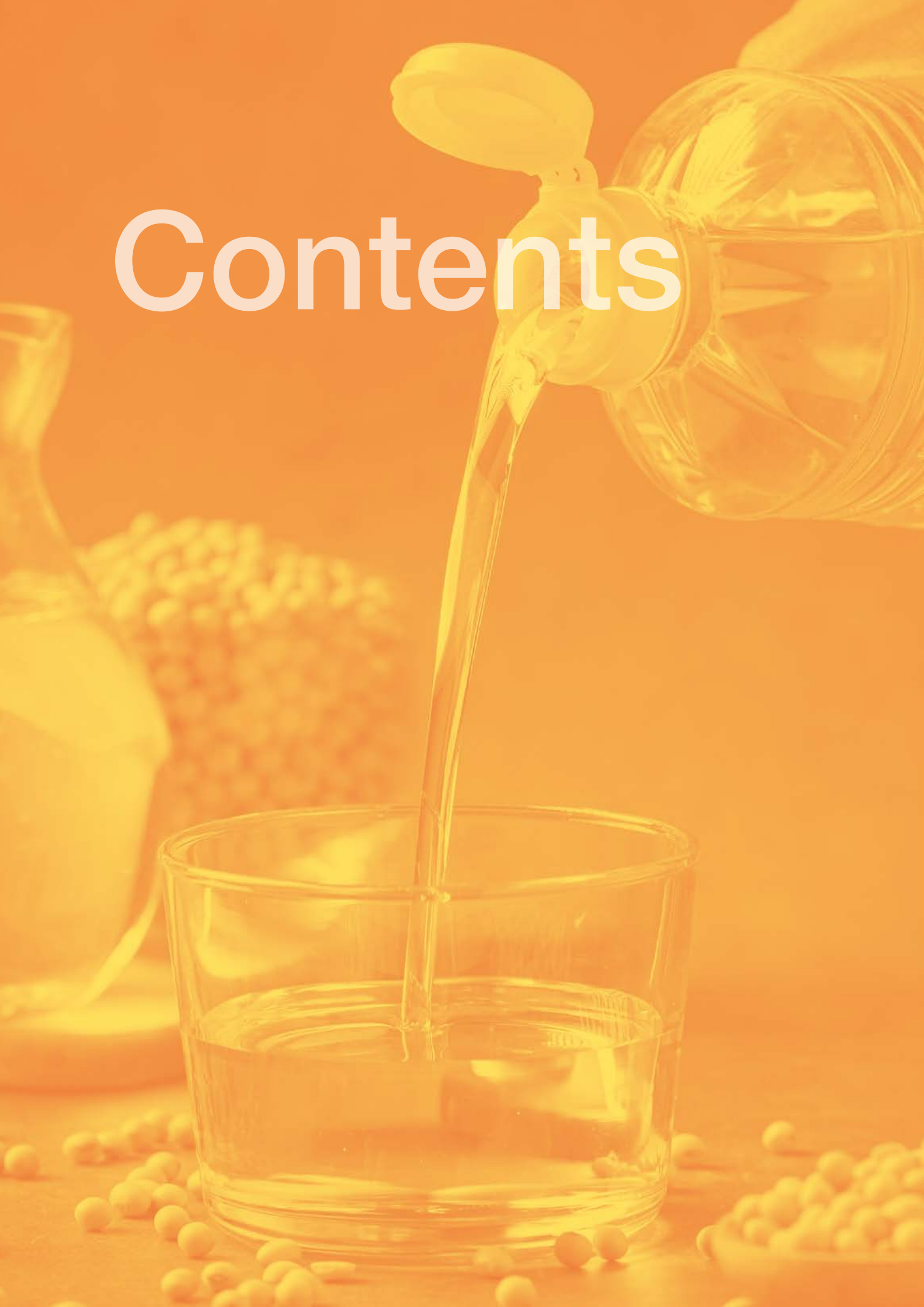

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Abbreviations

ASTA	Agrifood Systems Transformation Accelerator
3ADI+	Accelerator for Sustainable Agriculture and Agro-industry Development and Innovation +
ADAZ	Aquaculture Development Association of Zambia
CEEC	Citizen Economic Empowerment Commission
CFS	Crops Forecast survey
COMESA	Common Market for Eastern and Southern Africa
COMACO	Community Markets for Conservation
CSR	Corporate Social Responsibility
EIB	European Investment Bank
ETG	Export Trading Group
EUR	Euro
FAO	Food and Agriculture Organization of the United Nation
FISP	Farmer Input Support Programme
FRA	Food Reserve Agency
GAP	Good Agronomic Practices
GDP	Gross domestic product
GIP	Good Industrial Practices
GRZ	Government of the Republic of Zambia
GTAZ	Grain Traders Association of Zambia
ha	hectares
ICT	Information, Communication and Technology
IITA	International Institute for Tropical Agriculture
IRR	Internal Rate of Return
JV	joint venture
MSME	micro, small and medium enterprises
MT	metric tonnes
NGO	non-governmental organization
NPV	Net Present Value
OYA	Opportunities for Youth in Africa Programme

PAZ	Poultry Association of Zambia
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SHF	smallholder farmer
SSF	small-scale farmer
SWOT	strengths, weaknesses, opportunities and threats
UNIDO	United Nations Industrial Development Organization
UPND	United Party for National Development
USD	United States Dollar
VC	Value chain
VCA	Value chain analysis
WFP	World Food Programme
ZAMACE	Zambia Commodity Exchange
ZANACO	Zambia National Commercial Bank
ZARI	Zambia Agriculture Research Institute
ZESCO	Zambia Electricity Supply Corporation
ZMW	Zambian Kwacha

Scientists in a discussion with a soya bean's farmer in Chipata

Executive Summary

Executive Summary

The expansion of soya bean production in Zambia, primarily led by the growth in small-scale farmers, has not been accompanied by commensurate increases in yields, value addition, and a sufficiently enabling environment. Consequently, the value chain experiences significant inefficiencies, hindering its ability to meet the growing demand. To enhance livelihoods and alleviate poverty, it is imperative to promote growth and modernization within Zambia's soya bean sector. Leveraging the immense potential of soya bean can yield positive outcomes in terms of nutrition, income generation, and employment opportunities.

The Agrifood Systems Transformation Accelerator (ASTA) is a global programme that provides a comprehensive analysis of value chains and identifies investment options for upgrading value chains launched by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO) in 2023. It takes a holistic view of the environments that affect a value chain, from global, regional and national environments down to insights into the core and extended value chain actors (including public, private, R&D and civil society). The ASTA methodology (UNIDO and FAO, 2024) has been used to analyse the Zambian soya bean sector and propose the best investment opportunities.

The Zambian soya bean value chain has experienced remarkable growth in recent years, surpassing the growth of other crop value chains, except maize. In terms of area planted, soya bean ranks as the second most significant crop. Notably, small-scale farmers have emerged as the leading producers of soya beans, overtaking large commercial farmers in the past two years. Since 2011, small-scale farmer contributions to production have consistently increased at an average annual rate of 12 percent. In 2022, small-scale production accounted for 266 617 hectares, representing 81 percent of the total planted area of 327 500 hectares. The majority of soya bean production is concentrated in the Central, Copperbelt, and Eastern provinces, while Southern and Lusaka provinces exhibit potential for expanded production.

Although soya beans are predominantly used in food manufacturing, particularly for the production of soya oil and meal, recent growth in the livestock and aquaculture industries has driven up demand and prices for soya beans. This upward trend is expected to continue, especially with the expanding export markets. Furthermore, women and youth actively participate in soya bean production, contributing to the sector's success.

Zambia has significant potential for upgrading and scaling up its soya bean production. The country benefits from favourable agroclimatic conditions that support increased cultivation, coupled with the labour-intensive nature of the subsector. Furthermore, there is high levels of local and international demand but despite these favourable conditions, the soya bean sector in Zambia remains underdeveloped.

The underdevelopment of the sector can be attributed to several key constraints. Firstly, the sector faces challenges related to very low yields and poor seed quality, which hinder productivity and overall output. Additionally, weak linkages

among the various actors in the value chain, both horizontally and vertically, impede effective collaboration and coordination. Furthermore, the sector faces instability in accessing international markets due to regular export bans. Inadequate provision of business development services, as well as insufficient storage, trading infrastructure, and processing facilities, also pose significant obstacles to the sector's growth and development.

Access to finance, for long-term investment or short-term working capital, remains another major challenge across the soya bean value chain, particularly for small-scale farmers and micro, small and medium enterprises (MSMEs). Small-scale farmers lack working capital to procure inputs at the beginning of season while small aggregators lack the financing to buy from small-scale producers. The MSME processing sectors do not have enough initial capital outlay to buy from aggregators and cooperatives, and to invest in processing equipment. The lack or shortage of capital for both small-scale farmers and MSMEs to engage in production and value-added operations is linked to the limited capacity of smaller actors to make investments and their exclusion from financial services.

Lack of knowledge on Good Agricultural Practices (GAPs), access to affordable high-quality inputs, irrigation and mechanization for land preparation and threshing result in the low yields of soya bean in Zambia. Small-scale farmers in Zambia, on average, achieve yields of approximately 1 tonne per hectare (tonnes/ha), while large commercial farmers average around 2.8 tonnes/ha. In comparison, small-scale farmers in South Africa achieve an average yield of approximately 1.7 tonnes/ha, while commercial farms attain an average yield of 3.4 tonnes/ha. Low farmer productivity is further impacted by limited access to agricultural extension advisory services which are constrained by the lack of human and financial resources, limited improvements in knowledge dissemination and insufficient use of modern technology. Generally, production activities are undertaken equally between genders except for harvesting processes which are disproportionally undertaken by women. Access to markets largely favours the participation of men, with women mostly selling their produce at farm-gate outlets where prices are low.

The current business regulatory environment and trade policies (export bans on soya bean such as the export ban of soya bean meal in 2021[1]) are undermining the competitiveness of the sector and further investments from private investors. Market arrangements and mechanisms are needed to avoid the Government of the Republic of Zambia (GRZ) export bans, which seriously affect the sustainability of the sector.

On the basis of the diagnostic findings, this study proposes business models along the value chain to help unlock the sector's potential and improve its contribution to the national economy. Main investments include (1) facilitating Good Agricultural Practices (GAPs) and inputs such as certified, and post-harvest mechanization to small-scale farmers that will lead to increased yields and reduced post-harvest losses; (2) supporting lateral pivot centres for groups of organized farmers in drought areas facing climate change; (3) creating new MSMEs owned by women and/or youth providing thresher services and facilitating investments and access to finance for small-scale farmers; (5) increasing production of certified seeds; (5) establishing a warehouse receipt system and supporting community-store facilities, commercially managed by the private sector; and (6) creating new local processing SMEs to respond to the local demand for animal feed and to diversify soya bean by-products for human consumption (cooking oil, vegan food and milk, etc).

The Zambian soya bean value chain vision or core strategy for the period 2024 to 2033 is then proposed and focuses on increasing efficiency, competitiveness, and sustainability through accelerated private and public investments. The concrete strategic outcomes that need to be achieved in order to realize the vision are: (1) better governance and enabling environment for a competitive soya bean industry in Zambia; (2) better production, including added value, using cluster and aggregation schemes; (3) better business support providers by enhancing enablers and providers (inputs, finance and services) along the soya bean chain; and (4) better local, regional

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1 Business Daily Africa. 2021. Zambia material export ban sends feed prices record high. https://www.businessdailyafrica.com/bd/markets/commodities/zambia-material-export-sends-feed-prices-record-high-3531764

and global market access gained for Zambian value chain actors. The Theory of Change has been developed and is presented in chapter 4 of this report to guide the development of sound and evidence-based programme strategies, drawing on a causal analysis based on available evidence. In the second part of chapter 4, a model for interventions is proposed which aims to promote a combined and integrated value chain – cluster development model for the enhancement of the Zambian soya bean sector. According to UNIDO (2020), the potential of the cluster development approach resides not just in its capacity to stimulate high rates of growth, but also in the conducive environment it provides for the promotion of broad-based and inclusive forms of development.

Furthermore, an Action and Investment Plan for the period 2024–2030, ("ASTA project proposal"), is proposed to realize the vision. Specific targets, actions and expected results are suggested under the above-mentioned four strategic outcomes. Concrete actions include provision of (1) capacity building to apply GAPs and good industrial practices (GIPs) for small-scale farmers and processors, respectively; (2) packages of inputs (certified seed, inoculum, fertilizers, pesticides and herbicides) and services (access to finance and climate risk management products, such as agricultural insurance); (3) post-harvest mechanization; (4) irrigation schemes; (5) warehousing systems; and (6) facilities and equipment for SME processing (6) support to both the demand and offer of financial products for agriculture. For shortage of seed and working capital, the plan recommends, among other potential schemes, the provision of recoverable loans to small-scale farmers, MSMEs, processing SMEs, etc linked to outgrowers schemes and contract farming arrangements that would facilitate off-take markets such as processors. Facilitation in the design and set up of credit lines and/or guarantees are also foreseen in the financial scheme. Those investments should be accompanied by a conducive business environment and enabling regulatory and policy environment to invest in soya bean,

Boosting Zambia's soya bean value chain: innovation, sustainability, and growth.

strengthening the support providers, such as extension, R&D, financial services providers (FSP) and digital technology to improve access to services, information and knowledge, production of certified seeds by seed grower associations, etc. Women and youth will be targeted as the main beneficiaries for the plan intervention.

The Government of the Republic of Zambia, private sector actors, international financing institutions and the donor community are invited to mobilize their resources and support the public and private investments needed to implement the recommended interventions. The GRZ, including local government **authorities** and relevant agencies, has a key role to play in coordination and overseeing the implementation of the soya bean value chain development. Finally, the ASTA partners, including FAO and UNIDO, will continue to play a technical facilitating role in the sector strategy development and implementation of the investment plan, in partnership with the soya bean actors.

Introduction

Introduction

In 2021 the Government of Zambia (GRZ), the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO) adopted the "Incentivizing Public and Private Investments Programme (IPPIP)" as a collaborative approach to support the development of the agrifood systems in Zambia and unleash the potential for inclusive and sustainable agricultural growth in the country. The IPPIP coordinates the on-going and interlinked interventions in support of agrifood systems in Zambia. After a high-level consultative meeting with GRZ in March 2021, an Inter-ministerial Steering Committee was created to direct the development of the GRZ-FAO-UNIDO IPPIP, and in particular the development of a "value chain analysis and development strategy". This activity is funded under the Component IV Market-led agro-industrial development of the Sustainable, resilient and inclusive food systems development project (FMM/GLO/131/MUL – Zambia).

From this starting point, the GRZ, FAO and UNIDO held a multistakeholder workshop in May 2021 to select one strategic value chain with potential for growth and opportunities for local and foreign investments, for further analysis and strategy development. Out of ten commodities (aquaculture, dairy, goat, maize, onion, pineapple, potatoes, soya bean, sunflower and wheat), soya bean was selected as the strategic value chain with the greatest upgrading feasibility and positive potential impacts on markets, generation of youth employment, nutrition and diet diversification, and greening through the use of climate-smart agricultural practices and technologies. Soya bean has evolved as an important cash crop, attracting an increasing number of small-scale farmers – currently estimated to number about 389 000 (Ministry of Agriculture, 2022) – aggregators and processors into the value chain, and supporting the growth of the livestock and aquaculture sectors. In this context, the soya bean value chain in Zambia exhibits immense investment potential that would contribute to improving rural livelihoods, both directly and indirectly increasing incomes for value chain actors, creating jobs, enhancing food and nutrition security and improving national income.

To help unlock the sector's potential, a diagnosis was conducted to identify challenges and opportunities that can be leveraged to upgrade the value chain and help inform the development of a soya bean value chain strategy for Zambia. The study benefits from the joint FAO and UNIDO Agrifood Systems Transformation Accelerator (ASTA)[2] programme to analyse the soya bean value chain in Zambia. The ASTA is a joint value chain and market systems development programme that takes a holistic view of a value chain. It aims to develop inclusive and sustainable value chains by ensuring that investments in agricultural industrialization have

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2 Previously called the FAO / UNIDO Accelerator for Agriculture and Agroindustry Development and Innovation (3ADI+).

positive social, economic and environmental impacts. It combines capacities of local, national, regional and global actors in analysis, technical assistance, facilitating linkages, policy dialogue, and investment promotion to deliver maximum impact on the Sustainable Development Goals (SDGs). The ASTA methodology is the entry point to capture the complex interplay of factors that affect the value chain. It is also used to propose a development strategy for the sector that is aligned with the new government strategic vision for the agriculture sector, which focuses on promoting agricultural diversification, encouraging investments in value-added services, and promoting the participation of youth and women in the sector. The study is also enriched by the joint FAO and UNIDO "Opportunities for Youth in Africa Programme" (OYA).

To gain a comprehensive understanding of the soya bean value chain, a mixed method approach was utilized for data collection, learning and the development of upgrading strategies. The methods included:

- Desk Research. It included a review of available materials, data, and sector studies to develop a comprehensive understanding of the sector landscape in Zambia. The desk research contributed to provision of quantitative data and socioeconomic indicators related to the sector to be used in the investment analysis and business modelling.
- Field Research. It covered three provinces: the Lusaka, Central and Copperbelt provinces. The selection was based on the capacity of each region to demonstrate a mix of high production, processing and consumption in the value chain activity dynamics. The field research included one-to-one questionnaire-based surveys with small-scale and large-scale farmers, focus group discussions with farmers, key informant interviews with key value chain stakeholders, including input suppliers, processors, banks and microfinance institutions (MFIs), aggregators, service providers, extension workers, NGOs, fertilizer companies, exporters, and consumers. The FAO field mission interviewed

Modern farming techniques improve productivity and sustainability in agriculture.

(i) 44 farmers owning an average of 4 hectares (ha) of land and growing an average of 1 ha of soya beans; 27 farmers owning an average of 14 ha of land and growing and average of 3 ha of soya beans; and 23 farmers owning an average of 55 ha of land and growing an average of 12 ha of soya beans.

Stakeholder Consultations. The consultation process consisted of direct one-to-one consultation sessions and diagnostic workshops for stakeholders to discuss challenges, validate desk and field research outcomes, and explore options for sector development in the value chain. The following workshops were conducted:

1. The on-line High Policy Level Workshop of 24 March 2021 to present the IPPIP to the government and nominate the Inter-ministerial Steering Committee for the IPPIP and the ASTA Programme.
2. The hybrid (on-line and physical) Value Chain Selection Workshop of 27 May 2021 to provide a structured and participatory approach to value chain selection in a multistakeholder process. As a result of this workshop, soya bean was selected from 10 priority commodities[3] as the product with the greatest potential for socioeconomic and environmental impact if upgraded.
3. The First Soya Bean Workshop of 23 November 2021 to provide an initial overview to key actors in the chain on the existing/available secondary information, as well as of the data and information needs to conduct the assessment.
4. The Second Soya Bean Workshop of 10 March 2022 to present the findings of the field survey conducted by the team, the main constraints of the sector and the proposed opportunities to address value chain underperformance.
5. The Third Soya Bean Workshop of 28 April 2022 to pre-validate the business models and shared vision and strategy, as well as the key value chain upgrading interventions.
6. The Final Workshop conducted on 31 August 2023 to validate the final Soya Bean Strategy and Investment Plan.

– Resource mobilization: The workshops and several bilateral meetings with main soya bean value chain stakeholders were conducted to encourage collaboration and buy-in, and to mobilize resources for upgrading the soya bean sector in Zambia.

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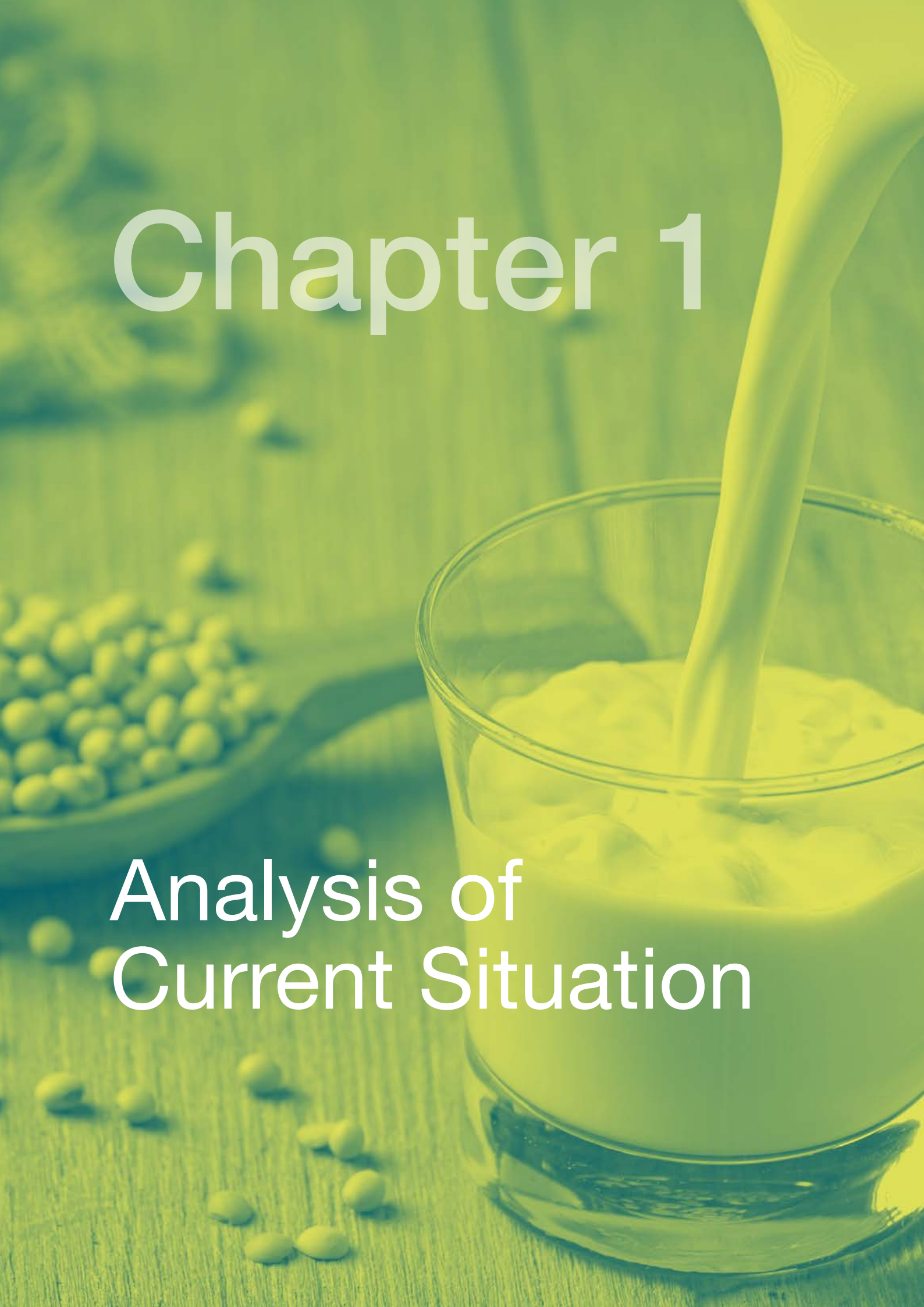
3 The following ten value chains were identified and shortlisted by the GRZ Workshop: Aquaculture; dairy; goat; maize; onion; pineapple; potatoes; soya beans; sunflower; and wheat. Rapid value chain assessments were conducted for each of them and then scored in the workshop.



Chapter 1

Analysis of Current Situation

Analysis of Current Situation

This chapter presents a situational analysis of soya bean production in Zambia while also looking at national and international markets and highlighting the main constraints to value chain development.

1.1 Overview of the soya bean value chain

Zambia has a total area of 75.3 Mn hectares (ha) of which 43.7 Mn ha is considered suitable for agricultural production, although as of 2022, only around 15 percent of it was under cultivation.[4] Soya bean is the second most extensively grown commodity in Zambia after maize, which remains the most highly produced crop. In 2021, soya bean was cultivated on about 327 500 ha (0.8 percent of agricultural arable land in Zambia) and maize on over 1.6 Mn ha. On average, Zambia has been producing just over 300 000 tonnes of soya beans annually and is the second largest producer in southern Africa after South Africa. Other major soya bean producers in the region are Malawi, Mozambique, and the United Republic of Tanzania. According to the Ministry of Agriculture Crop Forecasting Survey 2021-22, Zambia produced 411 115 tonnes of soya bean in 2021, increasing to 475 000 tonnes in 2022, with Central province contributing 42 percent to the total production of 2022); in contrast, South Africa produced over 2.02 Mn tonnes[5] (USDA, 2023). in 2022. Currently, soya bean production generates close to USD 140 Mn for farmers, 40 percent (USD 56 Mn) of which is grown by small-scale farmers and the balance (USD 84 Mn) by large-scale farmers.

The soya bean sector has experienced rapid growth in recent years, particularly among small-scale farmers who, in 2022, were expected to produce about 59 percent of total production with the other 41 percent being produced by large-scale farmers.[6] The increasing number of small-scale farmers growing soya bean over the last decade has been driven by favourable market prices, arising from the increasing domestic and regional demand and the deliberate government policy to encourage soya bean production through the Farmer Input Support Programme (FISP). Another key driver of rising participation of small-scale farmers in soya bean production has been the unfavourable market for cotton, which in the recent past has been hit by highly volatile international market prices, with some years recording a steep decline in market price. This discouraged farmers from producing cotton and they have continued to move across to soya bean. The productivity of

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4 International Trade Administration. 2022. Zambia - Country Commercial Guide. https://www.trade.gov/country-commercial-guides/zambia-agriculture#:~:text=Zambia%20covers%2075%20million%20hectares,land%20is%20currently%20under%20cultivation

5 United States Department of Agriculture (USDA). South Africa Soya bean Area, Yield and Production 2023. https://ipad.fas.usda.gov/countrysummary/Default.aspx?id=SF&crop=Soya bean

6 Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

soya bean among small-scale farmers remains low due to a myriad of factors, including limited access to improved inputs and technology, lack of good management skills, and unstructured markets.

The bulk of the soya bean produced in Zambia is for industrial use, mostly in the production of processed soya-based foods and animal feed manufacturing. There is an increasing trend towards processed foods for human consumption from soya bean such as edible oil, soya bean meal blends, and soya chunks. The processing sector has continued to grow over the years, with the crushing capacity standing at 850 000 tonnes in 2018, up from 375 000 tonnes in 2013 to produce edible oil and soya bean cake, and soya meal for animal feed.[7] [8] The processing sector is highly concentrated and dominated by a few multinational corporations located in three of the ten provinces, that is Lusaka, Central and the Copperbelt provinces.

Soya bean forms the base for an industry worth approximately USD 830 Mn in Zambia that sustains almost 700 000 jobs along the value chain.[9] [10] Zambia exports an average of USD 5.7 Mn worth of soya bean cake and meal annually to South Africa, Namibia, Botswana, Zimbabwe, the United Republic of Tanzania, Kenya, and international markets including India and China[11]. However, the bulk of exports are within the region. Despite the large processing capacity, the relatively high production of soya bean and oilseed crops (e.g. soya bean, sunflower, cotton seed, groundnut), and the export of soya bean cake and meal to the region, Zambia remains a net importer of edible oil, mostly from East Africa and East Asia. Zambia's edible oil demand is estimated at 120 493 tonnes/year, but the country only produces 40 096 tonnes, leaving an estimated 80 397 tonne gap, which is met through refined edible oil imports.[12]

1.2 Map of the soya bean value chain

This section discusses the soya bean value chain map in Zambia by identifying key value chain nodes and actors, their functions and interlinkages. **Figure 1** below presents a schematic representation of the soya bean value chain map for Zambia, showing the actors and their functions.

Soya bean Producers. Soya bean producers in Zambia can be grouped into two categories: large-scale commercial farmers and small-scale farmers.[13]

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7 Meyer, F., Traub, L..N., Davids, T., Chisanga, B., Kachule, R., Tostão, E., Vilanculos, O., Popat, M., Binfield,J. & Boulanger, P. 2018. Modelling Soya beans Markets in Eastern and Southern Africa. Joint Research Center Technical Report. Regional Network of Agricultural Policy Research Institutes (ReNAPRI), EUR 28978 EN, Publications Office of the European Union, Luxembourg. https://www.researchgate.net/publication/326059389_Modelling_soya bean_markets_in_Eastern_and_Southern_Africa

8 Chisanga, B., Sitko, N.J. 2013. The National Consumption Requirement Study for Edible Oils in Zambia, Indaba Agricultural Policy Research Institute (IAPRI), Lusaka, Zambia.

9 Ivy Mwansa, 15 April 2021. Lifting ban on cooking oil imports won't reduce prices. Zambian Business Times, Lusaka, Zambia. [Accessed 14 May 2021]. Available from: https://zambianbusinesstimes.com/lifting-ban-on-cooking-oil-imports-wont-reduce-prices/

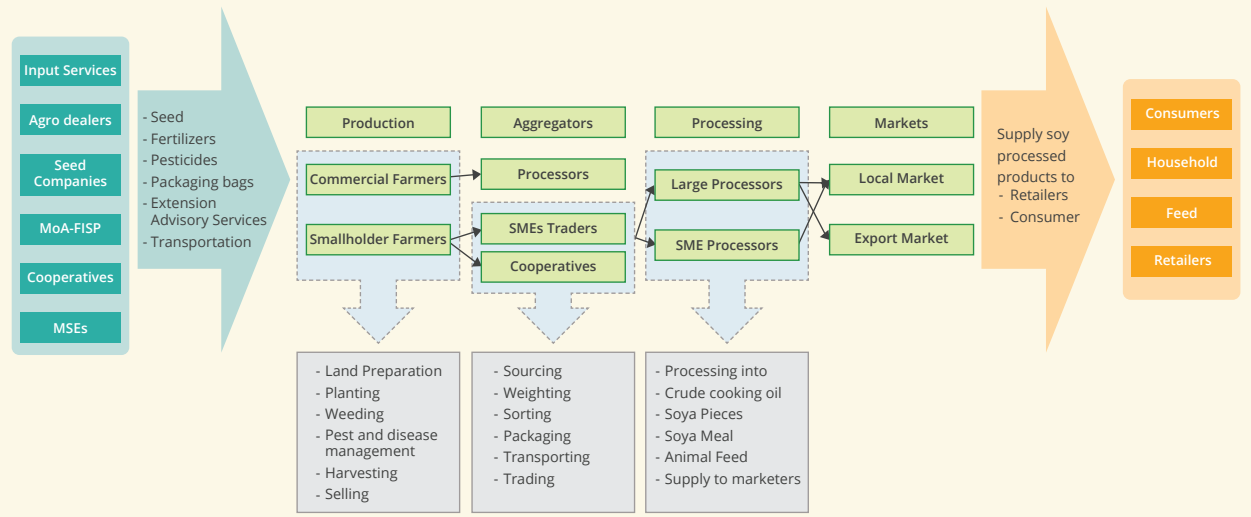
10 Zambian Business Times, April 2021.

11 Zambia Statistics Agency. 2022. Agricultural Trade Data. Zambia Statistics Agency, Lusaka, Zambia.

12 Zambia Association of Manufacturers. 2020. Cited 12 April 2021. http://zam.co.zm/upscaling-local-content-in-the-edible-oils-sector/?utm_source=rss&utm_medium=rss&utm_campaign=upscaling-local-content-in-the-edible-oils-sector#:~:text=While%20the%20country%20demands%20a,deficit%20of%2080%2C%20397%20tons

13 Farmer categorization: The Zambian government recognizes three categories of farmers: small-scale farmers cultivating a maximum plot size of 5 hectares, medium-scale farmers cultivating between 5 and 20 hectares and large-scale commercial farmers cultivating land sizes above 20 hectares. The Ministry of Agriculture Crop Forecasting Survey data and other research studies (Mulenga *et. al.*, 2020) uses only two categories: small-scale and large-scale commercial farmers, where all producers below 20 hectares are considered small-scale while those with 20 hectares and above are considered large-scale commercial farmers. The medium-scale farmers are therefore recognized as part of small-scale category. The justification for this simple dichotomy is vested in the fact that the majority of Zambia's farms are below 20 ha with a large percentage owning plot sizes below 5 ha. Hence, in this analysis, farm practices and operations become distinctive mainly when land sizes exceed 20 ha. This perspective is supported by some land-use studies, which show that when the value of production per hectare cultivated by small- and medium-scale farmers is calculated, we find that small-scale farmers tend to achieve greater returns per hectare cultivated (Sitko *et al.*, 2015), reinforcing the land-size productivity inverse relationship commonly discussed in productivity literature. The analysis proposed in this study has also adopted this dichotomy.

Figure 1 Soya bean value chain for Zambia



Source: Authors' own elaboration.

– **Large-scale commercial farmers.** A total of 859 large-scale farmers produced soya bean in the 2021/22 agricultural production season.[14] These commercial farmers are majorly located in the Lusaka, Central and Copperbelt provinces. Large-scale farmers access inputs through commercial sources such as input distributors and agents for input marketing companies, and are highly mechanized with equipment such as tractors, centre pivots and combine harvesters. Large-scale farmers apply recommended agronomic practices and have high levels of management skills. Hence, they have good average yields of about 2.8 tonnes/ha.[15]

– **Smallholders:** The segment of small-scale farmers cultivating less than 20 ha of land is growing rapidly in terms of area planted and number of farmers, from about 300 000 in 2019/20 to 389 000 farmers in 2020/21[16]. Householder farmers are mostly located in rural areas where poverty levels have remained stubbornly high at about 76 percent.[17] The production system is entirely rainfed, and is characterized by use of low-quality recycled seed, low use of chemical inputs, low mechanization and poor technical skills. According to the GRZ classification, there are three categories of smallholder households:

14 Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

15 Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

16 Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

17 Central Statistical Office (CSO). 2016. The 2015 Living Conditions Monitoring Survey Report. CSO, Lusaka, Zambia.

- **Category A:** Subsistence Farmers – these are poorer smallholders with access to land of about 0–1.99 ha with the following characteristics: they (a) undertake subsistence farming; (b) experience occasional food insecurity of about two months in a year; and (c) make minimal crop sales.
- **Category B:** Economically Active Farmers – these are smallholders, women, men and youth with access to land of 2–4.99 ha, operating just above the subsistence level and producing some surplus for the market.
- **Category C:** Commercially Oriented Farmers – These are also smallholder producers (not the larger commercial farmers in Zambia) that are able to partner with private sector stakeholders in response to market opportunities to supply a sustainable quantity and quality of the required commodity, and to access inputs and services on a commercial basis. They are also capable of adopting the right business model, after capacity building. The commercially oriented farmers have access to 5–19.99 ha of land.

Based on the nationally representative survey data[18], the total number of smallholders in Zambia in 2019 (1 657 000) were distributed as follows among the three categories: (i) Category A: 687 820 farmers (about 42 percent of total farmers); (ii) Category B: 540 679 (about 33 percent of farmers); and (iii) Category C: 428 500 farmers (about 26 percent of farmers). Farmers from each category who grew soya beans were as follows: 12.5 percent from Category A; 16 percent from Category B; and 17 percent from Category C.

Soya bean Traders. Soya bean is typically traded by large-scale traders and small and medium enterprises (SMEs), while small-scale traders, also referred to as assemblers, often set their buying points closest to farmers for onward delivery to large traders or even directly to off-takers. Traders remain largely fragmented and the majority of them do not belong to any association, although a growing number are registering with the Grain Traders Association of Zambia (GTAZ). In a number of cases contract growing has become the norm. The main target market for large traders is the domestic market with surpluses delivered into export markets.[19]

Processors. The crushing industry has grown in the last decade and is highly concentrated with a few large players that dominate the market sector. Prominent among these are Global Industries, Mount Meru, Gourock and Parrogate. Another factor driving up demand for the production of soya bean is the growth of the animal feed sector both in Zambia and regionally, with Novatek, Tiger Animal Feeds, Nutri Feeds, National Milling, Pembe Milling, Olympic Milling, and Emmans Feed Enterprises being among the key players in the domestic market. Feed manufacturing and the crushing industry rely mainly on commercial farms for the supply of their soya beans, followed by the large aggregators. Some large processors, such as Parrogate and Mount Meru, engage agents to aggregate the crop on their behalf by purchasing directly from smallholders in remote areas and bulking the crop at a central point in district centres.

The bulk of soya beans is utilized for its soya bean cake – an input in livestock and fisheries feed – with a smaller share going to the production of edible oils. There has been growth in the processing capacity of edible oils in the past decade, with new entrants such as Mount Meru, Parrogate, Global Industries and Gourock Industries adding to the existing capacity. Despite the increase in processing capacity, the supply of edible oils still falls far below the demand. Notable growth is taking place for soya-based nutritional products due to demand and growing nutrition awareness among the Zambian population, especially in urban areas. The processors are relatively well organized, with most of the processing companies belonging to the Crushers of Edible Oils and Refiners Association (CEDORA)[20] of Zambia.

Input Suppliers. Since soya bean is an input intensive crop, suppliers of inputs are major key players in the value chain. Inputs typically include certified

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18 IAPRI. 2019. Rural Agricultural Livelihood Survey Data.

19 Zambia Edge, 2020.

20 CEDORA is engaged in the development of the soya bean sector in Zambia through interventions to promote growth of oil seeds to reduce dependence on imports and to increase local processing of soya beans into cooking oil.

seeds, plant protection chemicals, and fertilizers, which are mainly supplied by private sector players. The government Farmer Input Support Programme (FISP) sources its inputs from the private sector. The Zambia Agricultural Research Institute (ZARI), a government department, provides some breeder seed of soya bean. ZARI is the only local producer of inoculum for root nodulation; inoculum is also imported and supplied by private sector chemical companies. Another important player in the input segment is the Zambia Seed Traders Association (ZASTA), which aims to provide an enabling trading environment for seed traders, including for soya bean. The Seed Control and Certification Institute (SCCI), a government department under the Ministry of Agriculture, plays an important role in the inspection and certification of soya bean seeds produced by various seed companies. The SCCI is currently chairing the National Technical Working Group on Soya bean that was appointed by the Ministry of Agriculture to oversee the needs of the soya bean subsector.

1.3 Market analysis

International soya bean trends

Globally, soya bean is one of the most economically important crops owing to its multiple uses for both direct human consumption and industrial use. Not only is it an oilseed crop and feed for livestock but also an ingredient for many chemical products.[21] The global soya bean market is mostly driven by the crushing industry, which produces soya meal and other soya products such as livestock feed, cooking oil, animal grains, vegan food and milk, biodiesel and other industrial applications.[22] As the growth in global population and rising incomes are coupled with urbanization, the demand for high quality protein food, particularly animal-based protein, is on the rise. Globally, about 76 percent of total soya bean output was used for animal feed production in 2018, and the remainder is consumed directly by humans.[23] [24] Another key driver of global soya bean demand is the growing uptake of vegan diets in western countries as plant-based diets become increasingly popular. The increased health awareness among consumers, mainly a result of higher standards of living, has also contributed to the rising demand for soya bean.

Global soya bean production increased by 36 percent from 260 Mn tonnes in 2010 to 353 Mn tonnes in 2020.[25] Although soya bean is globally consumed, large-scale production is concentrated in a few countries, mainly the United States of America, Brazil and Argentina, which represent 80 percent of global production and dominate global exports[26], mostly to China and Europe. As depicted in **Figure 2** below on the global soya bean trade, China remains the top importer of soya bean with the bulk of its imports coming from Brazil, followed by the United States of America and Argentina. China's import volumes rose from about 10 Mn tonnes in 2 000 to over 90 Mn tonnes in 2018. For Europe, imports have been rising, but have generally remained stable; the pattern for exports is similar. In 2017, overall,

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21 GlobeNewsWire. 2021. Global Soya bean Market & Volume (2021 to 2027) - by Consumption, Production, Import, Export Countries and Company Analysis. Cited 20 May, 2022. https://www.globenewswire.com/en/news-release/2021/10/11/2311593/28124/en/Global-Soya bean-Market-Volume-2021-to-2027-by-Consumption-Production-Import-Export-Countries-and-Company-Analysis.html

22 Voora, V., Larrea, C. & Bermudez, S. 2020. Global Market Report: Soya beans. International Institute for Sustainable Development.

23 Food Climate Research Network. 2020. Building Block Soy: food, feed, and land use change. https://tabledebates.org/sites/default/files/2021-12/FCRN%20Building%20Block%20-%20Soy_food%2C%20feed%2C%20and%20land%20use%20change%20%281%29.pdf

24 Thrane, M., Paulsen, P.V., Orcutt, M. W. & Krieger, T. M. 2017. Soy protein: Impacts, production, and applications (Ch. 2). In S.R. Nadathur, J. P. D. Wanasundara, & L. Scanlin (Eds.), Sustainable protein sources (pp. 23–45). Academic Press. http://www.sciencedirect.com/science/article/pii/B9780128027783000002

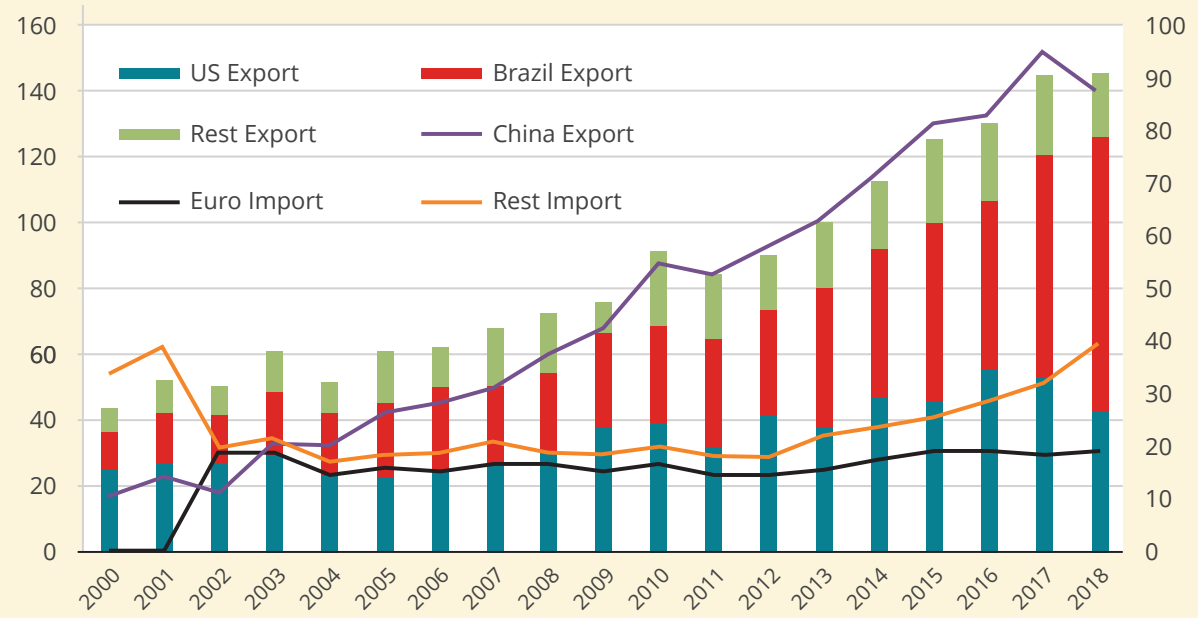
25 United States Department of Agriculture (USDA). 2022. Oilseeds: World Markets and Trade. USDA, Foreign Agricultural Service. Cited 5 May 2022. https://downloads.usda.library.cornell.edu/usda-esmis/files/tx31qh68h/cr56p5559/ff366b377/oilseeds.pdf

26 Thrane, M., Paulsen, P.V., Orcutt, M. W. & Krieger, T. M. 2017. Soy protein: Impacts, production, and applications (Ch. 2). In S.R. Nadathur, J. P. D. Wanasundara, & L. Scanlin (Eds.), Sustainable protein sources (pp. 23–45). Academic Press. http://www.sciencedirect.com/science/article/pii/B9780128027783000002

the soya bean sector had an estimated retail market value of USD 146.23 billion.[27]

This rise in demand has pushed up prices and triggered a supply response through increased production of the soya bean crop. Further price hikes are expected in 2022 and beyond, driven by geopolitical tensions and low supplies resulting from poor yields caused by climate change effects. According to Bloomberg market information, soya bean prices were expected to experience at least a 26.3 percent global price rise in 2022 as a result of increased demand from consumers and a reduction in supply due to the poor weather conditions.

Figure 2 **Global soya bean trade (Mn Tonnes)**



Source: Guan, C., Yahalom, S. S., Germanakos, L., Lapage, S., & McKeever, B. (2019). Global soya bean trade, supply chain and tariffs. WIT Transactions on The Built Environment, 187, 239–250.

Regional soya bean trends

Soya bean is a critical crop for the Southern African countries, including Zambia, that provides an important source of protein for human consumption and an input into livestock and poultry feed manufacturing.[28] [29] [30] The Southern African Development Community (SADC) trade ministers identified soya bean as one of the value chains to prioritize at the regional level. The ministers recognized that while impacted by numerous trade-distorting measures and market failures, soya bean has more potential for growth

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27 Thrane, M., Paulsen, P.V., Orcutt, M. W. & Krieger, T. M. 2017. Soy protein: Impacts, production, and applications (Ch. 2). In S.R. Nadathur, J. P. D. Wanasundara, & L. Scanlin (Eds.), Sustainable protein sources (pp. 23–45). Academic Press. http://www.sciencedirect.com/science/article/pii/B9780128027783000002

28 Southern Africa Trade Hub. 2011. Soyabean Value Chain Technical Report. Submitted by: AECOM International Development. Submitted to: USAID/Southern Africa.

29 Munguzwe, H., Chilese, C., Bernadette, C., & Mukwiti, M. 2014. Soya bean Value Chain and Market Analysis. International Labour Organization.

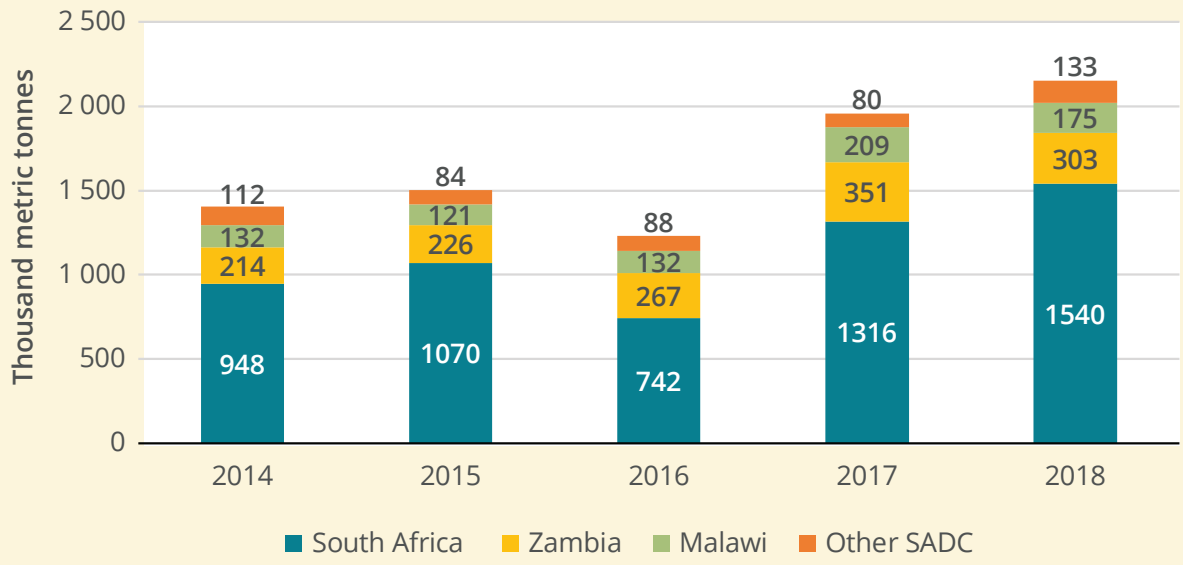
30 World Bank, BFAP, IAPRI & CARD. 2021. Strengthening the Soya Regional Value Chain in Southern Africa – Lessons from a Pilot. Presented at the Agriculture Cooperating Partners Group Virtual Meeting, 2 December 2020.

and integration of regional markets than traditional staple crops, as it is less politically sensitive than maize.[31]

The Southern African region has suitable climatic conditions and abundant arable land and water resources to produce soya beans at a scale similar to that of the large producers such as Brazil and Argentina. However, the region's potential has not been exploited with the African continent as a whole producing less than 1 percent of the total global soya bean output. South Africa, Nigeria and Zambia are the three leading producers of soya bean in Africa, with production shares of 39 percent, 25 percent, and 11 percent respectively.[32]

In the Southern African region, South Africa is the leading producer of soya bean, followed by Zambia and Malawi, with the three countries accounting for more than 90 percent of total regional output.[33] In aggregate, soya bean production in the Southern African region has been increasing, with South Africa maintaining its position as the leading producer. **Figure 3** below shows soya bean production trends for the region for the period 2014 to 2018.

Figure 3 **Soya bean production trends in Southern Africa (2014–2018)**



Source: World Bank, BFAP, IAPRI & CARD. 2021. Strengthening the Soya Regional Value Chain in Southern Africa – Lessons from a Pilot. Presented at the Agriculture Cooperating Partners Group Virtual Meeting, 2 December 2020.

With regards to trade, Zambia is currently not exporting soya beans to overseas markets directly, but Zambian soya beans have reportedly been exported to China through secondary exports from the United Republic of Tanzania. Large-scale farmers in Zambia sell either to processors or export mostly to South Africa. Other export destinations are Zimbabwe, Botswana, Malawi

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31 World Bank Group. 2020. Strengthening Required Value Chains in Southern Africa. Project Completion Report for the ASA; Supporting Trade, Jobs and Industrial Development in the SADC Region.

32 Cornelius, M. & Goldsmith, P. 2019. The State of Soya bean in Africa: Soya bean Yield in Africa. farmdoc daily (9):221, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, 22 November 2019.

33 World Bank, BFAP, IAPRI & CARD. 2021. Strengthening the Soya Regional Value Chain in Southern Africa – Lessons from a Pilot. Presented at the Agriculture Cooperating Partners Group Virtual Meeting, 2 December 2020.

and Angola.[34] The trade policy environment has remained one of the impediments to increased exports to the region. The Government of Zambia has, on several occasions, imposed ad hoc export bans on soya bean and soya products, particularly livestock and poultry feed. Such policy unpredictability has created uncertainty in the market and made investment planning by the private sector a challenge.

Figure 4 Soya bean exports to SADC in 2022

Source: ITC Trademap, 2022.

Zambia is an important exporter of soya bean in the region with key importing countries being South Africa, Zimbabwe, Tanzania, Botswana and Malawi. Zambia exported soya bean valued at USD 8 million to the region (including South Africa, Zimbabwe, Botswana, Angola and Congo) in 2022. The largest exporter was South Africa (USD 3.1 Mn), followed by Zimbabwe (USD 2.4 Mn), Botswana (USD 2.2 Mn) and Angola (USD 0.2 Mn) (as shown in **Figure 4**).

Zambia remains an important trade partner with most countries in the region, exporting and importing soya bean grain and soya-based products. Zambia exports soya bean grain to the region with key importing countries being South Africa, Zimbabwe, Botswana, the United Republic of Tanzania, and Malawi. An analysis of the soya bean value chain in Zambia by Mulenga *et al.* (2021) indicated that South Africa remains Zambia's main trading partner having imported USD 1.25 Mn worth of soya bean and related products in 2019.[35] Following South Africa is Zimbabwe where Zambia exported slightly over USD 1 Mn worth of soya bean and related products, while the rest of the countries imported less than USD 100 000 worth of soya bean and related products. In addition, the exclusive use of non-genetically modified strains makes Zambian soya beans particularly attractive on international markets. Currently, the export of raw soya bean represents the quickest route to profitability for traders. The export of soya beans to neighbouring countries is mainly conducted informally, and in some cases, illegally. The exported soya bean is either consumed locally or exported to China.

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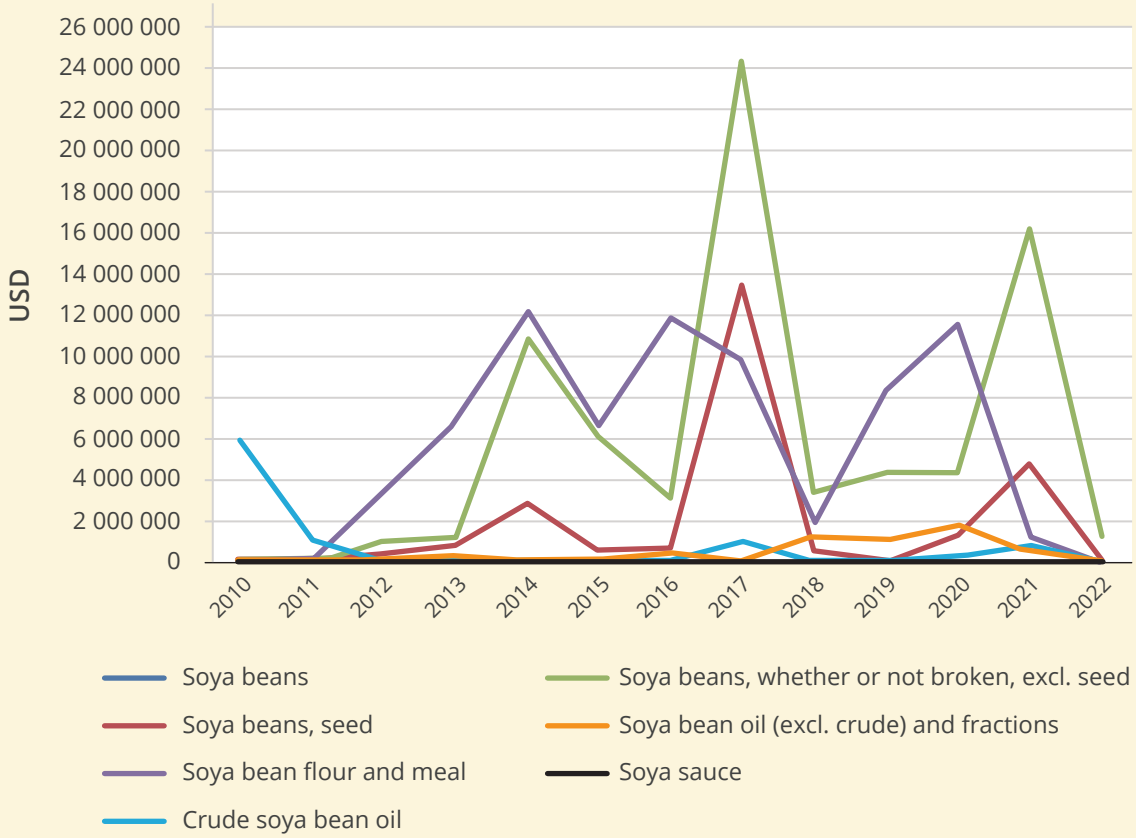
34 Mulenga, B.P., Banda, A., Kasoma-Pele, W. & Chapoto, A. 2021. Soyabean Value Chain Analysis in Zambia. IAPRI Working Paper 157. IAPRI, Lusaka, Zambia.

35 ibid.

Figure 5 Soya bean and related products export trend, 2010–2022



Source: Zambia Statistics Agency. 2022. Agricultural Trade Data (various years). Zambia Statistics Agency, Lusaka, Zambia.

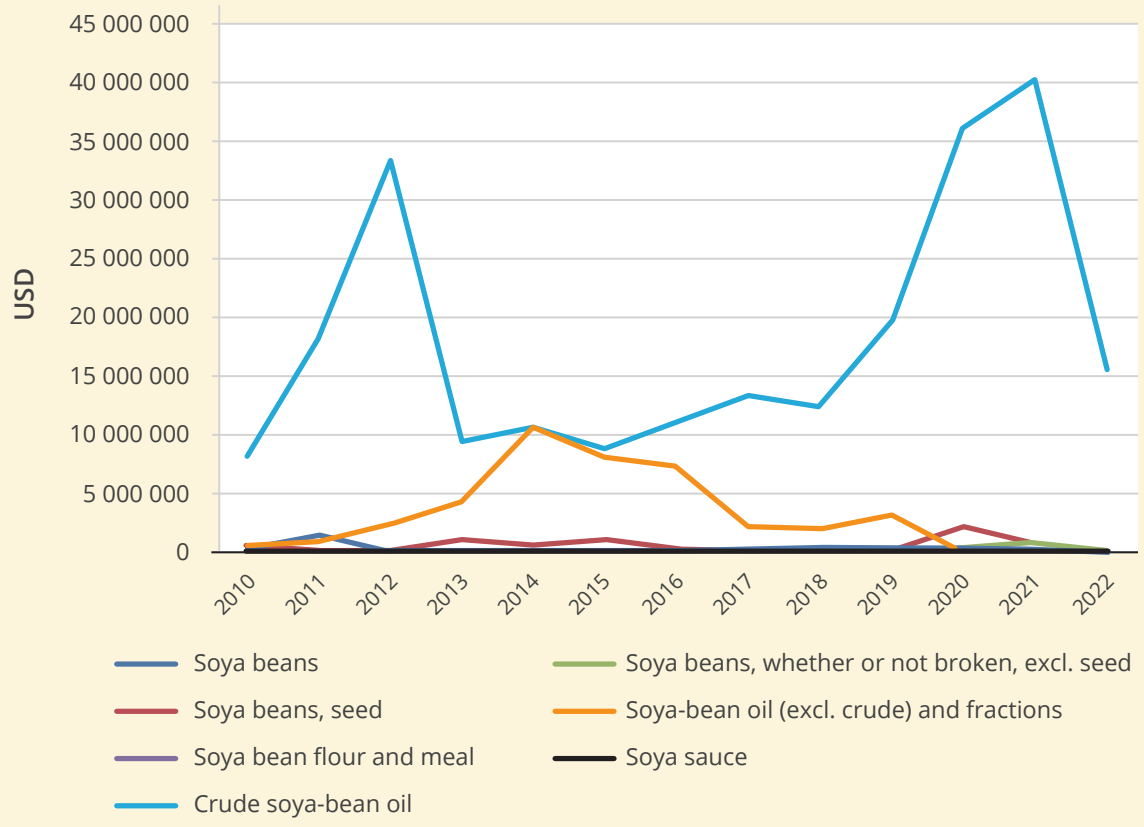
Zambia's engagement in the soya trade with partner countries is based mainly on five tradeable soya products, namely: 1) soya bean seed; 2) soya bean (broken or unbroken; excluding seed); 3) soya bean oil (excluding crude) and fractions; 4) soya bean flour and meal; and 5) soya sauce. Zambia's exports of these products to the region have been fluctuating across the years. **Figure 5** below shows the trends in exports for the five products for the period 2010–2022. Soya bean (broken or unbroken; excluding seed) remains the most exported product with an average annual export value of USD 5.8 Mn between 2010 and 2022. In second place is soya flour and meal with an average value of USD 5.7 Mn over the corresponding period, while that of soya bean seed (in third place) was USD 1.9 Mn over the corresponding period. Soya bean exports peaked in 2017 at USD 25 Mn, seed at USD 14 Mn and soya flour and meal at USD 10 Mn. Exports for other products remain very low. Generally, Zambia appears to have a competitive advantage in exporting three products: soya bean, soya bean seed and soya flour and meal.

Although Zambia's soya bean production and oilseed crushing capacity has grown rapidly over the years, and as of 2018 was at 475 000 tonnes and 850 000 tonnes, respectively – the country remains a net importer of vegetable oils.[36] The

[36] Meyer, F., Traub, L..N., Davids, T., Chisanga, B., Kachule, R., Tostão, E., Vilanculos, O., Popat, M., Binfield,J. & Boulanger, P. 2018. Modelling Soya beans Markets in Eastern and Southern Africa. Joint Research Center Technical Report. Regional Network of Agricultural Policy Research Institutes (ReNAPRI), EUR 28978 EN, Publications Office of the European Union, Luxembourg.

crushing capacity of 850 000 tonnes is not utilized exclusively for soya bean but includes other oilseeds such as cottonseed and sunflower. Thus, Zambia has continued to export significant volumes of raw soya beans to the region but equally imports significant amounts of soya bean products, with crude soya bean oil representing the bulk of imports (**Figure 6**), at an average annual cost of USD 18.2 Mn over the period 2010–2022. In second place is soya bean oil and fractions with an average value of about USD 3.2 Mn between 2010 and 2022. An analysis by IAPRI revealed that in 2019, Zambia's annual edible oil demand was estimated at 120 493 tonnes, against the domestic supply of 40 096 tonnes, recording a shortfall of 80 397 tonnes which is met through imports of refined edible oil. At 54 percent, the Southern African Development Community (SADC) supplies the bulk of the imports, the Asia Pacific Economic Cooperation is second at 27 percent and the Common Market for Eastern and Southern Africa (COMESA) at 19 percent.[37] Besides edible oils, Zambia imports soya bean seed, mainly from South Africa and Malawi, averaging a value of USD 495 000 for the period 2010 to 2022.

Figure 6 **Soya bean and associated products import trends (2010–2022)**



Source: Zambia Statistics Agency. 2022. Agricultural Trade Data (various years). Zambia Statistics Agency, Lusaka, Zambia. For 2022, the data only cover the period January to March.

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37 Zambia Association of Manufacturers. 2021. Upscaling Local Content in the Edible Oil Subsector: sector Update Report. Cited 14 April 2022. http://zam.co.zm/upscaling-local-content-in-the-edible-oils-sector/?utm_source=rss&utm_medium=rss&utm_campaign=upscaling-local-content-in-the-edible-oils-sector

Domestic soya bean trends

Zambian soya bean is mostly traded domestically from farmers to aggregators and processors. The domestic market in Zambia is fragmented with the concentration of soya bean production and crushing in specific locations in a few provinces (mainly Central, Copperbelt, Eastern and Lusaka). With regards to pricing, domestic market prices vary widely within the season with prices starting out low and peaking later in the season when supplies are dwindling. The duo system characterizes soya bean marketing:

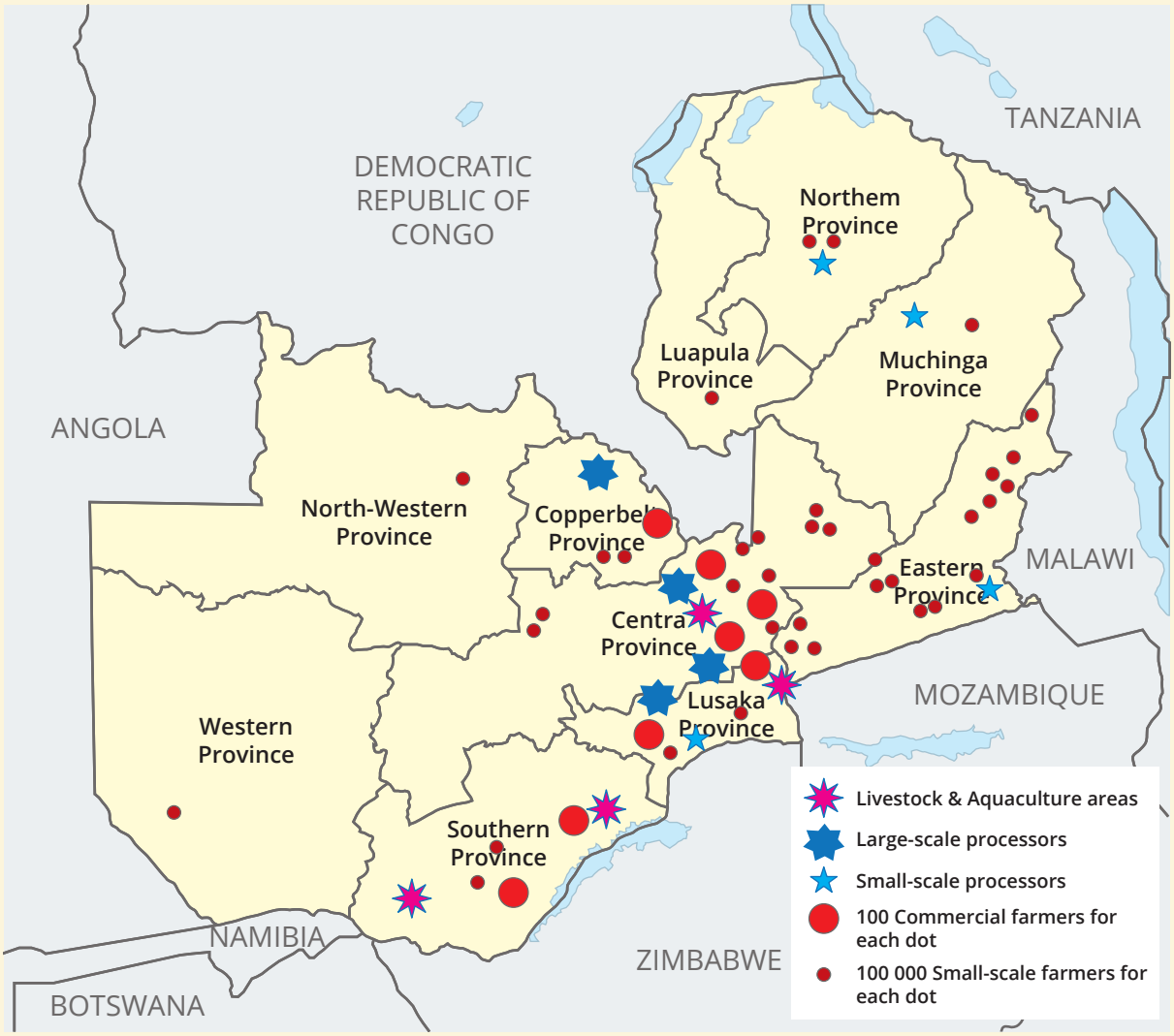
- Large-scale commercial farmers use more structured channels, which in some cases involve forward contracts with processors and direct exports, mostly to South Africa.
- Small-scale farmers are generally price takers owing to their fragmented marketing approaches, with individual farmers selling their crops in small volumes. Small-scale farmers use informal less structured channels, involving a long chain of aggregators of varying scales from small, medium to large. This market is unregulated with widespread reports of aggregators offering very low prices and using unscrupulous weighing scales that under-report the weight of crop.

Data from field research indicates three main marketing channels: farm gate, aggregators and processors. Small-scale farmers, particularly those with small volumes, prefer to sell at farm gate, which is mainly motivated by the immediate need for cash as well as the lack of funds to transport the crop to the market. In 2021, the price received at farm gate ranged widely from as low ZMW 2/kg to ZMW 8/kg (from USD 0.12/kg to USD 0.47/kg, calculated on the exchange rate ZMW 17/USD).

The booming animal feed manufacturing industry represents the single most important demand driver of soya bean domestically, with processors producing edible oil but targeting the by-product (soya flour and meal) for sale to poultry and fish farmers. Processors distribute edible oil and animal feed into the domestic market using their outlets or wholesale points, which in turn distribute to retail outlets and directly to end-users (consumers and poultry and fish farmers). Zambia's domestic production of edible oils falls far short of domestic demand, with the shortfall being met through imports. Countries such as Kenya and the United Republic of Tanzania export edible vegetable oil to Zambia at a highly competitive price which undercuts locally produced vegetable oil, including soya-based oil. Imports from East Africa are cheaper compared to domestic products owing to the unfavourable tax regimes where local edible oil production attracts a value added tax (VAT) of 16 percent, whereas imports from East Africa are not subject to VAT in the countries of origin. Thus, Zambia is less competitive in edible oil production in the region.

Zambia feed exports fill an important gap in poultry feed in the SADC region. Zambia has been exporting excess feed to regional markets, a practice that is more profitable for feed producers. Southern African countries in SADC have been a key market for Zambia's animal feed with 65 percent of feed exports going to Zimbabwe while the rest is mainly exported to South Africa, Namibia and Botswana. The majority of the large companies in Zambia are joint investments. For example, Nutri Feeds has operations in South Africa, and Tiger Animal Feeds is a part of Meadow Feeds operating in South Africa. Zamchick/Zamhatch has operations in South Africa. Novatek Animal Feeds have an outlet in the Democratic Republic of the Congo and also operate a feed mill in Zimbabwe. Any disturbance in supply significantly affects poultry value chains in those countries. In 2020, the Kenyan poultry farmers faced significant challenges due to the increased cost of feed as imports from Zambia were banned. The cost of a 70 kg bag of feed increased from about USD 20 to USD 25.5 in about three months. In addition, Business Daily Africa reported in September 2021 that thirty animal feed manufacturers closed down in a period of two months because, according to the Association of Kenya Feed Manufacturers (Akefema), a shortage of raw materials and a sharp decline in demand from farmers had pushed them out of business.

Figure 7 Zambia soya bean map



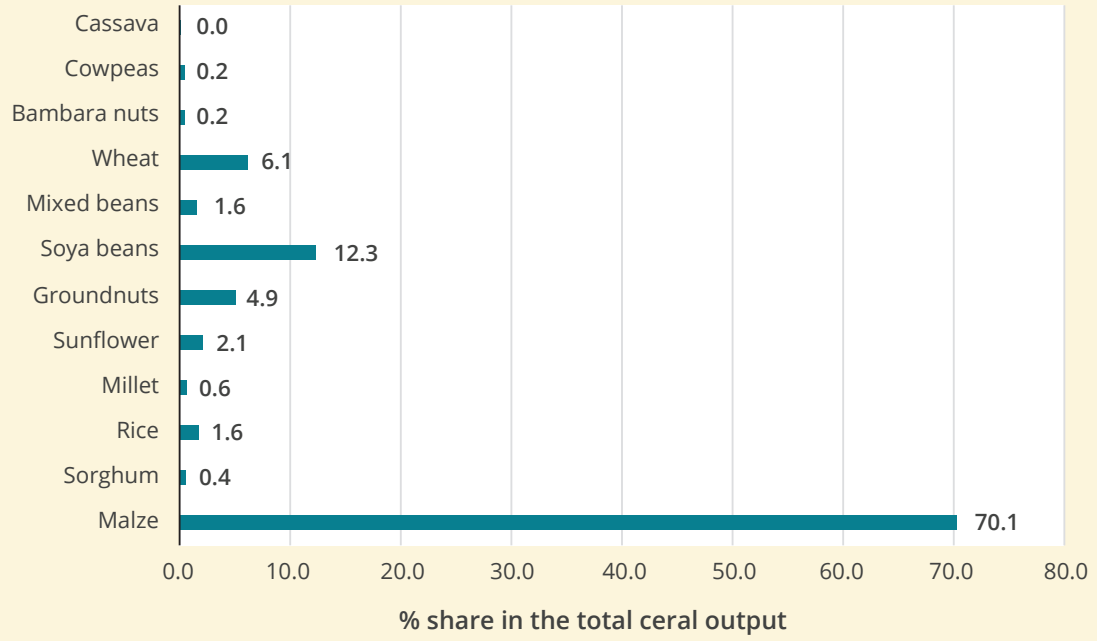
Source: Authors' elaboration.

1.4 Core value chain

Primary production

As depicted in **Figure 8** below, soya bean is the second most extensively grown commodity in Zambia. Small-scale farming in Zambia is overwhelmingly dominated by a single crop: maize, which accounted for 70 percent of total cereal output in the 2021/2022 season, followed by soya bean at 12.3 percent. During the FAO field survey, out of a total number of 90 soya bean farmers interviewed, 96 percent also grew maize. In terms of land allocation, soya beans ranked second to maize followed by groundnuts and wheat.

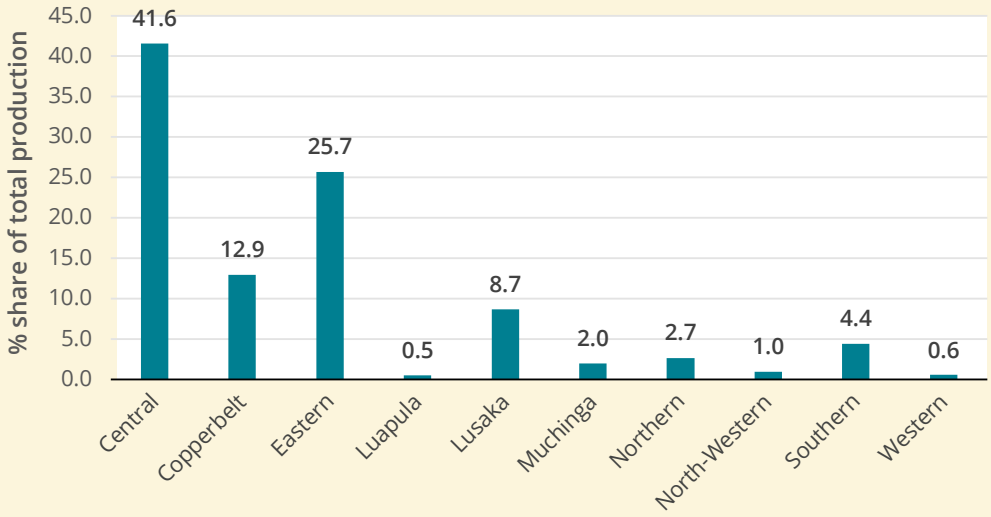
Figure 8 Distribution of main cereal production in 2021/22 agricultural season



Source: Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

As shown in **Figure 9** below, in terms of geographical distribution of production about 80 percent of total soya bean output is produced by three provinces: Central (42 percent), Eastern (25.7 percent) and Copperbelt (12 percent) (Ministry of Agriculture, 2022).

Figure 9 Distribution of soya bean by province



Source: Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

Large commercial farmers. The average productivity per unit area planted by large commercial farmers is around 2.8 tonnes/ha, which reached a peak of 3.08 tonnes/ha in the season 2015/16. However, as shown in **Figure 10** below, during the following seasons, when picked there was a downward trend in large commercial yields, hitting an all-time low of 1.67 tonnes/ha in 2018/19. Since then, yields have recovered. The biggest contributors to the yield reduction over these low output years were (i) drier seasons – farmers grew less under full irrigation due to low water levels in the dams, and (ii) lower soya bean sale prices – therefore it was not cost-effective for farmers to apply as much fertilizer.

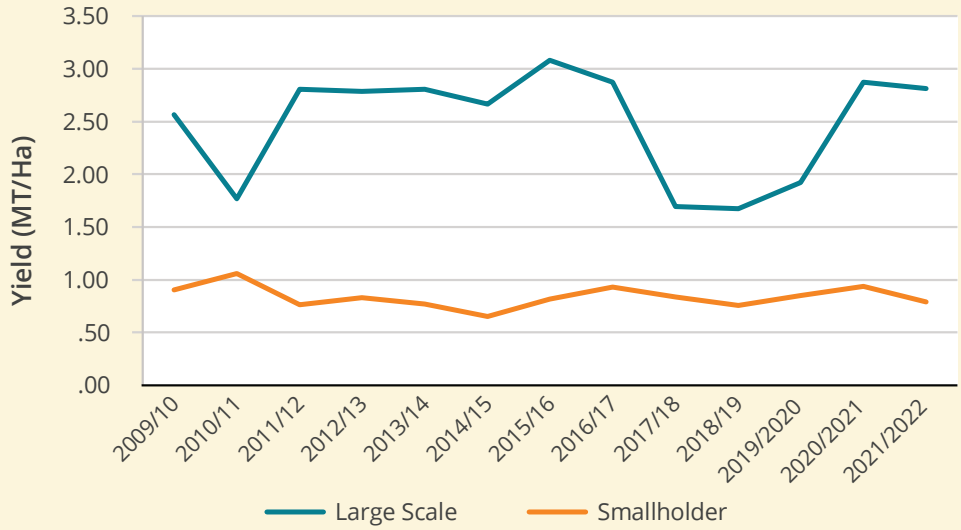
Large-scale farmers use Good Agricultural Practices (GAPs), have high levels of crop management skills and apply all the key inputs as recommended. Further, large-scale framers have mechanized most of their field operations enabling them carry out tasks in a timely manner; a key feature of good management. This results in higher yields compared to small-scale farmers. As a result of GAP and good harvesting and post-harvest handling, large-scale farmers supply good quality soya bean which earns them a premium price. Most of them have on-farm storage facilities such as metal silos which they use for on-farm aggregation before conveying the crop to the market. In terms of marketing, large-scale farmers use more structured markets, which includes making forward contracts with processors and sometimes supplying export markets directly. Large-scale farmers hedge themselves against exchange rate fluctuations by usually selling their crop in USD (United States of America dollars).

The yield of small-scale farmers remains low, ranging between 0.8 tonnes/ha to 1 tonnes/ha, which is far below that of commercial farmers (averaging around 2.8 tonnes/ha). From **Figure 10** below it can be seen that small-scale yields appear to have continued a downward trend since 2011 when they peaked at slightly over 1 tonne/ha. In 2022, small-scale yields were expected to be 0.79 tonne/ha, well below the 2.8 tonne/ha average of large-scale farmers. The low yield among small-scale farmers is mostly attributed to low adoption of improved inputs and technologies such as certified seed, fertilizer and inoculum. As soya bean production is relatively new to most small-scale farmers, there is also a lack of crop management knowledge and skills, which negatively affects yields.

With enhanced GAPs small-scale farmers can achieve yields of 1.5 to 2 tonne/ha. There are critical GAP practices, such as timing of planting, soil fertility management, use of certified seed, appropriate row spacing, weeding, pest management and timely harvesting, that must be adopted to increase yields. **Table 1** below lists some of the main agronomic practices with the associated yield improvement it will deliver.

Soya beans: A versatile crop essential for food, feed, and industrial uses.

Figure 10 Trends in soya bean yields for small- and large-scale farmers in Zambia



Source: Ministry of Agriculture. 2010 - 2022. The Crop Forecast Survey of 2009/2010 - 2021/2022 Seasons. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

Obtaining inputs, particularly certified seed, remain a challenge for small-scale farmers due to lack of availability; where certified seed is available, the price is beyond the affordability of most small-scale farmers, thus hindering expansion efforts.[38] Small-scale soya bean production takes place on family farms, with women actively engaged in field operations such as land preparation, planting, weeding, harvesting and post-harvesting handling. Generally, production activities are undertaken equally between men and women, except for the harvesting processes which are disproportionally undertaken more by women while men tend to be more involved in marketing. Small-scale farmers play different roles along the value chain. In addition to production, which is their primary and major function, a few of them produce and sell soya bean seeds, do basic processing and also sell to end consumers.

Table 1 Agronomic practices for improving soya bean yields

Practice	Yield impact
Seeds Selection	Potential for yield increases: 10 percent
Nitrogen Fixation (inoculation)	Potential for yield increase: 6 percent
Soil Acidity (below or close to pH 6)	Potential for yield increases: 4 percent
Soil Fertility	Potential for yield increase: 4 percent
Weed Control	Potential for yield increase: 5 percent

Source: Dreyer, J. 2021. Improving soya bean yield in South Africa: A practical approach. Oilseeds Focus, 7(4), 6-11.

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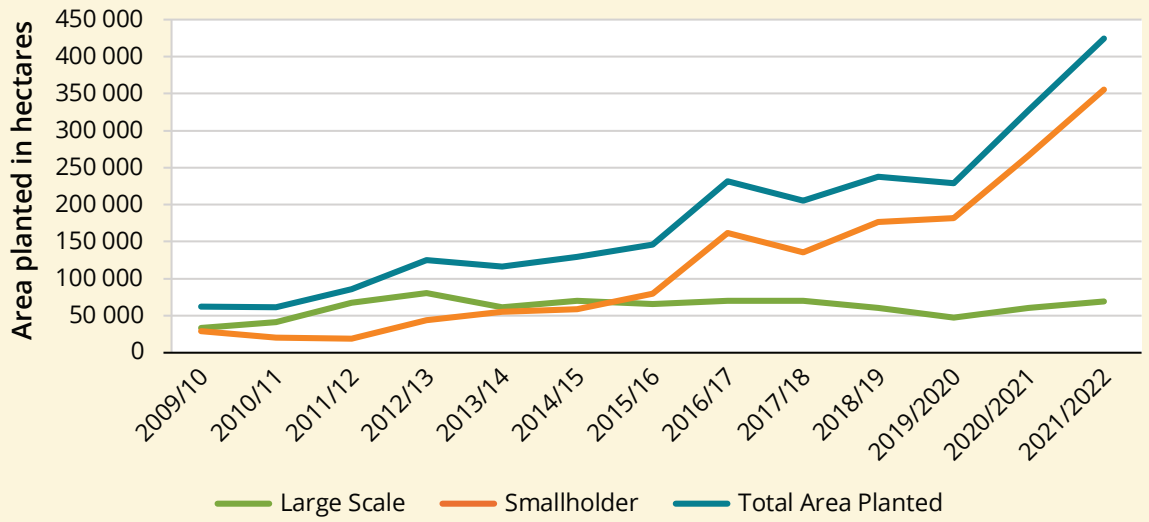
36 GIZ. 2021. The Dairy Value Chain in Southern Province and Groundnuts and Soya Beans Value Chains in the Eastern Province of Zambia. GIZ, Lusaka, Zambia.

Soya bean production in Zambia has continued to rise, driven mostly by the expansion of the area planted by small-scale farmers. Small-scale production of soya bean has been increasing year-on-year by about 12 percent, compared to the average year-on-year increase of 8 percent in commercial production.[39] As a result, small-scale production accounted for about 57 percent of the total soya bean output as of the 2020/21 agricultural season. Over the past three years (2019–2022) the expansion in area planted by small-scale farmers has allowed them to surpass commercial farmers in becoming the largest producers of soya bean. **Figure 11** below shows the trend in area planted to soya bean for the period from the 2009/10 season to the 2021/22 season for small-scale and large-scale farmers. The trend shows a steady rise in area planted by small-scale farmers from about 19 000 ha in 2011 to almost 60 000 ha in 2015. This was followed by a sharp rise between 2016 and 2022, with the area planted by small-scale farmers exceeding 350 000 ha in the 2021/22 season. For large-scale farmers, the area planted rose steadily between 2010 and 2013, then declined marginally in 2014 and remained constant up to 2018 before sliding back marginally in 2019 and 2020. Between 2020 and 2022, the area planted by large-scale operations increased from 47 000 ha in 2020 to almost 70 000 ha in 2022.

Figure 11 Trends in area planted to soya bean for small-scale and large-scale farmers



Source: Ministry of Agriculture, 2010 - 2022. The Crop Forecast Survey of 2009/2010 - 2021/2022 Seasons. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

The trends for production are similar to those for area planted, with output from small-scale farmers sustaining an increase since 2010 (see **Figure 12** below). The increase in output by small-scale farmers is driven by new entrants in production increasing the cultivated area, opposed to the increased productivity by small-scale farmers. For example, the number of small-scale soya bean producers increased from 298 000 in the 2020/21 season to 389 000 in the 2021/2022 season resulting in a 15.6 percent rise in production. Based on CFS estimates for the 2021/22 season, small-scale farmers were expected to account for 59 percent of total soya bean production, with large-scale farmers accounting for 41 percent; this is a slight increase on the 57 percent contribution of small-scale farmers in the previous season.

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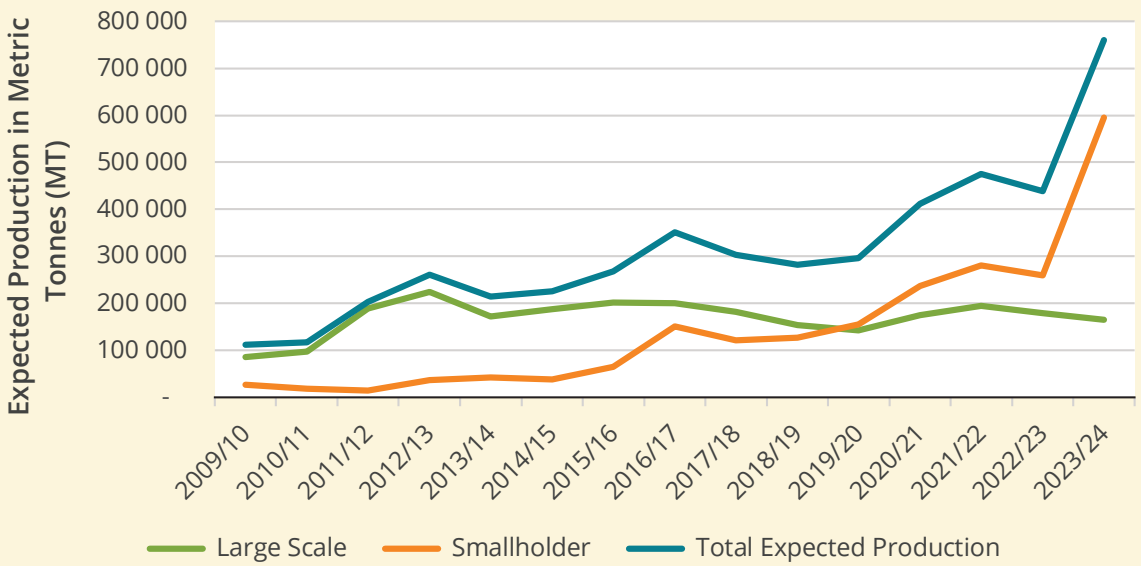
[39] Ministry of Agriculture. 2022. The Crop Forecast Survey of 2021/2022 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

Figure 12 Trend in soya bean production by small- and large-scale farmers in Zambia



Source: Ministry of Agriculture 2010 - 2022. The Crop Forecast Survey of 2009/2010 2022/2023 Seasons. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

In 2022, a large number of soya bean farmers were expecting to export their harvest to China and were in an uncertain situation when China chose to import its soya bean from elsewhere. The government had to intervene and asked the Food Reserve Agency (FRA) to buy soya bean at a minimum price.[40] The FRA bought at 11 Kwacha per kg, which was an attractive price based on which a large number of farmers switched to soya bean production from maize. This increase in production can be seen in the production for 2023 (as seen in **Figure 12** above) because more farmers were interested in soya bean production as the government set a precedent of buying the stock at an attractive price in the previous year.

In terms of economic value, small-scale farmers generated produce worth ZMW 3 billion in the 2020/21 season, producing 236 258 tonnes of soya bean from 266 617 ha of land cultivated, and achieving an average productivity rate of 0.88 tonnes/ha.

Zambia's soya bean productivity remains low (1.3 tonnes/ha in 2021) compared to South Africa (2.3 tonnes/ha) and Mozambique (2.1 tonnes/ha).[41] Various studies have observed different productivity levels per unit area for small-scale and commercial farmers. Data, as can be seen from **Figure 12**, shows that productivity levels have been changing over time. The recent data from the FAO survey observed that small-scale farmers have improved their productivity by approximately 10 percent. Despite the recent improvements, yields are still far below regional benchmarks. Small-scale farmers located near commercial farmers have demonstrated better yield levels. This is due to various factors, including the demonstration effect that encourages small-scale farmers to apply practices implemented by commercial farmers. During field mission interviews, the farm manager of ZATAKA Farms in Mpongwe explained how he provides support to small-scale farmers located in his neighbourhood. Farmers in this community

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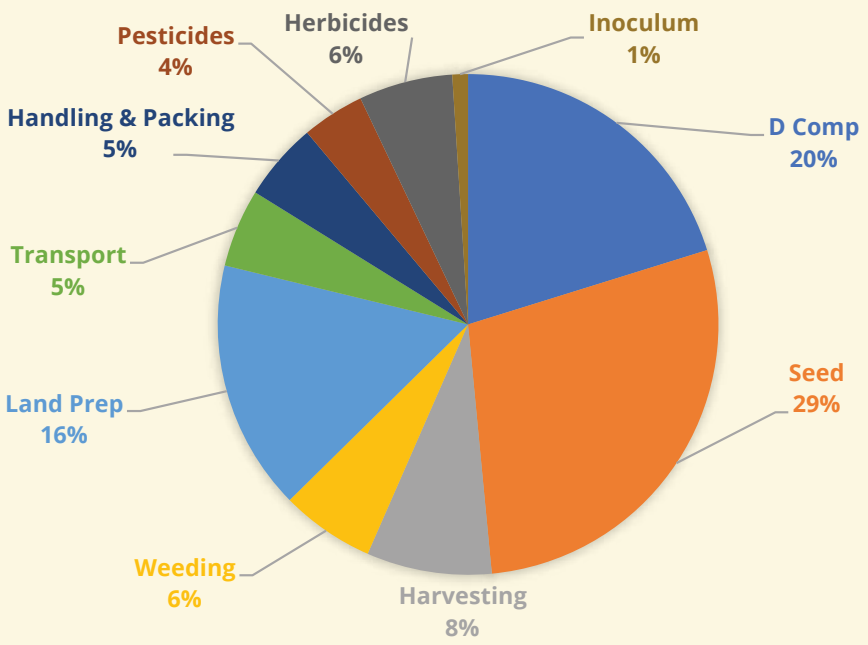
40 The FRA is mandated to maintain the strategic reserves for the staple foods such as grain.

41 FAOSTAT

have adopted the Spike variety, which is high yielding but also susceptible to shattering if not mechanically harvested. ZATAKA assisted farmers who adopted the Spike variety with provision of land tillage and harvesting equipment and crop management skills to support their farm operations. This ensured high yields averaging above 2 tonnes/ha.

As can be observed from **Figure 13** below, the major cost element in soya bean production for small-scale farmers is seed, which represents 29 percent of the total cost. During interviews, the high cost of seed was cited by farmers as the reason for using recycled seed, which in most cases resulted in lower yields. The D Comp fertilizer came second at 20 percent and the labour cost for land preparation, which is mainly done by hand, came third at 17 percent of total cost. The combination of pesticides and herbicides represented approximately 10 percent of the total cost. Profitability generated under this cost distribution, based on a selling price of ZMW 13 000/tonne, is presented in the **Table 2** below. The survey observed that cost distribution was different between provinces: Lusaka Province exhibited the highest total production cost at almost ZMW 6 000/ha, followed by Copperbelt at ZMW 5 700/ha, and lastly Central province with the lowest cost at ZMW 4 400/ha.

Figure 13 Cost structure for small-scale farmers



Source: AO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia

The differences in cost across provinces is significant at 36 percent between the highest and lowest. This difference could be attributed specifically to labour costs since Lusaka and Copperbelt are predominantly urban areas and thus likely to have relatively high labour wage rates compared to other regions, such as the Central province, which is less urban and makes extensive use of animal draught power. With regards to yield, Copperbelt farmers achieved higher productivity per hectare than their counterparts in Lusaka and Central province. The total cost of inputs/tonne produced was also highest in the Copperbelt indicating that farmers used more inputs than in

the other two provinces. Based on the responses from field interviews, Copperbelt farmers also had better access to extension advisory services than the other two provinces. Therefore, it is more likely that the combination of good access to extension advice and relatively high input application rates can explain higher productivity achieved by Copperbelt farmers. A higher productivity rate exhibited by Copperbelt farmers, even with higher costs per tonne, resulted in higher revenue and higher profitability.

Table 2 **Profitability analysis of small-scale farmers**

Small-Scale Farmers Profitability Analysis						
Province	Production Tonnes/ha	Production Cost (ZMW/ha)	Total Cost ZMW/tonne	Price ZMW/tonne	Revenue ZMW/tonne	Profitability
Lusaka	0.77	5 937	4 572	13 000	10 010	5 438
Copperbelt	1.15	5 731	6 591	13 000	14 950	8 359
Central	0.83	5 289	4 390	13 000	10 790	5 501

Source: FAO Field mission. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Small-scale farmers have a ready market for soya bean as there are many buyers during harvest. However, they face challenges in accessing favourable markets, such as processors who offer a relatively favourable price but are located far away (mainly in Lusaka, Central and Copperbelt). Small-scale farmers have low bargaining power due to their fragmented nature and are compelled to sell their crop at the farm gate or to intermediaries who set up buying points within farming communities. These buyers offer lower prices and sometimes use weighing scales that under-report the weight of the crop.

Aggregation / traders

Crop aggregation is the process of buying crops from farmers and gathering them at a central storage point for onward transportation to off-takers once economic volumes are attained. Aggregators (or intermediaries) either buy the crop delivered at a central collection point or pick the crop up from the farmer's gate. Such traders have been reported to buy at very low prices and use uncertified scales that tend to under-report the correct weight of the crop, thus undercutting farmers' margins. Traders from neighbouring countries such as Malawi, Mozambique and the United Republic of Tanzania also purchase the crop directly from small-scale farmers and informally export to the region. Informal trade is rife and has continued to thrive, mainly driven by price differentials. The porous nature of the borders aids small traders in easily moving their crop without detection by the border agents from the Zambia Revenue Authority (ZRA).

In an effort to create a structured marketing system, the government supported the creation of the Grain Traders Association of Zambia (GTAZ) in 2005. The association, which is administered by an exco and run by a secretariat in its offices in Lusaka, is a voluntary association open for membership to any aggregator. The association classifies its members into three groups: small-scale aggregators who trade 1–200 tonnes/annum, medium-scale aggregators who trade 201–15 000 tonnes/annum and corporate (large-scale) members who trade over 15 000 tonnes/annum. While not all grain traders in the country are registered members of GTAZ, members receive special incentives from the government through preferential trade deals and export quotas that are channelled through the association. The association has at least 70 small-scale aggregators, 30 medium-scale, and 16 corporate members.

When buying soya bean grain from farmers, the purchase price is determined by the export parity

price and the demand for the grain by processors. Small- and medium-scale aggregators buy for onward selling to off-takers who constitute large-scale aggregators, processors, and in a few cases to exporters. Some processors also directly participate in soya bean grain aggregation. In many cases, aggregators have contracts with their off-takers and therefore operate like subsidiaries to the off-takers. This arrangement results in aggregators offering lower prices to farmers so they can maximize their margins, which is the difference between the price offered to the farmer and the sale price offered by the off-taker. Small-scale aggregators reported that generally this margin is very small and volatile depending on the demand for grain by processors. Usually, when government policy makes export markets inaccessible, processors offer low prices to aggregators because supply is high and the market gets flooded; this results in huge losses to small- and medium-scale aggregators.

Small-scale aggregators achieve low returns for reasons that include:

- Buying poor quality grain from farmers and incurring transport costs for a low value commodity.
- Needing to turn over the grain to off-takers quickly when the prices are still low because of a lack of warehousing facilities.
- Incurring high transport costs and stock losses during transportation because of a high dependence on hired transport.
- Operating a cash business that requires high levels of trust in company staff; some aggregators reported cash thefts and unscrupulous practices, such as tampering with the weighing scales, by staff.

Many large-scale aggregators benefit from owning large storage facilities that allow them to hold the crop until prices are favourable, thereby maximizing their returns. Large-scale aggregators also engage in grain cleaning to allow them to deliver high quality grain to processors and receive premium prices. According to GTAZ members, some specific challenges faced by aggregators include:

- Poor access to finance. In 2022, it was reported that interest rates on loans from commercial banks range from 18 to 25 percent for local currency while interest rates on foreign loans range from 7 to 9 percent. Aggregators believe the ideal interest rate on local loans should be 10 to 12 percent, in line with Malawian banks. Zambian interest rates are considered too high for small- and medium-scale aggregators. As a result, these aggregators enter into pre-financed contracts with their off-takers.
- Poor quality grain forces large-scale aggregators to incur further costs for cleaning before delivering the grain to processors. This problem can be addressed at farm level by assisting farmers with certified seed and appropriate harvesting equipment. Generally, large-scale aggregators buy from commercial farmers who deliver good quality grain.

Processing and by-products

Zambia is dominated by a few large-scale processing companies, located along the railway line in Lusaka, Kabwe, Ndola and Kitwe, that buy the crop either directly from farmers through their agents or from aggregators who have extensive networks across the country. This leads to extensive crop haulage over long distances, with resultant pressure on road infrastructure and high transport costs accruing to farmers. Soya bean processing is mainly undertaken by large-scale commercial processors, with very little small-scale processing taking place. There is limited home processing, mainly done at household level, to produce products for human consumption or to incorporate into feed formulation for livestock. Domestic processing is very basic, and the resulting main product is soya flour which is used for making porridge or soya cake snacks, and/or soya bean cake for use as an ingredient in livestock feed.[42] The total oilseed crushing capacity in Zambia has grown from 125 000 tonnes in 2010 to 850 000 tonnes in 2020. The Crop Forecast Survey 2019/2020 indicates that 50 000 tonnes were processed as feed and 268 000 tonnes went to food manufacturers.[43]

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42 Munguzwe, H., Chilese, C., Bernadette, C., & Mukwiti, M. 2014. Soya bean Value Chain and Market Analysis. International Labour Organization.

43 Ministry of Agriculture. Various years. 2020/21 Crop Forecast Survey Estimates. Ministry of Agriculture, Lusaka, Zambia.

The processing of soya bean not only adds value to the local economy, but also supports the development of two strategic vertical value chains: poultry and aquaculture. Additionally, soya bean by-products can be exported to regional markets, supporting growth in the Southern African Development Community (SADC) region. The crushing industry is mainly dominated by large processors. Multiple factors, such as high fixed costs, large investment requirements, and large supplies required to fulfil the crushing capacity of the facility, differentiate the business dynamics and priorities of large processors from small processors. All processors interviewed indicated that soya bean crushing never runs at full capacity due to inconsistent supplies and the distorted export market. During field interviews, processors raised the unstable power supply from Zambia Electricity Supply Corporation Limited (ZESCO) and unpredictable export market policies as the major challenges faced.

Zambia's soya bean sector is poised for expansion given the continued rise in demand for soya bean and its associated products both locally and in the region. However, large-scale companies that command a major market share, particularly in the processing segment, dominate this growth. There is very limited participation of small and medium enterprises in this segment, with the high cost of machinery and equipment highlighted as the main barrier to entry. As a result, large-scale processors with the financial capacity to procure expensive machinery and purchase large crop volumes to meet their processing requirements, dominate the sector. The large processors usually stockpile during the harvest period, thus undercutting the small and medium enterprises that are only able to procure limited volumes at a time due to financial constraints.

Accurate estimates of processing costs are difficult to obtain, especially given that capacity is also used for other oilseeds and is not used to maximum efficiency. In general, processing using solvent extraction is estimated at USD 10/tonne, while mechanical extraction can range from USD 15/tonne to USD 20/tonne.[44] These cost estimates assume that the processing capacity is fully utilized; given the high level of fixed costs in the processing industry, low utilization levels lead to significant processing costs.

Processors recognize the ever-increasing supply source from the small-scale sector. One Lusaka-based processor reported that while 70 percent of the soya bean for the mill came from commercial farmers in 2018, 50 percent is currently supplied by small-scale farmers. This scenario highlights the increasing importance of small-scale farmers in the soya bean value chain, although the inconsistent supplies, low quality and small quantities from this source present a challenge to large processors.

The development of small processing and crushing facilities could make feed for local small-scale poultry and fish farmers more affordable. This would also create a ready market for local farmers and reduce transaction costs as the off-takers (small-scale processors and feed manufacturers) will be within local communities. There are business models for small-scale processing and crushing, designed for specific products such as animal feed, with target markets in the local communities. Thus, these activities would not be competing with large-scale processors. The average cost of a small-scale processing facility ranges from USD 10 000 to USD 20 000, which could process approximately 500 to 800 tonnes/month. These small-scale processing units can operate on solar, which would save significant cost on the production side. The introduction of small-scale processing and crushing units would enhance the economic value of the production process for small-scale farmers and introduce new economic opportunities for SMEs. However, there are challenges related to the viability of the business and technical capacity required to manage and operate the investment, access to the initial investment, and the marketing of the by-product.

The demand for Zambian soya beans is driven by two main channels: the export of raw soya bean and processing of soya beans into by-products. Soya bean yields 18.6 percent oil and 78.7 percent soya bean meal with the remainder being waste.[45]

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[44] Southern Africa Trade Hub. 2011. Soyabean Value Chain Technical Report. Submitted by: AECOM International Development. Submitted to: USAID/Southern Africa.

[45] FEFAC (European Feed Manufacturers Federation). 2007. Industrial compound feed production, FEFAC Secretariat General, Brussels, May 2007.

The oil can be extracted either mechanically or by means of a solvent. Soya bean meal is superior to other vegetable protein sources in terms of crude protein content and matches or exceeds them in both total and digestible amino acid content.

According to the Food Balance Sheet 2020/21 published by the Ministry of Agriculture, the soya bean end-market usage indicates a 12 percent utilization for livestock and aquaculture feeds, 85 percent for food manufacturing and a 3 percent wastage. This indicates that soya bean constitutes an important food in human diets, providing an estimated per capita intake of 158 calories/day, 18 g of protein/day and 8 g of fats/day. Zambian soya bean is mainly processed into soya chunks, soya meal, soap, refined cooking oil, unrefined oil, and soya bean cake, which is a major component of livestock feed formulations.

Edible oil

The edible oil sector in Zambia has always presented a challenge for the government. The annual consumption of edible oil is approximately 120 000 tonnes. The Indaba Agricultural Policy Research Institute (IAPRI) estimates that in 2019 the total domestic production of edible oils stood at 40 000 tonnes for the year, recording a deficit of 80 000 tonnes.[46] The large deficit in consumption is met by imports of refined edible oil from the rest of the world with the Southern African Development Community (SADC) taking up 54 percent of the imports, the Asia Pacific Economic Cooperation at 27 percent and the Common Market for Eastern and Southern Africa (COMESA) at 19 percent.

The three largest edible oil crushers that dominate the market are Global Industries, Parrogate and Mount Meru industries, while the smaller edible oil crushers scattered across Zambia mainly sell their crude edible oil to the three major players for further refining.

To meet the deficit in cooking oil in Zambia, the annual soya bean production should reach 800 000 tonnes. The production of soya bean in 2021 was approximately 400 000 tonnes, supplemented with imports of 374 000 tonnes in the same year (CSO), indicating a self-sufficiency ratio of 48 percent. The competition with imported cheap palm oil represents a significant challenge for locally processed oil.

If the current trend of an expanding soya bean production base is sustained (increasing numbers of small-scale farmers and increasing production and productivity), the Zambian soya bean value chain will become highly competitive in the region with additional foreign and local investments in the processing sector. The current levels of soya bean production are not considered high enough to attract investments in additional oil refineries. Investment in refining edible oil in Zambia would only become feasible under certain conditions that include high production volumes, a robust regional market, and a competitive business and regulatory environment that can support local production to compete with cheap imported oil from Asia.

Other soya-based foods for human consumption

Over the years soya bean consumption has been popularized by government and other stakeholders through the National Food and Nutrition Commission (NFNC) as an important source of protein. As a result, the Zambian population is generally aware of and has a fair preference for soya bean food products such as soya mince, Nyama Soya, soya milk, soya chunks, and Yummy Soya, most of which are considered to be tasty, cheap sources of protein that can be found in most wholesale and retail outlets, and open roadside markets.

The soya bean food consumption market is being driven by a growing population in Zambia, which has grown from around 9.8 million in 2000 to over 20 million in 2020. Most of this growth has been in the low- to middle-income and hence prefer the tasty cheaper soya bean foods as a source of protein over fish and meat.

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[46] Munguzwe, H., Chilese, C., Bernadette, C., & Mukwiti, M. 2014. Soya Bean Value Chain and Market Analysis. International Labour Organization.

Box 1 **The Zambian school feeding programme**

Another key demand driver of soya food consumption is the school feeding programme, which serves free food (mostly soya-based such as porridge made from soya and corn blend) to school going children, particularly in rural community schools. This programme is aimed at improving the school attendance of children from poor families who cannot afford a meal. A number of NGOs, notably **Mary's Meals** in the Eastern province, has partnered with COMACO that supplies them with Yummy Soya to distribute to schools for preparation of porridge for the children. In addition to meat proteins, soya chunks have been identified as a cheap protein source in most government boarding schools, further adding to the demand for soya-based foods.

The population includes a growing number of health-conscious individuals who are adopting a plant-based diet and hence use soya bean food products as an alternative source of protein. These opportunities are creating ever-increasing commodity consumption and hence an ever-growing market.

Poultry feed

The poultry industry is one of the fastest growing industries within the livestock sector and given that poultry firms are mainly responsible for investments in animal feed, it is not surprising that 65–70 percent of animal feed produced in Zambia is for poultry.[47] Recently however, more firms have been attracted into fish feed production in response to growing demand. Generally, the rapid growth observed in Zambia's feed and poultry industry can be attributed to favourable policies, changing tastes and preferences among consumers, a growing middle-income class, increased urbanization and population growth.

While 87 percent of soya bean was processed into soya oil and soya cakes in 2018, 99 percent of soya cake is used as animal feed. Soya cakes are used mostly in poultry farming (53 percent), followed by pig farming (29 percent), aquaculture (8 percent) and dairy farming (2 percent).[48] In Zambia, soya bean meal is used relatively more in the poultry industry than in others. The major aim is to provide high quality protein. Soya bean meal protein digestibility in poultry is approximately 85 percent, ranging between 82 percent and 94 percent for individual amino acid digestibility.[49]

The poultry industry in Zambia has nearly tripled between 2010 and 2018 and estimated growth is 8 percent annually. The annual broiler meat production increased from 52 221 to 125 691 MT (over 140 percent growth for the period 2010–14) while annual feed production grew by 117 percent.[50] The Poultry Association of Zambia (PAZ) 2014 annual report reveals that the poultry sector provides direct and indirect employment to 80 000 individuals of which 50 000 are permanent and the remaining 30 000 are seasonal employees. The report indicates that poultry production in 2014 generated over 1 billion eggs and 73 Mn broilers. The Zambian poultry industry has grown to move the country from importing poultry products to a state of self-sufficiency (personal interview with Poultry Association of Zambia). In 2022, the

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47 Samboko, P.C. 2017. Land Institutions in Zambia: Evolution and the Determinants of the Extent of Land Titling. IAPRI Working Paper No. 122. IAPRI, Lusaka, Zambia.

48 Food Climate Research Network (FCRN). 2020. Building Block Soy: food, feed, and land use change. https://tabledebates.org/sites/default/files/2021-12/FCRN%20Building%20Block%20-%20Soy_food%2C%20feed%2C%20and%20land%20use%20change%20%281%29.pdf

49 Woodworth, J.C., Tokach, M.D., Goodband, R.D., Nelssen, J.L., O'Quinn, P.R., Knabe, D.A. & Said, N.W. 2001. Apparent ileal digestibility of amino acids and digestible and metabolisable energy content of dry extruded-expelled soya bean meal and its effect on growth performance of pigs. Journal of Animal Science, 79: 1280–1287

50 Paul C. Samboko, Olipa Zulu-Mbata, Antony Chapoto. 2018. Analysis of the animal feed to poultry value chain in Zambia. https://www.tandfonline.com/doi/full/10.1080/0376835X.2018.1480932

industry generated around 5 percent of GDP and an estimated 47 percent of the livestock GDP.

The poultry industry is dominated by the SMEs that operate 60 percent of poultry production farms. Reports indicate that the poultry industry has tripled over the last five years in response to the growth in the animal feed industry, which in return has also responded to the increase in supply of soya beans. The poultry value chain in Zambia represents a strategic value chain that can support the local economy, employment, food and nutrition security, and the empowerment of women and youth. Feed represents an important element in the poultry industry, accounting for approximately 35 percent of the costs for broilers and 60 percent for layers. Globally, feed represents approximately 60 percent of both broiler meat and egg production costs. In that context, the availability of feed at affordable prices can significantly increase poultry farmers profitability and productivity, support sector growth and employment, particularly for women, who are in the majority in this value chain. Zambia allows importation of feed ingredients and premixes with the majority of suppliers sourcing inputs from South Africa. The feed business is mainly operated by large companies such as Zambeef (Novatek), Zamchick, Eureka Chickens, Olympic Milling Stock Feeds, Nam Feeds, Hybrid Poultry, Ross Breeders Zambia, Copper Belt Chickens, Golden Lay, Choma Milling, Pembe Milling, Tiger Animal Feeds, and Nutri Feeds. The existing animal feed and poultry firms are almost entirely based in Lusaka province. The average annual production is 320 000 tonnes. Most of these compound feed suppliers have their own poultry production facilities.

Production by small- and medium-sized poultry farmers of their own feed using their own ingredients, such as maize, soya, sunflower and wheat is increasing and presents an excellent option for controlling the cost of feed. However, the technical knowledge required to produce feed is limited among poultry farmers. To produce optimal balanced compound feeds requires high quality premixes and feed additives. The production of local feed at the farm level will help reduce demand for the commercially produced feed and thus make more feed available for the export market, which could benefit the local economy. The production of local feed by SMEs represents a potential for the development of the soya bean value chain. However, the lack of technical knowledge and challenges of finance present a key entry barrier. Poultry feed can be produced by SMEs at small scale. In fact, in the medium term, the production of poultry feed by SMEs represents an excellent investment opportunity to support the soya bean value chain. The expected economic value created through this investment would benefit two value chains: the soya bean value chain and the poultry value chain. However, a precondition to ensuring a viable small-scale poultry feed production subsector is an analysis of the current feed value chain, poultry farming concentration production areas, and segmentation of poultry farmers' profiles to understand their willingness and ability to adopt commercial feeds.

Box 2 **Promotion of small-scale poultry feed production**

In Malawi, promotion of small-scale poultry feed production helped reduce the feed cost by approximately 80 percent, which created significant economic value for poultry farmers. There are various options to develop the vertical integration with the poultry value chain including a micro-franchise model based on a network of local agro-dealers as agents, who equally provide technical knowledge and training to small-scale poultry farmers and the NGO models. The main challenge in this investment is the availability of technical and business knowledge, particularly on the feed formulation, access to finance, and access to marketing channels

Source: "A tale of chicken and egg: Malawi farmers reduce poultry feed cost by 80 percent and increase egg production by 200 percent through improved feed" by Chamuka D. Thebulo, Donald A.M. Kaonga, Ken Gunsalu, Michael Blummel, Sabine Homann Kee Tui, Sikhalazo Dube."

Fish feed

Fish is one of the most commonly consumed animal proteins in Zambia, with the demand projected to continue increasing driven by, among other factors, population and income growth, and increasing appreciation of the health benefits of fish consumption.[51] Zambia's domestic fish production fails to meet demand, with estimates showing a total annual production of 100 000 tonnes against annual consumption of 185 000 tonnes as on 2015.[52] To help close this supply gap, Zambia has been importing fish from the region, including international markets such as China, and continuing to make positive strides through investment in aquaculture development. At present there are two large scale aquafeed producers: Danish multinational Aller Aqua and Norwegian-based Skretting producing feed for fish companies such as Yalelo (a local company), and Lake Harvest (a subsidiary of the African Century Foods). Aller Aqua partnered with Yalelo to build a fish feed plant, which was commissioned in 2017, with an installed annual capacity of 50 000 tonnes. The plant is located in Siavonga on the shore of Lake Kariba. Skretting, a subsidiary of Nutreco of the Netherlands and the top global fish feed producer, has partnered with Lake Harvest to build a smaller, competing aquafeed plant in Siavonga, constructed by Famsum. Besides these two large fish companies, there are many small-scale fish producers using cage operations and dams, further adding to the demand for aquafeed.

Figure 14 below presents trends for aquaculture production and fish feed demand in Zambia for the period 2010 to 2021. Overall, aquaculture production in Zambia had been rising steadily for both large-scale and small-scale producers across the country until 2018 when both subsectors recorded sharp increases. The sharp increase in 2018 to 2021 was as a result of increased investment in the sector, particularly by large players like Yalelo and Lake Harvest fish companies. Furthermore, the increased demand for fish resulted in upward pressure on prices and attracted more investments at both large and small scale. On average, the large-scale producers account for 80 percent of total production and the remaining 20 percent is from small-scale producers. Over the past decade, production has increased from 10 290 tonnes in 2010 to 59 679 tonnes in 2021, representing an almost fivefold increase. The increase is mostly driven by expansion in the large-scale subsector which currently produces almost 48 000 tonnes compared to small-scale producers currently at slightly over 11 000 tonnes.

A farm employee feeds pellets to tilapia in ponds in Northern Province, Zambia.

Feed demand has also been on the rise, showing a similar trend to production by increasing from an annual demand of 13 000 tonnes in 2010 to 76 000 tonnes in 2021. The rising demand for feed creates an opportunity for the soya bean sector to integrate fish feed production and supply the aquaculture production sector.

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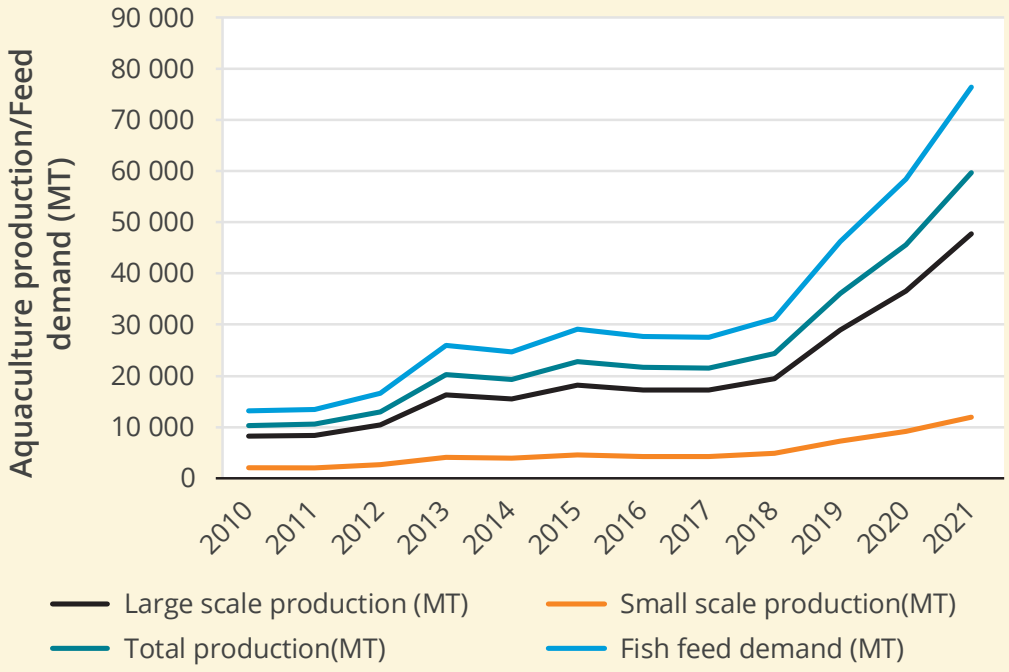
51 Tran, N., Chu, L., Chan, C.Y., Genschick, S., Phillips, M. J. & Kefi, A. S. 2019. Fish supply and demand for food security in Sub-Saharan Africa: An analysis of the Zambian fish sector. Marine Policy, 99: 343–350.

52 IAPRI. 2021. What is the current status of fishing industry in Zambia? Cited 16 May 2021. https://www.iapri.org.zm/what-is-the-current-status-of-the-zambian-fishing-industry/

Figure 14 Aquaculture production and fish feed demand trends in Zambia (2010–2021)



Source: Source: Aquaculture Development Association of Zambia. Personnel interview with the Chief Executive Officer; Ministry of Fisheries and Livestock. 2022. The 2021 End –Year Economic Report. Government of the Republic of Zambia, Lusaka, Zambia; World Bank. Aquaculture production data – Zambia. Accessed June 4, 2022. https://data.worldbank.org/indicator/ER.FSH.AQUA.MT?locations=ZM

The booming aquaculture sector has given rise to the demand for fish feed, with soya bean as one of the ingredients. Thus, the growth of the aquaculture sector presents an opportunity for the growth and development of the soya bean value chain in Zambia. During stakeholder consultations, the Aquaculture Development Association of Zambia (ADAZ) – an association representing the interests of aquaculture stakeholders in Zambia – indicated that soya bean cake can be incorporated into fish feed and supplied to small-scale fish producers. As some small-scale fish producers are located in soya bean production areas, it will be cost effective to set up small- to medium-scale fish feed processing plants within these areas to reduce transportation and other logistical costs. There is potential to integrate soya bean cake and soya meal into commercial feed manufacturing, but this will require technological changes and a robust soya bean aggregation system that guarantees availability of soya bean throughout the season.

Wholesale and retail distribution

The local markets present the first and major marketing outlets for farmers' crops. The major local market outlets are also frequented by aggregators, consisting of small-scale buyers (popularly known as briefcase buyers or vendors), medium-scale buyers, aggregators from neighbouring countries (such as the United Republic of Tanzania, Malawi, Mozambique, and the Democratic Republic of the Congo), large-scale buyers (including processing companies) and the government, through the Food Reserve Agency. The small- and medium-scale buyers usually aggregate on behalf of processors or are aggregators themselves who, after accumulating economically viable quantities, transport the crop to processors in Lusaka, Central and Copperbelt provinces for sale. In many cases, aggregators have contracts with processors and are engaged as agents for processors. These aggregators usually enter the market very early

in the season as they must aggregate enough produce to meet the processors' targets and the contract volumes. Agents acting on behalf of processors usually tend to offer a higher price than other aggregators in a bid to secure enough supplies.

Box 3 **Chibombo farmers supply their soya beans directly to Novatek Animal Feed**

Although most small-scale farmers sell their crop to traders who come to their communities, there is now an increasing number of farmers delivering directly to processors, mostly those located within their area. In Chibombo, for example, most farmers supply their soya beans directly to Novatek Animal Feed in Chibombo, a partner of Zambeef, that processes the soya bean to produce livestock feed for the local market as well as for export. Some farmers sell to processors outside their district, particularly those in districts such as Rufunsa, Chongwe, Kafue where there are no processors. Farmers from these districts usually deliver to processors in Lusaka such as Zamanita, or Mount Meru in Chisamba. However, transport remains a challenge for most small-scale farmers, as they have to meet their own transport costs, which increases their transaction costs and reduces their margins.

1.5 Value chain governance and summary of the profit margin analyses

The core value chain is unstructured and relationships among value chain players are not streamlined. During the last few years, there have been some market developments driven mainly by the private sector. There is an increasing number of companies engaging in out-grower schemes and contract farming arrangements with small-scale farmers, aimed at easing access of small-scale farmers to inputs and output markets. Also, some foreign direct investments (FDI) such as Global Industries, the largest crushing facility in Zambia, which is an Indian–Zambian Joint Venture. There has been increased investment in production of certified seeds, and expansion of value addition services. It is expected that the market growth will encourage more players, both local and foreign, to enter the market.

From the **Table 3** on profit margin analysis, it can be observed that there are wide variations in profit margins across different actors. Family farm achieves the lowest profit margin of 19 percent, followed by processors achieving 25 percent, and aggregators achieving 108 percent. The low profit margin earned by the family farm is a result of the low farm gate price they get for their crop. These farmers usually sell early in the season, immediately after harvest and sometimes even before harvest, when prices are very low. Early sales are driven by liquidity constraints as these are poor households.

The profit margin distribution is different for the category of small emerging farmers who earn the highest margins (42 percent), followed by processors at 25 percent and lastly aggregators at 14 percent. Despite incurring labour costs and having a relatively high production cost structure, small emerging farms earn higher profit margins than typical family farms, probably because by selling through different channels and at a different time, they are able to secure a higher price. As emerging farmers tend to be less poor, they are able to wait and sell their crop when the prices are higher. On average, the emerging farmers sold their crop at twice the price of family farmers. Furthermore, the emerging farmers sell most of their crop to aggregators found in district town centres, who offer a better price than briefcase buyers purchasing the crop at the farm gate. During field interviews, processors described their profit margins in the soya bean processing business as moderate.

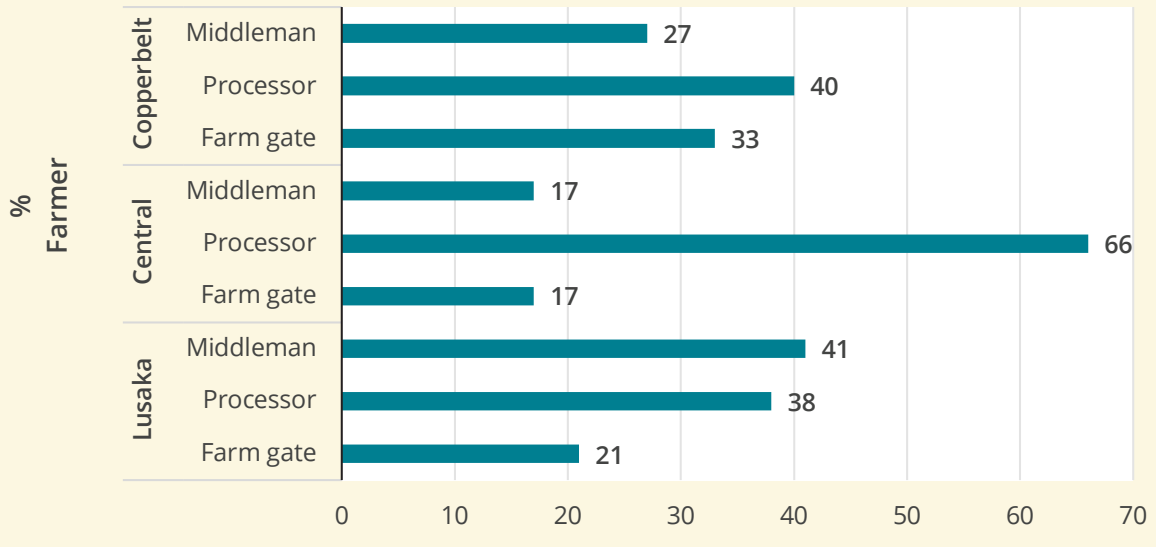
Table 3 Profit margin analysis of the key value chain actors

Small holder farmer type	Production costs	Sale price per tonne	Farmer average profit%	Transport and handling costs (20%)	Aggregators total cost	Aggregator average profit%	Processor buying price	Processor average profit%
Family farm	ZMW 4 200 (USD 247.1)	ZMW 5 000 (USD 294.1)	19%	ZMW 1 000 (USD 58.8)	ZMW 600 (USD 35.3)	108%	ZMW 12 500 (USD 735.3)	25%
Small emerging	ZMW 7 056 (USD 415.1)	ZMW 10 000 (USD 588.2)	42%	ZMW 1 000 (USD 58.8)	ZMW 11 000 (USD 647.1)	14%	ZMW 12 500 (USD 735.3)	25%

Source: Authors' calculation from field research data.

Rural agricultural markets are decentralized and farmers lack access to real-time market information (such as market trends, demand, prices and supply). As a result, farmers will take their crop to the nearest buyer and will accept the price offered.[53] This is the reason why briefcase buyers make the effort to reach rural farmers and buy at the lowest price. In many cases, rural farmers are not able to afford the transport costs to take their crop to aggregators or processors where they may earn higher prices. Transport costs were estimated at an average of ZMW 4/km/tonne and constitutes 5 percent of the total production costs. Processors receive grain at their factory outlets where deliveries are made by farmers and aggregators. Prices offered by processors range from ZMW 8/kg to ZMW 15/kg, mostly depending on the volume delivered; to incentivize large deliveries, higher volumes command higher prices.

Figure 15 Soya bean marketing channels



Source: Authors' calculations from survey data.
FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

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[53] International Labour Office. Systemic Approach to Inclusive Markets (SAIM). https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/projectdocumentation/wcms_630925.pdf

Large-scale commercial farmers on the other hand sell through a well-structured market, which in most cases involves forward contracts with major processors such as Global Industries, Novatek, Mt Meru, Gourock, and Zamanita. Because of the large volumes they supply, large-scale farmers have a relatively high bargaining power in terms of price and get a preferential price compared to small-scale farmers supplying small volumes. Processors usually enter into supply contracts with large-scale farmers, with the price quoted in USD to help hedge against exchange rate fluctuations, particularly the depreciation of the local currency against major convertible currencies. Large-scale farmers bulk the crop on-farm and send it direct to the processor; in most instances the processor sends their own transport to collect the crop from the farms. This helps reduce transaction costs for large-scale farmers, helping to boost their profits.

Table 4 Average soya bean prices by buyer category

Market player	Average price offered (USD/tonne)
Processors	706
FRA	588
Medium-scale Aggregators	470
Small-scale Aggregators (briefcase buyers)	290

Source: Authors' computation from survey data: FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia

Of the three main marketing channels (farm gate, aggregator, and processor), the aggregator channel was the second most commonly used by farmers. Out of the 90 farmers interviewed, 28 percent of small-scale farmers reported using this channel. The highest percent was in Lusaka province at 41 percent. Farmers received higher prices by delivering to an aggregator compared to selling at farm gate. Aggregators offered prices ranging from ZMW 8/kg to ZMW 11/kg (USD 0.47/kg – USD 0.65/kg). Both the farm gate buyers and aggregators offer spot cash markets to farmers.

Table 5 Market channels available to farmers

Channel	Average Sale Price (ZMW / kg)	Average Transportation cost to Market (ZMW / kg)	Total Revenue (ZMW) receivedper tonne
Farmgate	6	0	6 000
Aggregator	10	300	10 000
Processor	12	500	12 000

Source: Authors' computation from survey data: FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia

1.6 Extended value chain

Farming. While large-scale farmers mostly use machinery for their operations with extra manual labour brought in during the harvesting process, small-scale farmers, particularly when their farm plots are below 5 hectares, use family labour for all farm operations (land preparation, planting, pest management, weeding and harvesting). According to the survey conducted during the field research, out of the 90 farmers interviewed, 36 percent have animal draught power while 22 percent reported hiring machinery services to work their land. On average, there were three male and three female family members available to provide labour. Generally, production activities are undertaken equally between genders except for harvesting processes which are disproportionally undertaken by women. Access to markets largely favours the participation of men, with women mostly selling their produce at farm-gate outlets where prices are low. Additional farm labour is hired for land above 5 hectares. Small emerging farm uses a mix of hired and family labour.

Post harvest. Post harvest practices for soya bean in Zambia are limited and include threshing, shelling, winnowing, drying and storage. Threshing is the removal of grains from the pods which is by piling harvested plants on concrete floor or mats or tarpaulin and then beating lightly. Winnowing is then done to clean the grains and minimise exposure to pests and diseases. The soya bean is then dried in the sun for several days, after which it is packaged either in polythene or cotton fibre bags. In storage, bags are stacked on raided wooden platforms to avoid direct contact with the floor.

Close-up of soya bean pods, showcasing a vital crop for sustainable agriculture.

Aggregators. Aggregators employ seasonal workers to help with purchasing the crop, quality inspection, weighing and stacking the bags.

Processing. Large multinational processing corporations hire permanent and casual workers in their processing plants. Small- and medium-scale processors are few. A good example is Nezi Investment (Chipata, Eastern province) that produces soya bean cake and crude oil from soya bean. The processor employs about 30 workers, including women and youth. The women are particularly employed in sorting and grading the soya bean, while the youth are employed as machine operators and in maintenance. Processors utilize their agents to distribute the products to wholesale and retail outlets.

Wholesale and retail outlets are operated and managed by personnel employed formally by the large processing companies. Nezi Investment (Chipata, Eastern province) sells the soya bean cake locally to livestock producers and the excess is exported to neighbouring Malawi. The crude oil is sold to women marketers who refine and repackage it for sale in their small shops in township markets or along the roadside near the market.

Inputs

Seeds

Among small-scale farmers the use of improved input such as certified seed, fertilizer and inoculum remains low and limits the potential for yield growth. However, input suppliers continue to evolve, with mostly agro-dealer SMEs stocking and supplying the required inputs. Agro-dealers play a key role in the distribution of inputs through established business synergies with input producers who engage them as agents. Agro-dealers are dotted across the country, including in remote rural areas that were previously underserved. Use of farm produced organic inputs is insignificant. For instance, only one farmer reported using manure for soil fertility improvement during the field mission survey.

Box 4 **Out grower schemes**

With the private sector and NGOs entering into agreements with farmers groups and cooperatives, there are an increasing number of outgrower schemes. Companies such as Good Nature Agro, Community Markets for Conservation (COMACO), AFRISeed, and Tiens enter into outgrower scheme arrangements by providing inputs (mostly seed) and advisory services to help farmers apply the right agronomic practices. At harvest, farmers are expected to sell the crop equivalent of the value of inputs obtained, with interest, which varies across organizations ranging from 30 percent to 200 percent.[54] [55] [56]

The bulk of certified seed is domestically produced in Zambia and is open pollinated, making it easy to recycle, particularly among small-scale farmers. Only limited seed volumes are imported into the country, mostly from South Africa and Malawi. Production and distribution of seed in Zambia is dominated by the private sector, with companies such as Zamseed, Pannar, Pioneer, MRI, Kamano and Seedco being the prominent players.[57] Others include Afriseed and Syngenta. The Zambia Agriculture Research Institute (ZARI) is involved in seed production, but at a limited scale owing to the institute's low capacity to multiply seed. Further, the government through the Farmer Input Support Programme (FISP) distributes seeds to selected beneficiaries in different parts of the country under the legume initiative of the programme.

The use of recycled seed remains rife among both small-scale and large-scale farmers; however, the practice is more common among the small-scale farmers. The majority of small-scale farmers source seed from their own harvest, and some of them use a mix of their own saved seed and purchased seed. As depicted in **Table 3** below, use of seed from own harvest and from another farmer represented 53 and 27 percent, respectively for the 2017/18 season. This presents a challenge for most agro-dealers who face low seed demand, forcing them to stock only enough seed to meet the limited demand. On the other side of the coin, farmers lament the lack of seed on the market, which pushes seed prices up making it unaffordable. In many cases, agro-dealer outlets order seed based on the requests made by farmers, while in other cases seed companies deliver the seed to agro-dealer outlets without initial orders.

Spike's soya bean sample.

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54 For example, some farmers reported that when they get a 50 kg bag of seed, they may be expected to pay back three 50 kg bags of soya bean grain. In terms of value, a 50 kg bag of seed could be worth ZMW 1 300 while three 50 kg bags of grain may be worth ZMW 1 950. This is an interest rate of 50 percent.

55 IAPRI. 2021. Value Chain Analysis and Stakeholder Mapping: The Dairy Value Chain in Southern Province and Groundnuts and Soya Beans Value Chains in the Eastern Province of Zambia. GIZ, Lusaka, Zambia.

56 GIZ. 2021. The Dairy Value Chain in Southern Province and Groundnuts and Soya Beans Value Chains in the Eastern Province of Zambia. GIZ, Lusaka, Zambia.

57 IAPRI. 2019. Rural Agricultural Livelihood Survey Data.

Table 6 Main source of seed among small-scale soya bean producers

Seed source	Number of households (%)		
	2011	2014	2018
Private retailer/agro-dealer at boma	4 003 (7.1%)	149 (0.2%)	14 271 (7.2%)
Private seed company	662 (1.2%)	6 958 (8.5%)	4 363 (2.2%)
Government Food Security Pack	97 (0.2%)	2 435 (2.9%)	58 (0.1%)
Government Farmer Input Support Programme	87 (0.2%)	96 (0.1%)	1 418 (0.7%)
Another farmer	10 628 (19%)	25 518 (31.3%)	53 265 (26.7%)
Own Harvest	32 821(58.5%)	38 265 (47%)	106 514(53.3%)
Outgrowers/input credit, not NWK or Cargill	710 (1.3%)	1 300 (1.6%)	2 605 (1.3%)
Private retailer/agro-dealer outside boma	161 (0.3%)	661 (0.8%)	3 538 (1.8%)
Local seed producer	214 (0.4%)	349 (0.4%)	1 091 (0.6%)
Coop/farmer group e.g. ZNFU Lima credit	448 (0.8%)	855 (1.1%)	1, 796 (0.9%)
Friends or relatives	5 254 (9.4%)	2 090 (2.6%)	6 818 (3.4%)
COMACO (Community Markets for Conservation)	547 (1.0%)	2 401 (3.0%)	2 114 (1.1%)
Other sources	431 (0.9%)	392 (0.6%)	1 842 (1.4%)
Total	**56 064 (100%)**	**81 506 (100%)**	**199 802 (100%)**

Source: IAPRI. 2020. Rural Agricultural Livelihoods Survey Final Report. (RALS 2012, 2015, and 2019). IAPRI, Lusaka, Zambia

According to the benchmark yields recommended by the Ministry of Agriculture, a good soya bean seed variety could reach a yield potential of up to 3 to 4 tonnes/ha under good management practices. However, average yield level among small-scale farmers is around 0.8 tonne/ha. One of the major reasons for this low yield is the use of recycled seeds. Small scale farmers prefer recycled seeds because of easy accessibility and low cost compared to certified seeds. Certified seeds purchased from agro-dealers represent approximately 35 percent of the total production cost, which is a significant amount for many small-scale farmers.

Soya bean varieties grown across Zambia include Dina (supplied by Syngenta), Spike, Safari (supplied by SeedCo), Zambezi, Kafue, Magoye, Lukanga, (supplied by ZARI) Kaleya, Mwembeshi, Hernon 147 (supplied by ZamSeed), PAN 1867 (supplied by Pannar Seed). The varieties are distributed mainly from Lusaka province where most seed companies are based.

Box 5 **Common soya bean varieties accessed by small-scale farmers**

The findings of the field survey in Lusaka, Central and Copperbelt provinces indicate that the most common soya bean variety is Dina (used by 59 percent of the respondents), followed by Kafue (25 percent), Spike (8 percent) and Magoye (5 percent). Farmers are limited in the variety of choice at the agro-dealer shops and through FISP support (often Dina or Kafue). Farmers prefer the Dina variety because it is not susceptible to crushing upon ripening. The Spike variety seems to deliver the highest yields despite being vulnerable to shattering, which may not be a problem for commercial farmers who use harvesting machinery. For the small-scale farmers interviewed, the non-shattering feature is more important and preferable to yield potential as they have lower post-harvest losses when harvesting by hand labour.[58]

The price of a variety depends on its yield potential, field performance (such as drought tolerance, pest and disease resistance, and days to maturity) and whether it is registered to a specific company or is a public variety issued to seed breeders by the government-owned Zambia Agricultural Research Institute (ZARI). The Spike variety, for instance, is registered specifically to SeedCO and is acclaimed for its high yielding potential. This pegs its price on the high side at ZMW 875/25 kg packet, while the public variety Kafue, issued to seed breeders by ZARI and with a less competitive yield potential, has the price pegged at ZMW 625/25 kg packet. The selling price of the grain is not influenced by the variety type since famers generally sell a mixture of different varieties in a single bag, including grain from recycled seed. It is for this reason that processors do not indicate any preference for specific varieties when they buy the grain. The grain quality, in terms of physical characteristics, is the main determinant of the selling price.

Fertilizers and agrochemicals

As with certified seed, the private sector dominates the distribution channels for agrochemical inputs such as herbicides, fertilizers and inoculum. Zambia imports most of the chemical inputs used in soya bean production. Based on field research, there is an increase in the use of herbicides among small-scale soya bean farmers in managing weeds, and where resources are limited farmers use a mix of herbicides and manual labour to weed their fields. For inoculum, the use among small-scale farmers remains low at 12 percent (based on field research), with the majority citing cost as the main barrier. In terms of supply, inoculum is almost entirely imported, with ZARI being the only local producer. Because of its low use among small-scale farmers, agro-dealers do not stock large quantities of inoculum. With regards to fertilizer, it is recommended that farmers use basal fertilizer for good plant growth and prospects for a higher yield. However, most small-scale farmers do not use fertilizer because of the general assertion among farmers that soya bean does not require fertilizer. Even those who receive subsidized fertilizer as part of the legume initiative under the FISP prefer to reallocate the fertilizer to maize production rather than the intended soya bean field.

The use of chemical fertilizers in soil fertility management and the use of pesticides and herbicides in the management of pests and weeds are important factors that affect yields; however, this entails high costs that amount to approximately 30 percent of total production costs. Survey data shows that all farmer categories, small, medium and commercial, used external chemical inputs; the type and amount dictated by how much the farmer could afford to use. On the list of fertilizers, 65 percent of farmers used Compound D fertilizer and 10 percent of farmers reported having included growth boosters (urea, ammonia, foliar and flowering boosters). Only 12 percent of farmers reported using microbial inoculum. Inoculum is

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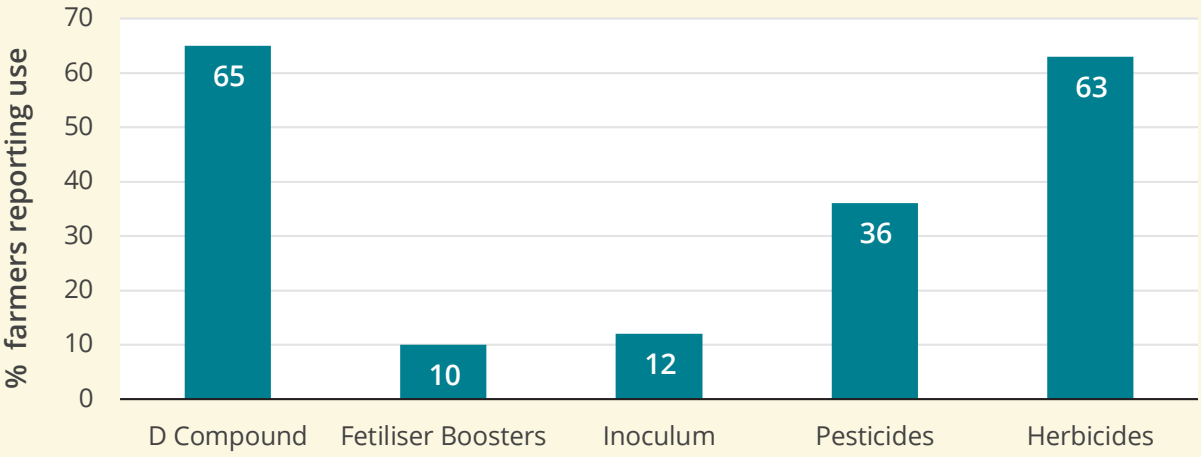
[58] FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia

proven to significantly enhance yield at a minimum cost by helping to fix much-needed nitrogen in the soil. In a few cases, farmers reported using sugar in place of inoculum, a practice which is not supported by scientific evidence and has unclear origins. About 36 percent of farmers reported having used pesticides and 63 percent reported having used herbicides.

Figure 16 Chemical input use among soya bean farmers



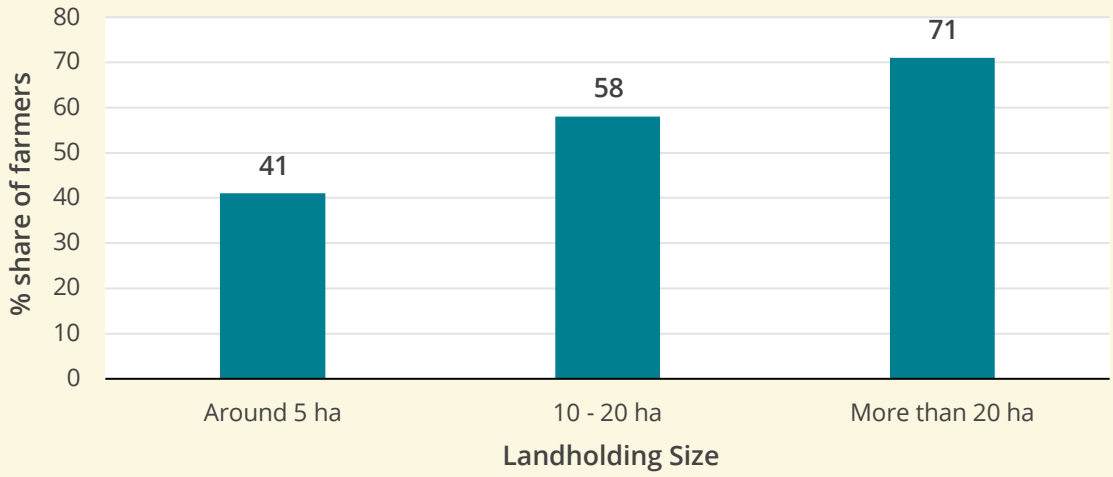
Source: Ministry of Agriculture. 2018. The Crop Forecast Survey of 2078/2018 Season. Government of the Republic of Zambia, Ministry of Agriculture, Lusaka, Zambia.

Survey data indicated that on average farmers spend ZMW 933/ha on inputs such as Compound D, pesticides and herbicides. The major cost (65 percent) is the Compound D fertilizer. Only 12 percent of farmers interviewed used booster fertilizers such as foliar fertilizer, urea, Easy Gro and flowering fertilizer. The total cost per hectare spent on booster fertilizer was ZMW 173/ha.

Mechanization: Machinery and equipment

Physical energy is required to accomplish the labour-intensive tasks ranging from land preparation to post-harvest activities in soya bean production. Mechanization of soya bean production relies mainly on animal draught equipment. Survey data shows that 41 percent of farmers cultivating more than 5 hectares reported using animal draught power and 58 percent of farmers cultivating between 10 and 20 hectares owned equipment that was also animal draught-powered. About 71 percent of the large-scale commercial farmers (over 20 hectares) interviewed owned farm machinery (of which only 5 percent owned tractors). Farmers who do not own machinery require high labour input for land preparation, which may be a limiting factor for them to expand cultivated areas. Data shows that fewer female farmers than male farmers owned their own machinery, leading to the need for female farmers to hire equipment for land preparation. The additional costs of hiring equipment resulted in smaller areas being planted. Women also face more challenges in the chores associated with the maintenance and operating requirements of some equipment ownership.

Figure 17 Percent share of farmers using animal draught-powered equipment



Source: Authors' computation from survey data: FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Irrigation

The use of modern and efficient irrigation systems among small-scale farmers is not common due to its high cost and the lack of expertise. According to the Southern Africa Trade Hub Technical Report in 2011, irrigated farms have higher fixed and financial costs than dry land farms, as the irrigation system requires a significant initial investment. Hence irrigation is used mainly by commercial farmers who have access to financing.[59] The implementation of efficient irrigation systems will increase yields and reduce climate change risks, particularly in areas susceptible to drought. According to the survey interviews, small-scale farmers do not consider dependency on rainfed agriculture to be a challenge (around 75 percent of farmers reported that there were sufficient rains to support growth through the season with the rest reporting excessive rains, a dry spell and late rains).

Post-harvest, packaging and storing

Commercial farmers use mechanical threshers to harvest soya bean, which is less labour-intensive and prevents post-harvest losses. The threshing methods for small-scale farmers are to either hit the beans with sticks or drive a tractor over the beans. Both methods are destructive and result in high bean breakage and high post-harvest losses. Threshing with a stick is a labour-intensive practice and sometimes farmers must hire extra labour to supplement family labour.

Small-scale farmers pack the threshed and cleaned soya beans by hand into 50 kg polythene bags and then stack them on raised wooden platforms.[60] The bags are sourced from the various suppliers at district central markets. On average, each bag costs about ZMW 4 (USD 0.24). Most small-scale farmers store the packed soya beans at the homestead, sometimes inside the house where they reserve one room for crop storage. Others have dedicated storage around the homestead. However, this storage is only for a short time until the crop is sold. Most large-scale commercial farmers have on-farm storage facilities such as metal silos which they use for on-farm aggregation before conveying the crop to the market.

Knowledge-based services

Generally, farmers have free access to information, knowledge and skills on farming provided by the

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[59] Southern Africa Trade Hub. 2011. Soyabean Value Chain Technical Report. Submitted by: AECOM International Development. Submitted to: USAID/Southern Africa.

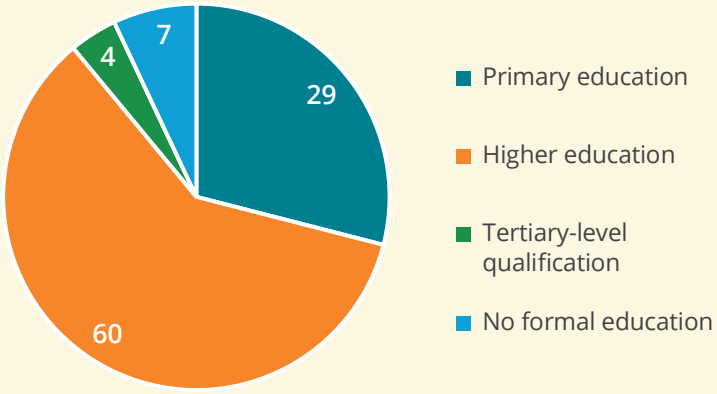
[60] Ministry of Agriculture. 2019. Soya Beans Production Manual. https://www.agriculture.gov.zm/integratedportal/?wpfb_dl=239

public agricultural extension advisory system of the Ministry of Agriculture.[61] There are about 2 400 public extension officers in Zambia. The ratio of extension officer to farmer is 1:1136 the FAO recommended standard is 1:400.[62] Knowledge and skills are disseminated through farm schools, farmer field days, farmer training programmes, on-farm trials/demonstrations and through radio transmitted by a Ministry of Agriculture radio network service working in collaboration with the Zambia National Broadcasting Service (ZNBC). During farmer meetings, extension officers train farmers in agronomic practices, livestock management, farm business management, nutrition and home economics. NGOs partner with public extension systems to deliver specific subject matter knowledge and skills relevant to their particular interests. However, the current extension services provided to farmers are not up-to-date, particularly on soya bean, which has been an emerging crop in recent years. The private sector extension system is very limited. A few agricultural businesses employ extension officers to provide after-sales support services.

Box 6 **Education levels of the farmers in the three provinces**

The education levels indicate that the majority of farmers (93 percent) are literate with a good school education. The majority of farmers, both female and male, have attained a high school education. Out of 90 farmers interviewed, only 7 percent reported not having attended any formal education. Twenty nine percent (29 percent) had attended primary education, 60 percent had attended high school and 4 percent had a tertiary-level qualification. However, despite the availability of basic education, farmers lacked any specialized agricultural education or had attended any agricultural training programmes. Limited technical and business knowledge remains a challenge among most small-scale farmers. Nonetheless, it is encouraging to note that given the basic school education, these farmers are capable of acquiring knowledge and growing their technical capacity. The development of any capacity building programmes should consider the current literacy and educational levels.

Figure 18 **Educational level of farmers (in percentage)**



Source: Authors' computation from survey data: FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

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61 The staff of the Department of Agriculture of the MoA are organized at national level in Lusaka, provincial level and district level. At district level, offices are subdivided into blocks and camps which form the interface with farming communities.

62 Minister of Agriculture Hon. Michael Katambo, as quoted by the Times of Zambia. 2021. More Agro Extension Officers Welcome. Times of Zambia, 1 April 2021, Lusaka, Zambia. Cited 29 April 2022. http://www.times.co.zm/?p=108313

Despite the low number of extension workers and poor funding, public extension workers remain the main source of knowledge for most small-scale farmers interviewed. On average, 80 percent of farmers interviewed indicated having obtained soya bean production knowledge from public extension workers and/or from NGOs (**Table 5**). This is to be expected as most NGOs work with public extension workers in their projects to deliver advisory services. This model has helped provide resources for public extension services to serve the small-scale farmers.

Table 7 Main sources of knowledge among small-scale soya bean farmers

Channel	Average Sale Price (ZMW / kg)	Average Transportation cost to Market (ZMW / kg)	Total Revenue (ZMW) received per tonne
Farmgate	6	0	6 000
Aggregator	10	300	10 000
Processor	12	500	12 000

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Finance

The formal financial sector in Zambia consists of commercial banks, parastatal organizations, microfinance intermediaries (MFIs) and credit-oriented NGOs that provide financial assistance to farmers. As stated by the Bank of Zambia, there are 19 international and local commercial banks registered across the country providing credit and agribusiness support services. Out of these 19 banks, only 5 have rural branch networks and agricultural credit portfolios that include soya beans. Financial inclusion was higher in urban areas at 84.4 percent compared to rural areas at 55.9 percent. In Zambia, 44.2 percent farmers are formally included while 35.8 percent farmers are informally included in the financial sector. This implies that there is a need for rural finance initiatives to empower productive capacity of farmers.

Commercial banks provide credit mainly to large-scale commercial farmers and do not lend to small-scale farmers and micro and small enterprises because of their lack of past track record with financial institutions, the absence of written records, and insufficient collateral. Furthermore, due to climate change agriculture is a highly risky economic activity. Most small-scale farmers do not have (i) resources to afford the high interest rates (ranging between 20 to 30 percent/annum) demanded by commercial lenders, (ii) collateral such as land titles[63] or assets, or legal guarantees, and (iii) financial literacy. Use of land as collateral remains an issue, with women being most affected by land tenure issues. Hence the absence of loan guarantees hinders many small-scale farmers and other small value chain actors from accessing finance. Consequently, farmers access loans, savings and insurance through mainly informal mechanisms. They also depend on their own savings, group savings and family support.

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[63] There are two land tenure systems in Zambia, customary land and state land. With state land farmers receive a Certificate of Title, which shows the ownership of land. Meanwhile, customary land is land that has been passed on from generation to generation without any title. Most small-scale farmers grow crops under customary land which cannot be used as collateral.

Box 7 **Credit access by small-scale farmers**

Out of 90 small-scale farmers interviewed, only 13 percent had access to credit. In order of importance, farmers responded that the poor access to finance was due to (i) high interest rates, (ii) lack of awareness of credit availability, (iii) desire to avoid risk of defaulting on a loan because of crop failure – farmers fear failure to repay bank loans due to the high-risk nature of agriculture production which may result in forfeiture of their collateral. Additionally, limited financial knowledge and absence of basic financial documentation are constraints on farmers in preparing business plans, and completing loan applications.

Source: FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Recently, banks have developed initiatives that allow farmers to access credit as a group and/or to receive loans in kind rather than cash. Group lending arrangements have proven to function better for both loan recipients and lenders. Also, receiving credit in the form of inputs rather than cash reduces the chances of misappropriation of resources, but is often localized and tied to few crops/commodities.

Credit tied to inputs is usually offered by outgrower schemes by SMEs and/or NGOs. Moreover, inputs delivered by credit institutions and suppliers can reach the farm too late. Several small microfinance institutions and NGOs try to bridge the gap left by commercial banks in the lending sector. However, the majority do not have the capacity to manage extensive credit components for rural-based farmers.

While microfinance institutions (MFIs) in Zambia do not constitute the primary source of agricultural credit, a limited number of them do engage in activities within the agricultural sector (listed below). MFI's loans are generally denominated in the local currency and come with elevated interest rates that fall within the range of 35 to 75 percent or 6 percent a month. These loans are predominantly backed by movable assets and group guarantees, although larger loans necessitate the inclusion of immovable assets as collateral.

In many rural areas, farmers belong to informal finance groups that operate small-loan lending services, usually payable within a growing season with much lower interest rates set by the group members. The uptake of informal financial products/services decreased to 32.3 percent in 2021 from 37.9 percent in 2015. This was mainly attributed to higher usage of formal mobile money services.

There has not been much progress in discounting interest rates for agriculture or for SMEs in the sector. Efforts targeted at the agricultural sector are mainly focused on increasing access to finance and risk sharing, such as:

- Zambia National Commercial Bank (Zanaco), in partnership with the European Investment Bank (EIB) launched the Agricultural Investment Initiative in April 2022. This seven-year initiative aims at improving agricultural productivity and upgrading agricultural processing. The European Union will back a risk-sharing facility to enhance smallholders and agricultural companies' access to finance. The total budget for this seven-year initiative is EUR 30 Mn, including EIB loan to Zanaco for a EUR 15 Mn credit line. Under the initiative, Zanaco will provide eligible clients with financing in ZMW, USD and EUR that will unlock investment that strengthens the overall competitiveness of Zambian agriculture. The Frankfurt School of Finance & Management will support Zanaco in further strengthening their agricultural lending capabilities and enabling agricultural companies led by women and female smallholders to better access the new financing.
- The First National Bank (FNB) in 2023 launched a business growth initiative that will provide SME's with support to help fuel economic diversification in the country. The initiative sees the bank setting aside 5 billion ZMW for lending to the private sector, 2 billion ZMW of which is targeted at the sectors encompassing SMEs.
- Stanbic bank offers need-based agricultural loans of varying terms to clients engaged in the farming of staple as well as cash crops, horticulture, plantations, poultry, animal husbandry, dairy, seeds and warehousing. Facilities may

be offered after credit due diligence is done on the farming entity. The bank also finances the supply of a wide range of agri-input products like seeds, fertilisers, pesticides, micronutrients and irrigation equipment. It has identified the transportation, storage and processing of food and other agri-commodities as focus areas and offer working capital and term loans with varying terms to eligible processors, based on their financials and the strength of the underlying commodities. The target is mostly medium to large enterprises.

- The AB Bank Zambia (ABZ) is a commercial bank dedicated to financing MSME, including rural population and women. With the support of the Smallholder Safety Net Upscaling Programme (SSNUP) of the Appui au développement autonome (ADA), the bank launched the Digital Rural Finance Initiative in 2022, targeting five value chains which includes soya bean. ABZ has developed crop cards for automated loan assessments The initiative comprises of the following multifaceted product offering using the bank's operational mobile wallet platform "eTumba": (i) Savings product for specific goals (education, healthcare, productive investment); (ii) Village banking and women's savings group to support women in rural areas; (iii) Digital loans to farmers and rural entrepreneurs to support investments in rural activities; (iv) Rural Business Management App that supports MSME in urban and rural areas plus small-scale farmers in managing their business efficiently and receiving appropriate financial education.
- Zambia Credit Guarantee Scheme (ZCGS) was established in September 2017 to promote growth and competitiveness of SMEs through providing a platform for financial institutions to offer affordable financial products and services at reduced risk. The scheme, not yet active, will contribute to the growth of the SME sector by providing guarantees to the providers of finance.[64]
- Citizens Economic Empowerment Commission (CEEC) is a statutory body under the Ministry of Small and Medium Enterprise Development (MSMED), offering concessionary capital to SMEs with soya bean being included among the targeted value chains. In early 2023, the government has increased the citizens empowerment fund from 365 million ZMW in 2022 to 377 Million ZMW to fund economic empowerment initiatives for the year.
- Development Bank of Zambia (DBZ) has a flat rate for their loans regardless of the sector and enterprise level.
- Others: World Vision operates VisionFund, a credit service with substantial outreach, and manages a viable credit component for rural farmers. Agora is another notable NGO providing credit to small-scale farmers and operating in most rural areas of Zambia.

The government launched the Land Titling Programme in 2014 with the aim of issuing Certificates of Title to landowners. This programme improves the access to finance for smallholder farmers by allowing them to use their land as collateral (banks do not allow customary land without a title to be used as collateral).

1.7 Enabling environment: societal elements

This section provides an overview of the wider space in which actors operate and interact to conduct business along the value chain. It explores policies and institutions, value chain governance and profit margins among actors, and physical infrastructure and socio-cultural norms that affect and influence the functioning of the value chain.

Policies, institutions and legal framework

Among other policy and strategy documents, Zambia's agricultural sector is guided by the Second National Agriculture Policy (SNAP) 2012–2030,[65] the Comprehensive Agricultural Transformation and Support Programme (CATSP) which is Zambia's Second National Agricultural

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64 Zambia Credit Guarantee Scheme Lmites. www.zcgs.co.zm/index.php/who-we-are/

65 SNAP primarily aims to develop the agricultural sector in Zambia and encompasses key facets of the agriculture sector, namely; food and nutritional security, agricultural production and productivity, agricultural diversification, agricultural research and extension services, sustainable resource use, promotion of irrigation, agro-processing and value addition, agricultural marketing and trade, livestock and fisheries development.

Investment Plan (NAIP II),[66] and the Eighth National Development Plan (8NDP). Additionally, during the Dakar 2 Summit in January 2023, the President of Zambia submitted the Country Food and Agriculture Delivery Compact, which included soya bean as one of the prioritized crops with a goal to reach 1 million MT produced by 2027.

The 8NDP sets out Zambia's strategic direction, development priorities and implementation strategies for the period 2022 to 2026. This plan is a successor to the 7NDP that was implemented over the period 2017 to 2021 and the fourth in the series of National Development Plans (NDPs) towards the national Vision 2030 in which Zambians aspire to live in a prosperous middle-income nation. As the penultimate plan, the 8NDP[67] will play a pivotal role as a building block towards the attainment of the national vision. Although these policies and strategies are explicit about promoting crop diversification, policy implementation has continued to favour maize production and marketing more, as evidenced by government's continued lopsided expenditure in the maize subsector compared to other crops.

The CATSP has been designed in response to both national, continental and international aspirations for the agricultural and agribusiness sectors in general and the agri-food system in particular. From the national perspective, the CATSP is fully aligned to the Eighth National Development Plan (8NDP) and the Republic of Zambia Vison 2030. Through increased production and productivity, the Programme seeks to achieve the following: (i) increased food security; and (ii) improved nutrition; (iii) increased job opportunities; (iv) increased agricultural exports; (v) reduction in food imports; and (vi) increased incomes and wealth creation opportunities. The CATSP has included soya bean as a prioritized commodity and has set key targets such as: (i)To increase annual soya bean production to 1 million MT by 2027; (ii) increasing smallholder farmers' yields to 1.55 tons/ha; (ii) increasing commercial farmers' yields to at least 3.2 tons/ha; and (iii) significantly increasing crushing capacity.

Zambia's Farmer Input Support Programme (FISP) was first introduced in 2001 as the Fertilizer Support Programme (FSP). Under the FISP, the government distributes subsidized agricultural inputs to small-scale producers of the staple food crop, maize. It also provides a guaranteed minimum price at which the Food Reserve Agency (FRA),[68] buys maize, cassava and sorghum from farmers. In 2022, due to an overproduction of soya bean, the government intervened and mandated the FRA to buy soya bean from farmers (which they did at 11 Kwacha per kg). However, as of 2023, the government's priority is to maintain sufficient stock to ensure food security. Therefore, the government has not approved soya beans as one of the crops that FRA buys at a minimum rate. The FISP has multiple stated objectives, including 1) increasing smallholder maize yields and overall production, 2) reducing poverty, and 3) promoting food security and enhancing rural incomes. In 2017[69], the government included a legume subsidy in the FISP – providing seeds and fertilizer for soya bean, groundnuts and sorghum – to selected beneficiaries. This measure contributed to increasing the number of newcomers to the soya bean sector, although the value of the subsidy for legumes is a small fraction of the maize subsidy and only available to a few selected farmers, thus limiting its impact on small-scale crop diversification.

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66 The CATSP is Zambia's Second National Agriculture Investment Plan (NAIP II). It succeeds the First National Agriculture Investment Plan (NAIP I) which was implemented from 2014 to 2018.

67 The Eight National Development Plan (8NDP) 2022–2026 focuses on value addition in agriculture, mining and manufacturing with strong local forward and backward linkages. Further, focus will also be placed on the development of MSMEs across all sectors as they have high income and job creation potential. The economic transformation agenda will be led by the private sector while the government will provide an enabling and supportive environment through the delivery of requisite policies, regulations and infrastructure. These interventions will result in increased productivity and the creation of socioeconomic transformation for improved livelihoods and employment opportunities, especially for the youth and women.

68 The FRA was established by the GRZ in 1995 to manage the National Strategic Food Reserve. FRA's functions are: (i) market and trade a designated agricultural commodity; (ii) purchase, import, sell, trade or export a designated agricultural commodity; (iii) establish, manage, lease and maintain a storage facility and equipment to be used in relation to a designated agricultural commodity; (iv) collect information related to the marketing of a designated agricultural commodity; and (v) advise the Minister on matters relating to the National Strategic Food Reserve. FRA supports small-scale farmers in rural areas

69 During the field mission, 27 percent of farmers interviewed indicated that they had received FISP support in the previous years to grow soya beans and reported that the yields were better because they had access to key inputs (seed and fertilizer).

The Ministry of Agriculture is in the process of revising the FISP to make it more efficient in terms of delivery and targeting, as stated in Zambia Farmer Input Support Programme and Recommendations for Re-designing the Program. The government is also considering striking a balance between the traditional physical delivery of inputs (seed and fertilizer) and using the FISP e-Voucher system. The 'E-voucher' programme is an effort by the Zambian Government, supported by Musika, which aims to improve the distribution of subsidised inputs to smallholder farmers. The current plan of government is to move from an 80/20 split of the programme between the traditional FIS and e-vouchers in 2020 to 60/40 in 2021, 20/80 in 2022 and 100 percent e-voucher by 2023. Whatever the eventual decision on the split each year, it needs to be based on evidence from an objective evaluation of readiness in each region.

The soya bean value chain falls within the mandate of the Ministry of Agriculture (MoA), in the crops department. Zambia does not have a specific soya bean policy or strategy yet, and several government policies and regulations continue to hinder the growth of the sector, the frequent imposition of bans on soya bean grain export being the most precarious. However, the government recognizes the potential of the crop to contribute to the country's agricultural diversification agenda, income growth, job creation and foreign exchange earnings, and has thus been devising and implementing policy interventions to improve the value chain. **Table 8** below shows some of the key policy and regulatory challenges and some of the interventions being implemented to address them.

Table 8 **Key policy and regulatory challenges in the soya bean subsector**

Policy	Challenge	Impact on Value Chain	Interventions being implemented
Trade	Unpredictable and opaque export and import restrictions	• Value chain actors such as traders and processors unable to devise investment strategies due to trade policy uncertainty. • Zambia's exports are less competitive due to erratic supply. • Market share for Zambian exports shrinking and taken over by other more reliable competitors.	• Government has committed to enhancing trade in agricultural commodities with neighbouring countries by keeping borders open when the country has surplus output. Government has continued to issue export quotas for soya bean.
Palm oil import policy	Palm oil imports from Kenya and the United Republic of Tanzania enjoy duty-free status under the COMESA agreement, although some of it is alleged to originate from East Asia, e.g., Malaysia and Singapore, thus flouting the COMESA rules of origin.	• Cheap imports depress domestic prices, weaken demand for locally produced oils thus hurting local producers.	• Government through the Zambia Revenue Authority (ZRA) has intensified monitoring activities to curtail smuggling of goods, including edible oils, in the country from the region and overseas.
Maize centred policies	Policies such as input subsidies (seed and fertilizer) under the FISP and output subsidies through above-market price setting by the FRA incentivizes maize production countrywide.	• Crop diversity is impeded as farmers respond to incentives by focusing on maize at the expense of other high value crops such as soya bean.	• The government modified the FISP to include a subsidy for legume inputs including for soya bean. This is meant to enhance small-scale crop diversification. The government also provides a market for soya bean through the FRA.
Value added tax (VAT) on edible oils	There is a 16 percent value added tax on edible oil produced in Zambia, which producers pass on to consumers. However, imports from East Africa are not subject to VAT in the country of origin, and are therefore landed cheaply in Zambia, undercutting the local products.	• Consumers prefer imported edible oils owing to the low price compared to locally produced oils. This affects the demand for local oils and negatively affects market shares of local processors.	• Stakeholders continue to rally government to remove VAT on edible oils.

Source: Authors' elaboration.

Among the reasons for low domestic edible oil production are high production costs, such as the value added tax (VAT) on edible oil, which makes Zambian edible oils less competitive than imports. In addition to the relatively high cost of soya bean production inputs, soya products, including edible oil, are subject to the standard VAT of 16 percent, making the locally produced cooking oil more expensive than imports from countries such as Kenya and the United Republic of Tanzania, which have removed VAT on edible oil. Thus, the demand for imported oil has surged, and as a result, edible oil smuggling into Zambia has been on the rise. There is a demand from some stakeholders to protect the sector from cheaper imports which are more competitive than locally produced products. There have been reports of palm oil imports from Kenya and the United Republic of Tanzania which is disguised as vegetable oil. These products enjoy duty-free status under the COMESA agreement, although some of it is alleged to originate from East Asia, e.g., Malaysia and Singapore, thus flouting the COMESA rules of origin.[70] In an attempt to protect the local industry, the government introduced an import duty of 25 percent on processed oil or ZMW 4/kg (USD 0.24/kg), whichever is greater. However, this resulted in skyrocketing domestic prices of edible oil, compelling government to suspend the import duty. However, crude oil remains duty-free but attracts the 16 percent standard VAT.

Another key reason is the inconsistent export policy (where government has at times imposed a total ban on soya bean cake and soymeal) which limits the market for soya bean cake, a by-product of edible oil production. Given that cake is more valuable than edible oil, processors are only willing to produce edible oil when they have a ready and favourable market for soya bean cake and soymeal.

I**mport Tariffs.** As stated earlier, Zambia imports edible oils to fill the domestic supply gap. Domestic edible oil producers have been advocating for the removal of the 16 percent VAT to help reduce consumer price of locally produced oils and ramp up demand to compete with imported oils. To help promote consumption of local edible oils, the government had imposed a 25 percent import tariff on edible oil. This resulted in a steep rise in edible oil prices, which spurred complaints from consumers. In May 2021, the government removed the import tariff via Statutory Instrument (SI) number 63 of 2021 which expired at the end of 2021, resulting in another wave of edible oil price increase.[71]

Standards and Quality. The Zambia Bureau of Standards (ZABS) is a specialized organization serving the country in the field of standardization, standards formulation, quality control/assurance, import and export quality inspections, and certification and removal of technical barriers to trade. The ZABS has recommended standards particularly in the production of products for human consumption. For example, the ZABS strictly requires that machinery used for processing soymeal for human consumption must be made of stainless steel to ensure food safety. ZABS also has standards for production machinery and equipment, which is expected to be inspected and certified.

Cooperation for development

The soya bean sector is also benefiting from donors and from International Financial Institutions through the following projects:

- The Zambia Growth Opportunities Program (ZAMGRO) was launched by the Government of Zambia in February 2023 with support from the World Bank. The USD 300 million program's goal it is to promote agricultural diversification, sustainability and jobs in the agri-food sector of Zambia.
- The Zambia Agribusiness and Trade Project (ZATP) is being implemented through the Ministry of Commerce Trade and Industry (MCTI) with support from the World Bank. The ZATP (2017-2022) aims at making investments at critical points in the agribusiness supply chain to help relax constraints related to infor-

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70 Mulenga, B.P., Banda, A., Kasoma-Pele, W. & Chapoto, A. 2021. Soyabean Value Chain Analysis in Zambia. IAPRI Working Paper 157. IAPRI, Lusaka, Zambia.

71 Government of the Republic of Zambia (GRZ). 2021. Statutory Instrument Number 63 of the Customs and Excise (Suspension) (Edible Oils) Regulations. Cited 15 May 2022. https://www.zra.org.zm/wp-content/uploads/2021/06/S.I.-No.-63-of-2021-The-Customs-and-Excise-Suspension-Edible-Oils-Regulations-2021.pdf

mation asymmetries, buyer-seller coordination and capital market inefficiencies. The project supports the formation of productive alliances between eligible farmer groups (poor and emerging farmers) and the buyers. The ZATP provides matching grants and technical assistance to implement business plans devised by the productive alliances. The project also seeks to boost growth-oriented agribusiness SMEs by investing in both their technical and productive capabilities and business management skills.[72]

- The International Fund for Agricultural Development (IFAD) funded Enhanced-Smallholder Agribusiness Promotion Programme (E-SAPP), led by the Ministry of Agriculture as executing agency, aims to increase the volume and value of agribusiness outputs sold by smallholder producers. The two components of the E-SAPP programme (USD 30 Mn over a seven-year period 2017–2023) are to create (i) an enabling environment for agribusiness development growth; and (ii) sustainable agribusiness partnerships–interventions, under which the capacity of smallholders and their service providers are built to compete for, and implement, matching grants from the E-SAPP. However, as of 2023, IFAD support in Zambia has been put on hold.
- The African Development Bank's (AfDB) USD 1.5 billion African Emergency Food Production Facility is supporting smallholders to meet the food shortfall by providing them with certified seed and technology to rapidly produce 38 Mn tonnes of food (20 Mn African farmers). With the disruption of food supplies arising from the war between the Russian Federation and Ukraine, Africa faces a shortage of at least 30 Mn tonnes of food, especially wheat, maize, and soya beans imported from both countries. The AfDB approved a USD 1.5 billion facility in March 2022 to help African countries avert a looming food crisis. This project will lead to the production of 11 Mn tonnes of wheat; 18 Mn tonnes of maize; 6 Mn tonnes of rice; and 2.5 Mn tonnes of soya beans. African farmers urgently need high-quality seeds and inputs before the planting season begins in May to immediately boost food supplies.
- The Agricultural Productivity and Market Enhancement Project (APMEP) is funded by the Global Agriculture and Food Security Program (GAFSP) (USD 31.1 Mn) to improve food production, develop value chains, and build capacity in districts with the highest levels of poverty and food insecurity. Main project interventions are the development of irrigation, aquaculture, and livestock production support, through crop diversification and intensification, through value chain development to promote agro-processing, and through agriculture service centres (including construction of three livestock service centres in Chongwe, Chitambo, and Gwemb; construction of agro-market centres, roadside markets, and access roads for local communities). APMEP also supports strong nutrition and capacity-building. APMEP Project document provides detailed information on Project objectives, expected results and activities.
- Other on-going projects are USAID funded Soya bean Innovation Lab project to improve varieties[73] and smart farming with the International Institute of Tropical Agriculture (IITA), the Zambian Agricultural Research Institute and the University of Zambia; UNICEF and WFP feeding programmes; and the Sustainable Intensification of Smallholder Farming Systems in Zambia (SIFAZ) Project managed by FAO.

Physical infrastructures

Transportation is another important support service, provided almost entirely by the private sector. Transporters help move inputs from manufacturers and marketers to distribution centres across the country, including in rural areas where SMEs act as agents for input suppliers. Following purchase by aggregators and assemblers, transporters also help move soya bean from rural areas to processors in Lusaka, Central and Copperbelt provinces. Further, transporters help

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72 Zambia Agribusiness and Trade Brief, World Bank, 2022.

73 The Soya Bean Innovation Lab has a project where they acquire varieties from seed companies all over South America (in regions with a similar agricultural zone to Zambia) and test them in Zambia. If the tests are successful, they are also involved in encouraging local seed companies to license the variety from the producing seed companies (breeder).

transport processed soya-based food products to wholesale and retail outlets in various parts of the country. Transporters also transport livestock and fish feed from processors to various distribution points across the country, mostly by road. Heavy reliance on road transport exerts significant strain on road infrastructures. There is a need for Zambia to rehabilitate and revamp its rail transport system for transportation of goods across the country and to neighbouring countries. Zambia's railway systems network has been operating at a sub optimal level compared to its capacity due to (i) lack of integration among railway companies within the region who have opted to operate as autonomous entities; (ii) declining levels of railway traffic due to deregulation of road transport in the region, due to high fixed costs, low investments in rail track infrastructure, working capital and rolling stock.[74]

Over the last 10 years massive infrastructure development in Zambia, mostly in roads and telecommunication, has led to improvements in communications and transport. However, infrastructure development has been skewed towards the urban regions, whereas the rural regions, where the bulk of soya bean production takes place, remain underserved. There have been fewer resources allocated to rural infrastructure development projects. However, the United Party for National Development (UPND) government, which came into power in August 2021, has been making efforts to attract investment in rural infrastructure. In October 2021, the government received financial support to the sum of USD 200 Mn for rural road construction to support rural agricultural development.

Limited infrastructure has led to low value addition as the **private sector is reluctant to invest in soya bean processing in rural areas due to high transaction costs caused by poor infrastructure**. The poor state of rural infrastructure, where it exists, negatively affects agricultural production and consumption of various processed agricultural products, has knock-on effects on employment creation for the youth in rural areas, and on consumption of soya bean processed products. Therefore, the few traders who take the risk of operating in remote areas with bad roads tend to set the buying price, which is usually lower than the market price, even after accounting for transport costs. This has compelled farmers located in remote areas to travel long distances in search of markets with favourable prices. This increases their transaction costs and reduces farmer income.

As Zambia is landlocked, the country has no access to sea ports. Because of the high transportation costs required to get the goods to the sea port before shipping, it is expensive to trade in international markets with countries outside the region. This makes Zambia's exports, including soya bean and its associated products, less competitive in international markets. The regional market provides a better option as soya bean and its products can easily be transported by road or rail.

Energy: A sizeable percentage of small-scale farmers (SSFs) are not connected to the mains electricity grid, with the current distribution showing only 14 percent of rural households having access to electricity compared with 80 percent in urban areas.[75] They rely on the use of fossil fuels such as petrol, paraffin and diesel. Use of solar panels for farm activities such as irrigation, lighting, refrigeration, and operation of small agricultural equipment is gaining popularity in rural areas. All commercial farmers have a connection to the national electricity grid. However, during the FAO field mission survey, frequent load-shedding, undertaken by the electricity company, was cited by commercial farmers as a major problem forcing farmers to rely on diesel generators. Energy poverty in rural areas is a major discouraging factor for potential investors in processing facilities in these areas because electricity supply is unreliable in cases where it is available. Investment in rural processing to a scale that would make a difference requires a stable electricity supply.

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74 Kasoma C Albert. 2019. Analysis ff Zambia Railway Sector -Structural Deficiencies & the Way Forward. https://www.researchgate.net/publication/334465926_ANALYSIS_OF_ZAMBIA_RAILWAY_SECTOR_-STRUCTURAL_DEFICIENCIES_THE_WAY_FORWARD

75 FAO, European Union & CIRAD. 2022. Food Systems Profile – Zambia. Catalysing the sustainable and inclusive transformation of food systems. Rome, Brussels and Montpellier, France.

FAO. 2021. Soya Bean Value Chain Diagnosis Household Survey.

Telecommunications and digital technology: At the inception of the seventh government in August 2021, Zambia established the Ministry of Technology and Science to promote the use of Information, Communication and Technology (ICT) to enhance economic growth and social inclusion. The ministry oversees the operations of three major telephone operators that include Zamtel, a government parastatal, and two private operators: MTN and Airtel. According to GSMA intelligence statistics, as of 2022 Zambia has 18 Mn mobile connections. Mobile connections were equivalent to 91.4 percent of the total population. However, people may make use of more than one mobile connection. As of 2022, Zambia had at least 5 Mn internet users indicating that 70 percent were offline. From the perspective of affordability, Zambia is listed at the lower end of the spectrum in the SADC region. However, when mobile services are benchmarked against other regions, telecommunication services in the SADC region are considered expensive and of poor quality.

Socio-cultural norms

Access to rights: As a member of the United Nations, Zambia provides for basic human rights such as access to water, land, education, health and safe working conditions for all its citizens. Land is the single most important factor for production, not only for soya bean but for other agricultural products. Zambia has a dual land administration system comprising a customary land system that administers 60 percent of land issues and the statutory land system (where land titles are given) that administers an estimated 40 percent of land issues.[76] As most small-scale farmers are located in rural areas under the traditional authorities, many of them have farm permits granted by traditional leaders under the customary land tenure system rather than land titles. The majority of large-scale commercial farmers have titled land and have

Zambia provides for basic human rights such as access to water, land, etc.

legal claim to it. Although no official statistics exist on the percentage of soya bean farmers that have land titles, the fact that the majority of soya bean producers are rural-based and small-scale implies that most of them cultivate on customary land, without title. Based on the Rural Agricultural Livelihoods Survey of 2019 only about 12 percent of smallholders reported having titled land, up from 9.8 percent in 2015.[77] [78]

Socio-cultural norms. Soya bean is still a relatively new crop for most small-scale farmers, having been a predominantly large-scale commercial farmer led crop about a decade ago.[79] [80] The crop has been gaining popularity among the small-scale farmers owing to its favourable price compared to maize. Soya bean also has lower input requirements than maize, allowing farmers to realize higher profits. Furthermore, the rising demand from the booming poultry and aquaculture sectors has been driving up soya bean prices to the benefit of producers and

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76 Honig, L. & Mulenga, B.P. 2015. The Status of Customary Land and the Future of Smallholder Farmers Under the Current Land Administration System in Zambia. IAPRI Working Paper No. 101. IAPRI, Lusaka, Zambia.

77 IAPRI. 2019. Rural Agricultural Livelihood Survey Data.

78 Samboko, P.C. 2017. Land Institutions in Zambia: Evolution and the Determinants of the Extent of Land Titling. IAPRI Working Paper No. 122. IAPRI, Lusaka, Zambia.

79 Mulenga, B.P., Banda, A., Kasoma-Pele, W. & Chapoto, A. 2021. Soyabean Value Chain Analysis in Zambia. IAPRI Working Paper 157. IAPRI, Lusaka, Zambia.

80 Munguzwe, H., Chilese, C., Bernadette, C., & Mukwiti, M. 2014. Soya bean Value Chain and Market Analysis. International Labour Organization.

processors. The export market has also added to the demand, with soya bean cake and grain exports creating market opportunities for private traders who purchase the crop from small-scale farmers to meet their export contracts. These dynamics have culminated in rising demand making soya bean production an attractive enterprise as a cash crop. It is common in Zambia's rural areas to find men heavily involved in the production and marketing of cash crops. The case is not different for soya bean, where men are heavily involved in marketing, whereas women and children are mostly involved in production through provision of labour.

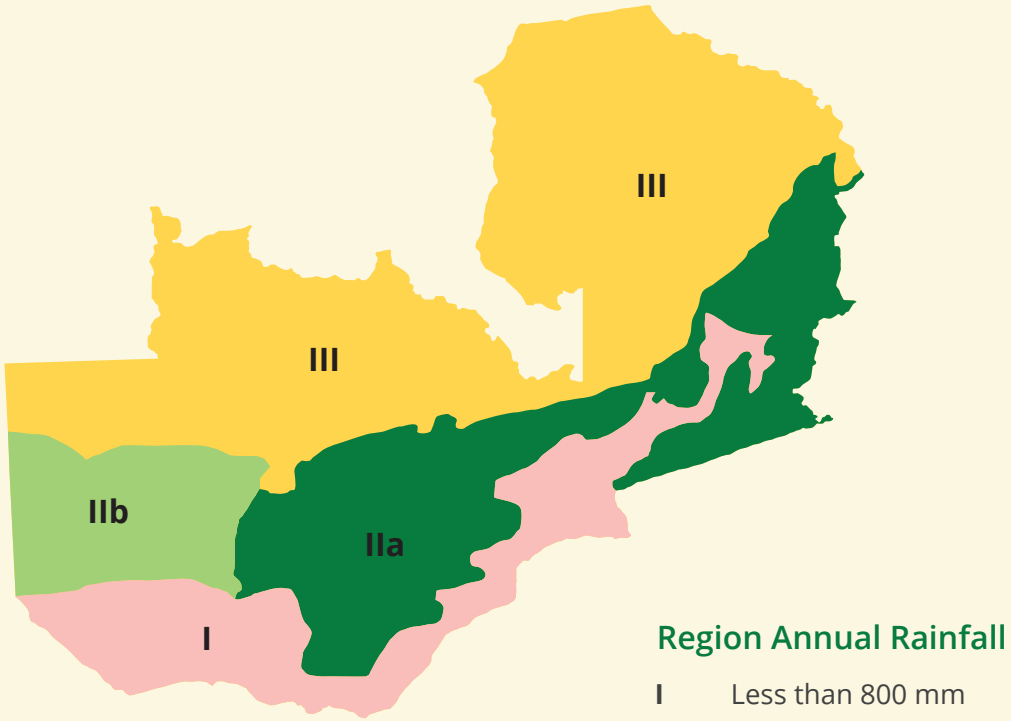
1.8 Enabling environment: Natural elements

Climate

As the majority of farmers operate on a small scale, relying almost entirely on rainfed production, Zambia's agricultural sector is vulnerable to climatic shocks such as droughts. Zambia is divided into three agro-ecological zones, based mostly on rainfall, soil and other climatic characteristics. **Figure 19** below shows the agro-ecological zone map for Zambia.

- **Region I covers the Southern, Eastern and Western provinces**, mostly in the valleys bordered by hills and escarpments. Region I has semi-arid features, with average seasonal rainfall ranging between 600 mm and 800 mm. The growing season is relatively short lasting for 80 to 120 days, with poorly distributed rainfall characterized by intraseasonal dry spells. This presents a risk for crop production due to moisture stress. Crop yields from land without irrigation are thus lower here than in regions II and III. The dry conditions characteristic of the region are not suitable for soya bean production, as they present a challenge for the vegetative growth during the initial growing stage. Major crops grown in the region include sorghum, finger millet, maize, groundnuts, and cowpeas. Most of these are drought-tolerant and thus suitable for the conditions, with the exception of maize. The very limited soya bean in the region is grown mostly by small-scale farmers.
- **Region II covers the Central, Eastern, Lusaka and parts of the Southern provinces of the country.** The region has an average growing season rainfall of 800 mm to 1 000 mm; although dry spells (not as severe as in region I) are common, rainfall is relatively well distributed across the season. The region has the most fertile soils in the country and has thus attracted many commercial large-scale farmers producing a variety of crops, including soya bean. The growing season in the region averages 100 to 140 days and conditions are suitable for soya bean production among other crops. The bulk of soya bean in the country is produced in region II by both small-scale and large-scale commercial farmers. This region has the highest concentration of commercial farmers, many of them involved in soya bean production.
- **Region III covers the northern region of the country including the Northern, Luapula, Muchinga, Copperbelt, Northwestern and parts of the Central province.** The region is characterized by high rainfall, with an average seasonal rainfall above 1000 mm, and a longer growing season of between 120 and 150 days. As a result of the high rainfall, soil leaching is common in the region leading to low soil pH, which has in turn resulted in acidic soils. The high soil acidity levels result in fewer soil nutrients, so making the soil less suitable for crop production, including soya bean. Stakeholders have been advocating for the e-voucher system of delivering the FISP to allow farmers to access inputs to address the high acidity of the soil, rather than being restricted to seed and fertilizer. The need of some farmers in region III for such inputs is greater than for fertilizer and an e-voucher system could help them to access the most appropriate input. Cassava, millet, maize, sweet potato, pumpkins and mixed beans are the most prevalent crops in the region. Soya bean production is very limited and mostly concentrated in the southern half of the region in Central province.

Figure 19 Agro-ecological regions of Zambia



Source: Chikowa, R. 2021. Description of cropping systems, climate and soils in Zambia. Global Yield Gap Atlas. Cited 12 May 2021. https://www.yieldgap.org/zambia

Agro-ecological regions I and II in the western and southern parts of the country are the worst hit by water-related stress caused by droughts. Similar to the projections by the Intergovernmental Panel for Climate Change, projections suggest that Zambia will become drier in the southern and western regions of the country, and water availability will decrease by 13 percent by 2 100 due to temperature increases and rainfall reduction.[81] Soya bean production by large-scale commercial farmers involves high use of irrigated water, which contributes to high water demand. If not managed sustainably, irrigation could lead to significant water resource scarcity.

Small-scale farmers lack the capacity, resources and financial assistance to adapt to climate change. The World Bank has assessed the impacts of a suite of Climate-Smart Agriculture (CSA) practices on achieving the sector goals and on household welfare. The report concludes with recommendations and proposals for future CSA investments, including soya bean.[82]

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81 Hamududu, B. H., & Ngoma, H. 2019. Impacts of climate change on water availability in Zambia: Implications for irrigation development. Environment, Development and Sustainability. 22(4): 2817–2838.

82 World Bank. 2019. Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/31383 License: CC BY 3.0 IGO.

Soils

Zambia has a wide variety of soils across the agro-ecological zones and regions, ranging from sandy to clay and acidic. Soils commonly found in region I include slightly acidic loamy and clay soils with loam topsoil, and acidic sandy soils. Most of these soils, coupled with the dry conditions of the region, present a challenge for crop production. Some of the major challenges are soil erosion, minimal soil depth, especially in hilly areas, poor physical properties that make it difficult to till especially on cracking clay soils, crusting, and low water-holding capacities in sandy soils.[83] In region II, the most prevalent soils are red to brown clay and loamy soil types that are moderately to strongly leached. A number of soil physical characteristics present a challenge for crop production. These characteristics include the following: shallow rooting depth; low water-holding capacity, and top soils prone to rapid deterioration and erosion; low nutrient reserves and retention capacity; phosphorus-deficiency; acidity; and low organic matter and nitrogen content. The soils in region II are highly acidic due to leaching caused by excessive precipitation and are low in nutrients; this presents a challenge to crop production.

Forests

In Zambia, forests cover about 60 percent of the total land area, making it one of the most forested countries in Africa. However, since the 1990s the country has been experiencing significant deforestation due to agricultural land expansion, urbanization, charcoal production, unsustainable fire management and timber extraction, among others.

Deforestation in Zambia is linked to expansion in areas under maize cultivation resulting from the FISP programme, as well as from increases in the production of oil crops such as soya bean, groundnuts and sunflower. This increase in production has been driven mostly by the changing diets and rising incomes in urban areas that have led to the rise in demand for processed food and animal-based products, with crops like soya beans as an important production input.[84] Soya bean production has continued to increase, mostly driven by area expansion rather than productivity. This pattern of production growth presents a threat to forests as farmers are opening up more land to produce the crop. Although currently not a visible threat, if left unchecked, the trend could lead to deforestation and compromise the country's climate mitigation efforts.

Biodiversity

Biodiversity loss is increasingly being recognized as a potential threat caused by agricultural production systems. One of the major contributors to biodiversity loss is agricultural land expansion involving total clearing of new land for agricultural production. With regard to soya bean, as the demand for the crop continues to rise and the market remains favourable, more small-scale farmers are likely to encroach upon forests and other biodiversity habitats for the cultivation of crops. If not addressed, this biodiversity loss stemming from agriculture will consequently affect agricultural productivity and lead to further biodiversity loss as farmers will continue to expand cultivated land to compensate for the low yields. Biodiversity loss coupled with climate change presents a much greater threat to agricultural production. Thus, there is a need to devise interventions that will address this twin challenge. Climate-smart agriculture technologies and practices that are adapted to climate change and will enhance biodiversity should be promoted. Conservation agriculture, which includes practices such as minimum tillage, crop rotation, agroforestry and residue retention should be scaled up for adoption among farmers, including in soya bean production.

Water

Zambia's total internal annual renewable water resources per capita has significantly reduced to 4 237 m^3/person as of 2020, down from

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83 Chikowa, R. 2021. Description of cropping systems, climate and soils in Zambia. Global Yield Gap Atlas. Cited 12 May 2021. https://www.yieldgap.org/zambia

84 FAO, European Union & CIRAD. 2022. Food Systems Profile – Zambia. Catalysing the sustainable and inclusive transformation of food systems. Rome, Brussels and Montpellier, France.

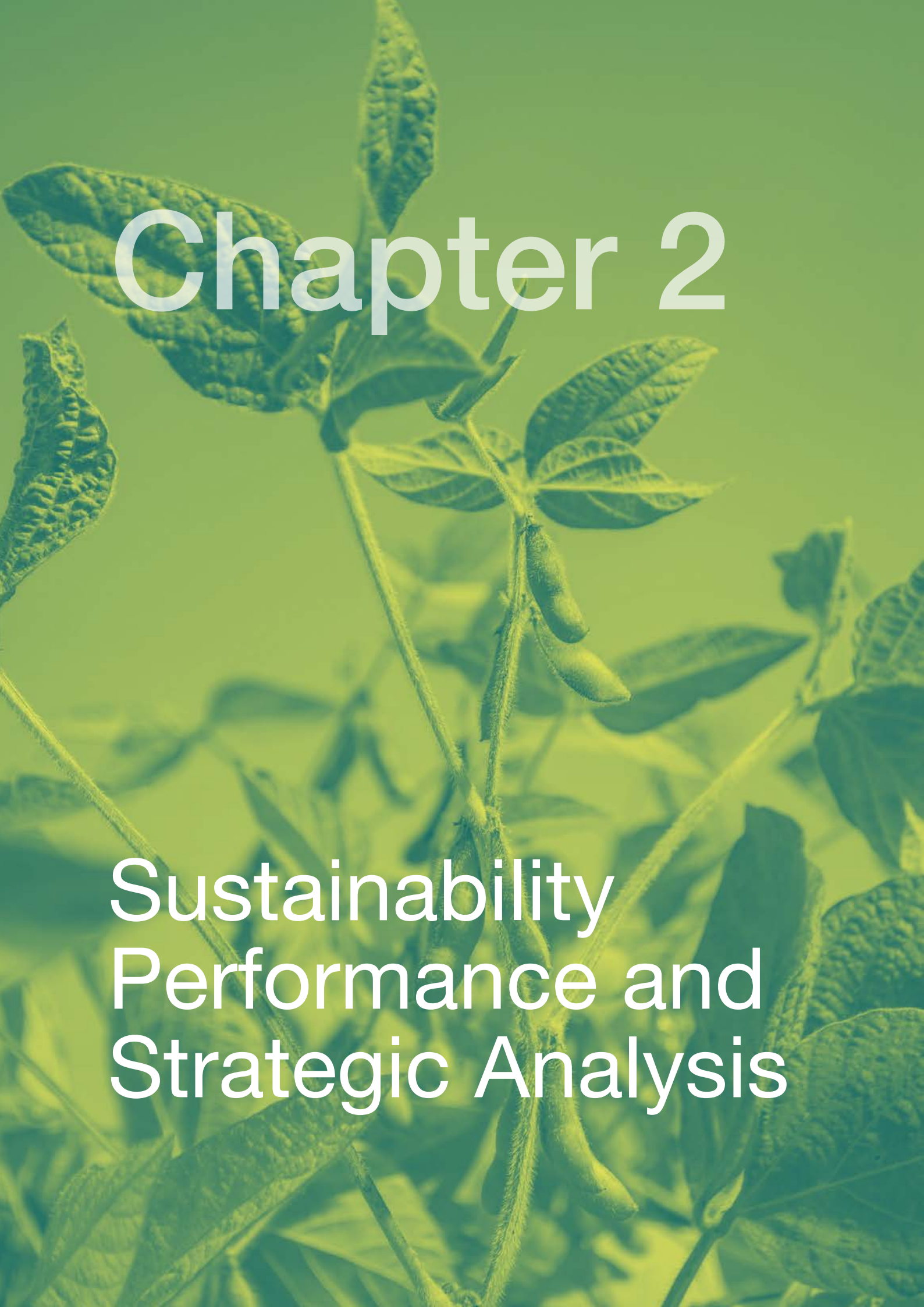
4 363 m^3/person in 2019.[85] Projections indicate that on aggregate, the changes in rainfall and temperature will reduce water availability by about 13 percent from (observed) levels of about 97 km^3 in 2022 to about 84 km^3 by the end of the century. By the middle of the twenty-first century, there will be a reduction in future availability of water resources in the Zambezi, Kafue, Luangwa, Chambeshi-Luapula, and Rufubu River basins.[86] The vulnerability of water resources is expected to increase in coming years because cumulative water demands for irrigation agriculture and other uses in future will exert significant pressure on water resources. Therefore, it is important that crop irrigation techniques that are efficient, such as drip irrigation, are promoted for adoption as a water-saving strategy but also an adaptation measure against climate change. There is also a need to promote conservation and protection of water catchment areas by ensuring that such areas are not allocated for other uses such as residential development, industrial development or farming, as was the case in the recent past.

Irrigation projects in the country typically do not have sustainability plans beyond initial support and after being handed over to communities. There is a need to create an enabling policy environment that would allow irrigation schemes to be run by the private sector and have market access opportunities, access to finance and engage in forward supply contracts with off-takers.

Promoting sustainable agriculture through drip irrigation systems in Zambia.

85 World Bank Group. 2020. Strengthening Required Value Chains in Southern Africa. Project Completion Report for the ASA; Supporting Trade, Jobs and Industrial Development in the SADC Region.

86 Hamududu, B. H., & Ngoma, H. 2019. Impacts of climate change on water availability in Zambia: Implications for irrigation development. Environment, Development and Sustainability. 22(4): 2817–2838.



Chapter 2

Sustainability Performance and Strategic Analysis

Sustainability Performance and Strategic Analysis

This chapter presents an analysis of the current state of the value chain sustainability and proposes the main strategic direction toward sustainable soya bean value chain development.

2.1 Sustainability performance

Economic sustainability

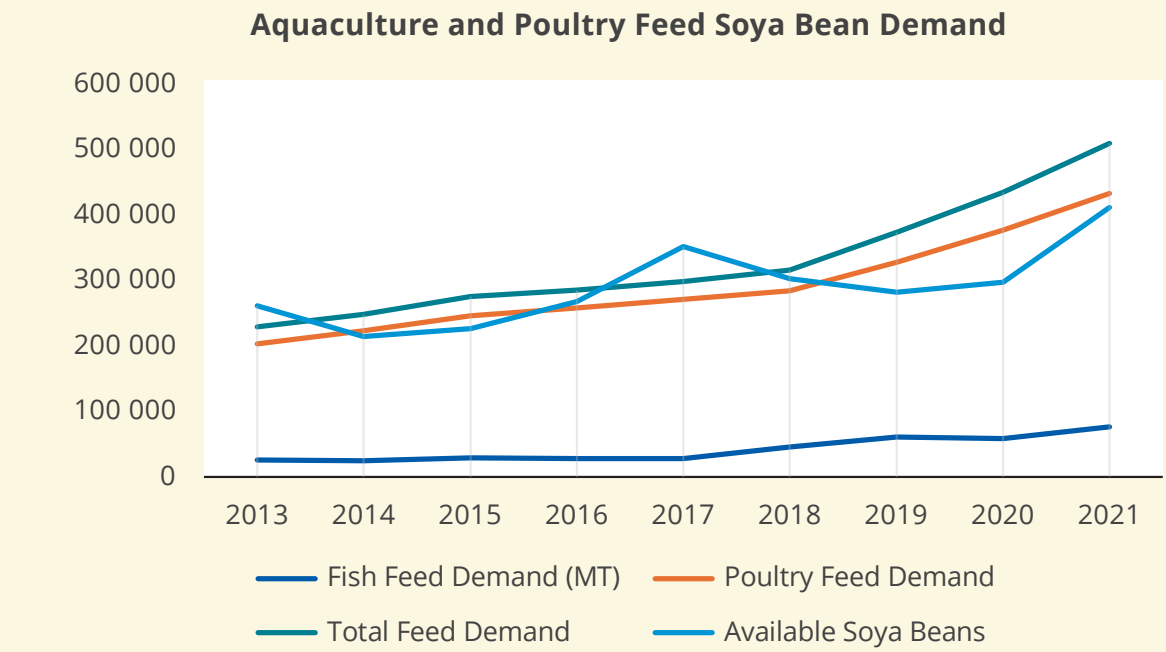
Overall, agricultural productivity in Zambia has been declining and has, among other factors, led to the agricultural sector's declining contribution to the country's gross domestic product (GDP) from 9 percent in 2010 to about 3 percent in 2021. Agricultural production is dominated by small-scale farmers who produce the bulk of agricultural produce across the 10 provinces of the country, with maize being the main crop. With regards to employment, more than 80 percent of the workforce is in the informal sector and unemployment rates in 2021 were estimated to be at 13 percent. The agriculture sector employs close to 50 percent of the total workforce, a decline from 70 percent in 2010.

Soya beans are the base for an industry worth approximately USD 830 Mn in Zambia, employing about 700 000 people along the value chain. As a key livestock feed ingredient, soya bean production and processing are set to grow in tandem with the developing livestock sector, particularly the poultry, and aquaculture sector, which are expected to continue growing in line with the projected rapid per capita income and population growth. Zambia produces about 300 000 tonnes of soya beans on average annually, generating close to USD 140 Mn for farmers, 40 percent (USD 56 Mn) of which is grown by smallholders and the balance (USD 84 Mn) by large-scale farmers. Soya bean crushers and refineries generate about USD 176 Mn from their value-added soya products, and the livestock feeds subsector generates about USD 202 Mn, with the poultry industry generating USD 312 Mn. Both soya bean cake and edible oil outputs provide a number of industries with vast potential for contributing to economic growth and poverty reduction by integrating smallholders in production.

Soya beans support a USD 830 Mn industry in Zambia, employing 700,000 people.

Figure 20 below shows recent trends in soya bean demand for animal feed production from the aquaculture and poultry sectors. Domestic production has not kept up with demand, resulting in significant growth in imports.

Figure 20 Increase of soya bean demand for feed production



Source: Crop Forecasting Survey (2013 - 2021); National Food Balance Sheets (2013 - 2021); Estimates from Aquaculture Development Association of Zambia (2022).

Please note that:

1. The soya bean production trends are from the Crop Forecasting Surveys produced annually by the Zambia Statistics Agency and Ministry of Agriculture.
2. The poultry feed demand data is from the National Food Balance Sheets that were provided by Rhoda from FAO ZM.
3. The Fish feed demand is from estimates that were provided by ADAZ.

Zambian soya bean production is competitive regionally, notwithstanding the marginal profitability of its large-scale producers. Zambia's soya bean competitiveness is due to its reasonably significant exportable volumes, a depreciated local currency, and a higher-than-average yields, which results in relatively low cost per tonne. Soya bean processing in Zambia is relatively competitive in comparison with its regional peers such as Zimbabwe, Malawi and the United Republic of Tanzania.

According to recent surveys,[87] Zambia has a very high cost of production per hectare (large-scale soya beans): USD 1 140 total cost/ha, including USD 877 variable costs. The high cost of production/ha is fuelled by the ever-increasing price of certified seeds, fertilizers and most fungicides and the general volatility of prices. Other soya bean inputs such as inoculant, fertilizers, herbicides and fungicides are imported, and their prices fluctuate when the local currency depreciates. However, Zambian smallholder soya beans are profitable (on cash cost basis) and competitive due to low cost of production. At 0.8 tonne/ha average yield, production cost per tonne is at about USD 330 (including USD 250 variable). Lower cost per tonne would make Zambian soya beans competitive in South Africa, Zimbabwe and the United Republic of Tanzania among other regional neighbours. However, frequent grain export bans imposed by

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87 Zimbabwe cost per hectare is lower at about USD 841 variable and USD 1 099 total cost; while the United Republic of Tanzania's per hectare cost is around USD 833 variable and USD 1 083 total cost.

the government every year make the soya bean value chain uncompetitive in the region.

Market support in soya beans is provided by forward contract farming offered by the main soya bean crushing companies. Product differentiation in the sector is achieved through soya oil, soya bean cake and soya chunks, which have become a popular source of protein in many households in Zambia. The inclusiveness of soya beans also extends to job creation as the industry's growth promises to create significant jobs downstream of the value chain as well as contribute towards industrialization. The soya bean value chain creates and helps sustain a total of over 460 000 jobs, including 389 000 producers, 3 000 people employed by the crushers and refineries and the 5 000 employed by the livestock feeds sector. Over 80 000 jobs have been created by the poultry sector. More jobs are expected as the aquaculture subsector grows and demands soya in its feed industry. Soya bean value chain offers potential for inclusive employment generation in the following areas: (i) mechanization creates opportunities for youth in machine maintenance and the repair businesses; (ii) development of input production and delivery services provide good opportunities for youth entrepreneurship; and (iii) development of pro-female business and entrepreneurship opportunities for the production and sale of soya-based foods in markets, particularly through small-scale processing to reduce labour.

In terms of contribution to export earnings, soya bean has continued to earn the country much-needed foreign exchange revenue, generating over USD 191 Mn over the past 10 years (2012 to 2022) from exports of soya bean and associated products.[88] Zambian soya bean and by-products have a specific competitive advantage over other products on the international market because they are not genetically modified organisms (non-GMOs). For this reason, great opportunities exist under export scenarios, particularly in the region where soya bean deficits exist. The food processing industry is also fast growing, producing several types of soya-based cheap and tasty

Zambian soya bean and by-products have a specific competitive advantage over other products on the international market

protein-rich snacks and chunks that are preferred in several countries in the Southern Africa region. Zambia's livestock feed industry has also grown to become competitive in supplying poultry and other animal feeds to its neighbours, particularly the Democratic Republic of the Congo, Zimbabwe, Malawi and the United Republic of Tanzania.

Soya bean price trends. Figure 21 below shows the price trends for soya bean for the period 2013 to 2021. The producer price is what the producers receive. The domestic market price is the price prevailing in the domestic market. The trend generally shows a consistent marginal gap between the two prices with the market price higher than the producer price. Prices have been fluctuating over the years with the lowest being in 2017 and the peak in 2021. The high price volatility across the years is mostly attributed to the supply responses from farmers, triggered by price changes both locally and in the regional and international markets. A favourable price in one season triggers a supply increase in the following season, leading to relatively lower prices.[89]

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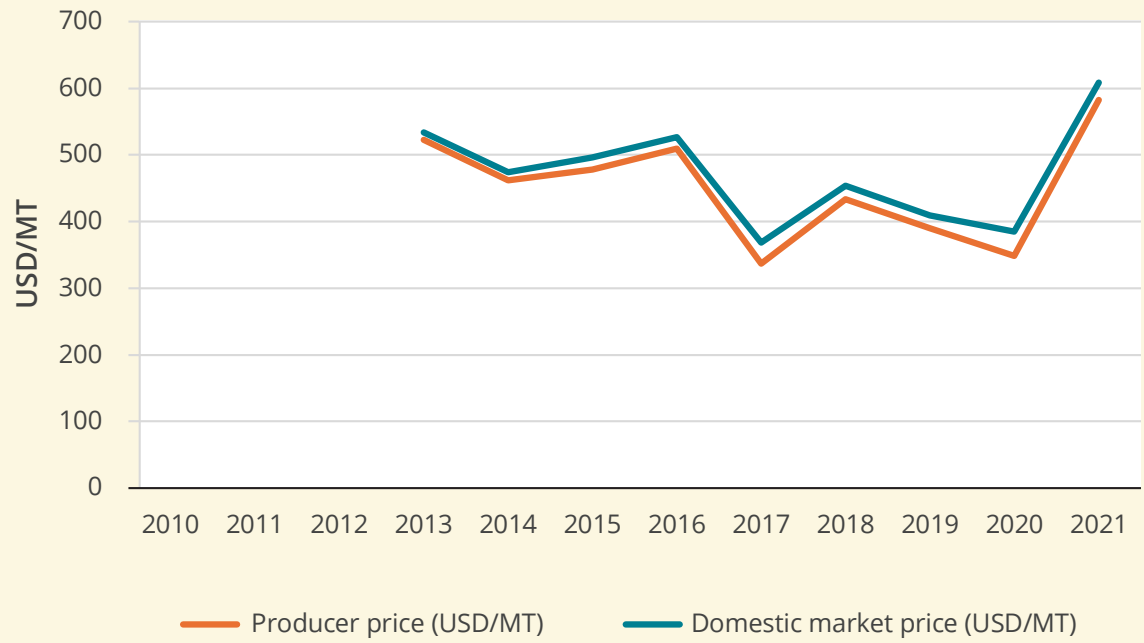
88 Zambia Statistics Agency. Various Years. Agricultural Trade Data. Zambia Statistics Agency, Lusaka, Zambia.

89 GIZ. 2021. The Dairy Value Chain in Southern Province and Groundnuts and Soya beans Value Chains in the Eastern Province of Zambia. GIZ, Lusaka, Zambia.

Figure 21 Soya bean producer and market price trends in Zambia (2013–2021)



Source: Grain Traders Association of Zambia (2010 - 2021)

Domestic versus international market price. Figure 22 below shows price trends for soya bean for the domestic and international markets. The trends show fluctuations across the years in both markets, with domestic prices remaining consistently above international levels. International prices recorded a sharp decline between 2013 and 2015, followed by a relatively stable run then a steady decline between 2015 and 2019, before increasing sharply in 2020 and 2021. The surge in prices on the international market in 2020 through 2021 was driven by several factors, including, according to USDA projections, reduced production in the United States of America as well as the late harvest for major exporters such as Brazil.[90] Domestic prices follow a somewhat similar trend with a sharp decline between 2016 and 2017 followed by a marked increase in 2018, then a sharp increase in 2019 through 2021. The sharp rise in price during this period was driven by the rising demand for soya bean on the international market, which was transmitted into the domestic market. Although Zambia does not directly export soya bean to overseas markets, Zambian soya bean is exported to countries like China through secondary export by the United Republic of Tanzania, creating a price transmission mechanism.

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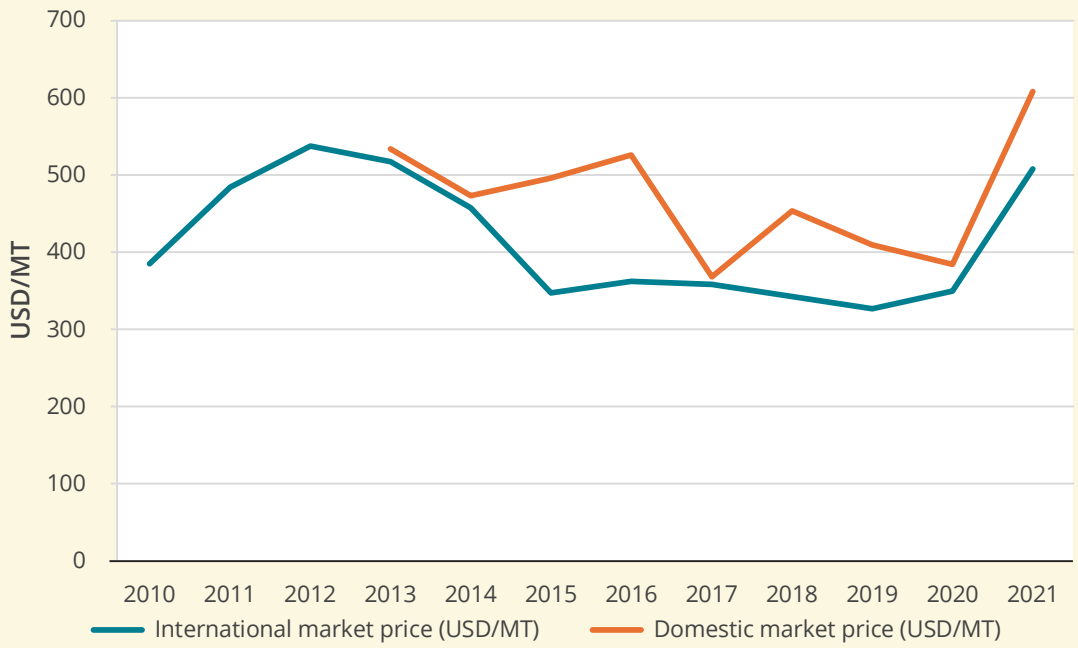
[90] United States Department of Agriculture (USDA). 2022. Oilseeds: World Markets and Trade. USDA, Foreign Agricultural Service. Cited 5 May 2022. https://downloads.usda.library.cornell.edu/usda-esmis/files/tx31qh68h/cr56p5559/ff366b377/oilseeds.pdf

Figure 22 International market and Zambia's domestic soya bean price trends (2010–2021)



Source: Statista (available on: https://www.statista.com/statistics/675817/average-prices-soya beans-worldwide/)

Social sustainability

Inclusiveness. Inclusiveness is discussed within four important areas, namely (i) distribution of share of value added, (ii) employment, (iii) poverty and vulnerability, and (iv) women and youth participation.

Share of value added: The key nodes of the soya bean value chain at which value is created are production (mainly small-scale farmers), aggregation, processing and distribution. At each of these nodes, actors add value and earn a profit margin as the product flows along the chain. Small-scale farms earn the least profit margin at 19 percent, while aggregators earn 108 percent and processors 25 percent (survey data). When considering small emerging farms, the margins are significantly higher at 42 percent, followed by processors who earn 25 percent and lastly aggregators who earn a 14 percent profit margin. Positive value distribution is more favourable for commercial farmers, processors and other players in the value chain, but maybe not good for smallholders who face the added challenges of access to profitable markets, high transportation costs, linkages to aggregation and limited storage options.

Employment: The inclusiveness of soya beans also extends to job creation as the industry's growth promises to create significant jobs downstream of the value chain as well as contribute towards industrialization. As mentioned above (see **Economic sustainability**), the value chain creates employment at every major node of input supply, production, aggregation, processing and marketing. However, there is more gainful employment potential in the downstream of the value chain, particularly in processing and product marketing where medium- to large-scale companies have made investments. Although data on wages is not available, these companies are required to meet the minimum wages and fringe benefits stipulated in the employment code of Zambia. The Zambia demographic outlook indicates that 58 percent of people reside in rural areas where agriculture is the mainstay. The rural

population is expected to continue to grow at an average rate of 2.4 percent per annum. The young population is expected to show growth in the reproductive age group (15–49 years of age) and the economically active age group (15–64 years of age). This demographic dividend implies that investing in the soya bean value chain will contribute towards harnessing the dividend by expanding income earning opportunities for women and youth.

The soya bean value chain presents opportunities for the socioeconomic inclusion of women and youth, through their participation in various segments of the value chain. Women continue to be involved mostly on the crop production side by providing labour. However, to ensure economic inclusion, deliberate interventions are needed that promote the participation of women in other more economically rewarding nodes of the value chain, such as input distribution, aggregation and processing. Field research revealed increasing involvement of the youth in aggregation of soya bean, with some of them working as agents for processors. Besides being involved directly in the value chain, youth are involved through employment, working for aggregators, and processors in the soya bean value chain. The Crushers and Edible Oil Refiners Association (CEDORA), a partner of the Ministry of Agriculture, could have a positive impact on employment conditions within the sectors of commercial farmers and traders (larger-scale and SMEs).

Poverty and vulnerability. Small-scale farmers remain the poorest and most vulnerable group in the value chain. Based on the Living Conditions Monitoring Survey estimates of 2015, rural poverty stood at 76.6 percent, against 23.4 percent in urban areas, and a national average of 54 percent. The high poverty rates among small-scale farmers implies high vulnerability to economic and biophysical shocks such as climatic shocks.[91] Being a largely rural occupation, agriculture has the potential to address this challenge and contribute towards the SDG 1, aimed at eradicating extreme poverty by 2030, by investing in value chains such as soya beans. Another segment of the value chain with immense potential for generating employment is value addition through processing soya bean into various products for consumption and industry. The activities of processing the crop, as well as in related areas of transport, storage and handling, offer numerous job opportunities along the value chain.

Food and Nutrition Security. For human consumption, soya beans are rich in protein and can be processed into shelf-stable Textured Vegetable Protein (TVP), tofu for use in kebab and locally produced snacks, and oil with potential for fortification, all of which are growing markets. Soya bean can be processed into various foods for home consumption, using basic domestic tools and equipment to make soya flour which can be mixed with maize meal to make porridge. Soya flour is also used to make soya cakes, which are consumed and sometimes sold for cash within local communities. Small-scale farmers also reported processing soya bean into soya milk and soya coffee (roasting and pounding the dry grain). Further, there are an increasing number of soya-based processed foods on the market being manufactured and marketed by actors such as COMACO, Seba foods, and 260 Brands, who market and distribute these products, mostly targeting the urban markets.

A small but growing proportion of soya beans is utilized for human consumption. About 8 000 tonnes of the national soya bean cake output is being used for value added soya products for human consumption. This is also gaining popularity even among the high-income earners as a healthy product. In this way soya bean is also contributing significantly to food security and household nutrition. The production increase of soya bean would have a high positive impact for country food security and household nutrition (soya for human consumption will increase for TVP and more related products).

However, own consumption of soya bean and its products remains low among households, who opt to sell the grain for cash. Interventions to help small-scale farmers learn methods for domestic processing of soya bean into nutritious foods could help to increase own consumption. Spearheaded by the National Food and Nutrition Commission (NFNC), Zambia has made an effort

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[91] Central Statistical Office (CSO). 2016. The 2015 Living Conditions Monitoring Survey Report. CSO, Lusaka, Zambia.

to popularize household level value adding and consumption of soya bean; the current popularity of soya-based foods on the market can be partly accredited to NFNC. However, the value adding technologies appropriate for households and small-scale farmers, such as simple technologies to produce soya milk, are still lacking. Zambia is still considered to be among the group of countries with the highest malnutrition and stunting rates in sub-Sahara Africa. According to the Zambia Statistics Agency et al. (2019), Zambia has high malnutrition levels, particularly among children under the age of five, with 35 percent of them being stunted.[92] This situation underscores the importance of investing in value adding food technologies that increase the nutrient density of household foods, especially weaning foods such as porridges.

Environmental sustainability

An important benefit of soya bean is its ability to fix atmospheric nitrogen in the soil and the ability of the crop canopy to reduce soil degradation. Both enhance soil fertility to the benefit of other crop production cycles.

Like any other agricultural value chain, the soya bean value chain involves the production of waste and pollution at various segments. At production stage for example, the use of chemical inputs such as herbicides and pesticides, if unchecked and uncontrolled, has potential to pollute groundwater sources through chemical residues percolating into the soil. Field research revealed that there are an increasing number of farmers using herbicides to manage weeds, and most of them lack training in the correct use of chemicals. This presents a hazard to both farmers and the environment. However, the levels of chemical inputs used in soya bean remain relatively low compared to other crops such as maize, where there is extensive use of chemical fertilizers.

Changes in precipitation patterns will require increased information transfer and support to rain-dependent farmers regarding planting timing and strategies to improve soil moisture retention (i.e., zero-till and mulching). Increased access to irrigation may help mitigate irregular rainfall, but drought is still a risk. Soya prices are linked with maize prices and also subject to market volatility resulting from climatic shocks to maize production; investment in storage facilities may help smooth this volatility.

Small-scale farmers use manual labour in harvesting and other post-harvest activities such as threshing and winnowing (i.e. cleaning) of the grain. During winnowing, most farmers use buckets and the wind to blow away crop residues and dust particles. This process results in air pollution, albeit very localized within the small radius around where the cleaning is taking place. The crop residues and dust particles, once blown, remain in the air and affect air quality, with potential to contribute to respiratory infections for those around the cleaning area. Alternative winnowing equipment such as mechanised winnowing machines have the ability to cut down on time and reduce the aforementioned air pollution.

At the processing stage, industrial and toxic waste is produced by most processing plants. Most soya bean oil producers use the solvent technology rather than mechanical pressing as the former produces higher oil recoveries. As the process uses a form of hydro-electric energy, the risk of air pollution from emissions from a coal-powered plant are eliminated. However, this process produces both liquid (from wastewater used for cooling) and solid waste, which requires careful disposal to avoid polluting the environment.

2.2 Strengths, weaknesses, opportunities and threats (SWOT) analysis

This section analyses the key strengths, weaknesses, opportunities, and threats (SWOT) of the soya bean value chain in Zambia.

Strengths. Overall, the Zambian soya bean sector harbours immense potential for growth owing to the availability of natural resources (e.g. land and water) needed to produce the crop, favourable climate and availability of labour. Building on current practices, Zambia has the foundations in place to ensure proper environmental safeguards

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92 Zambia Statistics Agency, Ministry of Health Zambia & ICF. 2019. Zambia Demographic and Health Survey. 2018. Lusaka, Zambia, and Rockville, Maryland, USA.

will accompany the improvements in production and productivity. Additionally, the development of the sector benefits from emerging vertical coordination between value chain actors, the willingness of farmers to improve their practices, increased interest in investing in soya bean production and processing, and expressed commitment from the government to promote the agricultural sector in general and soya bean in particular as an important crop.

Weaknesses. Notwithstanding these strengths, many weaknesses are still observed in the Zambian soya bean value chain.

Access to affordable inputs: Currently, very low domestic production levels of inoculum and chemical fertilizers/pesticides mean inaccessibly high prices for imported inputs. The profitability for seed suppliers is low because of the preferred use by smallholders of open pollinated varieties of seed that can be saved from year to year. The current lack of market potential leads to less investment in the production and distribution of high-yielding seed stock.

Lack of finance: Buying from small-scale producers is problematic for small aggregators because they lack the finance needed for (i) ownership of vehicles/carts to transport soya beans and the associated costs of auxiliary services to maintain vehicles; and (ii) maintenance of storage facilities, and the capacity to develop storage business models. Lack of finance also affects the development of the SME processing sector as most SMEs do not have enough initial capital outlay to invest in processing equipment.

Low bargaining power of small-scale farmers: Lack of cooperation among small-scale farmers and mistrust within cooperatives creates a fragmented small-scale subsector with low bargaining power and subsequent failure to benefit from favourable prices. Individual sales also imply increased transaction costs for smallholders and inhibit their participation in more profitable markets.

Participation of women: Despite planting similar areas of land with soya bean, female-headed households suffer higher yield deficits than male-headed households due to lower input use. Non-mechanized harvesting is very labour intensive and physically demanding. Small-scale processing of soya bean for local consumption is done largely by women. Mechanization may reduce the physical demands of this labour, but could result in a shift away from female control of the profitable and nutrient-rich product.

Opportunities. Opportunities include growing demand for soya bean globally and regionally. Additionally, opportunities include agriculture extension for better education in best practices and distribution of inputs, development of local production of inputs, access to irrigation and mechanization through cooperatives, and tractor-share business models. Opportunities also exist for aggregation and bulking by cooperatives, training in marketing and sale negotiation, building storage capacity, and strengthening market linkages between small producers and downstream actors such as poultry and fish feed manufacturers.

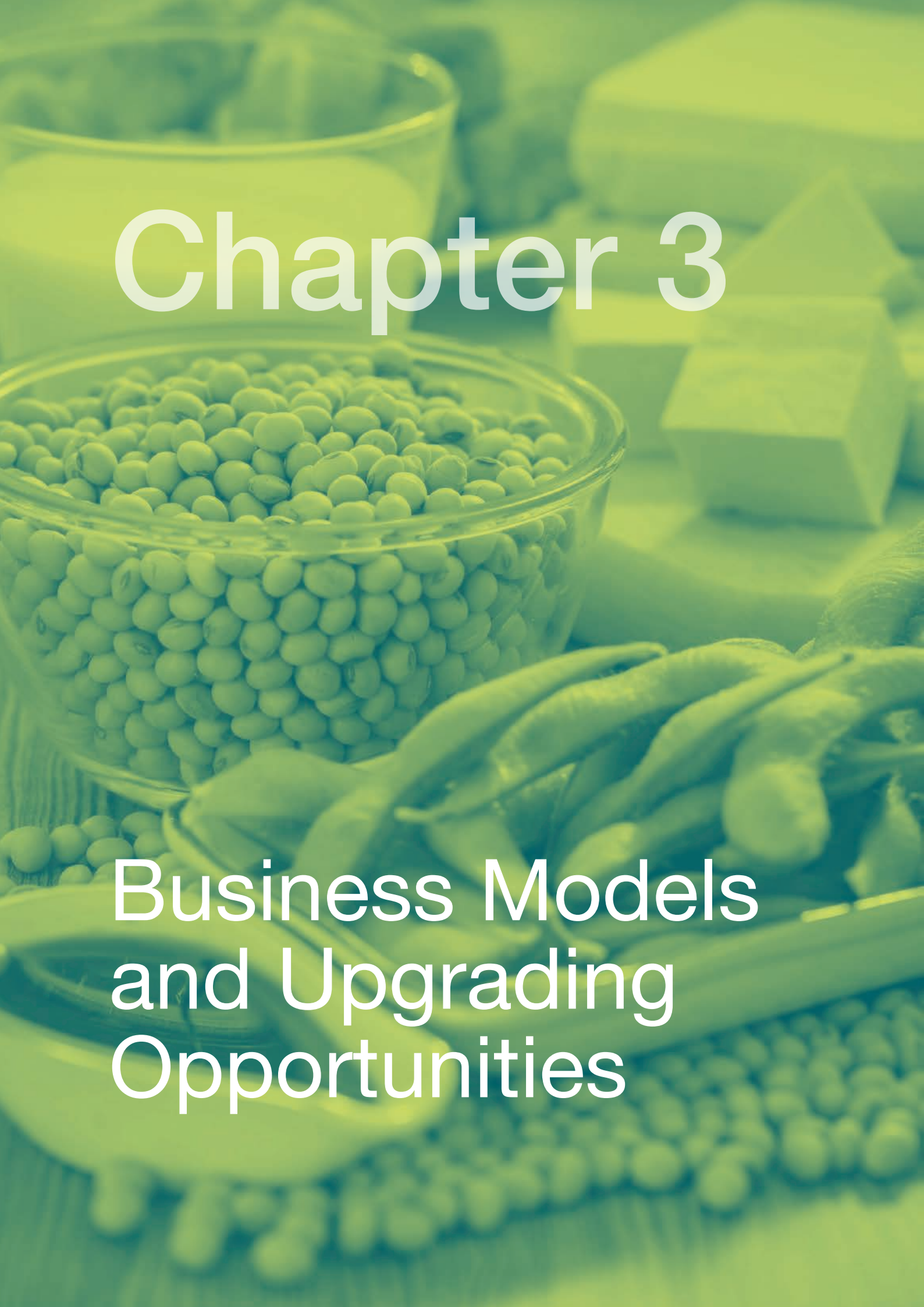
Threats. If left unchecked, the continued increase in land cultivation could lead to deforestation as farmers strive to increase production to supply the ever-rising demand for soya bean and to benefit from the favourable market. Owing to low productivity, farmers are most likely to compensate for this by expanding the cultivated area, thus threatening the integrity of biodiversity. The inconsistent trade policies that restrict trade and limit access to the domestic market could discourage investment by value chain actors and need to be permanently addressed.

Table 9 below presents a summary of the SWOT analysis, which also includes input from stakeholders during the validation workshop.

Table 9 SWOT analysis of the input and services provision

Strengths	Weaknesses
• Seed companies have capacity to reproduce the seed. • Availability of a large range of cultivars (10 released in past 10 years). • Zambia's variety of soya bean is non-GMO which attracts a better price than GMO varieties. • Soya bean can be cultivated in a wide variety of soil profiles.	• Poor agronomic practices due to poor knowledge, lack of extension support systems and a lack of capital. • Farmers do not follow guidelines on crop density. • Sourcing quality inputs (seeds) still difficult for most small-scale farmers (SSFs) due to a lack of capital and poor distribution to rural outlets since seed production is centralised. • Low use of fertilizers among smallholder farmers. • Late planting of soya beans among SHFs. • No soil testing among SHFs. • Unavailability, inaccessibility and unaffordability of certified seeds and inputs. • Companies unable to supply good quality seed in time. • Poor infrastructure increases transaction costs. • Access to finance is weak. • Insufficient coverage for farmers by service providers in remote locations.
Opportunities	**Threats**
• Growing interest in soya beans production among SHFs, including an increase in demand for inputs, particularly seed. • Growing global and regional demand of soya beans. • Availability of soil testing services. • Investment opportunity in the production and supply of inoculant. • Seed harmonization protocols endorsed by Zambia has facilitated import/export of new varieties and cultivars of soya beans. • The Act on fertilizer imports is under review. • Conservation farming practices. • Growing number of SFHs entering the value chain require agri-finance and insurance.	• Availability of good genetics is in decline. • Soil degradation after prolonged use and exposure to chemicals, lack of use of lime. • Registration of fertilizers & feed is difficult under current regulation. • Imports of uncertified fertilizers/ seed results in low productivity. • Inconsistency in government policy on exports. • Imports of cheaper soya bean-based products that compete with local production. • As the value chain grows, large players might crowd out SSFs.

Source: Authors' elaboration.



Chapter 3

Business Models and Upgrading Opportunities

Business Models and Upgrading Opportunities

The cost-benefit analyses of this chapter are conducted for six investment options. They show that investments in all the business models exceeds the opportunity cost of capital, even without factoring in environmental benefits.

3.1 Primary production

Current production practices

This subsection presents the cost-benefit analysis of large commercial and small-scale farmers. The data comes from the field survey where large commercial and small-scale farmers from Lusaka, Copperbelt and Central provinces were interviewed; the survey relies on one-year memory recall responses. Secondary data was used to validate some of the statistics obtained during primary data collection.

Commercial farmers. High productivity under commercial production (around 3 tonnes/ha) is attributed to better management skills, use of certified seeds and chemical inputs and irrigation, as well as use of machinery for land preparation (to achieve timely planting) and harvesting (to reduce crop losses and achieve high quality to secure premium prices). The productivity of large commercial farmers is over three times that of small-scale farmers (around 1 tonne/ha). However, according to the production model in **Table 10 & 11** below, commercial farmers achieve lower profit margins per unit area than small-scale farmers. This is due to high operation costs related to land preparation, harvesting, handling and packing, using a combination of machinery and manual labour. Fixed costs came second, mainly because of interest rates on borrowed capital and electricity tariffs. Low profit is compensated for by economies of scale achieved by planting large areas.

The main challenges faced by commercial farmers were reported during the field mission to be as follows: (i) low price offers by off-takers, (ii) cash-flow challenges since payments are not actioned immediately upon delivery of the crop, and (iii) power outages by the Zambia Electricity Supply Corporation (ZESCO). The unreliable power supply by ZESCO has forced farmers to invest in diesel-powered generators to supplement the main grid. Consequently, commercial farmers suffer high fuel costs in the region of 120 L/hour. For commercial farmers, motivation for growing soya beans was also driven by the need to enhance soil fertility in the cereal crop cycles that they undertake.

Table 10 Crop budget and margin analysis for soya bean large-scale farmers in Zambia

Item	Unit	Quantity	Unit Price (ZMW)	Total Amount (ZMW/ha)	%	Total (USD)
PRODUCTION COSTS						
Seed Spike (25 kg)	kg	4	875	3 500	10%	206
Comp D (50 kg)	kg	4	650	2 600	8%	153
Inoculant (120 gm Pack)	pack	2	80	160	0%	9
Chemicals (Pesticides and Herbicides)	lumpsum			5 610	17%	330
Land preparation, Harvesting, Labour, etc.	lumpsum			14 000	41%	824
Fuel (100 lt/ha)	lt	100	20	2 000	6%	118
Transport (100 km)	tonne	1	306	306	1%	18
Total Variable Cost				28 176	83%	1 657
Fixed Costs-Insurance, Interest, Elect., O&M				5 635	17%	331
Total Cost				33 811		
REVENUES						
Soya bean	tonne	3	13 000	39 000		2 294
Profitability - Income per ha				**5 189**		**305**
Break Even Price - Variable cost/Yield rate (ZMW)				**9 393**		
Break Even Yield - MT/ha (Variable cost/price)				**2**		

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Small-scale farmers. As depicted in **Table 11** below, seed is a major input cost followed by land preparation, D compound fertilizer and harvesting costs. The use of manual labour inflates costs of land preparation and harvesting. The high cost of seed may be contributing to the use of recycled seed by farmers as most small-scale farmers may not be able to afford certified seed. However, the field survey observed that farmers were aware of poor performance of recycled seed and only used it in instances where they could not afford certified seed. **Table 11** shows the major cost elements in soya bean production for small-scale farmers. Seed represents approximately 30 percent of the total cost. The high cost of certified seed was cited by farmers as the reason for using recycled seed, which in most cases resulted in lower yields. The labour cost for land preparation, which was mainly done by hand, came third at 17 percent of total cost. Chemicals (combination of pesticides and herbicides) represented approximately 10 percent of the total cost. Profitability generated under this cost distribution, based on a selling price of ZMW 12 500/tonne is presented in **Table 11** below.

Based on data collected during farmer interviews, a crop budget presented in the **Table 11** below was constructed and compared to that of enhanced business models in **Table 12**. The profit for small-scale farmers indicates that soya bean production is a worthwhile investment achieving at least a 100 percent return on investment over one season. This perhaps explains the fast-growing number of new entrants to soya bean production.

Table 11 Crop budget and margin analysis for soya bean small-scale farmers in Zambia

Current Production Practice						
Item	**Unit**	**Quantity**	**Unit Price (ZMW)**	**Total Amount (ZMW/ha)**	**%**	**USD**
PRODUCTION COST						
Recycled Seed	kg	100	17	1 700	24%	100
Fertilizers						
Comp D	kg	100	9.75	975	14%	57
Chemicals						
Inoculant	pack	1	80	80	1%	5
Herbicide 1st pre-emergence spray		1	375	375	5%	22
Insecticides						
Insecticide		1	240	240	3%	14
Other Costs						
Labour - Weeding	lumpsum	1	550	550	8%	32
Labour: Land preparation	lumpsum	1	1 000	1 000	14%	59
Labour: Harvesting	lumpsum	1	550	550	8%	32
Handling % Packing	lumpsum	1	550	550	8%	32
Transport	Tn/km	100	4	400	6%	24
Miscellaneous costs	lumpsum	1	300	300	4%	18
Total Variable Cost				**6 720**	**96%**	**395**
Fixed Costs @ 5%		**5%**		**336**	**5%**	**20**
Total Cost				**7 056**	**100%**	**415**
REVENUES						
Revenues		0.95	8 500	8 075		475
Profitability - Income per ha				**1 019**		**60**

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

The major limiting factor in small-scale production is the working capital needed to procure inputs at the beginning of each agricultural season. Break-even analysis is specifically important for the analysis of economic efficiency of farm operations to assess whether farmers are worse off after investing in the production processes. The break-even price will be the minimum price that the farmer can accept to cover all the production costs. Based on the data from our study, the break-even price was ZMW 7 074/tonne or about ZMW 7/kg. Data from field interviews indicates that the average price received by farmers was ZMW 12/kg, which was almost double the minimum price for a farmer to break-even, an indication of the viability of small-scale soya bean production and the reason for the current continued growth of the soya bean value chain. Nonetheless, according to field data 10 percent of farmers interviewed accepted a price equal to or below the break-even point. These were mostly those who sold their crop way too early, even before harvest time. It is common for traders to enter the market early, even before harvest, and offer farmers cash based on expected harvest. Farmers are usually desperate for cash at the beginning of the year and thus ready to accept a low price to enable them to meet immediate cash needs such as school fees and essential food commodities. The break-even yield is the minimum volume of produce that is required to cover the cost of production. Based on the data from our study, the break-even yield was 0.5 tonne/ha. Data indicated that 28 percent of farmers interviewed achieved yield rates below the minimum required to cover their production costs.

According to the field survey, soya bean production costs per province were different between provinces. As shown in **Table 12** below, Lusaka province exhibited the highest total production cost per hectare, of ZMW 5 937 (approximately USD 353), followed by Copperbelt with ZMW 5 731

(approximately USD 335) and Central province with ZMW 5 289 (approximately USD 260). Lusaka and Copperbelt are predominantly urban and likely to have relatively high labour wage rates compared to Central province, which is less urban and with extensive use of animal draught power. With regards to yield, Copperbelt farmers achieved higher productivity per hectare than their counterparts in Lusaka and Central province. The total cost of inputs per tonne produced was also highest in Copperbelt. Based on the responses from field interviews, Copperbelt farmers also had better access to extension advisory services than the other two provinces. Therefore, it is more likely that the combination of good access to extension advice and relatively high input application rates can explain higher productivity achieved by Copperbelt farmers.

Table 12 Soya bean profitability by province

Small-scale Farmers Profitability Analysis						
Province	Production tonne / ha	Total production cost / ha ZMW	Total cost / tonne	Price / tonne ZMW	Revenue / tonne ZMW	Profitability ZMW
Lusaka	0.77	5 937	4 572	12 500	10 010	5 438
Copperbelt	1.15	5 731	6 591	12 500	14 950	8 359
Central	0.83	5 289	4 390	12 500	10 790	5 501

Source: FAO Field mission

A higher productivity rate exhibited by Copperbelt farmers, even with higher costs per tonne resulted in higher revenue and higher profitability.

3.1.1 Business Model 1: Improved production practices

Small-scale farmers report current average yields of approximately 1 tonne/ha, while large commercial farmers' yields are about 3 tonnes/ha in Zambia. As described in more in detail in **Chapter 2.1.2**, small-scale farmers have difficulties not only to access quality inputs such as certified or improved seeds, inoculant, fertilizers and mechanization but also to afford them, as they are expensive. Failure to improve soya bean yields is worsened by poor knowledge, technical skills and husbandry practices. This first business model shows the incremental benefits and costs in a scenario in which small-scale farmers could have access to inputs (e.g. certified and improved seeds, inoculants and fertilizers) and post-harvest mechanization (threshers) and improve their production practices by applying GAPs.

Current production system versus "enhanced production practices". In the "without project situation" or "business as usual" option, small-scale farmers will continue facing challenges relating to availability, accessibility and affordability of inputs. They will use low inputs, recycled seeds, manual/animal labour and poor agronomic practices. In this situation, it is assumed that the expected yields would remain at the same low levels of 0.9 tonne/ha. As depicted in the above-mentioned **Table 12**, at 0.9 tonne/ha average yield the cost of production per hectare is about USD 415, including USD 395 variable cost (according to FAO field mission surveys). Assuming post-harvest losses of 5 percent, the revenue per hectare is USD 475, generating a profit of USD 60/ha.

With the "improved productions practices model", small-scale farmers will plant certified/improved seeds, and use the right input levels of inoculant, fertilizer, herbicide and insecticide, and the post-harvest services of threshers, etc. They will also receive appropriate training on Good Agronomic Practices (GAPs). By doing so, small-scale farmers would be able to increase soya bean yield from 0.9 to 1.55 tonnes/ha and reduce post-harvest losses from 5 to 2 percent. The cost of production per hectare will be about USD 571 and the revenue per hectare will be USD 760, giving a profit of USD 188/ha (three times more than current profit of USD 60/ha)

Table 13 Enhanced production practices

Enhanced Agronomic Practices						
Item	**Unit**	**Quantity**	**Unit Price (ZMW)**	**Total Amount (ZMW/ha)**	**%**	**USD**
PRODUCTION COST						
Certified Seed	kg	100	25	2 500	26%	147
Fertilizers						
Comp D	kg	120	10	1 170	12%	69
Chemicals						
Inoculant	pack	2	80	160	2%	9
Herbicide 1st pre-emergence spray	pack	1.2	375	450	5%	26
Insecticides						
Insecticide	pack	2	240	480	5%	28
Other Costs						
Labour: Weeding	lumpsum	1	550	550	6%	32
Labour: Land preparation (Rental mechanization cost)	lumpsum	1	1 000	1 000	10%	59
Labour: Harvesting (Rental of threshers)	lumpsum	1	600	600	6%	35
Handling % Packing	lumpsum	1	660	660	7%	39
Transport @ ZMW 0.94/km/tonne	tonne/km	120	4	480	5%	28
GAP Training & miscellaneous	lumpsum	4	300	1 200	12%	71
Total Variable Cost				**9 250**	**95%**	**544**
Fixed Costs @ 5%		**5%**		**463**	**5%**	**27**
Total Cost				**9 713**	**100%**	**571**
REVENUES						
Revenues		1.519	8 500	12 912		760
Profitability - Income per ha				**3 199**		**188**

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Investment description and analysis. To achieve the increase of yields and the reduction of post-harvests losses, the investment needs include, among others, start-up capital for small-scale farmers in the form of matching grants or subsidies and credits and/or guarantee schemes. This model proposes delivering integrated packages of inputs (e.g. certified seeds, inoculant and fertilizers), services (mechanization services and agricultural insurances) and training on Good Agronomic Practices and agricultural insurance. The package will include seed capital of USD 76/year per input and service and USD 50/year per training and advisory knowledge on GAP. The methodology proposed is based on the aggregation scheme to deliver "smart subsidy/credit".

Financial indicators. A cost-benefit analysis has been computed for 10-year period assuming a gradually annual increase of targeted beneficiaries with an outreach of 60 279 farmers in PY5 (about 15 percent of the total existing small-scale farmers in season 2021/2022). Incremental net incomes (with – without intervention) were contrasted to the potential investments needed to reach the total number of beneficiaries. As shown in **Annex 2 Table 1**, the Financial NPV and IRR, considering a total investment of USD 61 Mn, are over USD 33 Mn and 46 per cent, respectively. Payback period is 5 years, projections of incremental cost & benefits, and total investment interventions are presented in **Annex 2**.

3.1.2 Business Model 2: Provision of irrigation systems

Rainfed agriculture is directly affected by the hazards of climate. Zambia experiences only one rainfall season with a north-south decline in rainfall receipt. The southern agro-ecological

region is generally arid with mean annual rainfall lower than 500 mm per annum. Rainfall variability and unpredictability can be obstacles to farmers' crop choices, cropping calendar and productivity. The effects of climate change, which include late commencement of rains, flooding and poor rainfall variability during the season are frequent. Irrigation can help to improve and stabilize agricultural productivity, thereby contributing to food security and resilience against climate change. Whether full or supplementary, irrigation improves drought resilience and increases yields; it extends cropping periods and cycles, allowing the cultivation of a broader spectrum of crops and provides stable conditions for applying further yield-increasing measures such as fertilizers and chemicals. The irrigation option will also offer farmers the opportunity to include vegetables in the crop cycles, thereby improving nutrition when vegetables get added to local diets. Since initial costs for irrigation investment can be beyond the affordability of small-scale farmers, the 'irrigation intervention' option suggests bringing a group of farmers together under an irrigation scheme that provides shared resources. There is great potential for irrigation in Zambia since the country is well endowed with water resources. Irrigation potential is about 2.75 Mn hectares but only about 7 percent (156 000 ha) are currently being irrigated. Access to irrigation would supply supplementary moisture to the soya bean and allow a fully irrigated second crop to be grown during the winter/dry season.

Current situation versus "irrigated soya bean practices". Currently, all small-scale farmer soya bean production is rainfed, without full or supplementary irrigation, with average yields of about 1.5 tonnes/ha, as those farmers are already applying Good Agronomic Practices (GAPs) and using certified/improved seeds and the right input levels of inoculant, fertilizer, herbicide and insecticide, and the post-harvest services of threshers, etc. Zambian weather conditions indicate that the probability of a drought that would reduce productivity by 50 percent and is likely to occur once every three years. Hence the "without irrigation" situation would imply harvest losses every three years.

The 'do something' option implies providing small scale farmers an opportunity to own and operate a high capital-intensive farming system to cope with crop failures caused by climate change effects and unpredictable market access. Small-scale soya bean farms, coupled with better crop management would be the target for supplementary irrigation schemes. They would be selected based on their ability to demonstrate a commercial farming attitude, using certified seed and inputs provided with skills in GAPs, Climate Smart Agriculture practices and Integrated Pest Management The 'with irrigation' model assumes that (i) soya bean productivity would increase by 30 percent from 1.55 MT/ha to 2MT/ha, (ii) farmers would grow a second crop during the season; and (iii) they would not have losses during the droughts (it is assumed that there is water availability in the dams during drought years).

Table 14 represents a farm model for 1 hectare year-round production of irrigated soya bean and maize. The cost of production per hectare will be about USD 1 476 (155 per cent higher than the without project situation) and the revenue per Ha will be approximately USD 3 430, permitting a profit of USD 1 954/ha. Data of soya bean cost of production are based on 2021 figures (including inputs and labour) and those from revenues are based on average price offered for soya beans in 2021 season.

Table 14 Irrigation scheme covering 20 ha, irrigated by a lateral pivot

Irrigation + Enhanced Agronomic Practices						
Item	**Unit**	**Quantity**	**Unit Price (ZMW)**	**Total Amount (ZMW/ha)**	**%**	**USD**
PRODUCTION COST Soya bean						
Seed - Kafue	kg	100	25	2 600	27%	153
Fertilizers						
Comp D	kg	120	9.75	1 170	12%	69
Chemicals						
Inoculant	pack	2	80	160	2%	9
Herbicide 1st	pack	1.2	375	450	5%	26
Insecticides						
Insecticide	pack	1.2	240	288	3%	17
Other Costs						
Labour	lumpsum	1	550	550	6%	32
Land	lumpsum	1	1 000	1 000	10%	59
Harvesting	day	1	600	600	6%	35
Handling %	lumpsum	1	660	660	7%	39
Transport	Tn/km	120	4	480	5%	28
Miscellaneous	lumpsum	4	300	1 200	12%	71
Total Variable				**9 158**	**95%**	**539**
Fixed Costs @ 5%				**458**	**5%**	**27**
Total production costs soya bean				**9 616**	**100%**	**566**
PRODUCTION COST MAIZE						
Cost of maize / Ha (USD), including marketing cost (cold store, packaging, transport)						**910**
Total production cost maize						**910**
Total production costs (soya bean + maize)						**1 476**
REVENUES						
Soya bean		1.96	8 500	16 660		980
Maize				41 650		2 450
Total Revenue (USD)						**3 430**
PROFIT						**1 954**

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Description of the investment. An overhead high-pressure lateral pivoting irrigation system is more prevalent used in Zambia for soya bean cultivation. As shown in **Table 15** below, the total investment cost per system is about USD 96 800 to include the following: (i) a lateral pivot system with 9–24 wheels irrigating 20 ha; (ii) installation costs (20 percent of the cost of the equipment); and (iii) training for farmers on how to operate and maintain the system, agronomy of irrigated crops, group dynamics, business management, financial management, and irrigation water management, including sustainable water use, financial literacy, marketing and linking them to agro dealers. It is suggested to group at least 10 small-scale farmers into one water-user association or cooperative to operate a 20-hectare lateral pivot and provide knowledge and skills for the farmers to be able to run the business profitably. In that regard, Zambia boasts a wide spectrum of companies supplying, installing and providing after-sales services for irrigation equipment, which is imported mainly from South Africa and Israel. These companies include Amiran, Irritech Irrigation Systems, Agrico, Precision Irrigation, Powerback Energy Solutions and Valley Centre Pivots. Creating a Private–Public Partnership (PPP) arrangement is recommended, with the government extension systems providing day-to-day oversight and training on agronomy of crop production and private companies providing technical support and backstopping.

Table 15 Investment in a lateral pivot system (20 ha)

Investment USD/20 ha	Financial prices USD	Economic life (years)	% cost
20-ha investment			
Management, including farmer mobilization	10 000		
Laterall pivoting systems (9-24 wheels)	65 000	10	
Installation costs (20%)	13 000		20%
Training on technology	7 800		10%
Studies (impac; soil; etc.)	1 000		
Total	**96 800**		

Source: Irritech Company.

Financial indicators. A cost-benefit analysis has been computed for a 10-year period assuming a total outreach of 1 500 irrigated hectares by investing in 75 lateral pivot systems benefiting a total of 750 farmers (10 farmers with 2 Ha per pivot). This land will be under production by groups of commercially oriented small-scale farmers using soya bean varieties that are high yielding to maximise returns on irrigation investment.

Incremental net incomes (with – without intervention) were calculated for the outreach and contrasted to the potential investments needed to reach the 1 500 hectares by year 5. As shown in **Annex 2 Model 2**, the Financial NPV and IRR, considering total investments of USD 7.26 Mn, are: USD 4 Mn and 43 per cent respectively. The payback period is 3 years. Installation is suggested in two drier provinces of Zambia that include Eastern and Lusaka. The total number of people benefiting considering 5 people per household is 137 555.

The implementation modality for this intervention would be to link the irrigation schemes to off-takers (processors or exporters) using the "contract farm". For instance, companies such as the Export Trade Group (ETG), key player in the soya bean industry, has expressed its willingness to provide out-grower contracts, whereby inputs, capacity strengthening and a ready market for their produce would be supplied. Farmers would be expected to contribute to debt financing for the investment in form of cash or labour and share operation and maintenance costs of irrigation services. Additionally, Private Public Partnership (PPP) arrangements with the government extension systems could be used to provide day-to-day oversight and training on agronomy of crop production and private companies providing technical support and backstopping.

3.2 Secondary production

3.2.1 Business Model 3: Promote processing and value addition SMEs

The current landscape in Zambia in the processing industry is mainly dependent on the large processors who dominate the market and are majorly located in the Central Province which is far away from most smallholder producers. Because the majority of feed sold is produced in locations that are not close to market demand, the price of products is increased due to the additional costs of transportation. In that context, there are no small- and medium-scale processing units currently available to support local market growth or provide diversified and nutritious products to local communities.

This business model was prepared based on the experience of Nezi Investments Co. Ltd., which was established in March 1991 as a small-scale maize milling enterprise. In 2013 it expanded its operations and is currently producing livestock feeds, soya bean flakes, crude oil and mealie meal and provides oil pressing services to the community. The company is located at Stand No 4948 Katopola Road (Sido) Kapata Chipata (Eastern Province). The proposed business model is developed based on the financial and commercial aspects of the Nezi Investments Co. Ltd. Although the province is one of the major producers of crops such as maize, soya beans and sunflower – the major ingredients in animal feed formulations – there is still no livestock feed manufactured at a large scale in the province. Almost 100 percent of the livestock feed used in the province is sourced from Lusaka and beyond, resulting in higher prices.

Establish processing facility. The overall objective is not only to respond to the local markets for soya bean feed but to increase the availability and access to soya bean flour and other by-products and improve the nutritional status of local population. The local areas would benefit from creating economic value and local employment in the community. Poultry farmers and aquaculture producers would see reducing their feed cost by expanding sourcing from farmers in the local community and implementing out growers' schemes. Processing association could be supported to set up small soya bean processing facilities within the premises of bulking centres, where ingredients for stock feed (e.g. soya cake, full fat soya cake and other cakes) will be produced.

The projected increase in soya bean production will increase supply in the local market, which represents opportunities for value addition and agri-processing investments. The small- to medium-scale processing facilities represent medium- to long-term opportunities that require modest investments to start. Small- to medium-scale processing units are a complete production line that produce various products and process different types of grains. The facilities will produce poultry feed, crude oil, soya flakes and mealie meal. The production will support the growing poultry industry by providing poultry feed at competitive prices by cutting down transportation costs. The requirement of medium-scale processing units for raw material is relatively high, which could present a challenge in the short term while supply is growing. The working capital represents approximately 80 percent of the operational cost. The current low utilization of production capacity could represent a challenge and may impact profitability in the short term for medium-scale processors. The consistent supply of raw materials, including soya bean, is essential for the full utilization of the production lines. **Table 16** below provides a summary enterprise budget for a soya bean processing SME.

Table 16 Enterprise budget for processing facility

Enterprise model - SME / Added Value Center					
Item	**Unit**	**Quantity**	**Unit Price (ZMW)**	**Total amount (USD)**	**%**
(A) COSTS					
1. LABOUR					
Full time Director	Monthly	12	3 000	2 118	1%
Factory Manager	Monthly	12	2 000	1 412	1%
Book Keeper	Monthly	12	1 700	1 200	1%
Cashier	Monthly	12	1 500	1 059	1%
Data Entry Clerk	Monthly	12	1 400	988	1%
Operators (5 x ZMW 1 200 /month)	Monthly	12	6 000	4 235	2%
Security Guards (3 x ZMW 900 / month)	Monthly	12	2 700	1 906	1%
2. INPUTS AND OTHER VARIABLES COST					
Working capital (maize, soya bean, sunflower)	Yearly		2 569 165	151 127	85%
Fuels & Oils	Monthly	12	5 000	3 529	1.98%
Water	Monthly	12	1 000	706	0.40%
Packaging	Monthly	12	3 000	2 118	1.19%
3. ADMINISTRATION COSTS					
Communication (Telephone & Fax)	Monthly	12	500	353	0.20%
General Office supplies	Monthly	12	300	212	0.12%
Sanitation Costs	Monthly	12	250	176	0.10%
Advertisements	Monthly	12	200	141	0.08%
Insurance	Yearly	12	5 000	3 529	1.98%
Bank charges	Monthly	12	350	247	0.14%
Utilities-Electricity	Monthly	12	2 250	1 588	0.89%
Repairs & Maintenance	Monthly	12	1 000	706	0.40%
Professional fees (Legal, audit etc.)	Monthly	12	1 000	706	0.40%
TOTAL COSTS				**178 057**	**100%**
(B) REVENUES					
Animal feed (sales stock feed)				83 012	39%
Crude oil for cooking				47 322	22%
Soya bean flakes (or cakes)				58 910	28%
Mealie Meal				24 463	11%
TOTAL REVENUES				**213 706**	**100%**
INCOME				**35 650**	

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Description of the investments. The small-medium scale processing facilities represent medium to long-term opportunities that require small investments to start. The investment for each facility is USD 63 000 for the construction of the facility and the production line. The facility is composed of an extruder machine, crast & hammer machine, mixer and oil presser. The capacity of the processing facility could be approximately 2 MT/hour.

Table 17 Investment costs for a small-scale processing facility

Investments	Cost USD	Economic	% cost
Building and small storage	30 000	20	
Equipment / struder	15 000		
Crast / Hammer meal	6 000	10	
Mixing	6 000		
Oil pres	6 000		
Sub-total	**63 000**		
Training entrepreneur and operators to use the equipment	**9 450**		15%
TOTAL	**72 450**		

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Once the larger investors are identified, the enhancement or establishment of 6 new processing facilities across the specific zone areas in provinces producing soya bean is proposed. The overall objective is not only to respond to the local markets for soya bean feed but to increase the availability and access to soya bean flour and other by-products and improve the nutritional status of the local population. The local areas would benefit from creating economic value and local employment in the community. Poultry farmers and aquaculture producers would see reductions in their feed costs by expanding sourcing from farmers in the local community and implementing schemes for out-growers.

Summary of financial benefits and return on investment. A cost-benefit analysis was conducted for a 10-year period assuming the establishment of 5 processing facilities (one every year starting in year two). As shown in **Annex 2**, the Financial NPV and IRR, considering an investment of USD 538 200 in those facilities, food equipment and institutional strengthening, are USD 329 950 and 29 percent, respectively.

The business model developed in this report indicates that running an enterprise to crush soya beans and produce edible oil and livestock feed can be profitable over the years. Therefore, in the interest of expanding local markets in the provinces and consequently further triggering soya bean production, this report recommends investing in provincial based small scale processing plants. It is proposed that the newly established processing companies be linked to existing large processors for mentorship and support in terms of growing markets, technical skills and accessing financial resources. In all the cases and during the project design, as access to reliable electricity is a major setback for many businesses, power sources alternatives could be considered for these processing facilities (i.e. diesel, which leads to added costs, and solar where possible for some machines which could increase the cost of machinery).

3.3 Sector support providers

Additional operations, services and coordination efforts are required to make the entire soya bean value chain work. It requires a conducive enabling environment and a suite of supporting market functions. The following supporting functions and enabling environment interventions are required.

3.3.1 Business Model 4: Certified seed multiplication Programme

This intervention will result in increased seed quantities, and improved availability and accessibility of seed. One of the major challenges with soya bean production currently is that smallholder farmers recycle their seeds. Farmers are advised to stop recycling their seeds after 2-3 years due to it causing degradation in efficacy, productivity, and a buildup of diseases. Despite this, the majority of small-scale farmers continue recycling their seeds. This was one of the major contributors to the soya bean rust disease outbreak in 2022. In 2022, the prices for soya bean were low and farmers did not buy new certified seeds which

caused a buildup of the disease and contributed to the outbreak.

Description of the investment: Using the out-growers schemes, existing and new smallholder seed growers associations, referred to as Cottage Seed Industry, will be supported with parent seed, equipment and irrigation to effectively and efficiently produce certified soya bean seed for the markets. This model has been demonstrated to work (Proof of Concept) in the Eastern Province, where small-scale seed growers' associations have emerged, supported by a private sector company (Goodnature), and where good quality seeds are now available in the markets. The private sector would play an important role in organizing the small growers into associations or cooperative groups that will be registered to grow and sell certified soya bean seed. More farmers will be able to access the seed because it will be produced in local areas and will cost less because the varieties used will be public lines, developed by ZARI and CGIAR institutions (IITA). **Table 18 / 19** below show the parameters and investment needs to produced certified soya bean seeds to plant approximately 69 030 hectares which is about 19 percent of total area planted by small-scale farmers in 2021/22.

Table 18 Parameters for the production of certified soya bean seed

Seed Production Parameters	Unit	Quantity
Seed rate (1 ha seed to 20 ha commercial grain)	ha	40
Seed productivity	MT/ha	2.0
Number of Ha / Association	ha	40
Total Seed Growers Associations	Number	
Seed Growers Mobilisation cost	USD/Group	1 000
Seed Growers Training cost/Association	USD/Group	1 000
Outgrower scheme management costs	USD/ha	30
Cost of seed production (labour, cost of production, inputs)	USD/ha	1 000
Inbound ($16/MT) and outbound ($40/MT) transportation cost	USD/ha	140
Processing Cost material downgrade	%	5%
Working Capital (2 year cash conversion cycle)	USD/MT	100
Financing Cost (credit repayment ratio 91%, write-off loss)		9%
Initial Year 0 investment (Facilities/Equipment)	**USD**	**150 000**
Selling price of Kafue/Spike seed to distributors/farmers	**USD/MT**	**756**

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

3.3.2 Business Model 5: Post-harvest service provision through threshing machines

Soya bean is a labour-intensive crop. The majority of small-scale farmers are dependent on manual labour for their field activities from land preparation to packaging of the grain. Several operations require physical energy and take a long time to perform. The process of threshing soya beans involves hitting the crop with sticks to release the grain from the pods, followed by hand winnowing to separate the grain from the chaff. The hitting process causes grain breakages, thereby reducing the quality of the product. Farmers also reported that the process is unpleasant and laborious since the chaff is an irritant and the dust it produces has been blamed for causing respiratory problems. Threshing by hand limits the area that can be cultivated, since at the planting stage farmers must consider the physical capacity and time needed for harvesting and packaging the crop; the demands of the harvesting process dictate the size of the area planted and consequently the quantity and quality of the crop delivered for sale. This problem can be addressed through the

use of machinery rather than relying on manual labour. Mechanization of the harvesting process would increase productivity and profitability by inspiring farmers to grow more, motivated by the availability of labour-saving technology. Since manual threshing is also disproportionally carried out by women, providing access to durable and affordable harvesting equipment, such as crop threshers, would benefit women in particular.

Current post-harvest practices versus mechanization. Without intervention, small-scale farmers will continue to face challenges relating to post-harvest losses (at least 5 percent losses from shattering and lodging) and reduced grain quality. The labour-intensive activities and time needed to manually harvest and thresh a crop will continue to delay harvest. Threshing loss is second only to storage loss as a contributor to post-harvest losses in most crops. Without intervention, hand threshing using sticks will remain the most common way to thresh crops, whether on the farm or in the seed sector.

Service model: Micro, small and medium enterprises (MSME) or cooperatives. With the support of the government and development partners, women-owned micro, small and medium enterprises (MSME) or youth associations would be supported to provide post-harvest services to small-scale farmers. The use of locally manufactured multi-crop threshers would eliminate hand threshing and speed up the time needed to thresh crops. Locally manufacturing these threshers would be important since despite imported machinery being VAT free, the spare parts required to service the machinery would incur VAT charges and complicate the process. By ensuring local manufacturing of these threshers, the price and supply of spare parts can be controlled. The crop will get to market faster and provide income for farmers in a timely fashion. The machine is capable of threshing 5 tonnes of soya bean and 25 tonnes of maize per day. They can thresh many other crops, including millet, rice, sorghum, cowpea, and common bean. **Table 20** indicates the technical parameters and assumptions taken in the cost-benefit analysis of a new MSME providing the services of a threshing machine during 120 days per year.

Table 19 Assumptions for the MSME thresher business model

Item	Unit	Quantity
Operating cycle	days	120
Number of youth/women-own MSME or cooperatives	SMEs	50
Number of threshers / MSME or cooperatives	thresher	1
Revenues from threshers service provisions	USD/day	70
Daily operating costs of threshers (Oil, Fuel, Parts)	USD/day	17
Maintenance of store room (5%/annum of Thresher purchase price)	USD/year	325
Depreciation of thresher (10%/annum of thresher purchase price)	USD/year	650
Wages of operators full time (x 2 operators)	USD/day	5

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Given that small-scale farmers achieve 1 tonne/ha and grow a maximum of 5 hectares, the thresher can service more than 1 farmer per day. Hand threshing can cost a farmer more than USD 100, while shared threshing equipment could cost only a fraction of that amount. The threshers can easily be moved from farm to farm, pulled by animals, a tractor or a vehicle. The machine requires no electricity since it can be operated off the PTO of a tractor or a separate diesel engine. This form of mechanization could reduce labour cost from 24 percent of total production costs to approximately 10 percent, increasing farmers' revenues by approximately 15 percent. The low operation costs of the thresher suggests that multi-crop thresher enterprises have the potential to be significantly profitable.

Table 20 Annual operating profits of a business enterprise offering the services of threshing

Financial analysis - 1 MSME or Cooperative (Operating Cycle: 120 rental days / season)					
Item	**Unit**	**Quantity**	**Unit Price (USD)**	**Total amount (USD)**	**%**
(A) COSTS					
1. LABOUR					
Manager / Owner	monthly	6	200	1 200	18%
Full time youth workers (x 2 operators)	days	120	10	1 200	18%
2. VARIABLE COST for thresher operation					
Transportation of equipment	days	120	10	1 200	18%
Miscellaneous (Fuel, Oil, Parts)	days	120	17	2 040	31%
3. FIXED COSTS					
Mainten. and rep. of buildings/structures (Store room 5%/annum)	5%	6 500	0.05	325	5%
Depreciation of thresher (10%/annum of $6500)	10%	6 500	0.1	650	10%
TOTAL COSTS				6 515	100%
(B) REVENUES					
Revenues from renting the threshers	days	120	70	8 400	100%
TOTAL REVENUES				8 400	100%
Annual Operating Profit				**1 785**	

Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Constraints associated with the use of the multi-crop thresher include high demand for services in a limited time period, occasional mechanical breakdowns, unavailability of labour at the peak of the harvest, mistrust between owners and operators (labourers), the high cost of transporting the thresher to the field, and difficulty in threshing soya bean relative to the other crops.

Investment. The average cost of a locally manufactured multi-crop threshers is USD 7 500 including training cost of its operation and maintenance.

Summary of financial analysis. Based on an investment of USD 375 000 for 50 threshers supplied to youth/women-owned MSME with a credit modality, and assuming that post-harvest losses can be reduced from 5 to 2 percent, the NPV and IRR are USD 52 042 and 17 percent. Respectively. See **Annex 2** for further results.

3.3.3 Business Model 6: The Warehouse Receipt System

Zambia's soya bean market is characterized by a duo system consisting of a less formal chain dominated by smallholders and aggregators, and a relatively more formal channel through which commercial farmers market their produce. The less formal channel through which smallholders trade occurs has several challenges, with smallholders being the most negatively affected. The channel is less liquid because the traders operate at small scale, are under-capitalized and have little or no

access to credit. The majority of smallholders sell their soya bean early in the harvest season, and others sell even before the harvest, because of liquidity constraints pressuring them to meet immediate expenditure needs; they are also forced to sell early due to lack of access to good storage facilities. As a result, farmers are not able to take advantage of the favourable prices later in the season; they sell the bulk of their crop when the markets are oversupplied and prices are depressed, rather than sell when supply is relatively low and prices are high later in the season. Furthermore, the product quality from smallholders remains relatively low as no formal quality standards are generally enforced by aggregators and other market players. Traders tend to grade the produce by sight and grading can be highly subjective. Interactions with smallholders during field research indicate that their produce is subject to price reductions when taken to the processor because of poor quality and low volumes.

Current marketing arrangements for smallholders is driven by cash needs rather than price levels and is characterized by fragmented marketing which is not favourable for smallholder growth. A majority of smallholder farmers cannot hold onto their harvests and wait for a favourable price due to immediate cash requirements. This results in smallholder farmers being forced to sell at lower prices. A warehouse receipt system (WRS), where farmers can deposit their crop with certified warehouses and be issued with a receipt through which they can access short-term credit can help to ease liquidity constraints and improve farmer incomes. For it to be successful, small-scale farmers would need more sensitisation of the WRS, since WRS are trading limited commodities with a majority of the use coming from commercial farmers and traders. Integrating SHFs in the WRS can contribute to: 1) access to structured markets with favourable prices; 2) increased incomes; 3) access to credit; 4) enhanced bargaining power of SHFs; 5) digital and financial inclusion of smallholders; 6) improved product quality to meet WRS standards; and 7) reduced post-harvest losses.

Presently, the WRS in Zambia is regulated by the Zambian Commodities Exchange (ZAMACE) and backed by the Agricultural Credits Act of 2010 which was enacted in 2014. On the ground, the WRS still remains a proposition that is yet to receive sufficient buy-in from players across the entire value chain. In 2018, the commodity exchange only recorded 4 000 MT worth of trade that was fully settled through the exchange using WRS.

Mila's soya bean sample.

The strategy proposes establishing modern bulking centres or warehouses, which will be certified storage facilities and authorized to issue warehouse receipts against the deposited soya bean. The bulking centres will be managed as commercial businesses by certified private companies by ZAMACE. The senior manager will be in charge of the overall supervision of all 10 warehouses and will be responsible for aggregating all the information from the 10 warehouses. To help with stock loading and unloading and other activities related to stocking, each warehouse will employ five part-time operators who will also help with maintaining a clean environment around the facility. **Table 21** below provides only a snapshot of profits in a certain year of a warehouse.

Table 21 Enterprise model for a warehouse

Item	Unit	Unit Cost	Quantity	Total
Costs (USD)				
1. Labour				
Manager	month	1 000	6	6 000
Coordinator	month	600	12	7 200
Part-time	month	100	18	1 800
2. Inputs, equipment and other variable costs				
Furniture for manager's office	Lumpsum	1 000	1	1 000
Furniture for coordinator's office	Lumpsum	1 000	1	1 000
3. Fix costs				
Utilities (fuel, electricity, water etc.)	month	1 000	12	12 000
O&M (15% of warehouse building cost)				37 500
Security	month	200	12	2 400
Total operational costs (USD)				**68 900**
Revenues (USD)				
Storage fees	month	43.2	1 800	77 760
2% commission per each transaction	mt	12	1 800	20 880
Total revenue				**98 640**
Profit				**29 740**

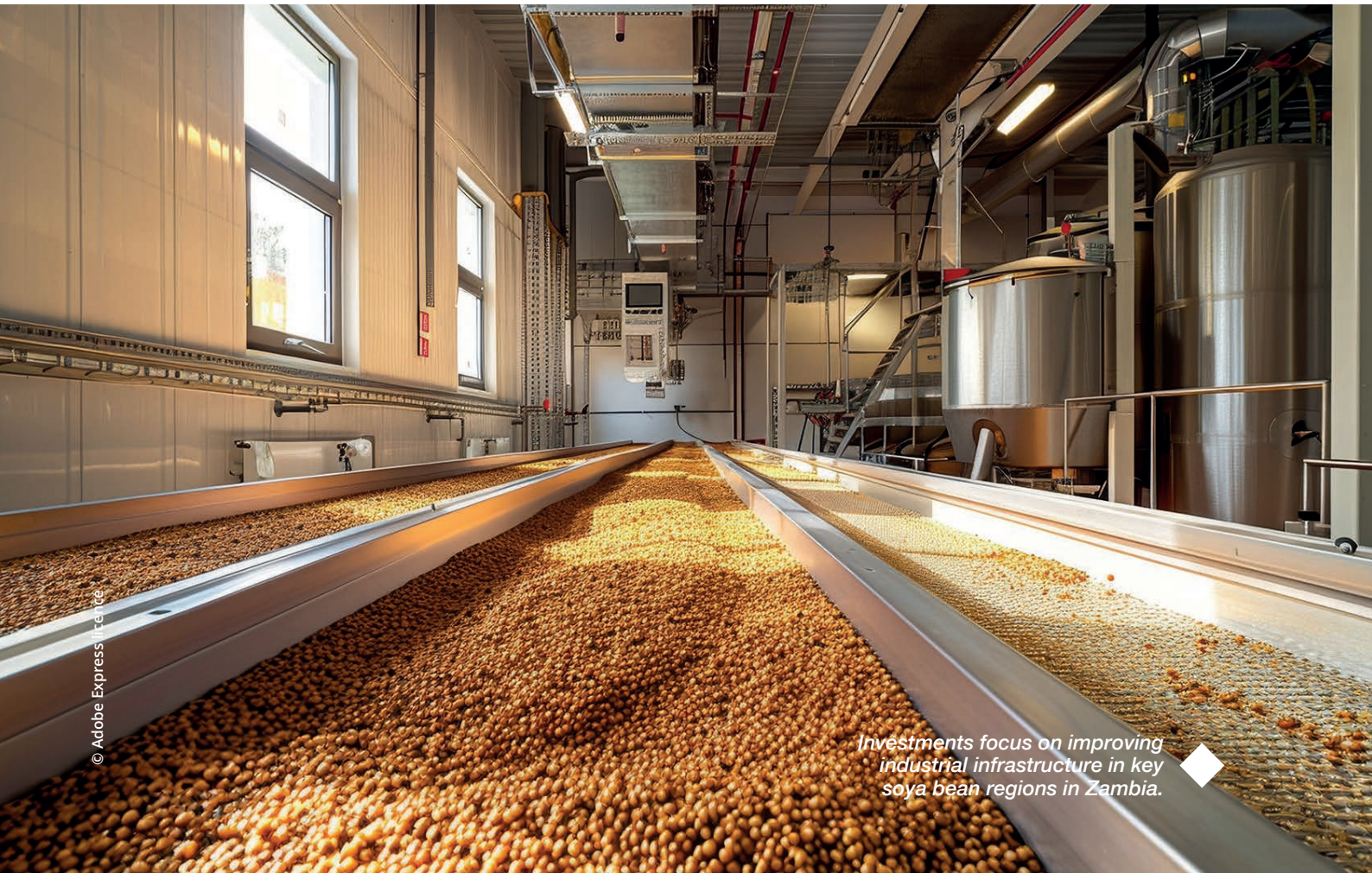
Source: Authors' elaboration based on field survey data. FAO. 2021. Soya Bean Value Chain Diagnostic Survey. FAO, Lusaka, Zambia.

Investments. The major investments in enhancing WRS will be focused in five high soya bean production provinces: Central, Copperbelt, Eastern, Lusaka and Southern. Three key investment areas are envisaged to help enhance warehousing. These are direct investments in infrastructure development (medium capacity modern warehouses) worth USD 660 000. Where existing infrastructure is available, investment will be directed toward rehabilitating the warehouse to an acceptable commercial standard. The private sector managing the WRS could be responsible for providing technical assistance to cooperatives in areas such as business development and internal governance. Cooperatives will be encouraged to be equity partners, particularly at the processing end, and will thus become shareholders. This will help with the financial sustainability of the cooperatives and ensure they remain active and continue to supply soya beans to the warehouse and processing plant. Shareholding will help smallholders benefit further from value addition, rather than from raw soya bean production alone.

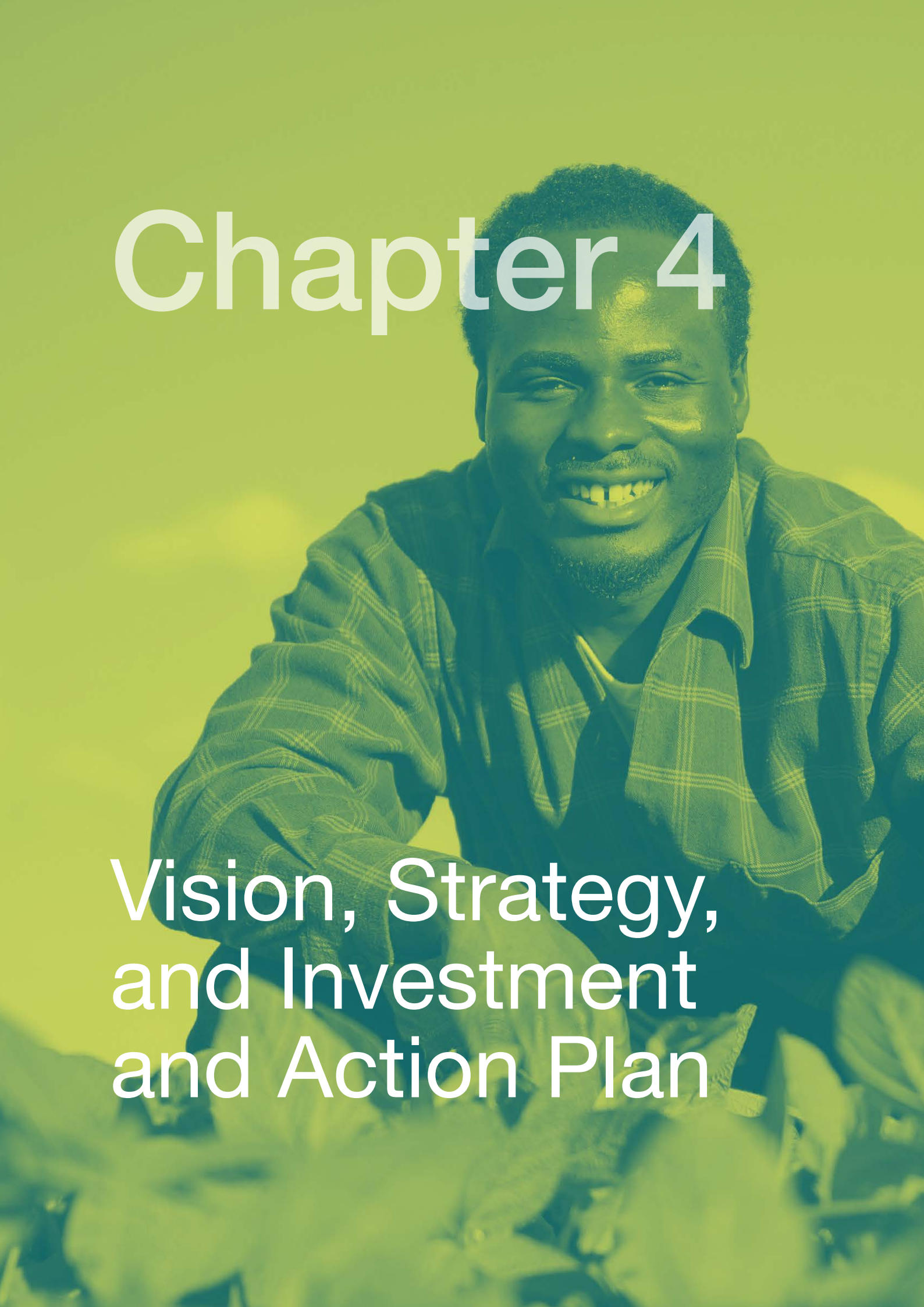
Summary of financial analysis. As shown in **Annex 2**, the Financial NPV and IRR, considering a total investment of USD 2.64 Mn, warehouses with

a capacity of 1 500 MT, are USD 919 937 and 24 percent, respectively.

Consultations on this business model was conducted with the private sector to discuss potential implementation modalities. The warehouses could be managed by the private sector, whose main interest is securing good quality and consistent supply of aquaculture feed ingredients derived from soya bean, for its members. Producer Organisations or cooperatives will be supplying soya bean to the warehouse for storage or sell to the feed processing plant managed. Upon depositing soya bean that meets the warehouse quality standards, farmers will be issued a warehouse receipt, by the warehouse manager, to aid them access cash from participating financial institutions. Farmers will be able to access up to 20 percent of the value of the soya bean deposited in the bulking centre (this should address the immediate working capital needs). Farmers will be paid the remaining 80 percent less transaction and storage costs once their soya bean is sold or processed. During the project preparation, it is planned to identify whether the 20 percent of the value of their stock paid by the WRS is enough for the working capital needs. This percentage can be increased based on a financial analysis and checking the requirement with farmers on the field.



Investments focus on improving industrial infrastructure in key soya bean regions in Zambia.



Chapter 4

Vision, Strategy, and Investment and Action Plan

Vision, Strategy, and Investment and Action Plan

4.1 The vision and strategic interventions

While it is evident that the Zambia soya bean value chain is already on the growth trajectory, this study has revealed that a clear vision and further strategic support and investments are required to transform, modernize and unlock the full potential of the sector and make it competitive. This section represents the vision of the sector, which is entrepreneurial and aligned with the national development plans of the GRZ.

Overall vision: By 2033, Zambia will have reached the target of producing 1 million MT of soya bean in a year. Additionally, the Zambian soya bean value chain will have increased its efficiency, sustainability and competitiveness through accelerated public and private investments. Measuring that such a goal has been achieved will require evaluating the overall competitiveness, sustainability and resilience of the new value chain development. The core tenets to attain this goal are founded on the following entry points.

1. **Facilitate robust value chain (VC) governance and a conducive business environment.** As presented in the analysis, the soya bean sector does not have an effective governance structure that permits VC actors coordination, collaboration, trust building and vertical and horizontal linkages within the overall chain. The latter is particularly applicable for small-scale farmers, micro, small and medium enterprises (MSMEs), women- and youth-led businesses, financing institutions and other key players. In addition, the absence of an enabling policy environment creates uncertainty among producers, processors and exporters. The negative effect of unpredictable trade policies is undermining any efforts to invest in a sustainable and competitive sector. Government has made pronouncements to keep borders open for trade to consolidate Zambia's regional trade integration, however, these pronouncements are not backed by legislation, thereby creating room for ad hoc changes. Supportive tax rules, such as the removal of VAT on locally produced edible oils, would increase both local and regional throughput of Zambian soya beans and edible oil and subsequently trigger further supply responses from farmers. The middleman/aggregator space would need to be regulated to avoid the situation of small-scale farmers reporting being defrauded through underpricing of the crop and use of faulty weighing equipment. With support from government to co-develop regulations to govern and enforce fair trade practices in the market, the Zambia Grain Traders Association, being the largest institution overseeing the activities of traders and aggregators, can potentially play a critical role.

   The government and soya bean industry could explore several legal structures to formalize their venture. A Public-Private Partnership (PPP) or multi-stakeholder joint venture (JV) could be established to enhance a common voice for the sector. This venture could be composed not only of already existing coordination bodies such as the Soya Policy Action Group (SOPAG) and Soya bean Working Group of the Ministry

of Agriculture but also by representatives of the VC actors, from producers and processors to distributors, as well as relevant stakeholders and public entities, including ministries, university and research institutes, international organizations and NGOs. Agreements on the above-mentioned critical constraints affecting the VC, as well as on the application and rolling out cluster and aggregation schemes aim toward public and private investments that will lead to a more effective and competitive VC. Furthermore, it will encourage public-private dialogue to address simultaneously and in a coordinated way the cluster policies and efforts needed at the local/regional/national level for value-chain enhancement. The development of a modern soya bean value chain in Zambia requires a "structural change" which, in turn, will rely on the (i) creation of new knowledge and skills; and (ii) strengthening of linkages between the relevant stakeholders.

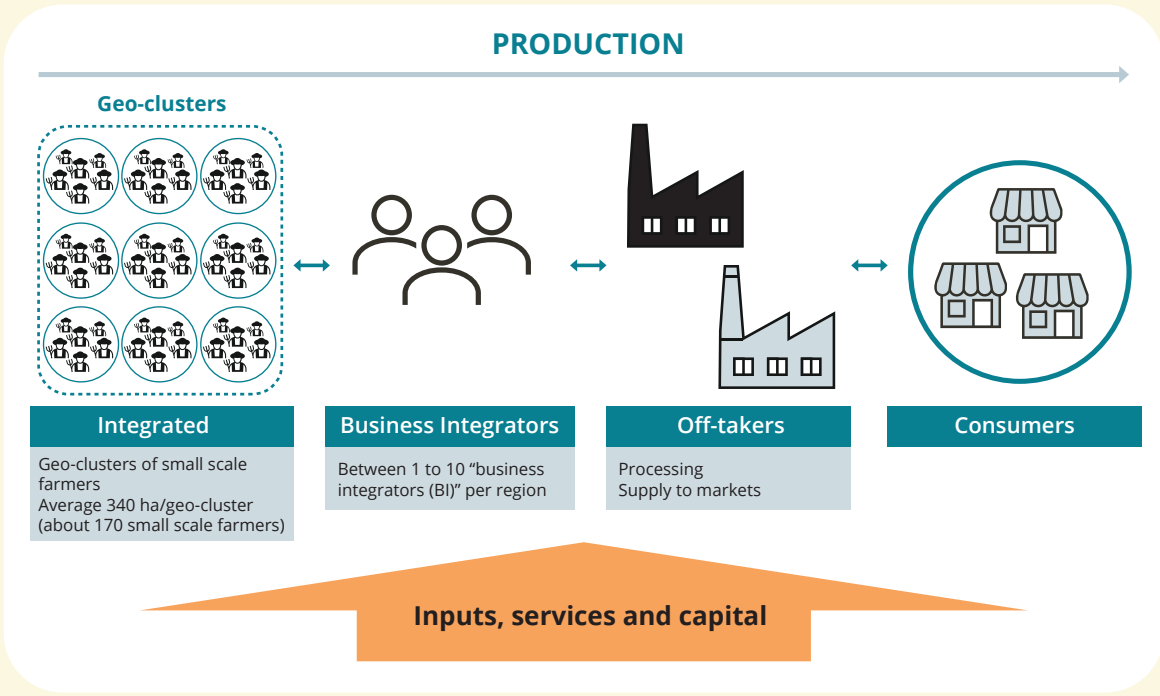
2. **Set-up geo-clusters of soya bean production and expand out-growers and aggregation models.**

   The most efficient way to achieve the desired production and productivity along the soya bean VC will be to follow a sort of small-scale big-push in different geographic areas, i.e. addressing simultaneously and in a coordinated way the bottlenecks affecting the different levels of the value chain: raw material production, storage and processing capacity and quality of the final product, and marketing channels. Clusters are facilitators of value-chain enhancement. A cluster approach is a strategy whereby different interventions are implemented in close proximity, within geo-locations, to create collaboration among the value chain actors and concentrate the benefits and returns to investments. Additionally, since soya bean is not suitably adapted to be grown in all the regions of Zambia, the cluster approach will be able to target specific areas that would be best suited for soya bean production. Lessons learned in such clustered development zones can then be scaled up in other locations. Trust building, the crucial element of cluster development efforts, is particularly important in developing economies where the coordination failure due to the high fragmentation and micro scale of economic agents is very pronounced. Besides, the effectiveness of technical and managerial training – a cornerstone in agro-value chain development methodologies – is boosted by the policy measures aimed at promoting interactions in clusters since actors have the opportunity to learn from each other in a systematic and continuous way. Selected geo-clusters of farmers will be supported to increase yields, reduce post-harvest losses and improve quality through access to GAPs, certified seeds, inoculants, and other inputs, irrigation and mechanized harvesting practices. This will be done using the out-growers and contractual farming schemes. Geo-clusters of small-scale farmers will be linked upstream to business support providers, such as seed growers, for source of seed (see **Figure 23**) and downstream, to off-takers/markets, for the sale of their soya beans. Soya bean will feed into emerging SMEs processing industries within the same locality to produce oil, livestock feed (soya bean cake for feed input for livestock and aquaculture sectors) and food. The support provided through the clustering process will reduce barriers between VC actors and encourage learning through imitation. By so doing, more SME actors will also increase their participation in the downstream soya bean value chain activities.

Summarizing the cluster approach: According to **Figure 23** below, all the above activities will amalgamate into a comprehensive development plan that links all interventions together in a given area, called cluster. The cluster will comprise of geo-clusters of crop production farmers (Category A and Category B), who will be linked upstream to seed growers for sources of seed, and downstream to off-takers/markets, through the "Aggregators", for the sale of their commodities. The Aggregators - an SME, which may be a trader, processor, service provider, large farm, or an individual farmer (Category C) with an emergent commercial profile that acts as an integrator) - will receive incentives to aggregate small holder farmers and test their aggregation models. Commodities will feed into the local emerging SMEs industries within the same locality to produce oil, feeds and food. Providers of warehouse storage and threshers will work with farmers in the clusters to provide the services they need. Financial service providers and extension advisory providers

will be at hand to facilitate access to finance and knowledge/skills in these clusters. When all these operations work together in tandem, the outcomes, as specified in the vision, will be an efficiently functioning, sustainable, resilient, and inclusive value chain.

Figure 23 Cluster approach to integrate VC actors for an efficient development of the VC



Source: Authors' elaboration

The proposed model of geo-cluster depends on the local conditions in each province such as proximity of farmers to each other's, total hectares in each district, and total planted soya bean areas in each district. In that context, the size of each cluster could be different. Assuming similar conditions across all clusters and an average of 34 000 hectares per cluster, each cluster (targeted province) will accommodate about 100 geo-clusters of small-scale farmers. Each geo-cluster of small-scale farmers will consist of approximately 340 hectares, representing 170 farmers (assuming category A farmers with 2 hectares per farmer). Each geo-cluster will produce 510 MT based on average production of 1.5 MT per hectare. The total value of production per geo-cluster is about USD 357 000 based on average price of USD 700 per tones.

The first phase of the project will be piloted in a targeted province. **Table 22** shows some preliminary assumptions:

Table 22 Piloting the cluster approach in a selected province

Cluster assumptions (average Figures)	Amount
Average targeted hectares / province	34 000
Average number of geo-clusters of small-scale farmers / province	100
Average hectares / geo-cluster of small-clusters	340
Average hectares / farmer (assuming Category A)	2
Average number of farmers / geo-cluster (2 ha/farmer)	170
Total production / geo-cluster @ 1.5 MT / ha	510
Value of soya bean produced per geo-cluster (USD 700 / MT)	357 000
Average number of "Business Integrators" / geo-cluster	2
Average working capital / BI / season (assuming 2 BIs /geo-cluster)	178 500
Total value of the production per province (USD)	**35 700 000**

Source: Author's elaboration.

In that context, each geo-cluster will require an average of USD 357 000 working capital within the soya bean season for sourcing soya bean. The Aggregators will require sufficient funds to be available to manage the sales volume in the geo-cluster. The financial capacity of the aggregators will determine the number of aggregators at each cluster, which could range from 1 Aggregator at an average of USD 357 000 per BI, 2 Aggregators at USD 178 500 to 5 Aggregators at an average of USD 71 400 per Aggregator. Market linkages between farmer groups with traders of agricultural products will be sought to broaden the marketing options for participating households.

The number of Aggregators in each geo-cluster will depend, to large extent, on their financial capacity and their ability to access working capital from financial institutions. Currently, for example, in Copperbelt province, Global Industries Processing Ltd., sources approximately 60 percent of the production from farmers, which limits the number of potential Aggregators to be created in this specific case. In that context, Aggregators in each province will vary according to the local context, market dynamics, and competition. Market linkages between farmer groups with traders of agricultural products will be sought to broaden the marketing options for participating households.

3. **Improve production by improving yields, reducing post-harvest losses and adding value.** A key constraint of the VC is the low yields of approximately 0.8 tonne/ha for small-scale farmers; yields are about 3 tonnes/ha for commercial farmers. As described in more detail in **Chapter 2**, small-scale farmers do not have working capital to access quality inputs such as certified or improved seeds, inoculant, fertilizers, irrigation or mechanization. The manual threshing conducted by small-scale farmers results in high post-harvest losses. Failure to improve soya bean yields are worsened by poor knowledge, technical skills and husbandry practices. Rain variability and unpredictability have an impact on the decisions made by farmers regarding their choice of crop and their cropping calendar, and also impacts on productivity. As presented in **Chapter 1**, the processing industry is mainly dependent on large-scale processors, who dominate the market. As the majority of feed sold is produced in locations that are not close to market demand, prices are increased to reflect the additional cost of transportation. There is an insufficiency of small- or medium-scale processing units to support local

market growth or to provide diversified and nutritious products to local communities.

The proposed component is structured around three main goals: (i) to improve the productivity of soya bean farming with the aim of ensuring a stable, growing and reliable supply of inputs to the benefit of the entire supply-chain; (ii) to promote crop/food diversification and linkages of farmers with downstream processors and off-takers; and (iii) to ensure processing and value addition of soya bean meets the domestic demand, not only for animal feed but also for other soya-based nutritional products and edible oils for human consumption. Farmers and processing SMEs organized in geo-clusters will be supported by technical assistance, i.e. Good Agriculture Practices (GAP), Good Industrial Practices (GIP), Climate-Smart Agriculture (CSA) and Integrated Pest Management (IPM), etc and "smart incentives (subsidies/credits)" – packages of GAPs/GIPs, inputs, irrigation schemes, mechanization services, civil works and associated food technologies and equipment for processing facilities of soya bean. Irrigation support will be crucial not only for achieving better yields but also for crop diversification and at least two or three crop production within a season. The Programme will support group irrigation schemes (lateral pivot) covering around 20 hectares.

Capacities of both, farmers and aggregators will be provided as aggregation models are yet to be tested in some regions. Partnerships between the Extension Advisory Service and the selected "Aggregators" will be placed to upgrade farmers and processors knowledge and skills to increase productivity, supply good quality commodity to markets and meet quotas if producing under an out-grower contract. Farmers working under clusters will have access to post-harvest services (threshers to improve product quality and storage facilities to stabilize commodity prices).

4. **Enhance VC support providers, services and institutions.** Significant investments in the provision of public goods and services linked to soya bean production will be needed to attain the sector vision. The main constraints the sector faces are factors such as (i) an insufficiency of affordable, available and accessible certified seeds for small-scale farmers; (ii) a lack of businesses providing post-harvest services; (iii) inadequate storage and warehousing infrastructure; (iv) a lack of cash and working capital (for both small-scale farmers and SMEs) and limited access to financial services and climate risk management practices (such as agricultural insurances); and (iv) extension services, R&D and information that are not up to date.

   – **Certified/improved seeds production.** This analysis has recognized that certified seed is a major cost for small-scale farmers. As a result, small-scale farmers avoid this cost by opting to use recycled seeds, which characteristically produce low yields. Both public and private stakeholders have suggested engaging small-scale farmers in the production of certified seed by implementing the cottage seed industry business model. Existing proven models of seed multiplication conducted by seed grower associations under out-grower schemes will be expanded. These partnerships with private sector seed companies such as SCCI, ZARI, and CGIAR institutions, will improve affordability and accessibility of certified seed (to be made available through agro-dealer outlets across the country). This approach will reduce reliance on costly seed that is currently controlled by a few private seed companies, some of which hold the plant breeder's rights to their varieties. The improved seeds will later be distributed to geo-cluster farmers, who will also have benefited from training in agronomical practices.

   – **Post-harvest services.** The process of threshing soya beans involves hitting the crop with sticks to release the grain from the pods, followed by winnowing by hand to separate the grain from the chaff. This task, disproportionally undertaken by women, is unpleasant and laborious since the chaff is an irritant and the dust has been blamed for causing respiratory problems. The programme will identify and select women-owned MSMEs (or cooperatives or youth-owned business) interested in providing thresher services to farmers. The service model will be commercially run and the selected MSMES will acquire the threshers through a credit/grant modularity Partnerships can then be formed between these MSME or cooperatives and private companies to develop appropriate

threshing machines that can be manufactured and maintained locally. Through partnership with private companies, the capacity of beneficiaries to run a successful business will be enhanced. Women or youth MSME will hire operators and run communal rental systems, which will benefit group members and other local farmer. This intervention will explore the possibility of a public–private partnership (PPP) between government (through the Ministries of Agriculture and SMEs), FAO and SIL.[93]

– **Storage and Warehouse Receipt Systems.** The warehouses aggregation centres (bulking centres) will be constructed within farming communities, but will be managed as commercial businesses by well-established processing associations. Aggregating the crop in this manner has the potential to empower farmers to secure a fair asking price for their crop, reduce price volatility, increase access to finance for their crop and address market-related risks within the agricultural sector. The approach being proposed is to support the operational capacity of private entities to operate a warehouse receipt system, specifically within the soya bean value chain, that will increase market and financial access, improve liquidity, and enhance credibility in the commodity markets for small-scale farmers. With this approach, the private entities will be able to offer the appropriate support and conditions to enable small-scale farmers to deposit their crop in the warehouse for bulk storage rather than being forced to make early sales at a low price when under household financial pressure. The private company will identify 70 to 80 viable cooperatives per province to be linked to the warehouse. Since the aggregation is happening through the cooperatives, the member farmers may have the confidence to store their produce in the proposed warehouse. Willing financial institutions will participate in the WRS by providing credit and the government will provide sustained trade policy support by facilitating exports. The private companies will be responsible for providing technical assistance to cooperatives in areas such as familiarizing with the WRS model, business development and internal governance. Cooperatives will be encouraged to become equity partners. This will create farmer and community ownership and help with the financial sustainability of the cooperatives to ensure they remain active and continue to supply soya beans to the warehouse and processing plant. Shareholding will also allow small-scale farmers to benefit further from value addition, rather than from raw soya bean production alone. After three years of operation, the private sector will offer cooperatives shares in the business. This will help create farmer and community ownership through having a stake in the business. The private sector will identify banks and other financial institutions with whom they will enter into an agreement to provide financing against the warehouse receipts. This will enable farmers access credit using warehouse receipts, with the private sector as the guarantor. Some of the processors and organizations which have showed interest in this model are the Aquaculture Association of Zambia (ADAZ), Poultry Association of Zambia (PAZ), Zambia National Farmers' Union, Zambia Cooperative Federation (ZCF) or District Cooperative Unions (DCUs). This intervention will also explore the possibility of a public-private-partnership (PPP) or the arrangement prosed above, with clear exit strategy in place to make the model self-sustainable economically.

– **Conveying financial services close to farmers and SMEs and leveraging large-scale investments into production and services.** The VCA indicates that access to finance/credit will help to ensure productivity in the sector. A guarantee fund, credit lines or revolving fund need to be developed to provide farmers, MSMEs, and SMEs with "smart packages". Mechanisms such as the establishment of blended financing, loan guarantees, and crop insurance schemes to de-risk the VC operations will be defined, particularly for farmers using irrigation, and

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[93] ZSIL is a network of public and private institutions across the entire soyabean value chain working to provide critical information and technology needed for successful advancement of soya bean development in Africa. SIL has designed threshers that are 80 percent faster, require only two operators and result in a post-harvest loss of less than 2 percent.

new SMEs providing soya bean added value. Measures such as supporting the development of flexible collateral arrangements, accounting for seasonality in repayment schedules and revising the demand for credit histories can be effective ways of tailoring financial services to meet farmers' needs. In addition, the government would need to design appropriate subsidy policies to make returns on investment in soya bean production attractive. Developing and rolling out an e-voucher system for farmer inputs at regional level will also be considered. Further, financing can be channeled through larger actors such as processors and input suppliers who would provide input credit to farmers through outgrowing schemes.

- **Extension, and Research and Development (R&D).** The provision of extension services is crucial to a good performing crop production system. One entry point is to empower extension workers through a Training of Trainers programme, who would in turn train lead farmers through farmer schools, and the lead farmers would eventually share knowledge with their peers through on-farm demonstrations and other training events. Extension service being provided by private sector will be explored through the out-grower scheme and contract farming. Other models for private extension could also be explored as a way to create employment for the youth. Research and anecdotal evidence have shown that farmers who have moved from basic knowledge to proficiency in the required crop management practices have been able to double their yields. Regarding R&D, ZARI has a specific soya bean commodity support team that undertakes research to improve the performance of varieties but further research is needed into areas such as soil fertility, cheaper fertilizer regimes, and the benefits of organic fertilizers that would be cheaper and more environmentally friendly.
- **Information.** As presented in **Chapter 2**, poor supply of seeds and other inputs is due to poor information sharing between farmers and agro-dealers. On the one hand, agro-dealers are reluctant to stock sufficient inputs on their shelves for fear of over-stocking and having to tie up their cash in stock. On the other hand, farmers are not aware of the availability of inputs at their nearest agro-dealer outlets. Functional digital solutions are necessary to spark innovation and facilitate markets. Digital technology can support small-scale farmers and agribusiness start-ups (particularly women and youth) to efficiently access information and markets and empower service providers (government extension systems, input suppliers, NGOs) to efficiently support farmers. Digital technology will also improve market access by providing information to farmers on the available market outlets and prices being offered. Furthermore, access to information systems including updated market information - Market Information Systems (MIS) - and weather updates will be crucial for farmers to make better decision in terms of production and marketing.

  The development of an online procurement system and input supplies digital platform will have the benefits of (i) enabling farmers to procure inputs online; (ii) helping input suppliers to plan and manage their inventory for different seasons and crops; and (iii) ensuring availability of input supplies in rural areas where access to agro-dealer outlets is challenging. The development of an online platform would also allow farmers to (i) make orders early enough, which in turn would help input suppliers to manage inventories, cashflows and respond to market demand in a timely manner; (ii) access information on market prices and disease occurrence; and (iii) access climate information. Collaboration with existing platforms such us the World Food Programme (WFP) and the MAANO E-Commerce digital platform is proposed.[94] The MAANO E-commerce digital platform was launched in 2020 as an e-commerce digital trading platform. The platform now has over 100 000 registered farmers and offers e-learning, access to finance and access to inputs with insurance for farmers (only for certain crops and not soya bean currently).

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[94] The platform was developed in collaboration with a private sector technological company called Digital Paygo.

The WFP Zambia team expressed interest in collaborating with stakeholders interested in further developing the systems and expanding functionality and outreach. The current WFP platform does not include an input suppliers' module that could facilitate access to input supplies for soya bean SSFs. The FAO SIFAZ e-Commerce / Learning Platform is being designed, and synergies could also be built into the programme. Currently the SIFAZ project has 21 000 farmers registered on its database. However, a further 1 Mn farmers can be accessed who are registered on the ZIAMIS database operationalized by the Ministry of Agriculture.

5. **Improved access to local, regional and global markets.** The VC analysis presented in chapters 1 and 2 has underlined that market access is one of the most severe constraints faced by small-scale farmers. It is crucial to promote backward linkages between soya bean farmers, traders and processors (as discussed above) and forward linkages between the processors and marketing agents, distribution chains, and retailers (domestic, regional and global markets). Market information and business-to-business systems will be needed to promote soya bean, including soya bean by-products for human consumption, for both the domestic and export market. Further promoting the consumption of soya bean products as part of a healthy diet in the domestic market is important in Zambia.

   Other key interventions will be to help SME processors progress from the current situation of selling unlabelled and unbottled crude oil to wholesale markets or intermediate traders to selling labelled and bottled (with quality certification in some cases) semi-refined extra virgin oil to a variety of other outlets. Technical assistance will be provided to the beneficiary processors to improve the quality, labelling and packaging of the final products. Through participation in specialized trade fairs and the establishment of formal linkages with marketing traders and retailers, processors will expand the geographical scale of their markets and, as a consequence, improve their profit margins. Additionally, soya beans are currently grown primarily as a cash crop and interventions are needed that would focus on the value-addition of soya bean beyond just edible oil. Campaigns or interventions that try and popularize food products derived from soya bean, will not just benefit by increased local consumption, but also from an agri-business point of view where SMEs can then be capacity-built to process soya beans into such commodities.

4.2 The Theory of Change

The underdevelopment of Zambia's soya bean sector stems from a combination of structural, financial, and policy-related challenges. At the core of the problem is low productivity, particularly among small-scale farmers, whose average yield is just 1 tonne per hectare, compared to the 2.8 tonnes/ha achieved by commercial farmers. This productivity gap is driven by poor seed quality, limited access to affordable, high-quality inputs, and insufficient mechanization and irrigation services. Moreover, a lack of knowledge about Good Agricultural Practices (GAPs) further constrains farmers' capacity to boost their yields. Weak linkages among value chain actors, both horizontally among small-scale farmers and vertically between producers, aggregators, and processors, further impede sector growth. This lack of coordination hinders collaboration, scaling of operations, and efficiency gains. Currently, small-scale farmers, MSMEs, and women- and youth-led businesses have limited opportunities to engage with other actors in ways that foster trust and cooperation. Another significant challenge is the instability caused by Zambia's trade policies, such as frequent export bans. This policy unpredictability undermines the sector's competitiveness, as potential investors are deterred by the risks associated with fluctuating regulations. The absence of a robust policy framework exacerbates the situation, limiting investment and growth opportunities within the soya bean sector.

In addition to these structural and policy challenges, the sector suffers from inadequate business development services, as well as insufficient storage, trading infrastructure, and processing facilities. These deficiencies restrict scaling and diversification, leading to post-harvest losses and reduced market potential for value-added products. Gender disparities in market access compound these challenges. While both men and women are involved in production, women disproportionately handle labor-intensive

processes such as harvesting. They often sell their produce at farm-gate outlets where prices are lower, limiting their access to more profitable markets, which are typically dominated by men.

Access to finance remains a major constraint for small-scale farmers, MSMEs, and aggregators. Farmers often lack working capital to procure inputs at the beginning of the season, and small aggregators struggle to finance purchases from smallholders. MSMEs, critical to processing, lack the capital to buy raw materials or invest in necessary equipment. This financing gap prevents smaller actors from making long-term investments or expanding value-added operations, stifling their ability to grow within the value chain.

To address these challenges, the National Soya bean Strategy promote the creation of a formal Soya bean Multi-stakeholder Coordination Platform that brings together key actors such as the Soya bean Policy Action Group (SOPAG), the Soya bean Working Group under the Ministry of Agriculture, and representatives from producer organizations, processors, distributors, and other relevant public and private entities. This platform will facilitate coordinated decision-making and dialogue, helping to overcome the fragmented nature of the value chain and fostering a more supportive business environment. A critical component of the Soya bean Multistakeholder Coordination Platform will be preparing Value Chain Development Plan Agreements (VCDPA) in partnership with industry association, along with the promotion of agriculture aggregation alliances (3As), as stated in the CATPS.

Aggregators will play a crucial role by linking farmers with markets, processors, and financial services. They will be incentivized to test different aggregation models, allowing them to scale up operations while ensuring fair trade practices that protect smallholder farmers. The coordination platform will facilitate access to finance for aggregators through instruments identified under the action plan outcome 1, which may include initial risk-sharing arrangements for loans taken by aggregators from commercial lenders, as well as cost-sharing for input packages through a matching grant mechanism that ensures lower input costs are passed on to farmers.

Capacity-building will be central to the strategy's success. Farmers and MSME will receive training on GAPs, Climate-Smart Agriculture, IPM, post-harvest management techniques, and GIP, enabling them to improve productivity and reduce post-harvest losses. Technical assistance will also enhance soya bean processing and storage, creating opportunities for local SMEs to add value through processing products such as edible oils and animal feed.Public and private extension staff will support cluster farmers. These extension staff may come from private, public, or international partners such as the Soya bean Innovation Lab (SIL) or the International Institute for Tropical Agriculture (IITA) to lead farmer sensitization efforts on GAPs and the importance of using certified seeds.

As a result of these interventions, the National Soya bean Strategy will strengthen governance within the soya bean value chain by improving coordination and transparency, and establish functional geo-clusters that integrate smallholder farmers, aggregators, and SMEs. The aggregation models tested will offer a framework for enhancing value chain efficiency and ensuring fair compensation for small-scale farmers. Financial institutions will be more involved, providing working capital to support the growth of these new aggregation models.

The strategy will also facilitate networks that connect local soya bean farmers with potential buyers in both domestic and international markets. Furthermore, it will promote soya bean consumption as part of a healthy diet in the domestic market, raising awareness of its health benefits and versatility in local diets. This increased domestic demand will help stabilize the local market, making it more attractive for producers to invest in soya bean production, thus contributing to the long-term goal of expanding market access.

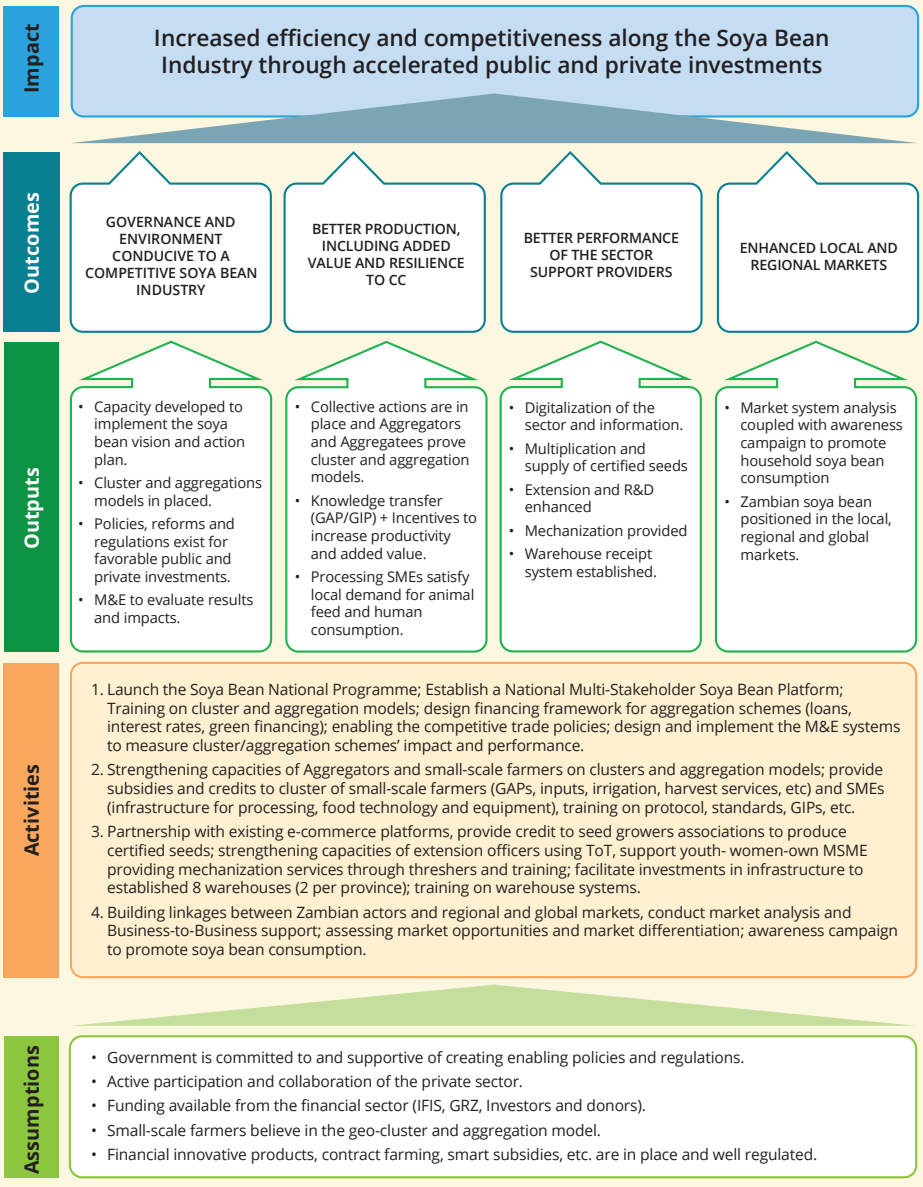
The immediate outcomes of the strategy will include improved productivity and yields for small-scale farmers, who will gain greater access to high-quality inputs and technical services. The strategy will foster stronger linkages between farmers, aggregators, and processors, enhancing the competitiveness of the soya bean value chain. Additionally, post-harvest services and improved processing facilities will reduce losses and add value to soya bean products, benefitting both farmers and SMEs.

In the long term, the National Soya bean Strategy aims to establish a sustainable, resilient, and inclusive soya bean value chain, increasing the

competitiveness of Zambian soya bean products on a larger scale. This will raise smallholder farmers' incomes, support the growth of local agro-processing industries, and position Zambia as a key player in regional soya bean trade. By building trust and collaboration across the value chain, the strategy will create a replicable model that can be scaled up, driving broader agricultural development and economic growth across the country.

Figure 24 below shows how the change is envisaged in the soya bean value chain in Zambia. It is a Theory of Change conceptualization of the assumptions and developments that will contribute to the upgrade and efficient functioning of the soya bean value chain.

Figure 24 Theory of Change for Zambian soya bean sector



Source: Author's elaboration.

4.3 An Action and Investment Plan

Hence an Action and Investment Plan, based on the ASTA methodology, that focuses on putting in place an efficient structure and reaching concrete targets over a period of five years, while leveraging the points to phase out.

Plan development objectives, beneficiaries and timeframe

The Programme Development Objective is to contribute to increase efficiency and competitiveness along the Soya bean Industry through accelerated public and private investments, and by using a combined cluster/aggregation and value chain development approaches. The concrete outcomes and outputs indicators that need to be achieved to realize the programme development objective are shown in **Table 23**.

Enhancing soya bean industry efficiency through public and private investments.

The soya bean value chain starts here, in fields where cultivation takes place.

Table 23 Output and outcome indicators for the soya bean development strategy

Outcomes and outputs indicators	TOTAL
Inproved productivity	
Number of Ha applying enhanced practices	138 060
Number of small scale farmers with improved agronomic practices	60 279
Average increase of profits / farmer / year (USD)	263
Average increase of income / farmer / year (USD)	188
Annual increase of incomes / year (USD)	11 330 465
Number of Seed Growers Associations targeted	108
MT certified seeds produced	3 452
Number of Ha with certified seeds	69 030
Net present value of annual incomes (USD)	5 849 399
Number of small-holders irrigating their land	750
Number of Pivots (20 Ha / Lateral Pivot) by PY5	75
Total Number of Ha irrigated by PY5	1 500
Number of MSME Threshing created	50
Number of permanent employment created (per month)	300
Number of seasonal employment created (per day)	6 000
Number of threshers	50
Annual Average MT saved in soya bean from year 1 to 5	68
Annual MT saved (not lost) because the use of threshers from Year 5	3 750
Average USD saved per year (from PY1 to PY5)	47 588
Average Annual USD saved from Year 5	79 313
Annual operating profit/MSME (USD)	1 785
Annual profits from 50 MSME	89 250
Increased soya bean storage capacity	
EMPLOYMENT	
Full time employment generated (Manager)	24
Full time employment generated (Coordinator)	96
Part time employment generated	432
STORAGE CAPACITY INSTALLED (MT)	9 600
PROFIT	
INPV Profit (USD)	6 364 360
Average Profit per year (USD)	636 436
Average annual profit per Warehouse (USD)	79 555
INCOMES	
INPV Net income (USD)	3 724 360
Average NPV income (USD)/year	372 436
Average annual income per Warehouse (USD)/year	46 555
Component 4 - Added Value	
Number of SMS	6
Average annual income / SME (USD)	35 650
Total full employment / SME / year (pp/month)	101

Source: Author's elaboration.

Geographic target. The five target provinces, i.e Central, Copperbelt, Eastern, Lusaka, and rest of provinces were selected on the basis of regional potential and government priorities, in a consultative process which involved the GRZ. These provinces are located at the epicentres of production and processing of soya bean in Zambia and therefore will best demonstrate proof of the concept behind the proposed interventions. In a subsequent phase, local governments will be involved in the identification of the specific districts and direct beneficiaries of the interventions.

Direct and indirect beneficiaries. The primary target beneficiaries of the project are small-scale farmers and small-scale processors and services providers, particularly women and youth. The programme will benefit about 60 030 small-scale farmers. Direct beneficiaries of geo-clusters will be responsible for cultivating a total of 138 060 hectares, of which about 30 percent are expected to be represented by women. Indirect beneficiaries include workers in rural areas (through additional demand for labour from geo-clusters, MSMEs and SMEs), providers of goods and services, small-scale producer organization (SPO) buyers (through improved supply of quality products) and consumers.

Timeframe: After a preparation phase, the implementation period for the action plan is five years. In that timeframe, the action plan must ensure the implementation of the exit strategy for each business model by commercializing the business model and engaging all stakeholders in the business models with focus on creating benefits and revenues for all. This will ensure that the activities will evolve smoothly after the five years and maintain the growth trend, as planned.

Plan description: Outcomes, outputs and activities

The development objectives of the plan will be achieved through the effective accomplishment of four outcomes:

OUTCOME 1: Formalized cluster and aggregation schemes established through public-sector collaboration with the soya bean industry, supported by enabling financial mechanisms, competitive trade policies, and a robust performance and impact monitoring system. The objective of this component is to strengthen the policy and institutional framework to support the operationalization and rollout of cluster and aggregation schemes, enabling the soya bean industry/ to become competitive in domestic, regional, and international markets. This objective will be achieved by attaining the following outputs and activities.

(1) ***Output 1.1.*** **Framework outlining the roles and responsibilities of public and private sector actors in the cluster and aggregation schemes and capacities enhanced to implement and manage the schemes effectively.** This subcomponent will support the creation of a Multistakeholder Coordination Platform for the Soya bean Value Chain led by the Ministry of Agriculture, and comprise of representatives from the GRZ, farmers, aggregators and off-takers, and other industry stakeholders to lead the effort of the soya bean development. Through this coordination platform, the private and public sector[95] will translate the proposed business models and plans into action, manage the overall investments in the sector and develop governance mechanisms around inclusive and sustainable geo-cluster and aggregation schemes. It is anticipated that this work will reduce investment risks at small-scale level by (i) carrying out market potential assessments and making coordinated investments at small-scale farmer and off-taker/market level, defining the public instruments that are missing to operationalize the value and supply chains and creating horizontal and vertical linkages between the VC actors.

- ***Activity 1.1.1.*** Establish the Multistakeholder Coordination Platform for Soya bean to support the cluster/aggregation models, coordinate public and private investments and build linkages between soya bean, livestock and aquaculture value chain actors.
- ***Activity 1.1.2.*** Complete the preparation-phase for piloting the implementation of cluster and aggregations schemes and

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[95] The National Soya bean coordination platform could include representatives of the core value change (production, aggregators, processor and distributers) and the Ministries, the university and research institutes, international organizations and NGOs.

its roll-out (adjust proposed business models by the Multistakeholder Coordination Platform for Soya bean, and agree on the investments, incentives and risk reduction mechanisms for the VC beneficiaries)[96].

- ***Activity 1.1.3.*** Conduct institutional assessments of VC actors, identify gaps in the application of cluster/aggregation models, out-grower schemes, financing tools, etc., and organize training workshops to enhance national institutions and soya bean industry' capacities to roll out aggregation schemes. Main target stakeholders for the training will be the Multistakeholder Coordination Platform for Soya bean, independent commodity associations, the Central Bank and commercial banks, service provides, IFIs and NGOs. Main capacity topics will be on (i) how to implement the cluster/aggregation models that is sustainable, inclusive and women/youth led; (ii) how to further define the instruments for a conducive investment environment; and (iii) how to involve banking and non-banking institutions that are critical actors for model sustainability. International best practices[97] will be assessed.
- ***Activity 1.1.4.*** Conduct a feasibility study to determine the legal structure required for rolling out the soya bean cluster and aggregation schemes at the national level. To implement these schemes, the GRZ and the soya bean industry could explore several legal structures to formalize their venture, such as Public-Private Partnerships (PPP)[98] or Joint Ventures (JV)[99], among others. The feasibility study will evaluate each potential legal structure, including the regulatory frameworks and agreements necessary to outline roles, responsibilities, financial terms, and enforcement mechanisms. The study will recommend the most suitable structure for the effective rollout of the cluster and aggregation schemes nationwide.

(2) ***Output 1.2.*** **Financial delivery mechanisms designed to support aggregation/cluster scheme.** Under this subcomponent the action plan can increase access to inclusive financial instruments through capacity building and information exchange between financial service providers (FSP), producer groups and SMEs.

- ***Activity 1.2.1.*** Assess the financial sector and identify what financial instruments are available and make recommendations on innovative financial tools (e.g. guarantee funds, working capital funds).
- ***Activity 1.2.2.*** Identify and engage financial institutions accredited to provide credit and insurance to Aggregators, farmer groups, MSME in the clusters to pilot-test the aggregation models and invest in improved production techniques. This includes the organization of Business to Business (B2B) meeting to link up financial institutions to SMEs and farmers 'organization.
- ***Activity 1.2.3.*** Provide technical support to financial service providers on agricultural value chain finance approaches to develop inclusive and tailored financial instruments suitable to stakeholders in the soya bean VC.
- ***Activity 1.2.4.*** Support set up derisking mechanisms such as guarantee schemes and credit lines for the soya bean VC through MFIs and banks.

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96 Best practices from Morocco and Nigeria will be applied, where aggregation law/regulation has created an enabling environment and regulated the aggregation of smallholder farmers effectively.

97 Ghana, Mozambique, Morocco, Ethiopia (ATA institutional framework and NIRSAL); Beyond Cotton Project, Cartier foundation and Master card foundation project.

98 A PPP is a collaboration between the public and private sectors, where each party shares risks, resources, and rewards. The government could provide policy support and infrastructure, while the industry (private sector) manages operations and provides expertise. The government and industry sign formal agreements defining the roles of aggregators (those coordinating supply chains and aggregating smallholder outputs) and aggregatees (smallholder farmers or SMEs contributing to the value chain). It allows for pooling resources from both sectors and ensures accountability through legal contracts, often with a regulatory or oversight framework.

99 A JV could be created as a legal entity, where both government and industry hold shares or partnership rights. The JV is a separate entity that contracts aggregators to manage the scheme, while the aggregatees remain independent suppliers. The legal framework would include clear terms of engagement, profit-sharing mechanisms, and operational guidelines. This structure offers flexibility in how the scheme operates and distributes responsibilities between the government and industry, while limiting liability to the venture itself.

(3) ***Output 1.3.*** **Sector-wide trade policies, reforms and regulations are in place for favorable public and private sector investments.**

- ***Activity 1.3.1.*** Conducting a comprehensive review and analysis of existing trade policies, regulations, and reforms in the soya bean sector to identify gaps and opportunities for improvement.
- ***Activity 1.3.2.*** Organizing workshops, roundtables, and consultations with key stakeholders, including government agencies, private sector representatives, trade associations, and industry experts, to discuss and align on necessary policy changes and reforms.
- ***Activity 1.3.3.*** Drafting policy recommendations and reform proposals that address sector-specific challenges, aiming to create an enabling environment for private sector investments and trade facilitation. This includes revising regulations that promote private sector participation, investment, and fair competition, including addressing issues such as market access, trade tariffs, subsidies, and environmental standards.
- ***Activity 1.3.4.*** Implementing campaigns to raise awareness among policymakers and the private sector about the benefits of the proposed trade policies and reforms, and how they will improve investment conditions.

(4) ***Output 1.4.*** **A monitoring and evaluation system developed withing the MoA to mobilize, register, monitor and evaluate cluster and aggregation schemes.** An M&E framework will allow constant improvement of the policy instruments, governance mechanisms and institutions. The M&E will register the geo-cluster areas, Aggregators, Aggregatees (farmers) and other beneficiaries.[100] This will decrease the risk of the aggregator and VC actors performing the aggregation. The M&E system will generate data for lesson learning to facilitate the programme exit-strategy and scaling up across the country.

- ***Activity 1.4.1.*** Design the M&E framework and IT system (AGIS, geo-cluster, farmer and integrator registration, verification numbers, e-subsidies/credits provided, etc).[101]
- ***Activity 1.4.2.*** Conduct quarterly and semi-annual field trips and surveys to measure behavioural change (from a baseline), technical performance changes (yield; post-harvest losses; added value) and results.
- ***Activity 1.4.3.*** Disseminate results widely through TV, radio and social media.

OUTCOME 2: Better production by increasing productivity, resilience to climate change and value added using a cluster approach. This component will finance the provision of (i) capacity building and incentives to aggregators and (ii) capacity building and "smart subsidies/credits" to small-scale farmers (primary production) and processing SMEs under geo-cluster, as follows:

(1) ***Output 2.1.*** **Aggregators in the targeted areas test aggregation schemes.** The main activities are:

- ***Activity 2.1.1.*** Launch competitive call for proposals to be pre-identified and select the "Aggregators" in each province and selected district (those led by women and youth would be prioritized) and disseminate the Programme activities including, inter alia, the results of the competitive call-for-proposals for "Aggregators", "Aggregatees" and the "Integration Plans".
- ***Activity 2.1.2.*** Provide incentives and strengthen capacity of selected Aggregators[102] to provide inputs and services to farmers, test the aggregation models and to provide monitoring and evaluation of the geo-clusters.
- ***Activity 2.1.3.*** Link selected Aggregators to suitable sources of working capital finance

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[100] Using experience and lessons from Nigeria, of NIRSAL Agro-geocooperatives that capture the biometric details and implement a farmer verification process that matches farmer details with Bank Verification Numbers.

[101] Design and implementation of a web-based system to track progress of result indicators, including the creation of a link to a web and SMS-based citizen feedback survey.

[102] Business aggregators can be large-scale farmers, small-scale commercial/emergent farmers – category C; SMEs processors; private service providers; off-takers and market actors, NGOs, etc.

to kickstart and pilot-test the aggregation models

(2) ***Output 2.2.*** **Small-scale farmers under geo-clusters receive "smart packages" of GAPs, inputs, mechanization services, and irrigation schemes.**

- ***Activity 2.2.1.*** Establish around 100 clusters of small-scale farmers per province and develop aggregation schemes through linkages with the Aggregators.
- ***Activity 2.2.2.*** Train farmers and SMEs on aggregation/out-grower models and marketing linkages with aggregators and/or agro-dealers. This include capacity enhancement and technical assistance to farmers and SMEs to develop effective business plans, on business management and financial literacy (access to financial services including agricultural insurance and other climate risk management strategies), business planning and management, market and marketing, information technology, and other technical productive services, cooperatives/associations, warehouse receipt management, gender, and youth and women's participation in group structures.
- ***Activity 2.2.3.*** Carry out support for three seasons to geo-cluster farmers consisting of, among others, one or more of the following activities ("smart packages (subsidies/credits)"):

  (i) provision and utilization of GAPs, certified seeds, inoculants and other vegetative material and agriculture inputs, tools, organic certification, soil conservation measures (terracing, land-leveling and watershed treatments etc.), and post-harvest machinery services; and

  (ii) provision of on-farm grouped irrigation schemes (75 group lateral pivots serving at least 20 ha/pivot) through competitive call for proposals and linkages to private sector (equipment suppliers), including training on water use; O&M of irrigation schemes; and financial literacy, marketing and linking them to agro-dealers.

(3) ***Output 2.3.*** **Soya bean processing plants in provincial cluster areas satisfied local market demand for soya bean for animal feed (soya bean cake) and for human consumption.** The main activity areas are:

- ***Activity 2.3.1.*** Conduct a feasibility study to fine tune the proposed business model for existing and new small- and medium- scale processing plants/units and to identify multi-purpose business areas in the clusters where new SMEs can be installed.
- ***Activity 2.3.2.*** Launch competitive call for proposals (including business plan and feasibility study) to operate six soya bean processing plants (two SMEs per province, except Lusaka) – priority will be given to women-owned enterprises and youth entrepreneurs in the selection process for support to operate soya bean processing plants. Facilities could be owned or co-owned by legal registered groups of farmers, associations or cooperatives, etc.
- ***Activity 2.3.3.*** Provision of infrastructure such as storage facilities for product processing, food technology and equipment through linkages to the private sector and banking sector to de-risk funding (credit).
- ***Activity 2.3.4.*** Build capacity through business incubation models and provide training in the application of protocols, standards and good processing practices, adoption of innovative technologies, etc. Link existing large-scale processors to newly established SMEs for mentorship and support in terms of growing markets, technical skills and accessing financial resources.

OUTCOME 3: Improved performance of soya bean support providers. This component is intended to enhance performance of the extended soya bean value chain actors[103] – public and private support providers who do not take ownership of the value chain products but play an essential role in facilitating the value creation process through the following outputs:

(1) ***Output 3.1.*** **Digitization of the soya bean industry and dissemination of information.** This

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[103] They supply physical inputs such as seeds and packaging materials, mechanization, storage, transport, laboratory testing, spraying, or financial or non-financial services such as loans, insurance, information, and market intelligence.

subcomponent will support the use of digital technology that is accessible to agro-dealers (input suppliers, etc), farmers, and SMEs.

- *Activity 3.1.1.* Conduct readiness assessments for digitization of soya bean sector.
- *Activity 3.1.2.* Partner with existing platforms (i.e. ZAMACE's platform. World Food Programme (WFP) MAANO E-Commerce digital platform or FAO ZIFAZ project – ongoing E-Commerce) and expand their functionality and outreach to include an input supplier modules and other functions (market prices, climate information, etc).
- *Activity 3.1.3.* Conduct regular M&E to report on performance, results and impacts.

(2) ***Output 3.2.*** **Multiplication and supply of certified seeds:** The ASTA programme will target setting up USD 7 000/ha soya bean seed multiplication fields through out-grower seed production schemes across the four target provinces. This subcomponent proposes to:

- *Activity 3.2.1.* Establish partnerships and work with the private sector seed companies to implement cottage seed industry business models, including capacity of smallholder seed-growers associations.
- *Activity 3.2.2.* Provide credit as working capital (in kind) to seed growers associations and generate an assured market for their seed.
- *Activity 3.2.3.* Work with agro-dealer outlets to improve inventory management to facilitate off-take of seed from smallholder seed growers.
- *Activity 3.2.4.* Enhance demand for certified seed. Work with private sector extension systems, public extension systems and international partners such as SIL and IITA to conduct widespread sensitization of farmers on the importance of using certified seed.

(3) ***Output 3.3.*** **Extension and Research & Development services enhanced** to deliver training on improved soya bean agronomic practices:

- *Activity 3.3.1.* Undertake a capacity development assessment of public and private extension workers operating in the targeted cluster areas to gauge the knowledge baselines.
- *Activity 3.3.2.* Implement a Training of Trainers programme and build capacities of public extension officers, NGOs, and others.
- *Activity 3.3.3.* Support R&D plots to measure the programme impact indicators. This may include liaise with ZARI soya bean R&D programme to develop better performing soya bean public lines and improve crop management practices.

(4) ***Output 3.4.*** **Mechanization of the harvesting process:** Facilitate multi-crop threshers to youth-owned and women-owned farmer groups and MSMEs through credits:

- *Activity 3.4.1.* Launch competitive calls for proposals (including business models) to establish youth-owned /women-owned MSMEs for post-harvest mechanization services.
- *Activity 3.4.2.* Support around 50 MSME private service businesses with the acquisition through credit schemes of threshing machines to be manufactured and maintained locally (setting up).
- *Activity 3.4.3.* Provide training to MSMEs owners and operators on how to run a successful communal business rental system and on O&M of the machinery.

(5) ***Output 3.5.*** **Warehousing receipt system established and commercially managed.** Under this subcomponent, the action plan can support the development of eight warehouses (two per each targeted province) with (i) credit for buildings and equipment; (ii) tailored training on the warehousing receipt systems operations for the organization (partner private entities certified by ZAMACE) that will be operating the warehousing; and (iii) conducting farmer sensitization on the operations and benefits of warehousing.

- *Activity 3.5.1.* Conduct feasibility studies for establishing warehouses for soya bean
- *Activity 3.5.2.* Competitively select partner private entities accredited by ZAMACE to manage the warehouses, through calls for proposals that include business plan and potential cluster producer groups who will be depositing soya bean in the warehouse.

Encouraging the consumption of soya bean products as part of a healthy domestic diet.

- ***Activity 3.5.3.*** Build capacity of partner private entities to operate warehousing system tailored training for the organization that will be managing and operating the warehouses.
- ***Activity 3.5.4.*** Facilitate investment in infrastructure for establishing eight warehouses (two warehouses per province).
- ***Activity 3.5.5.*** Conduct farmer sensitization on the operations and benefits of warehousing, and capacity development activities for both the supply and the demand for financial services.

OUTCOME 4: Market access. This outcome will conduct market systems analysis and design of trade and market diversification strategy and action / investment plans.

(1) ***Output 4.1.*** **Develop market linkages and partnerships agreements.**

- ***Activity 4.1.1.*** Conduct a market information and business-to-business analysis to promote the soya bean market, including by-products for human consumption for domestic consumption and export.
- ***Activity 4.1.2.*** Build linkages between Zambian value chain actors with the regional and global markets.
- ***Activity 4.1.3.*** Facilitate industry actors' participation in specialized trade fairs and study tours

(2) ***Output 4.2.*** **Promote the consumption of soya bean products as part of a healthy diet in the domestic market.**

- ***Activity 4.2.1.*** Conduct a study to promote soya bean consumption in Zambia, assessing current markets and rural opportunities, and developing a marketing strategy to differentiate Zambian soya bean by-products based on demand.
- ***Activity 4.2.2.*** Launch soya bean nutrition campaigns to raise awareness among rural populations about the importance of diversifying diets.

4.4 Programme costs and indicative financing

The programme could be financed over a six-year period by different stakeholders. **Table 24** below outlines the estimated investments from different funding streams that are needed to carry out the upgrading interventions. All are necessary and complementary, contributing to uplifting different segments of the value chain, the services that support the chain's operation, and the broader enabling environment, altogether constituting the holistic approach of an ASTA development project. While large investment to upscale the soya bean sector is needed, activities need to be carefully planned and monitored, and to ensure the inclusion of disadvantaged groups, especially female farmers and youth. It is expected that an ASTA facilitation project will be implemented for a period of four or five years to get the initiative off the ground in pilot areas, after which point the value chain will continue on a sustainable development path, driven by the private sector and facilitated by the public sector and non-governmental stakeholders.

Table 24 Tentative financing investments from different funding sources (USD Mn)

Main investments	Private sector	Development grants	Development bank loans	TOTAL	%
Multi-stakeholder Soya bean Joint Venture; capacity building; collective actions; Legal framework; M&E		1 613 121		1 613 121	2%
Training of Good Agronomic Practices		6 903 000		6 903 000	9%
On-farm investments (3 seasons)	7 608 451	5 706 338	24 727 466	38 042 256	49%
Irrigation schemes	1 452 000		5 808 000	7 260 000	9%
Small-medium scale processing plants	107 640		430 560	538 200	1%
Certified seeds production	3 511 758	2 633 819	11 413 214	17 558 791	23%
Post-harvest machinery	69 750	26 250	279 000	375 000	0.5%
Warehouse Receipt System	464 640	316 800	1 858 560	2 640 000	3%
Extension and R&D		500 000		500 000	1%
Soya bean digitalization and information dissemination		45 000		45 000	0.06%
Facilitation and Technical Assistance (analysis, design, coordination, capacity development; TA, studies, baseline.		2 306 763		2 306 763	3%
Total	**13 214 239**	**20 051 090**	**44 516 801**	**77 782 130**	**100%**
	17%	**26%**	**57%**	**100%**	

Source: Author's elaboration.

The financing of the programme is categorized into two types:

1. **Short-term financing – working capital:** Working capital is essential for implementing the business models from production to markets during the soya bean season. Working capital can be channeled through donors, government subsidies, NGOs, or microfinance institutions and the private sector investment (i.e., providing de-risking mechanisms for the private sector to provide short term credit). Working capital for farmers will be provided for input supplies (seeds, chemicals, fertilizers, etc.); working capital for aggregators could be supplied against purchased soya bean.

   In each cluster, the average estimated working capital is about USD 125 000, as follows:

   (i) **Farming** – a small-scale farmer will require working capital to access input supplies either directly or through aggregators; estimated working capital required per farmer is USD 250, which represents 50 percent of production costs;

   (ii) **Seed production** – seed growers associations will require working capital to access input supplies from the private sector; estimated working capital required per farmer is USD 250, which represent 50 percent of the production costs;

   (iii) **Processing** – SMEs will require working capital to access input supplies either directly or through aggregators; and

   (iv) **Aggregators** – purchasing of the production from farmers by aggregators will require approximately 50 percent of the total production cost; with an estimated production value at each cluster of approximately USD 800 000, it is calculated that USD 400 000 will be required to finance intermediaries.

2. **Investment financing** is required for greenfield projects or expansion of existing projects, which include warehouses, processors, mechaniza-

tion, and irrigation schemes. The investment financing will be provided through financing institutions such as banks, local and international investors and through innovative private sector partnerships. It is recommended that interest rates on loans are subsidized through the donor community, or a grant is provided. The investment is expected to be over one to three years. The financing mechanism and modalities will be further explored with stakeholders prior to implementation.

4.5 Institutional and implementation arrangements

The plan will be implemented through the Soya bean Multistakeholder Coordination Platform, a centralized unit with operational autonomy that will manage five "Aggregators" per region and about seven geo-clusters (a total of 5 000 ha). The JV will develop contractual and governance arrangements for "Aggregators" and geo-clusters.

The Soya bean Multistakeholder Coordination Platform will have a National Coordinating Unit (NCU) and dedicated Regional Operational Units (ROUs) which will be strengthened to manage this programme and other projects financed by different sources. The NCU will be in charge of overall programme coordination, oversight and quality control. It will have a programme coordinator as well as key fiduciary, safeguarding, technical and monitoring and evaluation staff. In each target region, a ROU will be established following a department agreement to be signed (or updated, if necessary) between the MoA and the respective recipient's autonomous government department. The NCU will approve the ROU's annual operational plans and budget, supervise their operations and provide final approval to appraised geo-clusters and aggregators. The ROUs will handle key aspects of the geo-cluster approach and project cycle, starting with the promotion, facilitation and identification of potential clusters and Aggregators; field supervision; local coordination; and monitoring. Training, technical assistance and capacity building activities for the geo-clusters will be supported by locally based consultants. Beneficiaries of this programme will be grouped into geo-clusters.

Out-grower contract brokering and management: This service will be offered to small-scale farmers who will be registered in the project. The plan will link farmers in a given cluster, either as individuals or as groups/cooperatives, to Aggregators for sale of their commodity, thereby providing them with an assured market. To ensure that farmers achieve the supply quotas specified in their contracts, they will be provided with credit to purchase inputs such as seed and fertilizer, which will be issued to them in kind (e.g. seed).

Each integrator is directly assisted by the programme and is responsible for delivering the project's non-cash loans to the small-scale farmers through contract farmers. Small-scale farmers repay the loans (in cash) through the same mechanisms and each integrator establishes the linkage between small-scale farmers and off-takers (e.g. an agro-processing industry). Aggregators will operate in partnerships with government departments and other public institutions such as ZARI, IITA and SCCI. Investment funds will be channelled directly into specific joint venture activities/initiatives outlined below.

4.6 Key risk and mitigation measures

Global events, such as the COVID-19 pandemic and the conflict between the Russian Federation and Ukraine, have resulted in input and output supply chain interruptions, which present an increased risk to the sector's growth. Zambia, for example, imports fertilizer from both the Russian Federation and Ukraine and the current conflict implies restricted supplies and a surge in prices. As fertilizer prices continue to rise, many farmers will be unable to afford the commodity with a resultant negative effect on yields and production. The global events have imposed challenges on many countries in securing stocks of essential grains. These challenges and risks also present opportunities for the development of the sector in Zambia. It is anticipated that the rise in demand for soya bean will create a global price increase of 26.3 percent, influenced by inflated prices of edible oil produced from sunflower (up by 25 percent) and the increased cost of shipping and supply logistics on a global level. In this context, the Zambian soya bean value chain has great potential for continued growth and to add value to local economies. Key risks identified are presented in **Table 25**.

Table 25 Key risks and mitigation measure

Risks	Likelihood	Impact	Mitigation measures
Policies that lead to non-distorted and properly functioning markets are not implemented and ad-hoc soya bean export bans affected the investments in the sector and competitiveness of the soya bean sector.	High	High	Promote national collaboration, and facilitate multi-stakeholder and multi-sectoral dialogues at the national level.
Novel technologies and innovative approaches are not adopted.	Medium	Medium-high	Partner with other organizations working on similar technical areas, to pool resources and investments to achieve impacts at scale and sustain the benefits. Involvement of local grassroot organizations (NGOs) that interface with key value chain players.
Non-controlled land expansion cultivating soya bean could negatively affect the environmental sustainability.	Low	High	Promote the adoption of sustainable and legal production systems, by strengthening governance and using existing tools.
Increased risk of inequality in the absence of explicit measures around inclusion.	Medium	High	Promote transparency and information sharing, facilitating the adoption of adequate informed policy decisions with all key decision-making constituencies (women, youth, men, rural, urban) are involved.
Lack of commitment by private sector players and other stakeholders.	Low	High	Early engagement with stakeholders to ensure commitment, create ownership, and share business models.
Reliance on a few donors for funding may slow progress on certain programmes.	Low	Medium	Expand collaboration with donors and financial institutions to widen the base of support.
Non-engagement of Smallholder farmer in diverse activities and poor adoption of knowledge and skills.	High	High	Awareness raising, widespread sensitization and capacity building and expand mobilization through NGOs and community groups.
Poor participation of aggregators, processors in the proposed market development business models.	Low	Medium	Promotion of demand driven market model through direct engagement with aggregators and processors.
Lack of access to finance for new investments / upgrading of existing opportunities.	Medium	Medium	Regulatory reforms that will address availability of financial products and promotion of alternative financing options such as guarantees, hedging funds, contract farming, outgrower schemes, etc.
Lack of capacity among implementing partners.	Medium	Medium	Extra fund is included for R& D which will support building capacity of implementing partners & Training is included in all business models as a Mandatory component.
Imports of cheaper soya bean-based products that compete with local production.	Medium	High	Build capacity for quality products and widen variety of locally produced soya bean based products at competitive cost of production.
Soil and environmental degradation following continuous unchecked use of chemical fertilisers, pesticides and herbicides and pollution arising from processing of products.	High	High	Promotion of use of sustainable food production systems such as conservation agriculture, organic agriculture, integrated pest management approaches etc and use of renewable and recycled resources in the processing activities.

Source: Author's elaboration.

4.7 Stakeholder involvement in the implementation of the soya bean vision and strategic interventions

The investment strategy requires the involvement and buy-in of different stakeholders who have important roles in supporting the development of the value chain and achieving the investment outcomes.

The role of Government: The government is the lead partner in this initiative, supported by the private sector, the donor community and NGOs. The government has various responsibilities in supporting the development of the value chain, which includes creating a regulatory framework required to address issues such as trade, VAT and non-tariff barriers to imports. Additionally, the government has the responsibility of facilitating access to finance through providing incentives[104] to small-scale farmers and SMEs, providing farmers with advisory knowledge through its network of extension service providers, and supporting the development of R&D and infrastructure, particularly transportation. This VCA and core strategy is an important example in which the government has partnered with the FAO and UNIDO to improve the soya bean value chain. Hence the role of government is to (i) coordinate with the IPPI Programme Steering Committee and other public and private entities to implement the proposed Action and Investment Plan for the sector (see **Chapter 4.4**); (ii) support the establishment of a soya bean national multistakeholder platform through gearing activities and partnering with different stakeholders; (iii) forge partnerships with international organizations and the private sector, NGOs, to coordinate the allocation of public and private investments into the soya bean sector.

The Role of Private Sector and Large Corporations. The private sector, particularly large firms, is a driver of growth in the sector. In that context, it is important for lead firms and large-scale investors to engage in the proposed business models and in the inclusion of small-scale farmers. The roles range from providing Corporate Social Responsibilities (CSR) engagements to financing and product sourcing. However, one of the important factors is to ensure that private sector players are included at the early stage of implementation to ensure successful integration. Large corporations in Zambia could have a significant role in supporting the value chain. The majority of these corporations are multinational companies and are foreign-owned. Despite being foreign-owned, many of these companies expressed interest in collaborating and engaging with local stakeholders in the development of the supply chain. The private sector can partner with small-scale farmers in implementing out-grower schemes that would provide small-scale farmers with opportunities to access inputs and output markets. Furthermore, as in the example of smallholder seed growers in Eastern province, capacity can be built to empower small-scale farmers with knowledge and means to undertake farm-based value addition activities.

NGO. NGOs have always played a strong and supporting role in the development of value chains. The field mission and the workshops revealed that the support of NGOs to the soya bean value chain is limited compared to other value chains. NGOs could play various important roles including capacity building of farmers, facilitating access to services and inputs, supporting farmers in marketing of soya beans and training households on home processing and consumption of soya beans to improve household nutrition and health. NGOs represent an excellent channel in the development of the value chain due to their extended outreach and availability of resources. However, for NGOs to sufficiently support an investment strategy, they need to have institutional capacity, resources, and commitment.

Donors and international financing institutions have been supporting the soya bean value chain, among other value chains, through different programmes and initiatives. Initiatives suggested as investment strategies in this report can be discussed further by the Cooperating Partners in Zambia to evaluate areas of donor involvement. The FAO and UNIDO team identified potential for collaboration with several existing initiatives, with

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[104] Initiatives such as Farmer Input Support Programme implemented by the Ministry of Agriculture and the Food Security Pack implemented by the Ministry of Community Development and Social Welfare have good intentions of improving access to and subsidizing input costs for small-scale farmers.

some recommendations proposed in **Chapter 3 and 4**.

4.8 Next steps and preparatory phase

Upon GRZ commitment to implement an ASTA Facilitation Project, a preparation phase will be initiated to draft a concrete ASTA Facilitation Project document to initiate the implementation of the strategy. This proposal will include the project log-frame, the targeted pilot areas, initial funds mobilized from each stakeholder and a work plan with detailed timelines for all the stakeholders on board. The initiative is envisioned to be women and youth-inclusive with target indicators for improvement; a logical result framework will reflect this accordingly.

Considering that the strategic interventions and business models are based on developing a Multistakeholder Coordination Platform that coordinate services and financing to all beneficiaries through a pre-identified criteria and contractual relationships, substantial consultation would be held during the preparation phase. However, as the model involves several stakeholders, it is important to consider the following steps during the project preparation:

- Agree on the initial investments, which require the involvement and buy-in of different stakeholders who have important roles in supporting the development of the value chain and achieving the investment outcomes. There should be some "agreement in principle" by all the key stakeholders that they are willing to make investments of about USD 76 million over 10 years to upgrade the sector.
- Develop the project guidelines and collaboration mechanism that will ensure smooth and successful implementation.
- Strengthen the institutional capacity of project partners including government, NGOs, and private sector.
- Develop a monitoring and evaluation system to monitor implementation, evaluate outcomes, and adjust modalities as required.

Prior to execution, the implementing partner(s) will need to develop the project implementation modalities. This will involve identifying project beneficiaries, developing collaboration mechanisms, and ensuring availability of funds and financing channels.

Strategic investments drive growth in soya bean production, boosting Zambia's agriculture sector.

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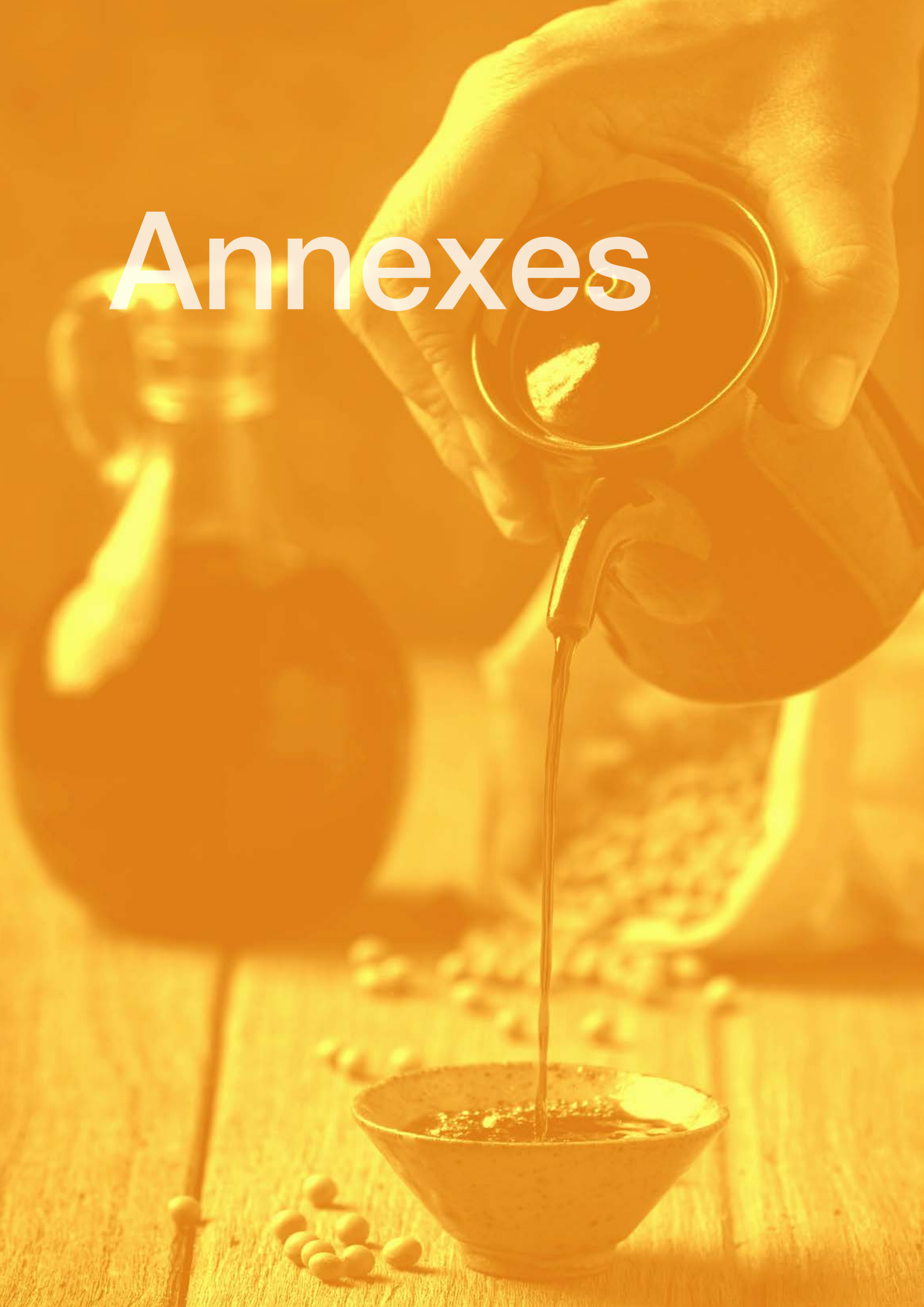
Opportunities for Youth in Africa (OYA) programme beneficiaries practicing soya bean cultivation methods in Kapiri Mposhi, Zambia.

Annexes



Annex 1 Action Plan: Activity Chart Over Time

Outcomes, Outputs and activities			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 -10
Outcome 1: Formalized cluster and aggregation schemes established through public-sector collaboration with the soya bean industry, supported by enabling financial mechanisms, competitive								
Output 1.1 Framework outlining the roles and responsibilities of public and private sector actors in the cluster and aggregation schemes and capacities enhanced to implement and manage the schemes effectively								
Activity	**1.1.1.**	Establish the Multistakeholder Coordination Platform for Soya bean						
Activity	**1.1.2.**	Complete the preparation-phase for piloting the implementation of cluster and aggregations schemes and its roll-out						
Activity	**1.1.3.**	Conduct institutional assessments, and design and implement a Capacity Building Program to roll out aggregation schemes						
Activity	**1.1.4.**	Conduct a feasibility study to determine the legal structure required for rolling out the soya bean cluster and aggregation schemes at the national level						
Output 1.2. Financial delivery mechanisms designed to support aggregation/cluster scheme								
Activity	1.2.1.	Assess the financial sector and identify what financial instruments are available and make recommendations on innovative financial tools						
Activity	1.2.2.	Identify and engage financial institutions accredited to provide credit and insurance to Aggregators, farmer groups, MSME						
Activity	1.2.3.	Provide technical support to financial service providers						
Activity	1.2.4.	Support set up derisking mechanisms						
Output 1.3: Sector-wide trade policies, reforms and regulations are in place for favorable public and private sector investments								
Activity	1.3.1.	Conducting a comprehensive review and analysis of existing trade policies						
Activity	1.3.2.	Workshops and meetings to gather insights, consult, validate and advocate soya bean exports' policies reforms, laws and regulations on trade policies						
Activity	1.3.3.	Drafting policy recommendations and reform proposals that address sector-specific challenges						
Activity	1.3.4.	Implementing campaigns to raise awareness among policymakers and the private sector a						
Output 1.4.: Monitoring and Evaluation System in place to register, monitor and evaluate impacts								
Activity	1.4.1.	Design the M&E framework and IT system (AGIS, geo-cluster registration, BI, incentives, subsidies/credits, etc.						
Activity	1.4.2.	Conduct quarterly and semi-annual field days and surveys to measure behavioral and technical performance changes						
Activity	1.4.3.	Disseminate results widely through TV, radio, social media						
Outcome 2: Better production by increasing productivity, resilience to climate change and value added								
Output 2.1. Aggregators in the targeted areas test aggregation schemes								
Activity	2.1.1.	Launch competitive call for proposals to be pre-identified and select the "Aggregators" in each province and selected district						
Activity	2.1.2.	Provide incentives and strengthen capacity of selected Aggregators						
Activity	2.1.3.	Link selected Aggregators to suitable sources of working capital finance						
Output 2.2. Small-scale farmers under geo-clusters receive "smart packages"								
Activity	2.2.1.	Establish around 100 clusters of small-scale farmers per province and develop aggregation schemes through linkages with the Aggregators						
Activity	2.2.2.	Train farmers on aggregation/out-growers model and marketing linkages, financial literacy, business, markets, etc.						
Activity	2.2.3.	Carry out support for three seasons to geo-clusters farmers - "smart packages (subsidies / credits)"						
(i)	provision and utilization of GAPs, certified seeds, inoculants and other inputs, post-harvest machinery services							
(ii)	provision of on-farm grouped irrigation schemes (75 groupal lateral pivots serving at least 20 Ha/pivot)							
Output 2.3. Soya bean processing plants in provincial cluster areas satisfied local market demand for soya bean for animal feed (soya bean cake) and for human consumption								
Activity	2.3.1.	Identify multi-purpose business areas in provinces where processing SMEs can be installed						
Activity	2.3.2.	Launch competitive calls for project proposalsto support 6 SMEs (including business plan and feasibility study)						
Activity	2.3.3.	Provision of infrastructure, food technology and equipment						
Activity	2.3.4.	Build capacity through business incubation model and provide training						

Outcomes, Outputs and activities			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 -10
Outcome 3: Improved performance of soya bean support providers								
Output 3.1. Soya bean digitization and Information dissemination								
Activity	3.1.1.	Conduct readiness assessments for digitization.						
Activity	3.1.2.	Partnership with on-going E-Commerce (i.e. ZAMACE, FAO ZIFAZ; WFP MAANO) to expand its fuctions to soya bean VC						
Activity	3.1.3.	Conduct regular M&E to report on performance, results and impacts						
Output 3.2 Certified Seed Multiplication Programme through Seed Growers Associations								
Activity	3.2.1.	Call for proposal for Aggregators and partnerships to implement out-grower seed production schemes						
Activity	3.2.2.	Provide credit as working capital to Seed Growers Associations and an assured market for their seed.						
Activity	3.2.3.	Work with agro dealer outlets to improve inventory management to facilitate off-take of seed from smallholder seed growers						
Activity	3.2.4.	Enhanced demand for certified seed.						
Output 3.3. Extension and R&D enhanced								
Activity	3.3.1.	Undertake a capacity development assessment of public and private extension workers operating in the targeted cluster areas						
Activity	3.3.2.	Implement a Training of Trainers program and build capacities of public extension officers, NGOs, and others						
Activity	3.3.3.	Support R&D plots to measure the programme impact indicators (e.g. ZARI Soya bean R&D programme)						
Output 3.4. Post-harvest mechanization services								
Activity	3.4.1.	Launch competitive calls for proposals to establish youth- & women-owned MSMEs post-harvest mechanization services						
Activity	3.4.2.	Support at around 50 MSME private service businesses with the aquisition of threshing machines						
Activity	3.4.3.	Provide training to MSMEs owners and operators						
Output 3.5. Warehouses Receipt System established and comercially managed								
Activity	3.5.1.	Conduct feasibility studies for establishing warehouses for soya bean						
Activity	3.5.2.	Competitively select partner private entities to manage the warehouses						
Activity	3.5.3.	Build capacity to operate warehousing system						
Activity	3.5.4.	Facilitate investments in infrastructure and equipment to establish community-owned warehouses (2 Warehouses per province)						
Activity	3.5.5.	Conduct farmer sensitisation on the operations and benefits of warehousing						
Outcome 4: Producers and processors gain access to local, regional and global markets and consumers diversified diets								
Output 4.1. : Develop market linkages and partnerships agreements								
Activity	4.1.1.	Conduct a market information and analysis, including business-to-business analysis y, for soya bean and by-products, and design a Trade and Market Diversification Strategy (including investment and						
Activity	4.1.2.	Build linkages between Zambian value chain actors with the regional and global markets						
Activity	4.1.3.	Facilitate industry actors' participation in specialized trade						
Output 4.2 Promote the consumption of soya bean products as part of a healthy diet in the domestic market								
Activity	4.2.1.	Conduct a study to promote soya bean consumption in Zambia, assessing current markets and rural opportunities, and developing a marketing strategy to differentiate Zambian soya bean by-products based on demand.						
Activity	4.2.2.	Launch soya bean nutrition campaigns to raise awareness among rural populations about the importance of diversifying diets.						
Programme Facilitation and Technical Assistance (FAO and UNIDO)								
Administrative cost								

Annex 2

Financial Analysis of Business Models and Upgrading Opportunity Investments

The below financial analysis including investment costs and expected cash flows for the different business models will be endorsed during the preparatory phase (ASTA Facilitation Project proposal), as there could be some variations in terms of the location, size, scale, linkages, etc.

Business Model 1: Improved production practices (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of Ha (2021)		354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000
% of annual increase of ha applying new practices	0	3%	5%	8%	10%	15%	0%	0%	0%	0%	0%
Number of targeted ha applying new practices	0	8 850	26 550	53 100	86 730	138 060	138 060	138 060	138 060	138 060	138 060
W/O PROJECT											
COST		3 673 271	11 019 812	22 039 624	35 998 052	57 303 021	57 303 021				
REVENUES		4 203 750	12 611 250	25 222 500	41 196 750	65 578 500	65 578 500				
% of revenue remaining after account		92.50%	92.50%	92.50%	92.50%	92.50%	92.50%	92.50%	92.50%	92.50%	92.50%
OP. PROFIT		**215 198**	**645 594**	**1 291 189**	**2 108 942**	**3 357 091**	**3 357 091**				
WITH PROJECT											
COSTS		5 110 875	15 332 625	30 665 250	50 086 575	79 729 650	79 729 650	79 729 650	79 729 650	79 729 650	79 729 650
REVENUES		6 721 575	20 164 725	40 329 450	65 871 435	104 856 570	104 856 570	104 856 570	104 856 570	104 856 570	104 856 570
OP. PROFIT		**1 610 700**	**4 832 100**	**9 664 200**	**15 784 860**	**25 126 920**	**25 126 920**	**25 126 920**	**25 126 920**	**25 126 920**	**25 126 920**
WITH-WITHOUT PROJECT											
Incremental profit		1 395 502	4 186 506	8 373 011	13 675 918	21 769 829	21 769 829	21 769 829	21 769 829	21 769 829	21 769 829
Investments											
Good Agronomic Practices (GAPs)	442 500	885 000	1 327 500	1 681 500	2 566 500						
Incentive Fund - subsidies (A)/credits (B,C)	672 600	2 690 400	6 726 000	12 644 880	21 119 640	10 492 560					
Total Investments	**1 115 100**	**3 575 400**	**8 053 500**	**14 326 380**	**23 686 140**	**10 492 560**	-	-	-	-	-
INCREMENTAL NET	**1 115 100**	**2 179 898**	**3 866 994**	**5 953 369**	**10 010 222**	**11 277 269**	**21 769 829**	**21 769 829**	**21 769 829**	**21 769 829**	**21 769 829**
CUMULATIVE INCR	**1 115 100**	**3 294 998**	**7 161 993**	**13 115 362**	**23 125 584**	**11 848 315**	**9 921 514**	**31 691 342**	**53 461 171**	**75 231 000**	**97 000 828**

Results	
NPV (USD)	$ 30 522 056
IRR	43%
Payback period	5

Business Model 2: Irrigation scheme to adapt to climate change, improve yields and to promote crop diversification (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of Ha		100	600	900	1,200	1 500	1 500	1 500	1 500	1 500	1 500
W/O TECHNOLOGY											
Productions costs		82 975	497 849	746 773	995 698	1 244 622	1 244 622	1 244 622	1 244 622	1 244 622	1 244 622
Revenues (soya bean)		90 000	540 000	810 000	1 080 000	1 350 000	1 350 000	1 350 000	1 350 000	1 350 000	1 350 000
% of revenue decrease as consequence of climate change		0%	0%	50%	0%	0%	50%	0%	0%	50%	0%
Op. Profit		**7 025**	**42 151**	**-341 773**	**84 302**	**105 378**	**-569 622**	**105 378**	**105 378**	**-569 622**	**105 378**
WITH TECHNOLOGY											
Number pivots - 1 pivot serves 20 ha		5	30	45	60	75	75	75	75	75	75
Production costs with irrigation		147 564	885 385	1 328 077	1 770 769	2 213 462	2 213 462	2 213 462	2 213 462	2 213 462	2 213 462
O&M		39 000	195 000	292 501	390 000	487 500	487 500	487 500	487 500	487 500	487 500
Water permits		19 685	19 685	19 685	19 685	19 685	19 685	19 685	19 685	19 685	19 685
Total costs		206 249	1 100 070	1 640 263	2 180 454	2 720 647	2 720 647	2 720 647	2 720 647	2 720 647	2 720 647
Revenues from irrigated crops (soya bean and maize)		343 000	2 058 000	3 087 000	4 116 000	5 145 000	5 145 000	5 145 000	5 145 000	5 145 000	5 145 000
Op. Profit		**136 751**	**957 930**	**1 446 737**	**1 935 546**	**2 424 353**	**2 424 353**	**2 424 353**	**2 424 353**	**2 424 353**	**2 424 353**
Incremental profits		**129 726**	**915 779**	**1 788 511**	**1 851 244**	**2 318 976**	**2 993 976**	**2 318 976**	**2 318 976**	**2 993 976**	**2 318 976**
INVESTMENT COSTS											
Centre Pivot irrigation equipment (including installation)		445 000	2 225 000	1 335 000	1 335 000	1 335 000					
Training on the technology		39 000	195 000	117 000	117 000	117 000					
Total Investment costs		**484 000**	**2 420 000**	**1 452 000**	**1 452 000**	**1 452 000**					
INCREMENTAL INCOMES		**-354,274**	**-1 504 221**	**336 511**	**399 244**	**866 976**	**2 993 976**	**2 318 976**	**2 318 976**	**2 993 976**	**2 318 976**
CUMULATIVE INCOMES		**-354,274**	**-1 504 221**	**336 511**	**399 244**	**866 976**	**2 993 976**	**2 318 976**	**2 318 976**	**2 993 976**	**2 318 976**

Results	
NPV (USD)	$ 4 798 451
IRR	50%
Payback period	0,3

Business Model 3: Promote processing SMEs / Smallholder value addition centres to meet local demand and to diversify human consumption products (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of SME managed by the private sector	1	3	5	6	6	6	6	6	6	6	6
Total COST		178 057	534 170	890 284	1 068 341	1 068 341	1 068 341	1 068 341	1 068 341	1 068 341	1 068 341
O&M of the investments		9 450	28 350	47 250	56 700	56 700	56 700	56 700	56 700	56 700	56 700
Total REVENUES		213 706	641 119	1 068 532	1 282 239	1 282 239	1 282 239	1 282 239	1 282 239	1 282 239	1 282 239
Net Profit / INCOMES	**9 450**	**7 300**	**59 699**	**121 549**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**
INVESTMENT											
Building and equipment (Extruder; craft/hammer mill; mixing; oil press)		63 000	126 000	126 000	63 000	-	-	-	-	-	-
Training		9 450	18 900	18 900	9 450	-	-	-	-	-	-
INCREMENTAL NET INCOME	**-81 900**	**-137 600**	**- 85 201**	**49 099**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**	**157 198**
CUMULATIVE INCOMES	**-81 900**	**-219 500**	**-304 701**	**-255 603**	**-98 404**	**58 794**	**215 992**	**373 190**	**530 389**	**687 587**	**844 785**

Results	
NPV	$ 243 669
IRR	28%
Payback period	6

Business Model 4: Certified seed multiplication programme (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total ha		354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000	354 000
Number of ha (applying certified seeds)			4 425	13 275	26 550	43 365	69 030	69 030	69 030	69 030	69 030
Number of ha of parent seed farms required (to produce certified seeds)		111	332	664	1 084	1 726	1 726	1 726	1 726	1 726	1 726
MT of commercial seeds produced		221	664	1 328	2 168	3 452	3 452	3 452	3 452	3 452	3 452
Revenues from certified seeds (USD 756/MT)		167 265	501 795	1 003 590	1 639 197	2 609 334	2 609 334	2 609 334	2 609 334	2 609 334	2 609 334
Number of Seed Growers' Associations (40 ha/ association)		3	6	11	16	27	108	108	108	108	108
Seed Growers Training Costs (@ USD 1 000/group)		2 766	5 531	11 063	16 041	27 103	108 413	0	0	0	0
Seed Growers Mobilisation cost (@ USD 1 000/ group)		2 766	2 766	5 531	4 978	11 063	81 309	0	0	0	0
Outgrower scheme management costs to multiply seeds	150 000	153 319	159 956	69 913	462 524	101 773	101 773	51 773	51 773	51 773	51 773
Total cost of seed production @ USD 1 000/ha (Seed Capital)		110 625	331 875	663 750	1 084 125	1 725 750	1 725 750	1 725 750	1 725 750	1 725 750	1 725 750
Transportation Cost		15 488	46 463	92 925	151 778	241 605	241 605	241 605	241 605	241 605	241 605
Processing Loss		8 363	25 090	50 180	81 960	130 467	130 467	130 467	130 467	130 467	130 467
Financing Cost		1 881	5 642	11 284	18 430	29 338					
Total seed cottage investment cost	150 000	295 206	577 322	904 645	1 819 835	2 267 098	2 389 316	2 149 594	2 149 594	2 149 594	2 149 594
Incremental Incomes	-150 000	-127 941	-75 527	98 946	-180 638	342 236	220 018	459 740	459 740	459 740	4 299 188

Results
NPV
IRR

Business Model 5: Support women- or youth-own MSME or Cooperatives to provide post-harvest services (thresher rental) to small scale farmers (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of SMEs or cooperatives (women and youth)		10	20	30	40	50	50	50	50	50	50
COSTS		66 150	132 300	198 450	264 600	330 750	330 750	330 750	330 750	330 750	330 750
REVENUES		84 000	168 000	252 000	336 000	420 000	420 000	420 000	420 000	420 000	420 000
OP. PROFIT	**0**	**17 850**	**35 700**	**53 550**	**71 400**	**89 250**	**89 250**	**89 250**	**89 250**	**89 250**	**89 250**
INVESTMENT COSTS (Threshers and training)											
Thresher (Investment)	70 000	70 000	70 000	70 000	70 000	0	0				
Training	5 000	5 000	5 000	5 000	5 000						
NET INCOMES AFTER INVESTMENT	**-75 000**	**-57 150**	**-39 300**	**-21 450**	**-3 600**	**89 250**	**89 250**	**89 250**	**89 250**	**89 250**	**89 250**
CUMULATIVE INCOMES	**-75 000**	**-132 150**	**-171 450**	**-192 900**	**-196 500**	**-107 250**	**-18 000**	**71 250**	**160 500**	**249 750**	**339 000**

Results	
NPV	$ 52 042
IRR	17%
Payback period	7

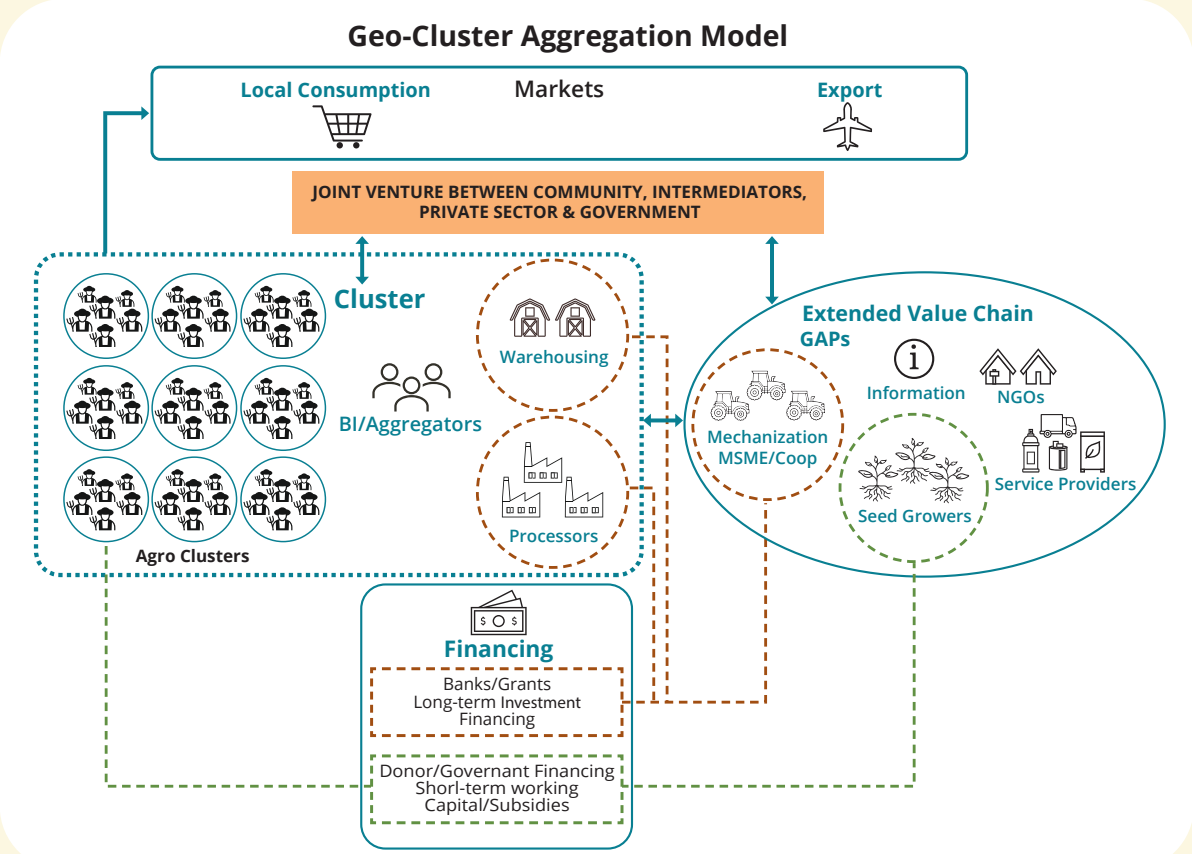
Business Model 6: Warehouse receipt system (USD)

Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
8 warehouses in 4 provinces over 4 years as follows		4	6	8	8						
TOTAL COSTS (incl. O&M costs)		275 600	689 000	1 240 200	1 791 400	1 791 400	1 791 400	1 791 400	1 791 400	1 791 400	1 791 400
TOTAL REVENUE		394 560	986 400	1 775 520	2 564 640	2 564 640	2 564 640	2 564 640	2 564 640	2 564 640	2 564 640
OP. PROFIT		118 960	297 400	535 320	773 240	773 240	773 240	773 240	773 240	773 240	773 240
INVESTMENT COSTS											
Training in business development		60 000	30 000	30 000	-						
Tailored training in WRS to empower farmers		60 000	30 000	30 000	-						
Sensitization to increase awareness on WRS benefits		40 000	20 000	20 000	-						
Rehabilitate/build commercial bulking centres			1 000 000	500 000	500 000	-					
Storage systems and Lift, Dock, Facility and Packaging			120 000	60 000	60 000	-					
Geocoding of bulking centers and capacity building			40 000	20 000	20 000	-					
Total investments		**160 000**	**1 240 000**	**660 000**	**580 000**						
INCREMENTAL NET INCOME		**160 000**	**1 121 040**	**362 600**	**44 680**	**773 240**	**773 240**	**773 240**	**773 240**	**773 240**	**773 240**
CUMULATIVE INCREMENTAL NET INCOME		**160 000**	**1 281 040**	**1 643 640**	**1 688 320**	**915 080**	**141 840**	**631 400**	**1 404 640**	**2 177 880**	**3 724 360**

Results	
NPV	$ 919 637
IRR	24%
Payback period	6

Annex 3

A Combined Cluster – Value Chain Development Model for Zambia Soya Bean Sector



Source: Authors' elaboration.

Annex 4 Actors Consulted for the Soya Bean Value Chain Analysis and Strategy Development

1 Field mission interviews

Type of Interview	Number of farmers
Farmer Focus Group Meetings	90
Farmer Interviews	94

2 Individual interviews

Institution	Name	Position/Title
Aqualculture Development Association of Zambia	Chibuta Mr.	Secretary
Aqualculture Development Association of Zambia	Mwale Fisho Mr.	Chairperson
Central statistical Office	Mulambia Mr.	Statistician
Export Trading Group	Diksit Alok Mr.	Manager
Global Industries Limited	Vaishy Pradeep	
Global Industries Limited	Kumar Alok	
GoodNature Agro	Carl Jensen Mr.	Manager/Founder
GoodNature Agro	Chipandwe Susan Ms	
International Food Agricultural Development Fund	Kapotwe Mr.	Country Coordinator
Kanyemba Farms	Sichinga Boniface Mr.	Farm Manager
Mount Meru Processors	Kumar Sanjay Mr.	Chief Executive Officer
MUSIKA – Making markets work	Mwamba Chisanga Ms	
MUSIKA – Making markets work	Siankwilimba Enock Mr.	
Ministry of Agriculture Policy and Planning	Chipasha Pascal Mr.	PACO Lusaka Province
Ministry of Agriculture	Kabinda Obvious Dr.	PACO Copperbelt Province
Ministry of Agriculture	Kimboni Victor Mr.	Camp Extension Officer
Ministry of Agriculture	Nansungwe Adreena Ms.	PACO Central Province
Ministry of Agriculture Policy and Planning	Nyirenda Yotam	
Panoply Investments Limited	Daka James Mr.	CEO
Parrogate Zamanita		
Provincial Agriculture Coordinating Office (PACO)	Mwale James	Technical Officer
SARO Agro Industry	Salah Calvin	Agricultural Advisor - Technical
Seed Certification and Control Institute	Chanda Richard Dr.	Seed Specialist
Seed Certification and Control Institute	Miti Francisco Dr.	Director
Seed Certification and Control Institute	Moyo Ignatius Mr	Seed Specialist
Seed Certification and Control Institute	Phiri Nathan Dr.	Seed Specialist
Seed Certification and Control Institute	Songolo Grace Ms	Seed Specialist
SIL		
Soya bean Innovation Lab	Clark Kerry	Head of Mechanisation

Institution	Name	Position/Title
Soya bean Innovation Lab	Goldsmith Peter	Professor
Stanbic Bank	Simfukwe Lillian Ms.	Agribusiness Consultant
Sylva Foods	Banda Sylva Ms	Manager/Owner
World Food Programme	Olipa Zulu	Programme Officer: Policy
World Food Programme	Emmanuel Mbewe	Programme Officer
World Food Programme	Natasha Lungwebungu	Programme Assistant
ZAMANITA (Parrogate)	Mbewe Emmanuel Mr.	Manager
Zambia Agriculture Research Institute	Chileshe Stephen Mr.	Agronomist
Zambia Agriculture Research Institute	Kabamba Dr.	Agronomist
Zambia Agriculture Research Institute	Mubanga Shadreck Mr.	Agronomist
Zambia Grain Traders Association	Mukandawire Yotam Mr	Senior Programme Manager
Zambia Irritech Limited	Gibson Barry	Manager
Zambia Market and Commodity Exchange	Mwale Jacob Mr.	Executive Director
Zambia National Banking Corporation	Cheyo Mwenechanya	Agribusiness Consultant
ZATAKA Farms	Botha A Mr.	Farm Manager

3 Participants of the three multi-stakeholder workshops

Institution	Name	Position/Title
AB Bank	Siyachaba Muze Ms.	Bank Manager
Archi-Con Associate Ltd	Mwenda Silumesi	Managing Director
AGRA	Martin Liywali	Consultant: Smallholder Productivity
Agribusiness Association of Zambia	Mary Tembo	Chairperson
Agriculture Consultative Forum	Msiye Nawiko	Programme Manager
260 Brands (SEBA Foods)	Gaurav VJ	
ABSA Bank	Bruce Jani	Business Development Director
AFGRI	Shane Travis Landing	Statistician
African Development Bank (ADB)	Lewis Bangwe	Agricultural Specialist
Agricultural Consultative Forum	Christian Chomba	Researcher
Agricultural Consultative Forum	Mwitwa Mambwe	Researcher
Capital Radio	Onishias Maamba	News Editor
Citizens Economic Empowerment Commission (CEEC)	Likando Mukumbuta	Director General
COMACO	Smith Kapeya	Eastern Regional Manager
Commodity Hub Ltd	Daniel Nyati	Director
Export Trading Group Ltd	Chetan Pal Singh	
Food and Agriculture Organisation	Suze Fillipini	FAO Zambia Country Representative
Food and Agriculture Organisation	Geoffrey Chomba	FAO Zambia Deputy Country Representative
Food and Agriculture Organisation	Maria del Mar Polo	Agriculture Economist and Lead Technical Officer, ESF FAO HQ
Food and Agriculture Organisation	Rhoda Mofya	National Coordinator. Nutrition Programme

Institution	Name	Position/Title
Food and Agriculture Organisation	Celestina Lwatula	Programme Associate. Zambia FAO
Food and Agriculture Organisation	Sherif Motawe	FAO International Consultant. Value Chains Specialist
Food and Agriculture Organisation	Eliab Simpungwe	National Consultant. Value Chains Specialist. FAO Zambia
Food and Agriculture Organisation	Brian Mulenga	National Consultant. Value Chains Specialist. FAO Zambia
Food and Agriculture Organisation	Samuel Gondwe	Agribusiness Specialist SHIFAZ FAO Zambia
Food and Agriculture Organisation	Milensu Kapaipi	Value Chains Specialist
Food and Agriculture Organisation	Mukaba Mukaba	Project Officer
Food and Agriculture Organisation	Patrict Chilumba	Monitoring and Evaluation
Food and Agriculture Organisation	Zuba Mwanza	Programme Officer: FAO Zambia
Food and Agriculture Organisation	Martha Chanda	Communication Specialist
Food and Agriculture Organisation	Barbora Hladka	Agric-Investments Specialist. FAO Zambia
Food and Agriculture Organisation	Mtendere Mphatso	National Coordinator FAO Zambia SIFAZ project
Food and Agriculture Organisation	Chama Turnbull	National Coordinator FAO Zambia SCRALA Project
Food Reserve Agency	Richard Chintu	Provincial Marketing Officer
GIZ Zambia	Cynthia Mwenda	Agroforestry and Climate Change Advisor
GIZ Zambia	Bethel Nakaponda	Consultant (NAIP Support)
GIZ Zambia	Theresa Kinkese	Policy Advisor: Agriculture Cluster
GIZ Zambia	Nyirongo Fuvya	Programmes Officer
GIZ Zambia	Alinani Sinkala	Intern
Glencoe Farming & Veterinary Serv.	Chris Hawke	Chief Executive Officer
Global Industries Ltd	Alok Dikshit	Production manager
Grain Traders Association of Zambia (GTAZ)	Yotam Mkandawire	Senior Programs Manager
Indaba Agricultural Policy Research Institute (IAPRI)	Stephen Kabwe	Grassroots Coordinator
Kaswenge Farms	Muchelembe Halwindi	Farmer
Louis Dreyfus Company (Formaly NWK Agri-Services)	Milimo Mdimba	
Louis Dreyfus Company (Formaly NWK Agri-Services)	Macdonald Sampa	
March Associates	Enock Siamayobela	Research Associate
March Associates	Cynthia Chibebe	Research Associate
Ministry of Agriculture	Peggy Mlewa	Director Policy and Planning
Ministry of Agriculture	Francisco Miti	Seed Certification and Control Institute
Ministry of Agriculture	Harriet Matipa	Policy and Planning
Ministry of Agriculture	Yotam Nyirenda	Policy and Planning
Ministry of Agriculture	Christopher Mbewe	Policy and Planning
Ministry of Agriculture	Timothy Nyirenda	Senior Budget Analyst: Policy and Planning
Ministry of Agriculture	John Mulongoti	CEO
Ministry of Agriculture	Dr Adreena Nansungwe	PACO Central Province
Ministry of Agriculture	Dr Obvious Kabinda	PACO Copperbelt

Institution	Name	Position/Title
Ministry of Agriculture	Dr Kenneth Msiska	Director: Plant Quarantine and Phytosanitary Services (PQPS)
Ministry of Agriculture	Mr Pascal Chipasha	PACO Lusaka
Ministry of Agriculture	Kaunda Kapepula	Chief Agricultural Economist Agribusiness
Ministry of Agriculture	Rebecca Lungu	
Ministry of Agriculture	Chongo Banda	Principal Economist. Policy
Ministry of Agriculture	Mwiya Makungu	Principal Agriculture Officer
Ministry of Agriculture	Yapulani Chunga	Provincial Planner
Ministry of Agriculture	Yasa Chisanga	Agriculture Research Officer
Ministry of Agriculture	Maureen Chomba	Principal Agricultural research Officer (PQPS)
Ministry of Agriculture	Pritchard Mukuwa	Senior Plant Health Inspector (PQPS)
Ministry of Agriculture	Martin Siazemo	Senior Plant Health Inspector (PQPS)
Ministry of Agriculture	Emmanuel Mazimba Sikazwe	Senior Plant Health Inspector (PQPS)
Ministry of Agriculture	Kalumba Shephard	Plant Health Inspector (PQPS)
Ministry of Agriculture	Brenda Mweemba	Plant Health Inspector (PQPS)
Ministry of Agriculture	Vincent Mwiinga	Plant Health Inspector (PQPS)
Ministry of Agriculture	Kafwafwa Nswana	Agricultural Research Officer (ZARI)
Ministry of Agriculture	Nkolola Halwindi	Agriculture Research Officer (ZARI)
Ministry of Agriculture	Chisanga Mukuka	Agriculture Research Officer (ZARI)
Ministry of Agriculture	Anita Kaleba Mwanga	Agriculture Research Officer (ZARI)
Ministry of Agriculture	Dickson Nguni	Agriculture Research Officer (ZARI)
Ministry of Agriculture	Ndashe Kapulu	Agriculture Research Officer (ZARI)
Ministry of Agriculture	Dennis Munachusa	Senior Marketing Development Officer.
Ministry of Agriculture	Brian Ngandu	
Ministry of Agriculture	Morton Mwanza	Principal Agriculture Officer: Vegetables
Ministry of Agriculture	Lous Chikopela	Principal Agriculture Officer
Ministry of Agriculture	David Mbewe	Principal Agriculture Officer
Ministry of Agriculture	Dominic Namunyungu	Principal Extension Methodologist
Ministry of Commerce, Trade and Industry	Kelvin Kamayoyo	Chief Economist
Ministry of Agriculture	Elijah Mutuna	Senior Agricultural Officer
Ministry of Fisheries and Livestock	Young Vibeti	Deputy Director, Livestock Department
Ministry of Fisheries and Livestock	Nicholas Mwale	IPPIP Focal Point, Principal Budget Analyst / Policy, Planning and Information
Ministry of Foreign Affairs	Kayoya Masuhwa	Permanent Representative: Agriculture
Ministry of Green Economy	Nkonde Edson	Seed Specialist
Ministry of Lands and Natural Resources	Sibajene Mudenda	National Project Coordinator
Ministry of SMEs	Shadrec Mungaluka	Head of Mechanisation
Mt. Meru	Goldsmith Peter	Professor
Musika Development Initiatives	Reuben Banda	Managing Director
Musika Development Initiative	Enock Siankwilimba	Consultant

Institution	Name	Position/Title
Musika Development Initiative	Chibamba Mwansakiliwa	Cassava SPDA Consultant
Musika Development Initiative	Mseteka Mwiza	Agri-PPP Platform Consultant
National Food and Nutrition Commission	Musonda Mofu	Director
National Union of Small-Scale Farmers	Mr Lolozi	
National Union of Small-Scale Farmers	Dr Francis Kayula	Executive Director
National Uninion of Small Scale Farmers	Noel Sumukonde	
Omnia Fertilizers	Moomba Nangamba	
Parrogate	Rhit Kumar	
Parrogate	Emmanuel Mbewe	
Parrogate	Dawid Keon	Managing Director
Seed Certification and Control Institute	Franscisco Miti	Executive Director
Seed Certification and Control Institute	Nathan Phiri	Seeds Officer
Seed Certification and Control Institute	Grace Malambo	Seeds Officer
Stanbic Bank	Lillian Simfukwe Salasini / Emmanuel Kasongo	Agriculture Finance
Sylva Foods	Sylva Banda	
Tiger Feed	Rowena Blanco	Animal Nutritionist
Two Six Zero Brands Africa	Arun Jain	Head Supply Chain
United Nationa Industrial Development Organisation (UNIDO)	Mr. Maziko Phiri	Country Representative
University of Zambia (UNZA)	Paul Kachapulula	
University of Zambia (UNZA)	Chewe Nkonde	Head of Agricultural Economics Department
USAID	Harry Ngoma	Food Security Advisor
Workers Compensation Fund	Justine Mushinge	Operations Manager
World Bank	Hazem Ibrahim Hanbal	Agricultural Specialist
Zambia Bureau of Standards	Martha Zulu	
Zambia Bureau of Standards	Choolwe Mutelo	Standards Officer
Zambia Federation of Associations of Women in business	Ms. Maureen Sumbwe	CEO
Zambia National Commercial Bank	Cheyo Mwenechanya	
Zambia National Commercial Bank	Lozindaba Dauya	
Zambia Metrological Department	Ms Loveness	

Soya bean plants flourish under the sun, symbolizing growth and sustainability.

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