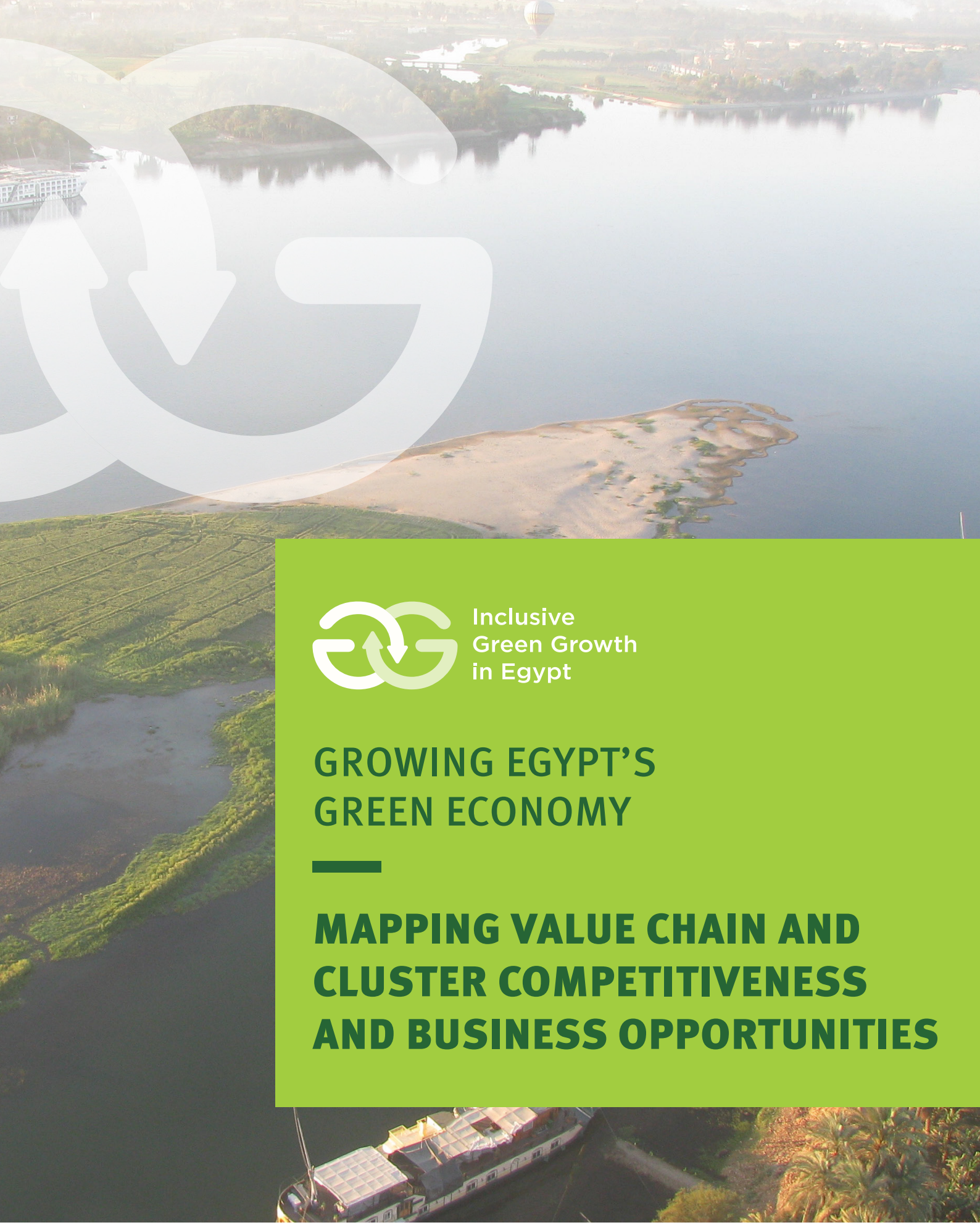

Inclusive
Green Growth
in Egypt

GROWING EGYPT'S GREEN ECONOMY

MAPPING VALUE CHAIN AND CLUSTER COMPETITIVENESS AND BUSINESS OPPORTUNITIES

Schweizerische Eidgenossenschaft
Confédération suisse
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UNITED NATIONS
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Acknowledgments

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Introduction

1.1 Background to the Inclusive Green Growth in Egypt (IGGE) project

The United Nations Industrial Development Organization (UNIDO) is implementing a project entitled **Inclusive Green Growth in Egypt (IGGE)**, with funding from the Government of Switzerland (Swiss Agency for Development and Cooperation). The main counterpart in the Egyptian Government is the Ministry of Trade and Industry. Collaborating partners include the Ministry of Environment, the Industrial Modernization Center (IMC), the Micro, Small and Medium Enterprises Development Agency (MSMEDA), the Luxor and Qena Governorates, as well as private sector associations and civil society organizations. The geographical coverage is the Luxor and Qena Governorates in Upper Egypt.

IGGE aims to contribute to the efforts of the Government of Egypt to boost growth, productivity and job creation, while at the same time safeguarding the environment. The green economy has great potential in this area, with the private sector acting as a key driver of inclusive green growth. Micro, small and medium-sized enterprises (MSMEs) in the green economy play a crucial role in local economic development and make use of resources traditionally overlooked or wasted. As such, their development brings about both economic and environmental benefits. The project's ultimate aim is to support **market system changes** for a favorable environment to businesses and the workforce in the green economy. To this end, the IGGE project:

I. Supports green MSMEs, including those led or owned by women, to improve their productivity, innovation and competitiveness and strengthen their resilience;

II. Enhances the offerings from financial and non-financial support institutions to green MSMEs; their resilience;

III. Fosters the employability of youth and women in targeted green sectors;

IV. Mainstreams green growth approaches into government policies and strategies.

The project targets the green economy sectors of **sustainable agriculture and food production, waste management and sustainable energy**, with a particular focus on the valorization of biomass streams from the farming community and the agro-industrial sector, renewable energy applications in the agro-industrial sector (such as biogas and solar), as well as key clusters and value chains in Luxor and Qena, including sugarcane, tomato and date palms. The assessments conducted by the project during the mobilization phase identified additional clusters and value chains that could be considered, such as fruit and vegetable processing and packaging, as well as medicinal and aromatic plants and herbs.

Targets

10 financial and non-financial institutions promote green business and investment opportunities

150 MSMEs with improved management practices

10 training and employment service providers offer upgraded services in line with market demand

1,000 market actors gained knowledge and skills for employment

4 new /revised policies adopted by policy makers

1.2 Improving market intelligence in key green sectors

UNIDO has implemented many projects in these green economy sectors since 2014, including industrial development work, policy assessments, entrepreneurship facilitation and MSME support projects. Through this work, UNIDO has identified that **limited and asymmetric access to market data** and market knowledge is one of the key barriers to participation and competitiveness of cluster and value chain participants in Egypt, particularly in Southern Upper Egypt. For example, the burdens of analyzing technology and market risks in relatively nascent business areas is an impediment to investment by banks and private investors.

To remedy this, UNIDO has made the creation of **Market Intelligence Products** integral to its industrial development approach. These are centred on local data, information and insights and are targeted at key participants, such as start-ups, MSMEs, financiers, policymakers and support institutions. [1].

The following Market Intelligence Products were developed as part of UNIDO's IGGE project in 2020-2021:

- IGGE Sector Policy and Regulatory Mapping (2021)
- Barriers to Green Enterprise Growth and Competitiveness (2021)
- Business Opportunity Mapping, Clusters and Value Chains Diagnostics (2021).

By making such information available, UNIDO aims to **support the mobilization of resources** by key stakeholders and r**emove barriers to their entry and engagement** in these focus sectors, including policy-makers, financiers, start-ups and MSMEs.

1.3 What's in this market intelligence product?

The following Market Intelligence Product – *Mapping Value Chain and Cluster Competitiveness and Business Opportunities* – aims to shed light on value chains (VCs) and clusters in Luxor and Qena, as well as highlighting gaps or areas for improvement which also lay the foundation for business and investment opportunities.

Leveraging a comprehensive literature review, interviews with stakeholders and using the **Cluster and Value Chain Mapping and Competitiveness Assessment Framework** developed by IGGE, nine value chains were identified and their competitiveness assessed. Following the Business Opportunity Mapping (BOM) methodology [2], **51 green business opportunities (BOs)** within or serving those value chains and clusters were identified. The BOM is a crucial step towards improving **market visibility,** which, as confirmed by the interviewed stakeholders, is key to **unlocking investment and business growth** in the target green clusters and VCs. The 51 BOs mapped – and their interactions with target clusters and VCs – are presented in Section 4.

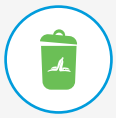
[1] Recent Market Intelligence Products by UNIDO include:

- *National Road Map Summary for Strengthening the Quality of Locally Manufactured Products and Components Related to Solar Water Heaters and Solar Thermal Technologies in Egypt (2020)*
- *Business Opportunity Mapping in Waste Management, Renewable Energy, and Agro-industry in Luxor Governorate (2017)*
- *Pre-feasibility Analysis of Medium and Large-Scale Investment Opportunities in Luxor (2017)*

2 The Business Opportunity Mapping (BOM) is a methodology developed by UNIDO and implemented since 2014 in various governorates in Egypt. The BOM offers a systematic approach to map and prioritize business opportunities (BOs).

Unsurprisingly, most of the BOs interact directly or indirectly with agri-food related clusters and value chains, which are significant to the two governorates' economies. However, they serve a **wide variety of sub-markets**, including:

Intermediary products for food, pharma, wood and paper industries



Compost and animal feed

Renewable energy solutions

Dried products

Technology/equipment manufacturing

Food retail products

Handmade accessories

The BOs have varying degrees of local, regional, national and export growth potential and target firms of **various sizes** (from micro and small to medium and large). While most of the BOs are locally rooted, about one-quarter (13) have the potential to serve **national and export markets**. Moreover, about 67% (34) have the potential to **grow to a medium or large size**, despite starting at a micro or small scale.
This study, alongside the market information and insights generated, represents a foundation for interventions to be implemented by the project in the implementation phase. It will be instrumental in both **raising awareness** of market opportunities for multiple market actors (from firms and banks to government support institutions), as well as in **channeling innovation** towards opportunities that are economically profitable, environmentally sound and socially impactful.

1.4 Document structure

This Market Intelligence Product – Mapping Value Chain and Cluster Competitiveness and Business Opportunities – is divided into the five sections below, which outline both the methodology used and the key results:

Section 1 Introduction:

Introduction to UNIDO's IGGE project and the Mapping Value Chain and Cluster Competitiveness and Business Opportunities Intelligence Product.

Section 2 Green Value Chains (VCs) and Clusters in Luxor and Qena:

Overview of the nine value chains and potential clusters identified in the IGGE sectors in Luxor and Qena, as well as their key strengths and weaknesses based on the Cluster and Value Chain Mapping and Competitiveness Assessment Framework developed for the project.

Section 3 Business Opportunity Mapping (BOM):

Overview of the business opportunity mapping (BOM) methodology, upgrades made since 2014 and the key results of developing the long-list, short-list and factsheets of the business opportunities (BOs) as well as their prioritization.

Section 4 Interaction between the Value Chains (VCs), clusters and Business Opportunities (BOs):

Overview of the shortlisted business opportunities (BOs) as well as their interaction with the value chains (VCs) and clusters; operating within or serving them. Those operating within the VCs or clusters enhance the quality, sustainability and competitiveness of the target clusters and VCs by providing products, services or technologies that fill a gap in the cluster/VC or add value to existing business activities. Those serving them provide supporting products, services or technologies to existing business activities, indirectly enhancing their quality, sustainability and competitiveness.

Section 4 Annex

Annex 1 Shortlisted Business Opportunities Classified by Firm Stage

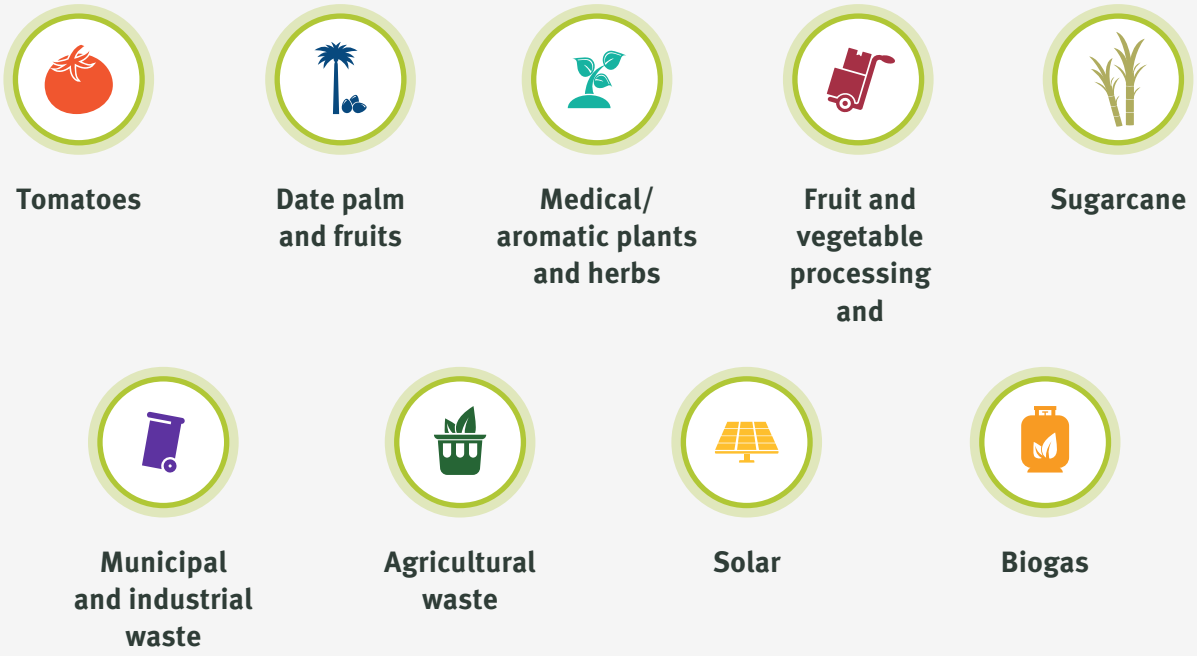
Green value chains and clusters in Luxor and Qena

Green value chains and clusters in Luxor and Qena

The IGGE project aims to stimulate the green economy by **promoting green clusters and value chains**, enabling key participants and championing the realization of **business opportunities**. As such, a crucial starting point was identifying key value chains and potential clusters in Luxor and Qena, based on an assessment of existing business activities and their competitiveness.

This section presents an overview of the **nine value chains and clusters** identified in the IGGE sectors in Luxor and Qena, as well as an assessment of their **key strengths and weaknesses** in order to provide context for the identified business opportunities. The following section contains an overview of the BOs which could fill gaps and help to strengthen the value chains and clusters.

The nine value chains and clusters identified are:



Some of these value chains are focused on a **single stream**, such as tomatoes, while others include **various streams**, such as medical/aromatic plants and herbs. This reflects the dynamics of the streams. For instance, medical/aromatic plants and herbs, unlike tomatoes, of course represent multiple plants. But because **they serve similar markets** and have similar dynamics, it is a coherent approach to analyze them collectively. In other instances, we chose to select **broader value chains**, such as fruit and vegetable processing and packaging (of which tomatoes is obviously a sub-set) to provide a view of value chains at a different resolution.

The assessment was conducted using a **Cluster and Value Chain Mapping and Competitiveness Assessment Framework** developed for the project, which is largely based on Porter's Competitiveness framework[3], and consists of a series of key elements[4] characterizing **healthy, functioning and competitive clusters and value chains.** The nine value chains and clusters, alongside an assessment of their key strengths and weaknesses – and hence their competitiveness – are outlined in Figure 1 to Figure 8 below.

[3] *Porter, Michael E. 1990. "The Competitive Advantage of Nations." Harvard Business Review 68 (2): 73–93.*

[4] *The competitiveness elements assessed: linkages within clusters and value chains, effectiveness of forward and backward linkages, entrepreneurship, governance, access to information, access to finance, access to supporting businesses, principal firms, environmental protection and gender mainstreaming.*

Tomatoes

The tomato value chain consists of **post-harvest activities** of the tomato crop in Luxor and Qena. This includes crop collection, processing (e.g. drying), packaging and distribution of tomatoes. The tomato crop is one of the **major crops grown in Luxor and Qena,** primarily focused in Esna. However, there is **little value-added activity** conducted locally and the crop is mostly transported out of the governorates for processing. Some activities exist locally such as **drying for and distribution to local and national markets** (including bazaars, hypermarkets, hotels and restaurants), as well as some **handling of fresh tomatoes** for the food processing and packaging value chain/cluster nationally. This creates **vertical linkages** between the farmers/growers, traders, processors, packaging facilities and distributers/ retailers.

Strengths

- Existing demand, as well as proximity and availability of inputs.
- Availability of knowledge in educational institutions.
- Linkages between firms within the value chain/ cluster and within similar business activities.
- Services by stakeholders/ market players and government entities.
- Traditionally accepting of women.

Weaknesses

- Limited market differentiation (target segments and types of products) and degree of innovation in the products/services is below average in the market in Egypt.
- Limited activity in local value-added production (e.g. concentrate), with activities mainly in contract farming, trading and distribution.
- Market is mainly limited to local and regional markets due to low quality of final products and low accessibility of key technologies, with low penetration of products for key national and export markets.
- Lack of specific finance programs and general financing for business activities.
- Seasonality and the volatility of tomato prices in Egypt result in sporadic cash flows for firms.
- Lack of packhouse, cooling and logistics facilities.

Figure 1 *Strengths and weakness within tomato value chain*

Date palm and fruits

The date palm and fruits value chain (and potential cluster) consists of **post-harvest activities** of date palm and fruits in Luxor and Qena. This includes collection, processing (e.g. drying) and distribution of dates, as well as the equipment and inputs used in the process. **Vertical linkages and inter-linkages** exist in the value chain of farming, collection, drying, syrup-making and the trading and distribution of dates. As with tomatoes, there is **little value-added processing locally** and the palm dates are typically sold dried or semi-dried to local and national markets (primarily firms in the Delta).

NB. **Palm trees and date waste** are grouped in the general agricultural waste value chain/cluster, because independently they do not represent a standalone, developed value chain, but rather form part of what could be considered a single agriwaste value chain.

Strengths

- Existing demand (for the crops and services, such as palm tree pruning and treating of infections) as well as the proximity and availability of inputs and the existence of vertical linkages.
- Availability of knowledge in educational institutions.
- Formal stakeholders/market players and government policies and initiatives.
- Services by stakeholders/market players and government entities.
- Existence of principal firms.

Weaknesses

- Degree of innovation in products and services is below average in the market in Egypt.
- Lack of specific finance programs and general financing for business activities.
- Connections to major traders and large markets exist, however there are weak inter-linkages between firms. Moreover, there is limited support provided by principal firms to startups and MSMEs. This is often due to the inability of the firms to meet the quality (and often quantity) needs of the market, as well as the existence of dominant traders.
- Fragmentation of cultivated areas and lack of modern farming.
- The majority of the palm date varieties are unknown, which leads to low quality and non-homogeneity of fruits in the market.
- Lack of proper drying, packhouse and value-added production facilities.

Figure 2 *Strengths and weakness within the date palm and fruits value chain*

Medical/aromatic plants and herbs

The medical/aromatic plants and herbs value chain consists of **post-harvest activities** of key medical and aromatic plants and herbs in Luxor and Qena. This includes collection, processing (e.g. drying), distillation, packaging and distribution of produce. There are farming, drying, packaging, trading and distribution activities in Luxor and Qena, resulting in the **proximity of inputs and existence of vertical linkages** in the value chain/cluster. The major activities are in **farming and cultivation** (contract farming), **local trading** and **retailing**. There is some processing and **limited higher value-added production**, such as the production of high-quality packaged herbs and oils.

Strengths

- Existing demand, as well as proximity and availability of inputs.
- Compared to other value chains and clusters, there is some market differentiation, influx of new businesses and the level of innovation is higher than the market average.
- Services by stakeholders/market players and government entities.
- Support provided by principal firms to startups and MSMEs.

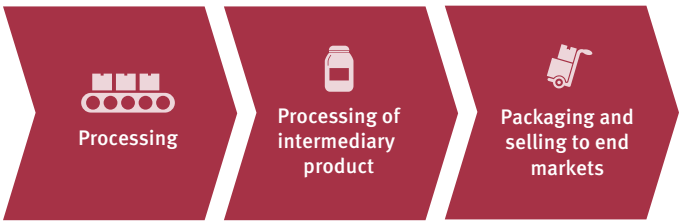
Weaknesses

- Lack of specific finance programs and general financing for business activities.
- Limited knowledge available in education institutions.
- Lack of principal firms.
- Lack of proper drying and value-added production facilities.

Figure 3
Illustration of the medical/aromatic plants and herbs cluster/value chain as well as the direct and supporting BOs

Food processing and packaging

The fruit and vegetable processing and packaging value chain (and **potential cluster**) consists of general food processing activities, including **post-harvest processes** for key fruit (tomatoes, mangoes, bananas, grapes, etc.) and vegetables (green beans, okra, etc.) in Luxor and Qena. This includes drying, freezing, packaging, distribution and retail.



Strengths

- Large market size and demand, as the food sector is the largest industrial sector in Luxor and Qena (by number of factories).
- Proximity and availability of inputs.
- Advantages of formal stakeholders/market players, government policies and initiatives, targeted services and access to policymakers.
- Frequent entry of new businesses, compared to other value chains/clusters.
- Penetration of finance is above average compared to the other value chains and clusters.
- Availability of knowledge in educational institutions.
- Traditionally accepting of women.
- Established a new road network, linking the region with red sea ports for export.

Weaknesses

- Level of innovation is below average in the market in Egypt.
- Limited business activity with markets that demand high-quality products, such as exporters, which also hinders opportunities with principal firms. These limitations could be due to a lack of (access to) market data, technical labour/employees, key infrastructure or supply chain aspects and the absence of specifications/standardization for certain products.
- Insufficient suppliers across the value chain (from raw materials for packaging services).
- Lack of specific finance programs.
- Drop in demand for food by the HO.RE.CA (hotels, restaurants, cafés) sector due to COVID-19 pandemic.
- Challenges with access to some inputs through global value chains.
- Risk of sharp competition in export markets.

Figure 4
Strengths and weakness within the fruit and vegetable processing and packaging value chain

Sugarcane (including waste)

The sugarcane cluster consists of post-harvest activities of sugar cane in Luxor and Qena, targeted at **sugar production.** This includes sugar cane collection, sugar processing, packaging and distribution. It also includes supporting value chain activities such as **animal feed, compost and power production from sugarcane residues**. The main activities are farming and sugar processing as well as the collection, recycling and trading of certain **by-products** by the factories (as bagasse, sugar mud and molasses)[5]. There are also some activities in the collection and processing of **sugarcane farm waste** (straw and tops) to produce animal feed, compost and fuels. However, most of the sugarcane waste is openly burnt.

Strengths

- Proximity and availability of inputs.
- Formal stakeholders/market players and government policies and initiatives, as well as services offered.
- Availability of knowledge in educational institutions.
- Principal firms who provide support to startups and MSMEs.

Weaknesses

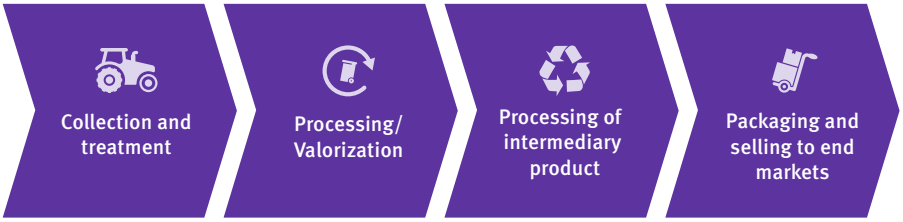
- Limited differentiation, innovation, entrepreneurship and lateral collaboration between firms.
- Limited cultural acceptance of women and existence of logistical barriers in collection and transportation due to land fragmentations
- Lack of variation in early activities in the value chain.
- Absence of pre-processing recycling activities for sugarcane waste.
- Lack of specific finance programs and limited access to finance in general for business activities.
- High water intensity of sugarcane farming and lack of modern irrigation methods (e.g. drip irrigation).
- Lack of recycling machinery suppliers.

Figure 5
Strengths and weakness within the date palm and fruits value chain

[5] *UNIDO, 2016, Youth Employment for Socio-Economic Stability in Upper Egypt – Business Opportunity Mapping in Luxor Governorate.*

Municipal and industrial waste

The municipal and industrial waste value chain (and **potential cluster**) consists of solid waste management (collection, sorting, processing/ **valorization** and distribution) of municipal and industrial waste. We define municipal waste to encompass the most prominent types of waste from the commercial facilities and households in Upper Egypt: **waste streams of recyclables** (paper, cardboard, plastic, aluminum, glass) and **food waste**. We define industrial waste as waste streams produced by **workshops** or **factories**, including textile waste, wood, electronic waste, tyres, glass and water (water treatment). However, it is important to note that waste valorization activities in Luxor and Qena, as well as across Egypt, typically rely on **mixed waste streams** and that a strict differentiation is not applicable in practice. There are firms operating in the **collection and processing of various types of waste** streams to produce pressed recyclable materials, plastic pellets, as well as refuse derived fuels (RDF), with backward linkages with collectors usually from the informal sector and basic equipment providers.



Strengths

- Proximity and availability of inputs.
- Market differentiation in segments and type of products.
- Frequent entry of new businesses.
- Level of innovation is above average in the market in Egypt.
- Access to policy makers.

Weaknesses

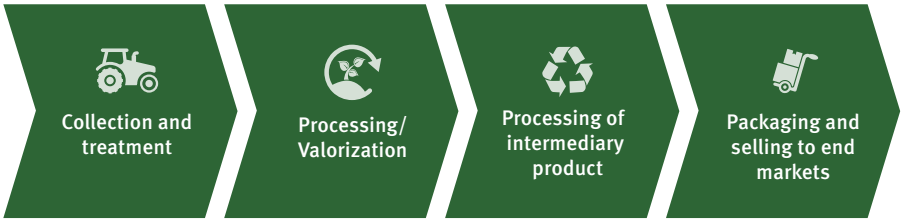
- Limited market size due to a variety of factors, including lack of trust from buyers regarding the quality of the products, limited capacity of firms to meeting product specifications and quantities required by the market.
- Lack of value chain-specific support (institutions, policies).
- Lack of specific finance programs and general financing for business activities in, mainly due to informality issues and absence of clear regulations, product specification and standardization.
- Limited knowledge available in education institutions.
- Limited principal firms in Luxor and Qena or support provided by them to start-ups and MSMEs.
- Lack of sufficient access to raw material suppliers and availability of processing technologies.

Figure 6
Strengths and weakness within the municipal and industrial waste value chain

Agricultural waste

The agricultural waste value chain (and **potential cluster**) consists of the collection, sorting, processing/ **valorization** and distribution of agricultural waste, including animal manure, palm trees and date waste, tree trimmings and crop waste (tomatoes, bananas, etc.). It also includes the production of **animal feed and compost** from agricultural waste. Generated **waste from palm trees** is in the form of midribs, fronds and second grade dates. Currently, most of the palm tree waste is sold as raw material. Midribs are used to produce packing boxes for fruit and vegetables, while waste palm dates are used in the making of animal feed. Corn waste is sometimes used to produce silage, although it competes with **sugarcane waste** in Luxor and Qena and is more common in Sohag. There is little-to-no processing of **banana waste**, with few activities in compost production. Agricultural waste is generally **processed at low levels**, although this is variable dependent on the type of waste. Most palm tree and sugarcane waste is burnt in open air, banana waste dumped in waterways – as it is difficult to burn – and tomato waste scattered on fields and in roads while being transported.

NB. For the sake of the present analysis, this value chain does not include sugarcane waste as it is a central waste stream in the sugarcane cluster. As described previously, there are low levels of sugarcane waste being collected from the field for compost, animal feed and waste-to-energy applications.



Strengths

- Proximity and availability of inputs.
- Market differentiation in segments and type of products.
- Frequent entry of new businesses.
- Level of innovation is above average in the market in Egypt.
- Access to policy makers.

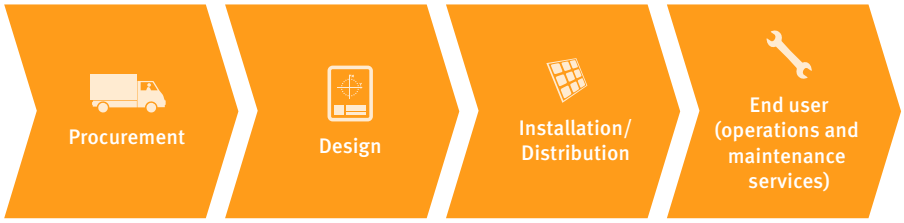
Weaknesses

- Limited market size due to a variety of factors, including lack of trust from buyers regarding the quality of the products, limited capacity of firms to meeting product specifications and quantities required by the market.
- Lack of value chain-specific support (institutions, policies).
- Lack of specific finance programs and general financing for business activities, mainly due to informality issues and absence of clear regulations, product specification and standardization.
- Limited knowledge available in education institutions.
- Limited principal firms in Luxor and Qena or support provided by them to start-ups and MSMEs.
- Lack of sufficient access to raw material suppliers and availability of processing technologies.

Figure 7
Strengths and weakness within the agricultural waste value chain

Solar and Biogas

The solar value chain includes the design, manufacture, installation, distribution and maintenance of **solar PV and solar thermal systems** (mostly off-grid for agricultural applications). There are minimal and sporadic, albeit **growing**, business activities in the solar value chain in Luxor and Qena. These are largely in **engineering, procurement and contracting (EPC), operations and maintenance and the distribution and marketing of systems**, with a focus on off-grid applications in **agriculture**. The **biogas** value chain includes the construction, design, installation, distribution and maintenance of biogas units. There are **few business activities** across key areas in the biogas value chain in Luxor and Qena, including in the construction, design, installation, distribution and maintenance of biogas units.
NB. The solar and biogas value chains are considered together here due to their **market parallels**.



Strengths

- Existing demand.
- Frequent entry of new businesses into clusters.
- Level of innovation is above average for the market in Egypt.
- Access to supporting businesses within the value chain.
- Limited informality and seasonality issues.
- Availability of specific financing programs for renewable energy sector.

Weaknesses

- Minimal variation in the types of solar business models and technologies in Luxor and Qena. Firms typically import the systems and often the know-how, from Cairo or Lower Egypt and operate in the parts of the value chain closest to the customers.
- Lack of value chain-specific support (institutions, policies).
- While there are some specific financing programs, penetration of financing for firms is below Egypt's average.
- Limited support provided by principal firms to startups and MSMEs.
- Location of working sites and clients are largely rural and at times remote (e.g. in the desert), there are barriers for women, mainly for logistical and cultural reasons, to find jobs in the market.
- Limited capacities of technical service providers.

Figure 8 *Strengths and weakness within the solar and biogas value chains*

Business opportunity mapping

Business opportunity mapping

In parallel to the value chain and cluster assessment, a Business Opportunity Mapping (BOM) was conducted to identify a set of business opportunities (BOs) with **high success rates for entrepreneurs** in the IGGE sectors at **various stages** of their development. This section presents an overview of the BOM methodology, the upgrades made since similar projects by UNIDO in Egypt in 2014/15 and 2016/17, as well as the key results of developing the long-list, short-list and factsheets of the BOs, in addition to their prioritization.

3.1 Overview of methodology

The BOM methodology is a systematic approach used to **map and prioritize** promising business opportunities. Developed by UNIDO alongside Chemonics Egypt in 2014, it has been developed and refined in successive projects, with the methodology being applied **across the Egyptian market over 30 times** by multiple donors since that time. The main objective of the BOM is to identify business opportunities that meet pre-set criteria that present business opportunities with a **high success probability** for start-ups as well as Micro, Small and Medium Enterprises (MSMEs).

The identification of BOs builds on published and unpublished reports, resources shared by the team at UNIDO, identified opportunities from the stakeholder interviews and previous startup and MSME projects implemented between 2016-2019. The upgraded version of the BOM methodology, developed in 2020/21, includes minimum performance criteria – called "knock-out" criteria – which rapidly identify BOs with a high probability of being realized, factoring in **key market, regulatory and infrastructure considerations**. The criteria include six indicators representing "critical success factors" and a BO is immediately excluded if a single indicator is not met. Furthermore, the shortlisted opportunities were also prioritized against a set of criteria important for the IGGE project. Finally, the BOs were **grouped according to the markets that they operate in**, in a "sub-market" analysis and classified according to the stages at which firms would realize them.

3.2 Overview of results

The key results of the BOM assessment are presented below.

Prioritization of BOs

The BOs were scored against a set of 21 criteria and user-defined weights, qualitatively comparing and ranking the short-listed BOs based on a set of criteria derived from the objectives of the IGGE project and expert scoring. The shortlisted opportunities were furthermore analyzed at a high level from the **perspectives of financiers and policymakers in addition to UNIDO.**

An overview analysis of the resultant heatmap highlights significant results of certain indicators. These are: forward and backward **linkages**, existence of **demand, capital intensity,** degree of **innovation,** degree of **value-addition**, **labour intensity** and favourability to **women**. It also sheds light on the diversity of the BOs and their potential for local **socio-economic development and positive environmental impact** potential.

Linkages: Most of the shortlisted BOs have significant forward or backward linkages to markets locally (same governorate) of 73% and 71%, respectively. In terms of forward linkage potential specifically, 20% of the identified BOs link to Cairo and export markets and 6% only link the export market. Looking at the backward linkages, 24% of BOs link to the supply in Cairo and export market and only 2% link to the export market only.

Demand: In terms of demand, 35% of BOs have existing demand in the same governorate and 43% have considerable demand in Upper Egypt, while 22% of BOs have reasonable demand in Lower Egypt only.

Capital intensity: In terms of capital intensity, 43% of BOs are not considered capital intensive (i.e. they require less than EGP 500,000); only 6% require 100s of millions of EGP.

Innovation: With regards to degree of innovation, 51% of BOs have a considerable degree of innovation and 55 % have high value-added.

Employment: In terms of employment, 61% of BOs are labour intensive and 39% are favourable for women to work with.

The **top ten business opportunities** encompass those opportunities which are aligned with IGGE's goals as well as having relatively lower barriers to entry and higher social impact compared to the pool. The business opportunities are centred around dried fruits and vegetables for a variety of buyers in local and export markets; animal feed; compost; biogas for rural household/agriculture markets and finally marketing and farming services for local agriculture markets:

- **Biogas/compost from animal waste for households, poultry, husbandry**
- **Untraditional agricultural marketing services**
- **Dried fruits and vegetables for export**
- **Sun-dried aromatic plants and spices for local markets**
- **Hot air-dehydrated aromatic plants to export markets**
- **Animal feed from sugarcane bagasse for cattle breeders**
- **Sun-dried tomatoes for consumers and retailers**
- **Dried fruits and vegetables for local markets**
- **Advanced farming services for palm farmers, including treatment of date palm and fruits**
- **Dried dates from fresh dates for local markets**

Moreover, focusing on select key criteria for the IGGE project: growth potential; value-addition; degree of innovation; capital intensity; operating cost and labour intensity, the top ten BOs are presented from the highest to the lowest scoring in Table 1.

Growth Potential	High Value-Addition	High Degree of Innovation	Low Capital Intensity	Low Operating Cost	Labour Intensity
Dried fruits and vegetables for local markets	Dried fruits and vegetables for export	Hot air-dehydrated aromatic plants to export markets	Dried fruits and vegetables for local markets	Biogas/compost from animal waste for households, poultry, husbandry	Dried fruits and vegetables for local markets
Dried dates from fresh dates for local markets	Dried fruits and vegetables for local markets	Dried fruits and vegetables for export	Dried dates from fresh dates for local markets	Untraditional agricultural marketing services	Dried dates from fresh dates for local markets
Hot air-dehydrated aromatic plants to export markets	Dried dates from fresh dates for local markets	Dried fruits and vegetables for local markets	Sun-dried aromatic plants and spices for local markets	Dried fruits and vegetables for local markets	Hot air-dehydrated aromatic plants to export markets
Dried fruits and vegetables for export	Hot air-dehydrated aromatic plants to export markets	Dried dates from fresh dates for local markets	Sun-dried tomatoes for consumers and retailers	Dried dated from fresh dates for local markets	Advanced farming services for palm farmers, including treatment of date palm
Sun-dried aromatic plants and spices for local markets	Sun-dried aromatic plants and spices for local markets	Sun-dried aromatic plants and spices for local markets	Biogas/compost from animal waste for households, poultry, husbandry	Hot air-dehydrated aromatic plants to export markets	Dried fruits and vegetables for export
Sun-dried tomatoes for consumers and retailers	Sun-dried tomatoes for consumers and retailers	Sun-dried tomatoes for consumers and retailers	Untraditional agricultural marketing services	Advanced farming services for palm farmers including treatment of date palm	Sun-dried aromatic plants and spices for local markets
Animal feed from sugarcane bagasse for cattle breeders	Animal feed from sugarcane bagasse for cattle breeders	Animal feed from sugarcane bagasse for cattle breeders	Hot air-dehydrated aromatic plants to export markets	Dried fruits and vegetables for export	Sun-dried tomatoes for consumers and retailers
Untraditional agricultural marketing services	Biogas/compost from animal waste for households, poultry, husbandry	Biogas/compost from animal waste for households, poultry, husbandry	Animal feed from bagasse for cattle breeders	Sun-dried aromatic plants and spices for local markets	Animal feed from sugarcane bagasse for cattle breeders
Biogas/compost from animal waste for households, poultry, husbandry	Advanced farming services for palm farmers, including treatment of date palm	Advanced farming services for palm farmers, including treatment of date palm	Advanced farming services for palm farmers, including treatment of date palm	Sun-dried tomatoes for consumers and retailers	Biogas/compost from animal waste for households, poultry, husbandry
Advanced farming services for palm farmers, including treatment of date palm	Untraditional agricultural marketing services	Untraditional agricultural marketing services	Dried fruits and vegetables for export	Animal feed from sugarcane bagasse for cattle breeders	Untraditional agricultural marketing services

Table 1 *Common 10 business opportunities arranged highest to lowest by key indicators*

Firm Stage and Sub-market Analysis

The BOs were grouped according to the markets that they operate in, in a **"sub-market" analysis** and classified according to the stages at which firms would realize them, based on UNIDO's experience in Southern Upper Egypt.

The short-listed 51 BOs vary from BOs which target **micro to small firms, medium to large firms** and some which fall into the category of BOs which target micro to small firms but could grow to medium to large. There are four BOs which target the micro and small firm stage; 12 BOs which target the medium to large firm stage and 34 BOs which target micro to small but could grow to medium and large. Annex 3 – Classified Business Opportunities List based on Firm Stage presents the short-listed BOs classified according to the firm development stage.

The BOs which could largely be realized by micro to small firms could, in theory, **grow to become medium to large**. However, in many cases they tend to stay at the small-scale and serve local markets due to a lack of pivoting and changing their business model to a structure which can support growth. These types of businesses could be supported by local NGOs and micro-lending entities. The 12 BOs (24%) which target medium to large are difficult to start at the micro to small firm stage and should start with higher production capacity to be profitable and feasible. Most of the BOs (34; 67%) could be realized by micro to small firms and grow to medium to large. Moreover, having observed a pattern in the shortlist of the 51 BOs identified, in terms of the markets/value chains/clusters served as well as their strongest and weakest aspects, we grouped the opportunities to further explore the interventions that could be implemented to serve collections of BOs. We grouped the 51 BOs into **seven sub-markets**. Each sub-market contains a set of BOs grouped by **shared strengths, weaknesses, markets served** and **policy challenges.** Figure 9 illustrates the sub-markets identified.

Table 2 below presents set of **business opportunities within each sub-market**. Most of the BOs serve the sub-markets of Dried Products, Animal Feed and Compost, Renewable Energy Solutions and Intermediary Products, indicating potential across all three IGGE sectors, as well as in value-added manufacturing.

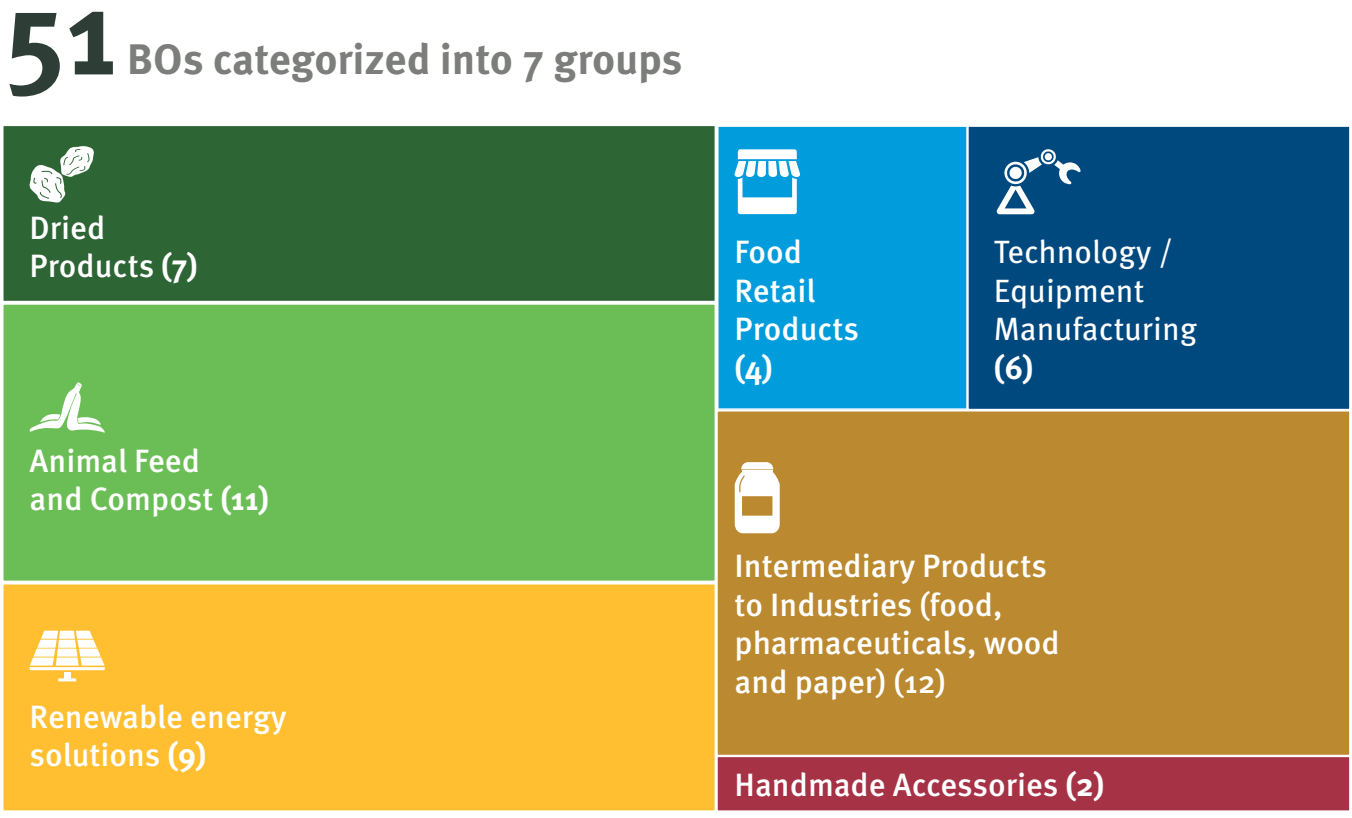


Figure 9 The grouping of 51 BOs into sub-markets

Sub-market	Business Opportunity (BO)
Dried Products SA&FP Integrates food processing with renewable energy (through solar drying). Highly promising sub-market that can **grow into a comprehensive industry** in Luxor and Qena. This sub-market will c**ontribute to the reduction of food waste, valorization of agricultural products and create extra impact for farmers**. It leverages the high sun irradiance in Luxor and Qena. It is job intensive and can create jobs for semi-skilled labour as well as skilled roles. This industry can serve various markets from local to export.	• Dried fruits and vegetables for export • Sun-dried aromatic plants and spices for local markets • Sun-dried tomatoes for consumers and retailers • Dried onion powder for consumers, retailers and food industry • Hot-air dehydrated aromatic plants for export markets • Dried fruits and vegetables for local markets • Dried dates from fresh dates for local markets
Animal Feed and Bio-fertilizers SA&FP This sub-market perfectly integrates with agriculture value chains. It is a prime example of circularity in economic activities. It couples agricultural waste with serving sustainable agriculture. The growth of this market will **increase profitability of farming processes, add extra income to farmers by purchasing agriwaste generated by them, increase sustainability and limit environmental hazards** associated with chemical fertilizers and processed animal feed and with the burning of biomass residues. It saves water and energy indirectly by replacing traditional feed and fertilizers, the production of which requires intensive use of water and energy. This will contribute to the **promotion of agriculture farming and support the export of agricultural products** by providing organic alternatives to processed feed and fertilizers.	• Animal feed from barley for cattle breeders • General fermented animal feed from agricultural waste for cattle breeders • Vermi-compost from food waste and agricultural waste for farmers • Animal feed from date pits for retailers • Vermi-worms for vermi-compost manufacturers and fisheries • Animal feed from sugarcane bagasse for cattle breeders • Animal feed from sugarcane straw for cattle breeders • Biochar from sugarcane waste for farmers
Handmade Accessories This is part of the wider market of **creative industries** and is mainly hinged on **valorization of agriwaste** to home accessories. It is a **job intensive** sub-market, though perhaps on a smaller scale than others.	• Fibres from banana waste for handmade products • Artistic paper from agricultural waste for consumers

Table 2 *Set of business opportunities within each sub-market (1/3)*

Sub-market	Business Opportunity (BO)
Renewable Energy Solutions RE Renewable energy is a rapidly growing market in Egypt. However, this sub-market is unique in the sense that is centred on **serving agriculture value chains**. This sub-market will be centred on integrating renewable energy to the agricultural process, including solar-powered agricultural equipment and solar energy for general farm use as well as for lighting or energy consumption in administrative buildings and labour lodges. This will **increase farmers profitability** (who currently spend 30% of their costs on energy), save the government on energy subsidies and in some cases **valorize waste from farms.** This sub-market also includes **agricultural equipment** that is powered by solar energy. The sub-market revolves around three technologies: **solar thermal, photovoltaic (PV) and biogas**. It also focuses not only on serving farms, but also serving cold storage units and food processors.	• Biogas/compost from animal waste for households, poultry, husbandry • Biogas units for livestock and poultry farms • Biomass pellets and heaters from agricultural waste for poultry farms • Solar thermal heating for poultry farms • Solar PV pest control for farmers • Solar PV powered ventilation for poultry farms • Solar PV powered lighting systems for poultry farms • Solar PV pumping for farmers • Solar-powered cold storage units for farmers and retailers
Food Retail Products SA&FP This sub-market links agricultural products through **value-added manufacturing** to local markets. Most retail products in the food sector in Luxor and Qena come from Lower Egypt. However, food processing of agricultural products to serve retail can replace the products on the shelf in supermarkets and groceries with those produced locally. In this sense, IGGE is targeting **sustainable consumption** where local resources serve local markets, **limiting energy consumption** in transportation, processing agricultural products **close to source** and **limiting cost** of transporting raw material to Lower Egypt markets.	• Black honey products from sugarcane for consumers and retailers • Traditional food retail products such as baked goods and ready-made meals for local markets • Packaging of dried aromatic plants for local markets • Packed frozen agricultural products for small-scale markets

Table 2 *Set of business opportunities within each sub-market (2/3)*

Sub-market	Business Opportunity (BO)
Technology / Equipment Manufacturing **SA&FP** This sub-market is part of the sector of **engineering industries** as well as the **chemical industrial sector.** It focuses on producing technology and machinery to serve the food and agriculture sectors. Production of technology locally enables other industrial facilities to expand their operations. This provides l**ocal access to cost-effective equipment**, potentially coupled with maintenance services. The focus is on equipment which enables sustainable food production, including drying to decrease waste, recycling of agriwaste, bio-pest control systems, etc	• Agricultural machinery for recycling businesses (shredders, crushers, trucks, loaders, date palm trimmers) • Efficient animal feeder system for rabbit production and poultry farms • Pheromone bio-pest control traps for farmers • Farm bedding from wood waste for poultry and livestock farms • Manufacturing of fruit and vegetable dryers • Advanced irrigation system components for farmers
Intermediary Products to Industries (including food, pharmaceuticals, wood and paper) Most of Egypt's imports are intermediary industrial goods. This sub-market focuses on producing various **industrial intermediary products** and services to industries including **food, pharmaceuticals, wood and paper**. It creates strong interaction along value chains. The sub-market enables value chains to grow by providing **local value-added** intermediary goods. All opportunities are those which enjoy **lower resource consumption** than the market average, thereby increasing sustainability of the final markets. These products add greater value for the same amount of resources than current practices.	• Date syrup/dips from second grade dates for food and feed industries • Aromatic plant oil extracts for perfumes, cosmetics and food • Pulp from sugarcane bagasse for paper industry • Ethanol from sugarcane molasses for pharmaceutical industry • Medium-density fibreboard (MDF) from agricultural waste for wood industry • Tomato paste from second grade tomatoes for packaging facilities • Tomato/mango concentrates from second grade tomatoes/mangoes for food industry • Dates to powder (not instant) for food and dairy industries • Jam manufacturing for packaging facilities (confectionary) • Untraditional agricultural marketing services for retailers and small-scale markets • Services for date palm farmers including trimming, collection and treatment

Table 2 *Set of business opportunities within each sub-market (3/3)*

Considering sub-markets is critical as it provides a view beyond individual business opportunities. This overview shows that there are certain sub-markets and economic activities that are **promising at large scale in Luxor and Qena**. Therefore, while supporting the principal business opportunities is IGGE's primary aim, developing the above sub-markets is another critical indirect element of IGGE's interventions. Focusing on business opportunities which form a sub-market can help to **grow a sub-sector or an industry**, rather than simply growing individual businesses. All these markets rely on **sustainable manufacturing** as a source of value-addition, by either valorizing agricultural products or availing inputs to farming which increase sustainability of their overall economic activities. For instance, drying fruits using solar energy **decreases the loss of** agricultural products, while also **utilizing renewable energy**. This sustainable manufacturing increases the overall sustainability of the value chains where it will be used (tomatoes for instance). Various opportunities, such as **valorizing agro-industrial waste** from sugar cane factories to compost, or MDF production, demonstrate how **circularity** can be part of mainstream industrial activities even in rural Egypt, leading to a **green industrial recovery** and development.

Interaction between value chains, clusters and business opportunities

This section provides an overview of the **shortlisted business opportunities** (BOs) as well as their **interaction with the value chains and clusters**. Most of the BOs identified could be realized by entrepreneurs and micro-firms who could grow their businesses to a medium or large size. They also serve diverse sub-markets in the IGGE sectors **locally, regionally, nationally and internationally.**

Through a series of visual depictions (Figure 10 to Figure 17), this section also showcases how the BOs service the nine value chains and potential clusters discussed in Section 2. This can be direct (**operating within, filling gaps or adding value** to the core value chain activities) or in a serving role (**supporting business activities to enhance the quality, sustainability** and/or **competitiveness** of the value chains and clusters).

These figures showcase the **interaction of the direct and serving BOs** with the nine value chains and clusters. In the diagrams, the waste value chains were combined (waste management value chain), as were the solar and biogas (renewable energy value chain).

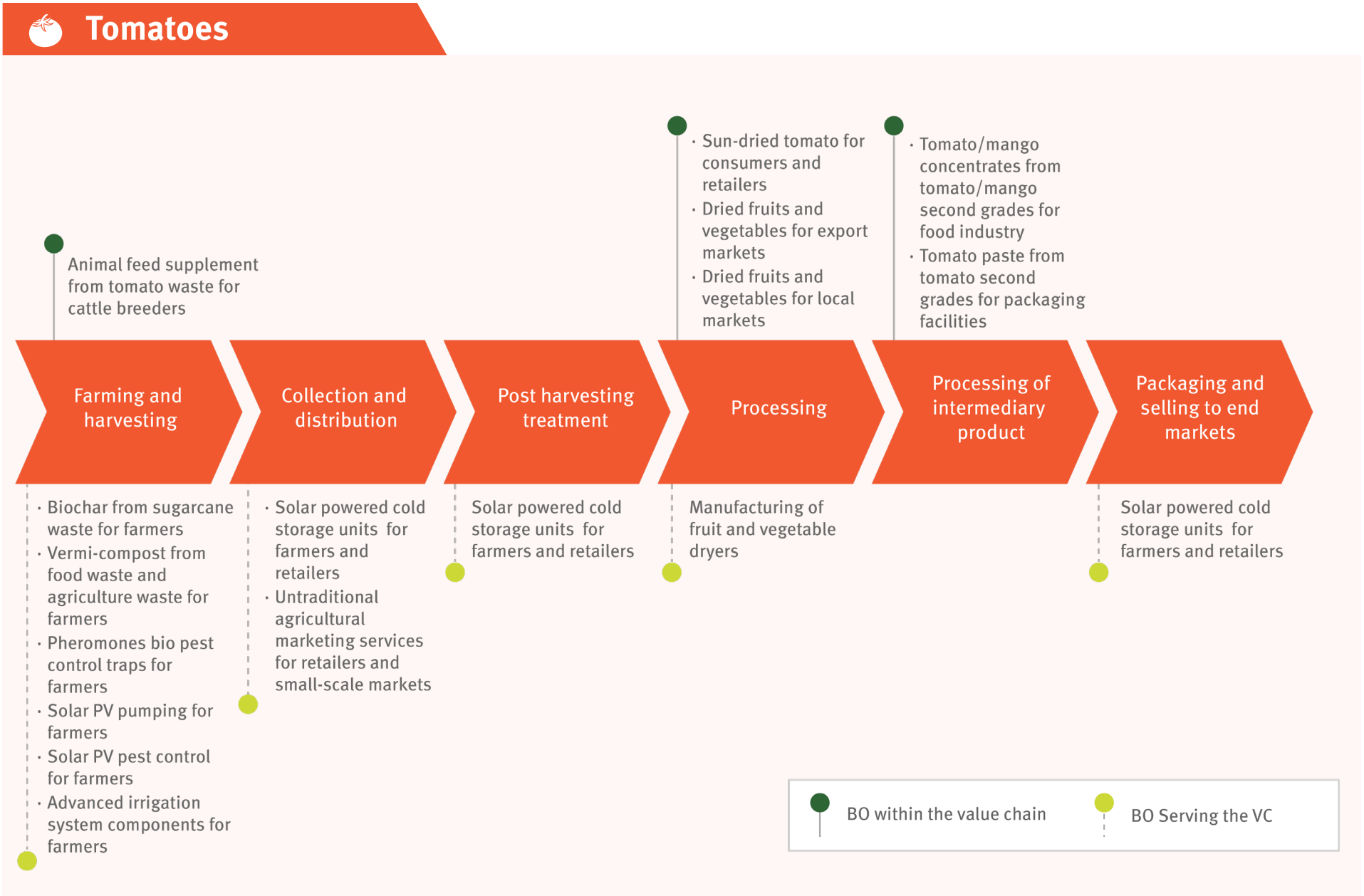


Figure 10 *Illustration of the tomato value chain as well as the BOs within and serving it*

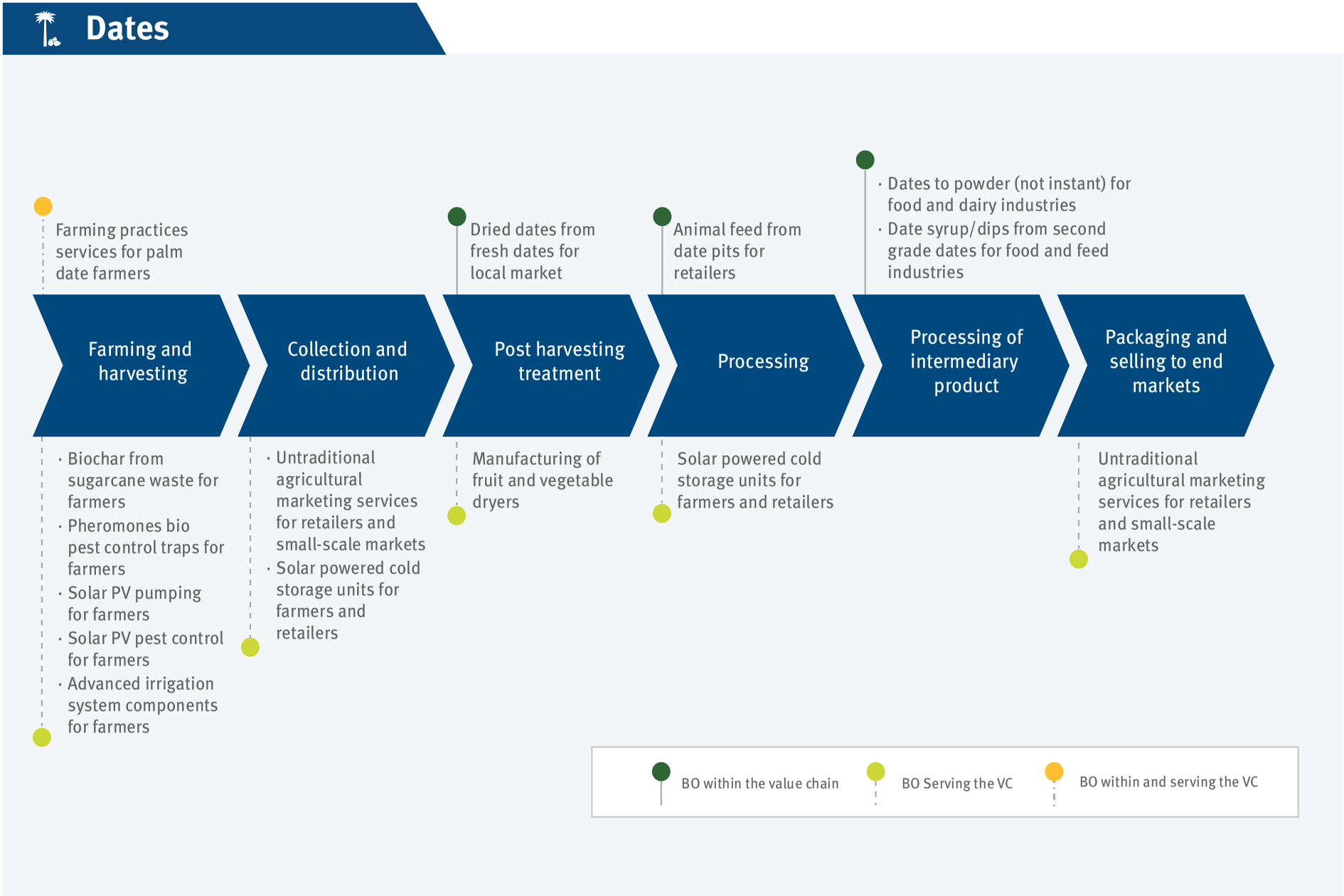


Figure 11 *Illustration of the date palm and fruits value chain as well as the BOs within and serving it*

Medical / Aromatic Plants and Herbs

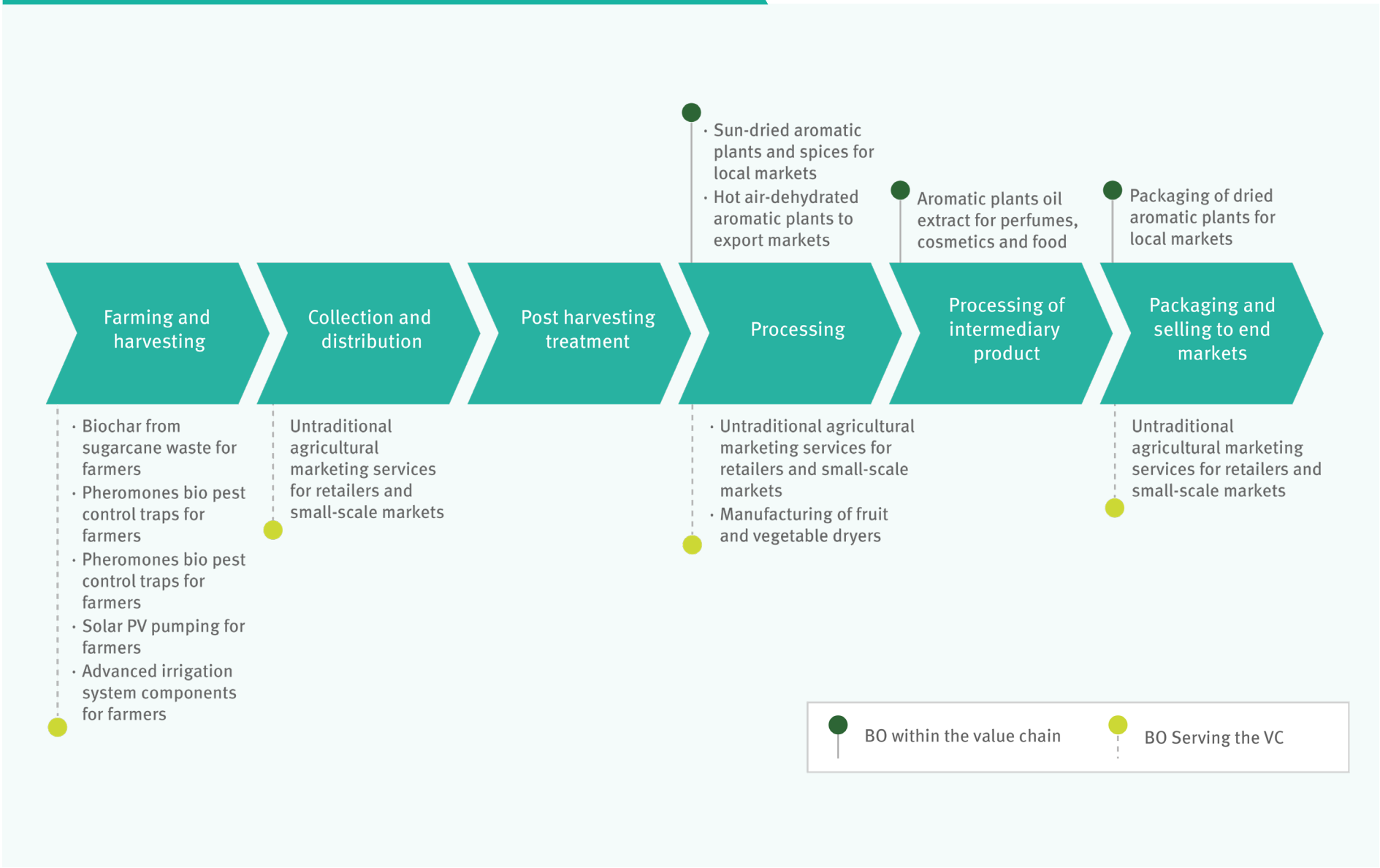


Figure 12 *Illustration of the medical/aromatic plants and herbs value chain as well as the BOs within and serving it*

Food processing and packaging

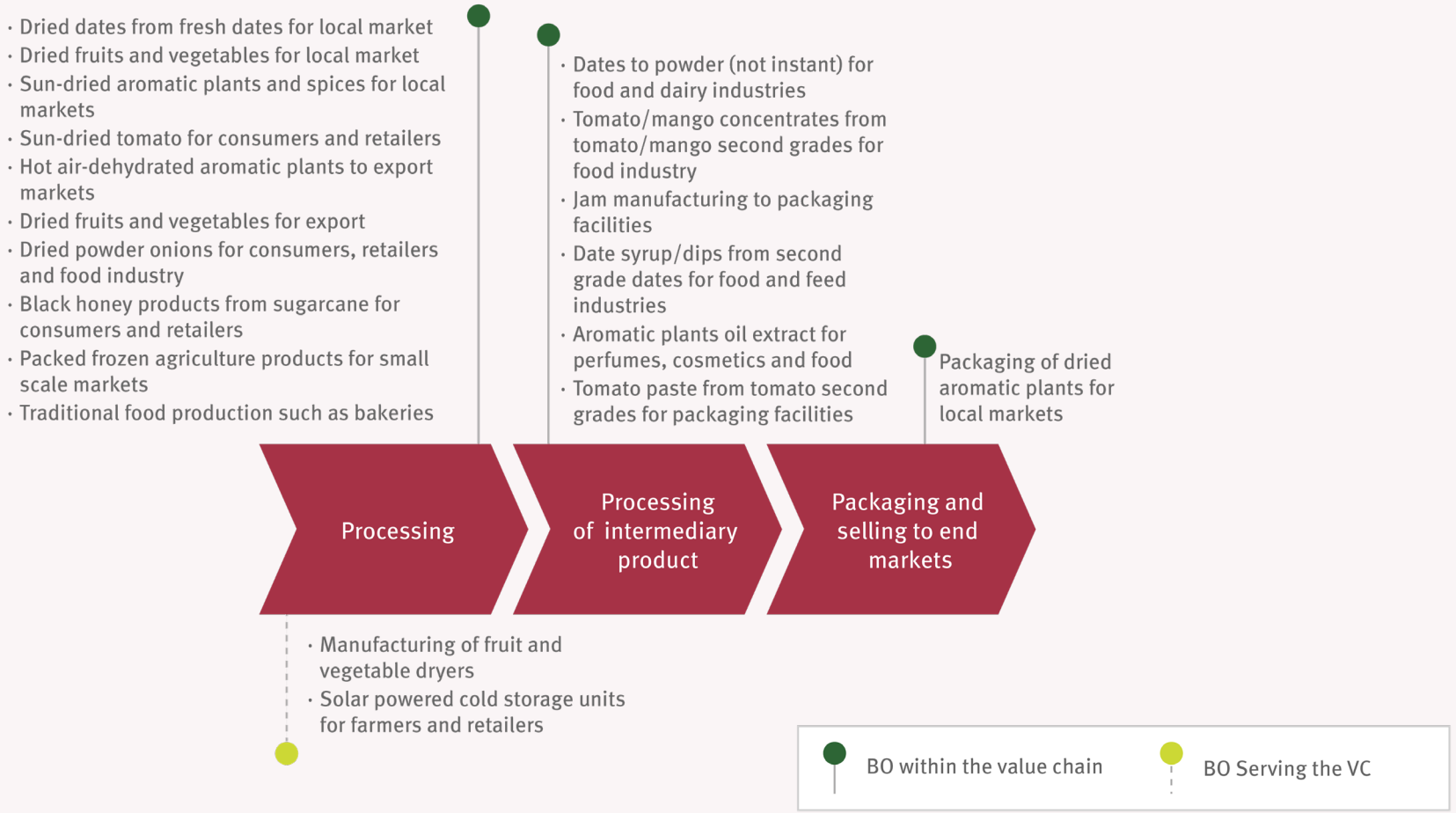


Figure 13 *Illustration of the fruit and vegetable processing and packaging value chain as well as the BOs within and serving it*

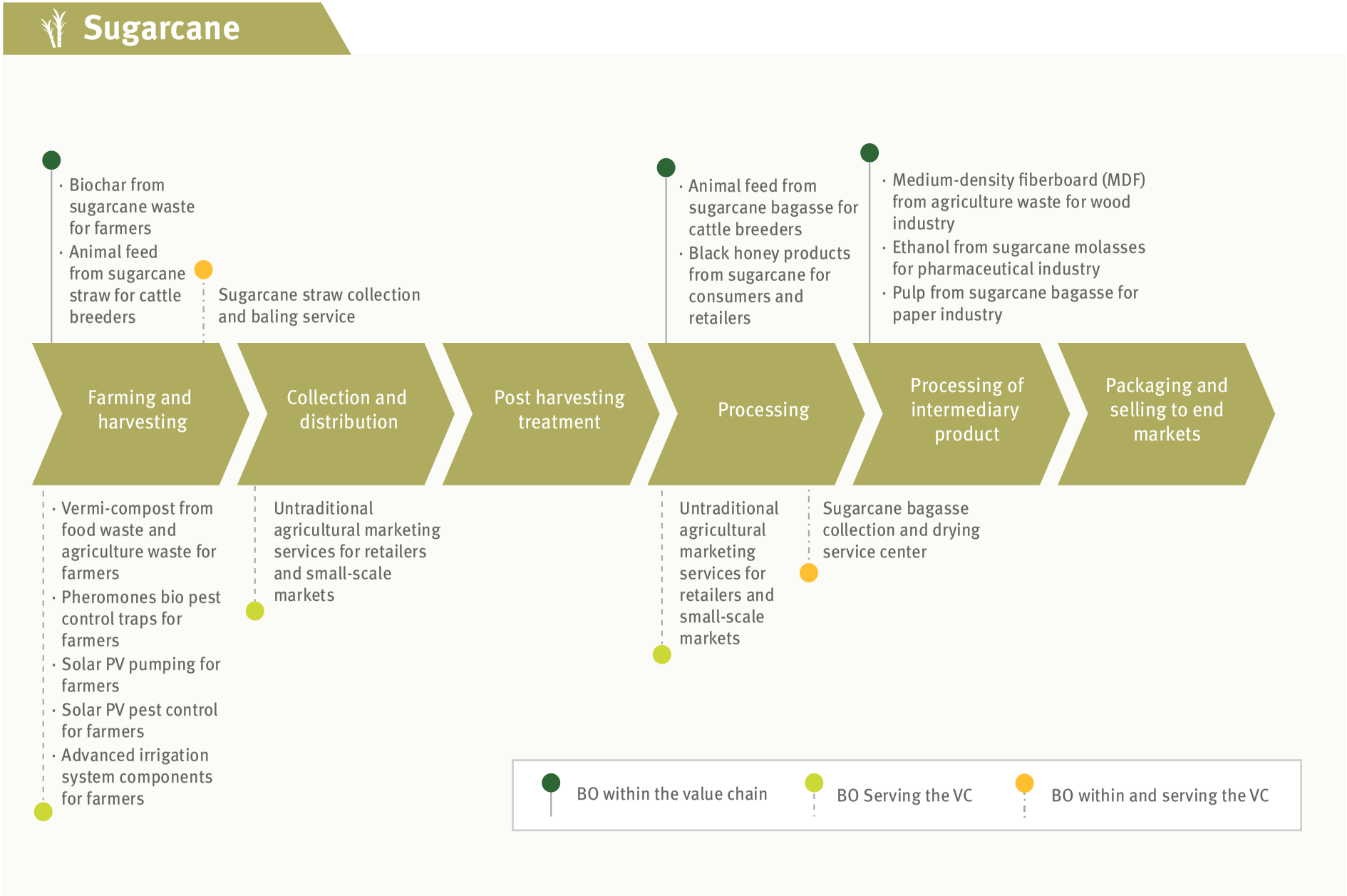


Figure 14 *Illustration of the sugarcane cluster as well as the BOs within and serving it*

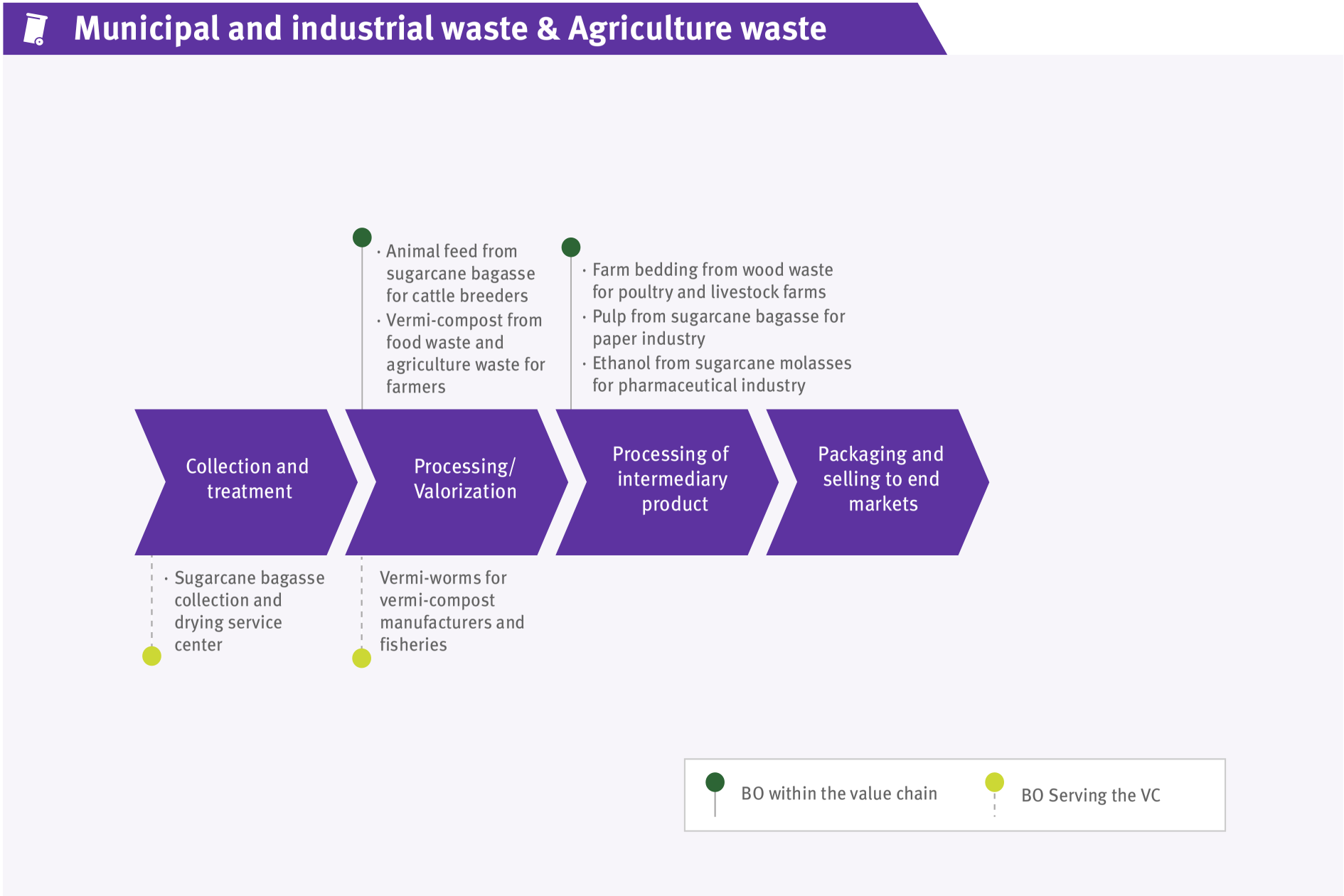


Figure 15 *I Illustration of the municipal waste value chains as well as the BOs within and serving*

Agriculture waste

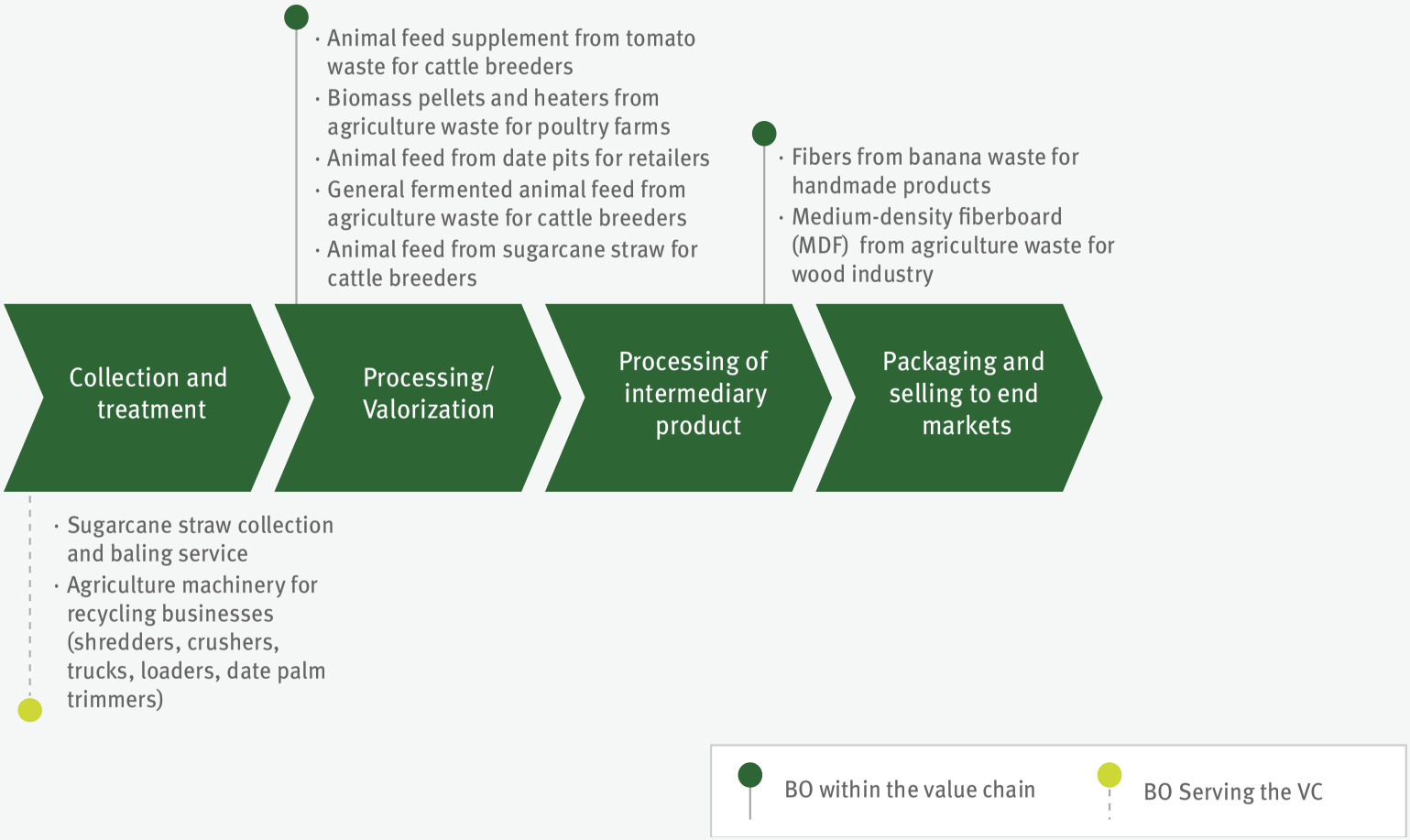


Figure 16 *Illustration of the agricultural waste value chains as well as the BOs within and serving it*

Solar & Biogas

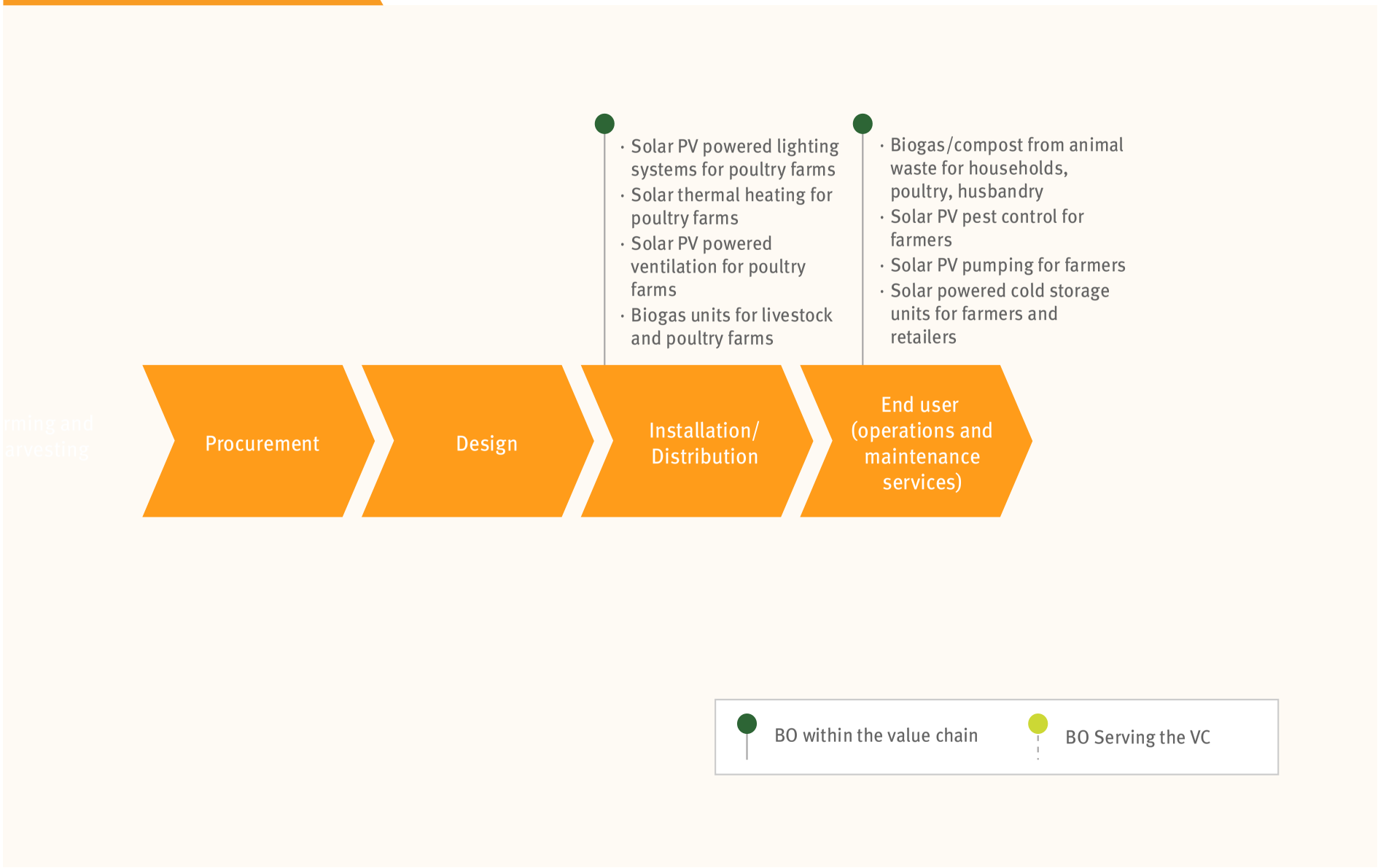


Figure 17 *Illustration of the solar and biogas value chains as well as the BOs within and serving it*

As can be seen, the mapped business opportunities are **strongly tied to value chains**. The opportunities serve both upstream and downstream needs in the value chains, with most opportunities being end-customer facing. The downstream activities open markets and channel profits and returns to farmers and suppliers. However, they will r**equire effective marketing and quality control** to serve end-markets adequately. The opportunities will help to ensure value chains are extended and experience healthy growth.

Conclusions

Conclusions

The mapping activity shows a **very high level of diversity** in the business opportunities, which are tied to targeted value chains. BOs vary in their growth potential, value-addition, degree of innovation, capital intensity, operating cost and labour intensity. This means that **various types of investors and entrepreneurs** can find a place in the renewable energy (RE), waste management (WM) and sustainable agriculture and food production (SA&FP) sectors in Qena and Luxor.

The analysis of value chains shows that there are several successful and high-potential ones in Qena and Luxor. It also shows common weaknesses, such as access to finance and limited access to working knowledge. The mapped opportunities **valorize products** in the value chains, expand them and/or provide the value chain members with products and services which increase their **productivity**, while systematically increasing their **sustainability and/or circularity**.

The opportunities mapped are best seen through the lens of **sub-markets**. The mapped opportunities fall under various sub-markets which in turn can grow to become established industries in the region. Some of these markets (such as compost and animal-related products) increase the **circularity of industrial and economic activities** in Luxor and Qena by **valorizing waste and by-products** of economic activities and returning them to productive value chains.

UNIDO's IGGE project targets firms across all stages, aims to promote business opportunities across the nine value chains and potential clusters identified and to provide **support to policymakers, service providers, green start-ups and MSMEs** and other key stakeholders to realize such opportunities. UNIDO will therefore promote and provide varying degrees of support to all 51 business opportunities identified.

Annex

Annex 1 *Shortlisted business opportunities classified by firm stage*

No.	BO	Micro to Small Firm Stage	Medium to Large Firm Stage	Micro to Small and can grow to Medium to Large Stage
1	Dried fruits and vegetables for local markets			✓
2	Dried dates from fresh dates for local markets			✓
3	Sun-dried aromatic plants and spices for local markets			✓
4	Sun-dried tomatoes for consumers and retailers			✓
5	Untraditional agricultural marketing services for retailers and small-scale markets			✓
6	Hot-air dehydrated aromatic plants to export markets			✓
7	Animal feed supplement from tomato waste for cattle breeders			✓
8	Vermi-compost from food waste and agricultural waste for farmers			✓
9	Biogas/compost from animal waste for households, poultry, husbandry			✓
10	Solar PV pest control for farmers			✓
11	Solar PV-powered lighting systems for poultry farms			✓
12	Animal feed from bagasse for cattle breeders			✓
13	Vermi-worms for vermi-compost manufacturers and fisheries			✓
14	Solar PV pumping for farmers			✓
15	Farming practice services for date palm farmers			✓
16	Fibres from banana waste for handmade products	✓		
17	Solar thermal heating for poultry farms			✓
18	Biochar from sugarcane waste for farmers			✓
19	Biomass pellets and heaters from agricultural waste for poultry farms			✓
20	Solar PV-powered ventilation for poultry farms			✓
21	Dried onion powder for consumers, retailers and food industry			✓
22	Animal feed from barley for cattle breeders	✓		

No.	BO	Micro to Small Firm Stage	Medium to Large Firm Stage	Micro to Small and can grow to Medium to Large Stage
23	Pheromone bio-pest control traps for farmers			✓
24	Sugarcane straw collection and baling service (service)			✓
25	Sugarcane bagasse collection and drying service centre (service)			✓
26	Jam manufacturing for packaging facilities (confectionary)			✓
27	Animal feed from sugarcane straw for cattle breeders	✓		
28	Animal feed from date pits for retailers			✓
29	Biogas units for livestock and poultry farms			✓
30	Manufacturing of fruit and vegetable dryers			✓
31	Black honey products from sugarcane for consumers and retailers	✓		
32	Efficient animal feeder system for rabbit production and poultry farms			✓
33	General fermented animal feed from agriwaste for cattle breeders			✓
34	Artificial insemination of cattle for food production (could become veterinarian services)			✓
35	Artistic paper from agricultural waste for consumers			✓
36	Agricultural machinery for recycling businesses (shredders, crushers, trucks, loaders, date palm trimmers)			✓
37	Dates to powder (not instant) for food and dairy industries			✓
38	Traditional food production such as baked goods and ready-made meals for local markets	✓		
39	Farm bedding from wood waste for poultry and livestock farms			✓
40	Dried fruits and vegetables for export		✓	
41	Tomato paste from second grades tomatoes for packaging facilities		✓	
42	Tomato/mango concentrates from second grade tomatoes/mangoes for food industry		✓	
43	Solar-powered cold storage units for farmers and retailers		✓	
44	Packaging of dried aromatic plants for local markets		✓	
45	Date syrup/dips from second grade dates for food and feed		✓	
46	Packed frozen agricultural products for small-scale farmers		✓	

No.	BO	Micro to Small Firm Stage	Medium to Large Firm Stage	Micro to Small and can grow to Medium to Large Stage
47	Aromatic plant oil extracts for perfumes, cosmetics and food		✓	
48	Medium-density fibreboard (MDF) from agricultural waste for wood industry		✓	
49	Advanced irrigation system components for farmers		✓	
50	Ethanol from sugarcane molasses for pharmaceutical industry		✓	
51	Pulp from sugarcane bagasse for paper industry		✓	

Inclusive Green Growth in Egypt

INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT