UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

BUSINESS OPPORTUNITY MAPPING IN WASTE MANAGEMENT, RENEWABLE ENERGY AND AGRO-INDUSTRY IN LUXOR GOVERNORATE

Start-ups and MSEs Development through Access to Knowledge and Market Information

From the People of Japan
Ministry of Trade & Industry
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TABLE OF CONTENTS

Section 1: Introduction....3
1.1 Start-ups and MSEs in Waste Management, Renewable Energy, and Agro-industry....3
1.2 The Role of Access to Market Information in Entrepreneurship Activities 3
1.3 Business Opportunity Mapping: Upper Egypt Experience 4
1.4 Luxor Business Opportunity Mapping....4
1.5 Description of the Document....5

Section 2: Methodology....6
2.1 Long List of Business Opportunities....6
2.2 Assessment of Business Opportunities....8
2.3 User Defined Short Listing....9
2.4 Pre-feasibility Studies for Top Business Opportunities....9
2.5 The Long List of Opportunities....10
2.6 Findings of the Long List....15
2.7 Business Opportunity Assessment and Short-listing....23

Section 3: How to Utilize the Document....25

Annex I: Business Opportunity factsheets....28

LIST OF TABLES

Table 1: Summary of the business opportunities identified.....2
Table 2: Example of Business Opportunity Factsheet.....7
Table 3: Long list of business opportunities in Luxor.....11
Table 4: Selected business opportunities exceling in certain indicators.....17

LIST OF FIGURES

Figure 1: The distribution of business opportunities across sectors of focus.....15

Figure 2: Business opportunities by degree of linkage to clusters/value chains/economic activities geographically.....16

Figure 3: Diversity of business opportunities in terms of capital intensity and value added.16

Figure 4: Business opportunities cascaded towards high value addition.....19

Figure 5: Potential cluster of herbal and aromatic plants that could develop on very limited value added activities.....20

Figure 6: Potential cluster of tomato that could develop on very limited value added activities.....21

Figure 7: Potential cluster of sugar cane that could develop on very limited value added activities.....23

Figure 8: Snap shot of excel sheet showing the top-ranking opportunities when balanced criteria is used for ranking.....23

Figure 9: Snap shot of excel sheet showing the top-ranking opportunities when a criterion is used for ranking that favours major investments (more weight to value added and grow....24

EXECUTIVE SUMMARY

Start-ups, micro and small enterprises (MSEs) are a dynamic force for economic growth and can be an important instrument for job creation, industrialization and sustainable development. UNIDO has the vision that start-ups and MSEs in waste management, renewable energy, agro-industry can be an efficient agent in local economic development and job creation. However, the potential for private sector development and inclusive growth in these sectors still remains largely untapped. One of the major challenges has to do with access to knowledge and market information as per extensive interviews carried through past and present projects implemented by UNIDO together with the Ministry of Trade and Industry and with funding from the Government of Japan.

In 2014, at the outset of its entrepreneurship support programme in waste management in Upper Egypt, UNIDO conducted with Chemonics Egypt Consultants and Cleantech Arabia a mapping of the entrepreneurship ecosystem with the objectives to identify skills required for entrepreneurs in Egypt, barriers facing start-ups and MSEs in kick-starting and growing their businesses in Egypt, support mechanisms required for entrepreneurs in Egypt.

A common barrier hindering start-ups, MSEs, as well as supporting entities including investors from venturing in the waste management sector resulted to be the lack of sector-specific knowledge and market information.
UNIDO with Chemonics Egypt Consultants and Cleantech Arabia devised and implemented what proved to be an effective tool in lowering this barrier and that guided the successful implementation of the entrepreneurship support programme: business opportunity mapping (BOM).

Through a thorough analysis of resources, markets and technology and with direct participation of the local private sector, the BOM intends to:
- Mitigate the barriers and risks related to difficulty in accessing sector-specific knowledge and market information;
- Increase the chances of success for start-ups and growth for MSEs;
- Channel innovation towards opportunities that are economically profitable and socially impactful, thus, avoiding a major dilemma in “social entrepreneurship”;
- Leverage more support from the entrepreneurial ecosystem;
- Attract more capital investment and finance.

Due to the high impact of the BOM conducted in 2014, in 2016 UNIDO carried out with Chemonics Egypt Consultants and Cleantech Arabia a BOM in Luxor governorate addressing two additional sectors, agro-industry and renewable energy, and with focus on interlinkages within the businesses and the existing clusters, value chains, and competitive economic activities.
The identified opportunities could be seeds of developing clusters in Luxor. They complement and add value to existing activities, are linked to value chains and clusters in forward and/or backward manner. Continuous support of such business opportunities is believed to develop clusters.

This document presents the mapped opportunities, the methodology, and how various stakeholders may benefit from it. The BOM is highly relevant to Qena as well. Some of the opportunities are also relevant to other parts in Egypt. The opportunities are presented briefly in the table below.

Renewable energy	Waste management		Agriculture					
Solar energy	**Waste to Fuel**	**Agriculture & animal waste**	**Fruits and Vegetables**	**Palm dates**	**Herbal/Aromatic plants**	**Livestock and poultry**	**Sugarcane**	**Equipment**
PV pumping for desert irrigation	Biogas and compost from animal waste	Large scale aerobic compost for agriculture	Tomato farming for food industry	Dates pits to animal feed for livestock farms	Sun dried aromatic/herbal for local market	Bedding from wood sod for poultry farms	Sugar cane straw to animal feed for livestock farms	Agriculture machinery for farms
PV powered lighting systems for poultry farms	Biomass pellets and heaters for poultry farms	Extracts from composted animal waste to fertilizers for agriculture	Small scale household branded food products	Date palms trimming	Fragrant oils from aromatic plants for perfumes	Efficient animal feeder system for livestock and poultry farms	Pulp from bagasse for paper/cardboard	Irrigation system components for farms
PV powered ventilation system for poultry farms	Alternative fuel for energy intensive industries	Agriwaste to artistic paper for consumers	Dried fruits and vegetables for local markets	Fresh dates to dates powder for bakeries	Dried onion and garlic for consumers and retailers	Artificial insemination for animal production	Sugarcane straw to cellulose for packing/starch	Selling dryers for agriculture
Off-grid PV systems for farms	Microbial starters for biogas/compost	Agriwaste to fermented animal feed	Agriculture products for export	Date syrup for domestic use, retail and food industry	Biocontrol agent from plant extracts	Ultrafiltration of milk for food industry	Sugarcane (straw) to glucose for food/pharma	Pheromone traps pest control for agriculture
PV powered pest control for agriculture		Vermi-compost from animal waste for agriculture	Dried fruits/ vegetables for niche markets	Date pits for cosmetics	Powdered garlic and onion for consumers, food industry or export			
Solar heaters for livestock production & households		Tomato waste to animal feed supplement for livestock farms	Tomato waste to juice for food industry	Date pits to fibres for food/pharma industries	Hot air dried aromatic/herbal plants for niche markets		The darker the shade the higher the capital investments are	
			Market leftovers to biochemicals for food/pharma industries	Second grade dates to fructose for food industry	Aromatic plant extracts for pharma/food/textiles/cosmetics			
			Dried fruits and vegetables for export	Dates to powder for food industry	Packed dried herbal drinks			

Table 1 Summary of the business opportunities identified

SECTION 1 - INTRODUCTION

1.1 Start-ups and MSEs in Waste Management, Renewable Energy, and Agro-industry

Start-ups, micro and small enterprises (MSEs) are a dynamic force for economic growth and can be an important instrument for job creation, industrialization and sustainable development. MSEs fuel independent business and entrepreneurial endeavours; "they are flexible and can adapt quickly to changing market demand and supply conditions; they generate employment, help diversify economic activities and make significant contribution to export and trade"[1].

Due to this flexibility and agility, in sectors such as the waste management, renewable energy, as well as agro-industry start-ups and MSEs have a significant direct impact on improving quality of life and the prosperity of communities. These sectors are efficient creators of local jobs and economic development. The jobs created in such sectors are diverse; from highly qualified professional, to technical labour, and unskilled labour. A large percentage of the cost of products and services in these sectors is directly spent on labour and in many cases local supplier. This in turn boosts local economic development. The services and products offered in waste management, renewable energy, as well as agro-industry directly improve local environmental conditions and quality of life. They provide citizens and businesses with sustainable/affordable supply of material(recycled) and energy thus increasing the sustainability of citizens and competitiveness of businesses. However, start-ups and MSEs across the sectors above face a challenge with accessing knowledge and market information as per extensive interviews carried through multiple UNIDO projects[2].

1.2 The Role of Access to Market Information in Entrepreneurship Activities

Entrepreneurs, more so in these sectors, must be able to understand and identify markets before designing their solutions. Access to market information allows careful selection of the business idea to anchor the firms on local demand. Knowledge of local economy allows developing businesses that can be incorporated in value chains increasing success and sustainability. Specifying information on the demand and supply, as well as knowledge of available technologies is necessary for start-ups and MSEs to realize opportunities. Moreover, expert backed and validated sector-specific data can make investing in initially high risk nascent businesses more rational and normalized. Accessibility of information can help make markets more visible and lower risk of entry for both the entrepreneur and the investor. Easy access to sector-specific knowledge and market information can help entrepreneurship support programs become more effective and efficient by supporting businesses that are more likely to succeed.

All the above is amplified for sectors such as waste management, renewable energy, as well as agro-industry. The knowledge of types and amount of waste, agriculture produce, and forms of energy consumption are essential for start-ups, investors, and supporting entities in these sectors. Despite the realization that waste management, renewable energy, as well as agro-industry are promising sectors in Egypt, challenges with access to knowledge and market information hinder the realization of the full potential of these sectors.

[1] Ministry of Foreign Trade, The Small and Medium Enterprises Policy Development Project (Sepal), "Profile of M/SMEs in Egypt".
[2] UNIDO. 2014. "Waste Management Entrepreneurship Support in Southern Upper Egypt for Sustainable Development", Chemonics Egypt Consultants & Cleantech Arabia, implemented by UNIDO in "Enhancing Youth Employability and Local Economic Development in Upper Egypt Project" funded by the government of Japan, 2014. ; UNIDO. 2016. "Business Opportunity Assessment in Luxor Governorate", Chemonics Egypt Consultants, implemented by UNIDO in "Youth Employment for Socio-Economic Stability in Upper Egypt Project" funded by the government of Japan, 2016.

1.3 Business Opportunity Mapping: Upper Egypt Experience

An efficient tool, which has been developed and piloted by UNIDO and Chemonics Egypt Consultants and Cleantech Arabia in Egypt to improve access to knowledge and market information, is Business Opportunity Mapping (BOM).

The main objective of the BOM is to specify opportunities in a certain geographical setting which offers start-ups a higher chance of success and also ensure that such success implicitly improves social conditions; for instance, preservation of natural resources and job creation for youth and women. Furthermore, the BOM provides basic knowledge related to the business opportunity, which acts as starting point for start-ups and stakeholders.

In 2014, UNIDO with the consultant carried out a BOM in Sohag, Qena, Luxor, and Aswan governorates in waste management, which guided the implementation of a support program for 12 idea-stage entrepreneurs and 2 microenterprises.

Start-ups and microenterprises supported in pre-mapped business opportunities since 2014 have shown an extremely higher business success rate than usual (to date 50% of idea-stage businesses that were supported are successfully operating, with above 30% continuing to grow). Moreover, start-ups and microenterprises supported in pre-mapped opportunities have realized the predetermined social impact[3].

An initial survey in 2014 demonstrated that multiple entrepreneurship supporting entities in Egypt realize the importance and the potential of the sectors of waste management, renewable energy, as well as agro-industry. Yet, their support to start-ups in such sectors is deterred by the lack of sector-specific knowledge and market information. The BOM has proved successful in tackling this barrier. Based on the mapping, 5 entities have been focusing their support on waste management.

The identification of such opportunities through a neutral party encouraged angel investors to invest in sectors with which they might not be most familiar. In 2014, the BOM played a crucial role in the facilitation of 1.25 Million EGP of investments in 8 supported firms. Similar results were replicated through business opportunity BOM preceding the Renewable Energy Support Program, Nawart, in 2015[4].

UNIDO has the vision that start-ups and MSEs in waste management, renewable energy, agro-industry can be an efficient agent in local sustainable development. Due to the high impact of the BOM on such sectors, in 2016 UNIDO carried out a BOM in Luxor governorate. The BOM is highly relevant to Qena as well. Some of the opportunities are also relevant to other parts in Egypt. The dissemination of the results is to serve various stakeholders as discussed later.

1.4 Luxor Business Opportunity Mapping

In line with the above, the main objective of Luxor BOM is to identify business opportunities that meet pre-set criteria leading to well described business opportunities with high success probability for start-ups. Luxor BOM provides basic information relevant to opportunities. Each opportunity is outlined, by providing knowledge on supply, demand, technology, main challenges, winning points, etc.

[3] UNIDO. 2014. "Waste Management Entrepreneurship Support in Southern Upper Egypt for Sustainable Development", Chemonics Egypt Consultants & Cleantech Arabia, implemented by UNIDO in "Enhancing Youth Employability and Local Economic Development in Upper Egypt Project" funded by the government of Japan, 2014.
[4] Nawart 2015. "Renewable Energy Start-up Support Program" Implemented by GIZ RIBH MENA, Ministry of Trade and Industry, PWC Egypt, Chemonics Egypt Consultants, Cleantech Arabia, 2015

The BOM provides basic information to start-ups to neutralize lack of access to market data, which is needed to shape their business through knowledge of demand, supply, legal requirements, order of magnitude scale of Capital Expenditure (CAPEX) needed, and other challenges.

The BOM helps also disqualify opportunities for which high legal and regulatory barriers exist. Knowledge about such regulatory barriers is not readily available to start-ups in many cases. Thus, the objectives of Luxor BOM can be summarized for the chosen sectors as:

- Mitigate the barriers and risks related to difficulty in accessing sector-specific knowledge and market information;
- Increase the chances of success for start-ups and growth for MSEs;
- Channel innovation towards opportunities that are economically profitable and socially impactful, thus, avoiding a major dilemma in “social entrepreneurship”;
- Leverage more support from the entrepreneurial ecosystem;
- Attract more capital investment and finance

1.5 Description of the Document

This document presents the mapped opportunities, the methodology, and how various stakeholders may benefit from it. In section 2, the BOM methodology is briefly explained. In section 3, the highest 17 ranking business opportunities are discussed briefly. Section 4, explains how the BOM may be utilized by stakeholders and how it can be leveraged in other geographical settings. The long list of 56 business opportunities and their factsheets that present basic data are included in Annex I.

SECTION 2 - METHODOLOGY

The BOM was conducted through desk research, interviews with several key stakeholders (21 diverse stakeholders located in Luxor governorate or operating there), as well as primary data collection through field visits. The study also included an analysis of Qena governorate as its geographical proximity and intermingling with economic and social profile of Luxor governorate cannot be ignored. There is a significant overlap between Luxor and Qena in demand and supply from a local market perspective.

2.1 Long List of Business Opportunities

Prior to the assessment of high potential business opportunities, a clear identification and characterization of a long list of business opportunities in the aforementioned sectors is required.

For a proper assessment, two challenges must be met:

1. The list of business opportunities must be comprehensive, and it must capture the hidden opportunities, which are likely to have high potential.
2. The characterization and description of each opportunity must be presented in a clear and methodological way, thus allowing a proper assessment of its potential.

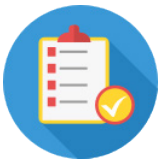
Looking at various definitions (Ardichvili, 2003; McMullen, 2007; Acs, 2010) one may define a business opportunity as a chance to meet “needs” (demand) through “means” (supply) involving creative “methods” (innovation/technology) while generating “value or benefit”. The BOM gives priority to a demand or supply that is linked to existing clusters and value chains. The methods are to be as innovative as possible.

Thus, after the existing clusters, value chains, and main economic activities were identified in Luxor through primary and secondary data collection, a list of relevant demand and supply was developed. A panel of 6 experts were presented by such finding as well as the economic and demographic profile of Luxor. Experts were asked through repeated rounds to develop business opportunities following the criteria discussed above. Once a method linked existing supply and demand, a long list of business opportunities was provided. Only opportunities with consensus between experts for potential success were included. Furthermore, interviewed local stakeholders were asked to nominate business opportunities that were also added to the business opportunity long list upon approval of experts. This resulted in the identification of 56 business opportunities pertinent to Luxor governorate.

Accordingly, a business factsheet, which provides the necessary information pertaining to each opportunity, was developed and validated. Shown in Table 1 is an example of a business opportunity factsheet. The items included in the factsheet eventually become the indicators upon which the opportunities are selected and ranked. They also provide the base for developing the entrepreneurs’ business model, team, and action plan. The full long list of opportunities is shown in Annex I.

Table 2 Example of Business Opportunity Factsheet

BUSINESS OPPORTUNITY FACT SHEET 1: LARGE SCALE AEROBIC COMPOST FROM BIOMASS (CHICKEN LITTER, CATTLE MANURE, AND/OR PLANT RESIDUE (PARTICULARLY BANANA) FOR AGRICULTURE	
Market	
Final Products	Low cost organic fertilizer
Required Inputs	Bedding mixed with litter, cattle manure, plant residual (banana particularly), or possibly additives (bacterial additives)
Competing Products	Chemical fertilizers, traditional manure based fertilizers
Process	
Type of Process	Simple - manual and mechanical processing
Technology	Shredding and aerobic digestion
Equipment & Material	Manual tools, shredders, loaders and access to land
Human resources	Manual labour, technical operation, agriculture specialist
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers, municipalities, landscaping in hotels
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of compost
CAPEX	Low - mainly cost of machinery
OPEX	Low - processing of material
Considerations	
Key Challenge	Long processing time – access to land
Advantages	High demand on organic fertilizers, competitive edge in quality and pricing compared to other types of fertilizers
Impact	
Environmental	A source of bio-fertilizers that ensure sustainable and organic produce, safe disposal of waste
Social	Increase returns of agriculture sector by selling waste and provide affordable organic fertilizers that reduce costs for agriculture activities



2.2 Assessment of Business Opportunities

The long list of business opportunities was assessed and compared according to a framework of indicators. The framework was particularly developed to allow comparing diverse business opportunities and reflect both the economic and business side of the opportunities in addition to social objectives of creating employment, economic growth, as well as supporting youth and women. This framework takes into consideration forward-backward business linkages and success requirements for cluster/value chain formation. The following set of indicators were used in ranking the business opportunities:

LINKAGES:

1. *Forward linkages* (linkages to clients in existing economic activities, value chains, and clusters - local; regional; nationwide; international)
2. *Backward linkages* (linkages to suppliers in existing economic activities, value chains, and clusters – local; regional; nationwide; international)

DEMAND/ SUPPLY:

3. *Availability of supply* (availability of surplus of suitable supply)
4. *Existence of demand*
5. *Supply chain simplicity* (particularly crucial in waste management and sustainable agriculture)
6. *Market saturation* (important to consider since demand can exist but might be met by competitors)

ECONOMIC:

7. *Growth potential* (generally favourable and could be achieved by increasing sales or upgrading products)
8. *Capital Intensity* (low is favourable to accommodate for start-ups)
9. *Value addition*

BARRIERS TO ENTRY:

10. *Existing Competition*
11. *Simplicity of technology* (simple technology is favourable, but in case technology is complex but mastered by start-ups it would be more beneficial as it creates a barrier to entry)
12. *Access to knowledge*
13. *Clarity and simplicity of regulations*

SOCIAL:

14. *Labour intensity*
15. *Absorptive capacity for unemployed/unskilled labour*
16. *Absorptive capacity for women workers*

Experts were asked to give a qualitative grade for each indicator reflecting how positive the business opportunity ranks against the indicator: Excellent, Very Good, Good, and Acceptable. Missing information that hindered the assessment were retrieved during the process of assessment.

2.3 User Defined Short Listing

The qualitative grades above were given a numerical equivalent (Excellent = 10, Very Good = 7, Good = 3, and Acceptable = 1). A total score was provided for each business opportunity. The weight each indicator was given was left to users to define in an excel sheet. Accordingly, ranking of the short-listed opportunities to focus on certain criteria can be generated. The tool developed allows rapid decision making on opportunities to focus upon a given user-defined criteria. The tool should not be used to provide definite answers regarding the comparison of two opportunities for instance. Its use should be limited to short listing of top ranking opportunities. A criterion of equal weighing was used to determine what is considered the top 16 business opportunities for start-ups and MSEs to succeed and grow while achieving the social impact in terms of job creation, fair access to jobs for women, as well as local economic development.[5]

2.4 Pre-feasibility Studies for Top Business Opportunities

Following the short-listing of the top business opportunities, key experts were asked to elaborate and fill in datasheets that would serve as the precursor for the pre-feasibility financial models. The data was both qualitative and quantitative. It covered qualitative information such as:

- final product/service,
- target markets,
- key suppliers,
- type of technological process,
- competitive advantage,
- barriers to entry,
- key stakeholders,
- special regulatory requirements,
- risks and mitigation measures

As well as quantitative data, such as:

- required input amounts,
- production capacity,
- cost of goods sold,
- number of employees and salaries,
- expected revenue.

In addition to the above data, the financial models were done based on several key cross-cutting assumptions:

- Cash flow projections should be for the next five years;
- Capital structure assumes no debt financing, 100% from equity;
- Cost of Capital was assumed at 30%, which we believe is the minimum required rate of return for equity investors given the current economic climate and high risk-free rates;
- Terminal growth rate (beyond 5-year horizon) is 5%, assuming the businesses keep growing;
- Initial investment requirements included initial capital expenditure plus at least three months of working capital;
- Cash conversion cycles were assumed to be three months;
- For businesses that rely on machinery for production, it was assumed that they start at 75% capacity during Years 1 and 2 (capped by sales capacity) and reach 100% by Year 3;
- For businesses that are of project-based nature, i.e. with little to no capital expenditure and rely on labor and components, sales projections were assumed case-by-case.

[5] For the List of 17 business opportunities see section 2.7.

Pre-feasibility analysis and detailed data sheets for the top-ranking opportunities can be provided by UNIDO upon request.[6]

Business Opportunities in Luxor Governorate

2.5 The Long List of Opportunities

According to the methodology discussed above, a long list of 56 business opportunities pertinent to Luxor governorate was developed as shown in Table 3. The factsheets for these opportunities are provided in Annex I.

The long list represents a diverse set of opportunities in terms of success chances. Regardless of the degree of success, these opportunities simply represent businesses that could tie demand and supply through a technology that is accessible to the local community.

[6] Office.egypt@unido.org

Table 3 Long list of business opportunities in Luxor

BO Serial #	Descriptive Title	Demand	Technology	Supply
1	**Large scale aerobic compost for agriculture**	Low cost organic fertilizer	Shredding and aerobic digestion	Bedding mixed with litter, cattle manure, plant residual (banana particularly), or possibly additives (bacterial additives)
2	**Vermi-compost from animal waste for agriculture**	Low cost organic fertilizer	Worm digestion	Bedding mixed with litter and /or cattle manure, specials species of worm (as a starter), additives
3	**Biogas and compost from animal waste for agriculture, homes, poultry and livestock farms**	Fertilizers and energy (methanide)	Anaerobic digestion	Bedding mixed with litter, cattle manure, (possibly bacterial starter additives)
4	**Biomass pellets and heaters for poultry farms**	Energy	Pelleting and machining	Palm fronds, mixed wood dust and waste, mixed agriculture waste
5	**Artificial insemination of cattle for animal production**	High quality animal breeds	Artificial insemination, special freezing	Vet tools, equipment, spermatozoon (imported)
6	**Extracts from composted animal waste to fertilizers for agriculture**	Low cost organic fertilizer	Mixing	Composted animal waste
7	**Aromatic plants extract for pharmaceutical industry**	Herbal plants extract	Drying, mixing and evaporation, distillation	Aromatic plants (pharmaceutical grade supply)
8	**Aromatic plant extracts for textile industry**	Organic dyes	Drying, mixing and evaporation, distillation	Aromatic plants
9	**Aromatic plant extracts for food Industry**	Organic flavours, fragrance, and preservatives	Drying, mixing and evaporation, distillation	Aromatic plants
10	**Aromatic plants extract for cosmetics**	Organic extracts for skin and hair care products	Drying, mixing and evaporation, distillation	Aromatic plants
11	**Fragrant oils from aromatic plants for perfumes**	Natural fragrant oils	Material handling, boiling, steam distillation, separation	Aromatic plants

11	**Fragrant oils from aromatic plants for perfumes**	Natural fragrant oils	Material handling, boiling, steam distillation, separation	Aromatic plants
12	**Sun Dried leaves from aromatic/herbal plants for local market**	Dried aromatic and herbal leaves	Sun Drying	Aromatic and Herbal plants
13	**Hot air dried leaves from aromatic/herbal plants for niche markets and consumers**	High quality dried aromatic and herbal plants	Hot air drying	Aromatic and Herbal plants
14	**Packed dried herbal drinks**	Herbal drinks	packing	Herbal plants
15	**Dried onion and garlic for consumers and retailers**	Dried onion and garlic	Hot air drying	Onion and Garlics
16	**Powdered garlic and onion for consumers, food industry or export**	Powdered onion and garlic	Hot air drying - Grinding	Onion and Garlics
17	**Agriwaste to artistic paper for consumers**	Niche artistic paper	Manual shredding and pulping	Bagasse - agriculture waste
18	**Pulp from sugar cane bagasse for paper and cardboard manufacturing**	Low cost pulp	Oxygen delignification, bleaching and pulping	Sugar cane bagasse and other agriwaste
19	**Sugarcane straw to cellulose for packing material for food / starch industry**	Cellulose	Pulping and chemical bleaching	Sugarcane straw
20	**Sugarcane and Sugarcane straw to glucose for food/pharma industry**	Glucose	Vaporization, purification and chemical conversions	Sugarcane or sugarcane straw
21	**Agriwaste to fermented animal feed for livestock farms**	Animal feed	Shredding and anaerobic fermentation	Mixed agriculture waste
22	**Sugar cane straw to animal feed for livestock farms**	Animal feed	Shredding and pressing	Sugarcane straw
23	**Tomato waste to animal feed supplement for livestock farms**	Animal feed supplements	Drying and shredding	Tomato waste
24	**Dates pits to animal feed for Livestock farms**	Animal feed	Grinding and packing	Date pits and second grade dates
25	**Tomato farming for food industry**	Tomato feedstock	high quality farming	Tomato seeds and agriculture equipment
26	**Tomato waste to juice for food industry**	Tomato juice feedstock	Distillation, evaporation, pasteurization	Tomato (market left overs and fresh)

27	**Food Industry by-products and fresh market left overs to special biochemicals for food and pharmaceutical industries (pectin from mango and lycopene from tomato)**	Biochemicals (Pectin and Lycopene)	Fermentation or thermal treatment	Tomato, Tomato waste, Mango Peel
28	**Ultrafiltration of milk for food industry**	Cheese milk , protein- enriched milk	ultrafiltration	Raw milk
29	**Date palms trimming**	Trimming service	Manual trimming	Trimming tools
30	**Second grade dates to fructose for food industry**	Fructose	Extraction , filtration , clarification, concentration and filling	Second grade dates (left overs from fresh market)
31	**Dates to powder for food industry (milk and juice factories)**	Dates powder as alternative to sugar	Extraction ,spray drying (fluidized bed drying)	Dates
32	**Fresh dates to dates powder for bakeries**	Dates powder as alternative to sugar	Drying, grinding, sieving	Dates
33	**Date pits for cosmetics**	Date seeds oil	drying, grinding, extraction	Date pits
34	**Date pits to fibres for food and pharmaceutical industries**	Date pits fibres	drying, grinding, separation	Date pits
35	**Date syrup for domestic use, retail and food industry**	Syrup and dips	Extraction, filtration, concentration	Second grade dates (left overs from fresh market)
36	**Agriculture products for export**	High quality fruits and vegetables	Packing, Modified Atmospheric Packing System)	Agriculture produce
37	**Small scale household branded food products**	Food products	preparation, cooking, packaging	Agriculture produce
38	**Traps using pheromones pest control for agriculture**	Bio pest control	Design and machining	Pheromones, material
39	**Biocontrol agent from plant extracts**	Bio-pest control	Distillation, extraction	Special plants
40	**Dried fruits and vegetables for niche markets (Onions, Garlics, Tomatoes, Mangos, Bananas, Grapes, etc.)**	High quality dried fruits and vegetables	Solar drying/hot air drying	(Tomatoes, Mangos, Bananas, Grapes, etc.)

41	**Dried fruits and vegetables for local markets**	Low cost dried fruits and vegetables	Sun Drying	(Tomatoes, Mangos, Bananas, Grapes, etc.)
42	**Dried fruits and vegetables for export**	High quality dried fruits and vegetables	Hot air drying, freeze drying and texturing	(Tomatoes, Mangos, Bananas, Grapes, etc.)
43	**Efficient animal feeder system for Livestock production and poultry farms**	Saving and controlling feed	Design and machining	Material and tools
44	**Agriculture machinery for farms**	Agriculture machinery	Design and machining	Material, components and tools
45	**Advanced Irrigation system components for farms**	Efficient agriculture	Design and machining	Components
46	**Bedding from wood sod for poultry farms**	Low cost bedding	Shredding	Wood sod from factories and agriculture waste
47	**Microbial Starters for biogas/compost production**	Efficient fermentation	Bacterial propagation	Microbial strains
48	**PV Pumping for desert irrigation**	Energy saving pumping system	Design and integration	Electric components and equipment
49	**PV powered lighting systems for poultry farms**	Energy saving lighting	Design and integration	Electric components and equipment
50	**PV powered ventilation system for poultry farms**	Energy saving ventilation	Design and integration	Electric components and equipment
51	**Low cost solar thermal heaters for Livestock production**	Hot water	Design and machining	Material and components
52	**Low cost solar thermal heaters for households**	Hot water	Design and machining	Material and components
53	**Off-Grid PV systems for farms**	Energy	Design and integration	Electric components and equipment
54	**PV powered pest control for agriculture**	Bio pest control	Design and integration	Electric components and equipment
55	**Selling dryers for agriculture**	Fruits and vegetable dryers	Design and machining	Material and components
56	**Alternative fuel for energy intensive industries**	Energy	Shredding, pressing and cutting	Sugar cane bagasse or Biomass from (palm dates fronds also wood waste, bagasse)

2.6 Findings of the Long List

The long list of business opportunities represents diverse options when it comes to value addition, capital intensity or technology complexity. This diversity creates options and opportunities for entrepreneurs from various backgrounds and diverse resources/educational background. The high value addition also makes the opportunities attractive to investors and financiers.

The assessment focused on innovative businesses and interlinkages within the businesses and the existing clusters, value chains, and competitive economic activities. Most opportunities are either backward or forward linked to the agriculture sector, as it is the prevailing economic activity in Luxor governorate. Only 7 business opportunities serve consumers as clients, 14 serve the industry and 32 serve agriculture. Only one business opportunity relies on consumers (households), while 16 and 37 rely on the industrial and agriculture sector. This strong forward and backward linkage with the industrial and agricultural sector is a simple consequence of the BOM approach, which is anchored on supply and demand from clusters and value chains which in turn rarely end at the household level.

Moreover, many of the opportunities, as shown in Figure 1 below are cross cutting among sectors of focus; waste management, renewable energy, and agro-industry.

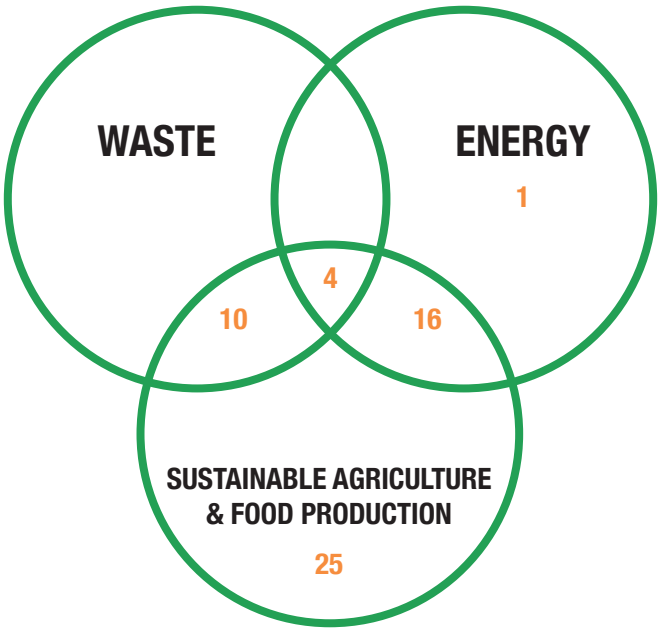


Figure 1 The distribution of business opportunities across sectors of focus

There is a strong linkage in most business opportunities with markets locally (Luxor and Qena), regionally (Upper Egypt and Red Sea), nationwide, and internationally as well. Opportunities linked to local supply/demand only were considered of a marginal linkage; opportunities linked to local and regional supply/demand were considered to have reasonable linkage; opportunities linked to local, regional, and nationwide supply/demand were considered to have appreciable linkage; and finally, opportunities linked to local, regional, nationwide and international supply/demand were considered to have significant linkage. Figure 2 below shows that most opportunities enjoy high level of linkages to supply and demand. This increases growth potential significantly since businesses can start by being anchored on local supply and demand and then expand to move to regional, nationwide and international markets.

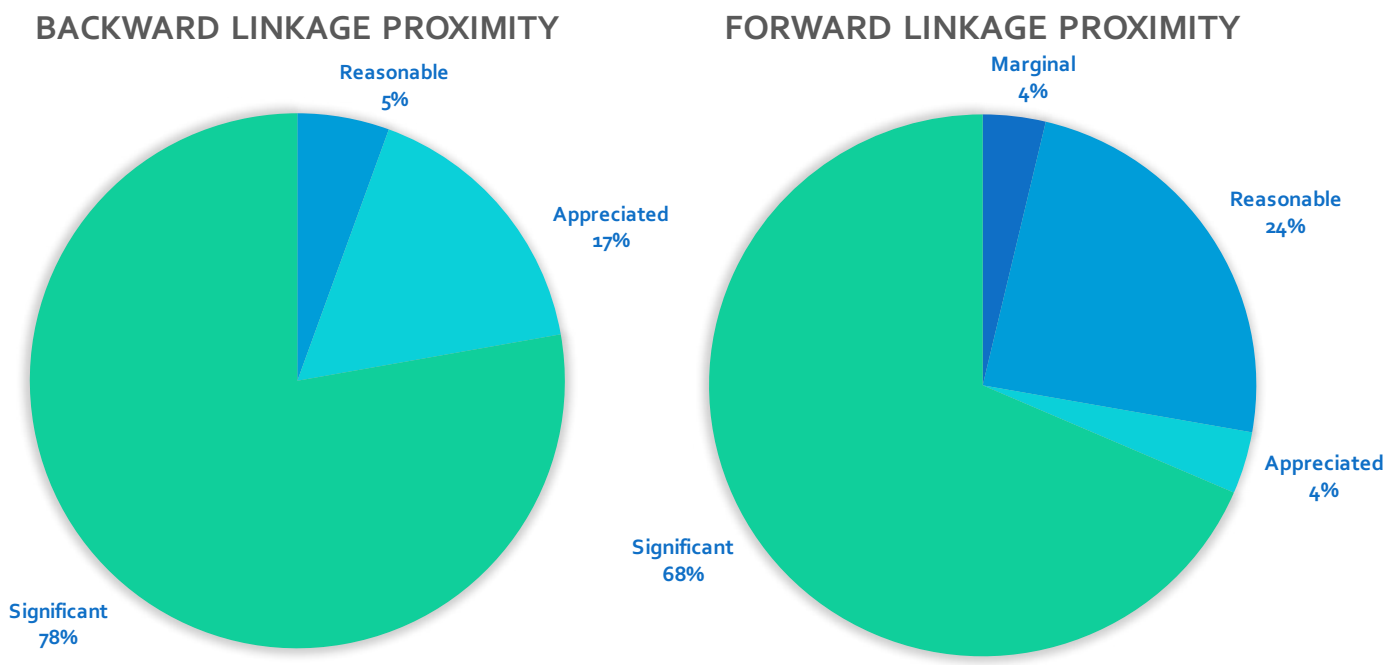


Figure 2 Business opportunities by degree of linkage to clusters/value chains/economic activities geographically

In terms of capital intensity, 55% of the opportunities are not considered capital intensive (less than 500,000 EGP).

Also, 45% of the business opportunities were considered of significant value addition.
Figure 3 shows the diversity of business opportunities identified in terms of capital intensity and value addition.

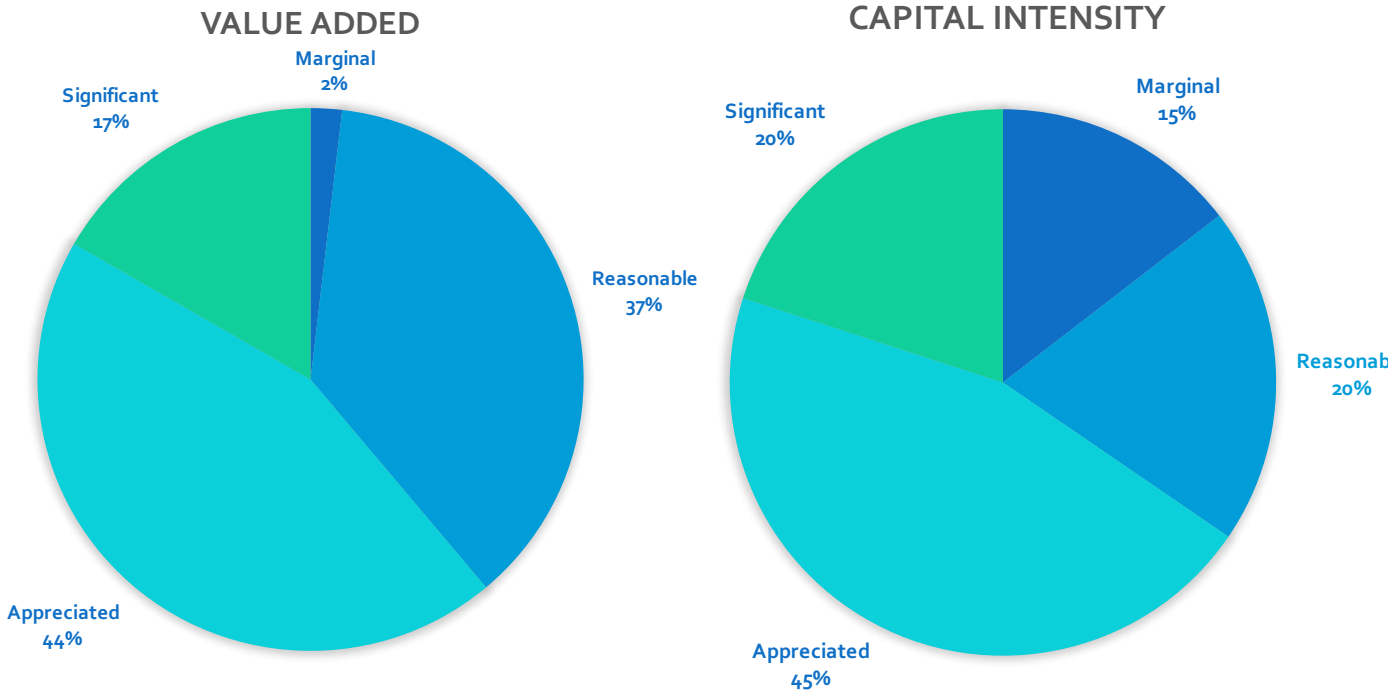


Figure 3 Diversity of business opportunities in terms of capital intensity and value added

In Table 3 below is a selection of business opportunities which rank highest/lowest in value addition, growth potential, capital intensity, and labour intensity.

Table 4 Selected business opportunities exceling in certain indicators

High Value added	High Growth Potential	High Capital Intensity	Low Capital Intensity	High Labour Intensity	Low Labour Intensity
Fragrant oils from aromatic plants for perfumes	Fragrant oils from aromatic plants for perfumes	Ultrafiltration of milk for food industry	Agriculture waste to fermented animal feed for livestock farms	Selling Fruit and Vegetable Dryers for agriculture	Ultrafiltration of milk for food industry
Aromatic plant extracts for food industry	Aromatic plant extracts for food industry	Aromatic plant extracts for pharmaceutical industry	Agriculture machinery for farms	Dates pits to animal feed for livestock farms for agriculture	Dates to powder for food industry (milk and juice factories)
Aromatic plant extracts for textile industry	Aromatic plant extracts for textile industry	Sugarcane / sugarcane straw to glucose for food/pharma industry	Traps using pheromones pest control for agriculture	Sun dried fruits and vegetables for local market	Sugarcane / sugarcane straw to glucose for food/pharma industry
Sugarcane straw to cellulose for packing material for food / starch industry	Sugarcane straw to cellulose for packing material for food / starch industry	Dates to powder for food industry (milk and juice factories)	Selling Fruit and Vegetable Dryers for agriculture	Agriwaste to artistic paper for consumers	Sugarcane straw to cellulose for packing material for food/ starch industry
Microbial starters for biogas/compost production	Microbial starters for biogas/compost production	Second grade dates to fructose for food industry	Dried onion/ garlic	Small scale household branded food products	Second grade dates to fructose for food industry
Food industry by-products and fresh market left overs to special biochemicals for food and pharmaceutical industries	Food industry by-products and fresh market left overs to special biochemicals for food and pharmaceutical industries	Food industry by-products and fresh market left overs to special biochemicals for food and pharmaceutical industries	PV powered lighting systems for poultry farms	Alternative fuel for energy intensive industries	Food industry by-products & fresh market left overs to special biochemicals for food and pharmaceutical industries
Sugarcane / sugarcane straw to glucose for food/pharma industry	Sugarcane / sugarcane straw to glucose for food/pharma industry	Aromatic plant extracts for textile industry	PV powered ventilation system for poultry farms	Low cost solar thermal heaters for households	Artificial insemination of cattle for animal production

It is notable that the existing activities are mostly at the lower level of value addition. Many of the opportunities can be seen as successive steps in increasing value addition on certain feedstock. For instance, in Figure 4 businesses working on agriculture waste have various degrees of increasing the value addition such as use as alternative fuel in energy intensive industry (low value-added) to the creation of special biochemical compounds (high value-added). Same for dates where grinded pits can be sold as animal feed (low value-added) to the utilization of reject date in the production of fructose (high value-added).

It is important to notice that in many cases the capital intensity of businesses may increase towards higher value addition. This may imply that start-ups and MSEs are unlikely to be able to provide high value added products and services. In that case a conscious compromise should be taken towards identifying and promoting opportunities with value added and still with capital accessible to start-ups and MSEs. In addition, start-ups and MSEs could be directed to target opportunities which allow future strategic expansion in the direction of higher value addition as those shown in Figure 4. Focusing on opportunities with future expansion potential into higher value addition is usually attractive to investors and allows start-ups to grow organically.

The identified opportunities could be seeds of developing clusters in Luxor. They complement existing activities and continuous support of such business opportunities is believed to develop clusters. This is expected since the opportunities generated were chosen to be connected to existing economic activities, value chains, and clusters, in forward and/or backward manner. The collective of the business opportunities in the long list does serve existing economic activities with products and services thus increasing their profitability. Furthermore, they add to the value of existing products and economic activities.

Figures 5, 6, and 7 show three main economic activities and underdeveloped clusters that could be developed further when the business opportunities identified are supported.

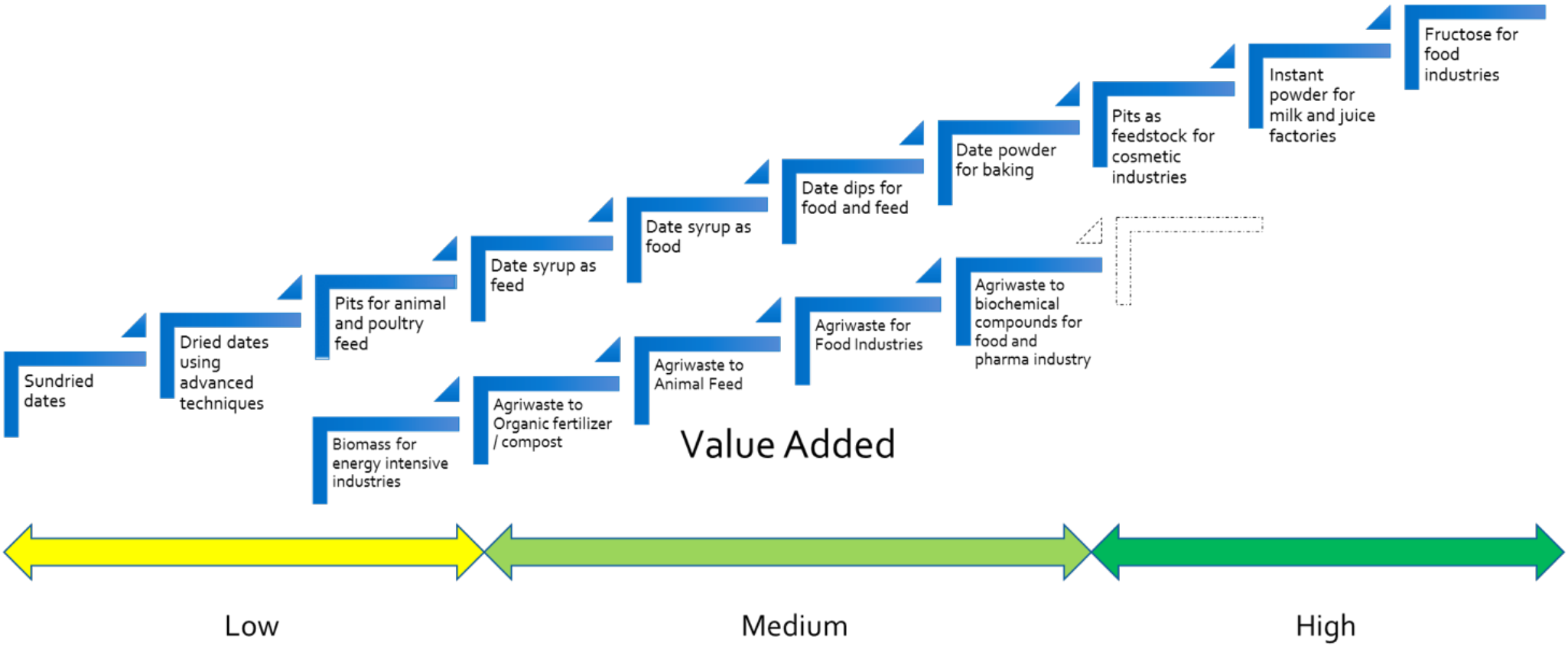


Figure 4 Business opportunities cascaded towards high value addition

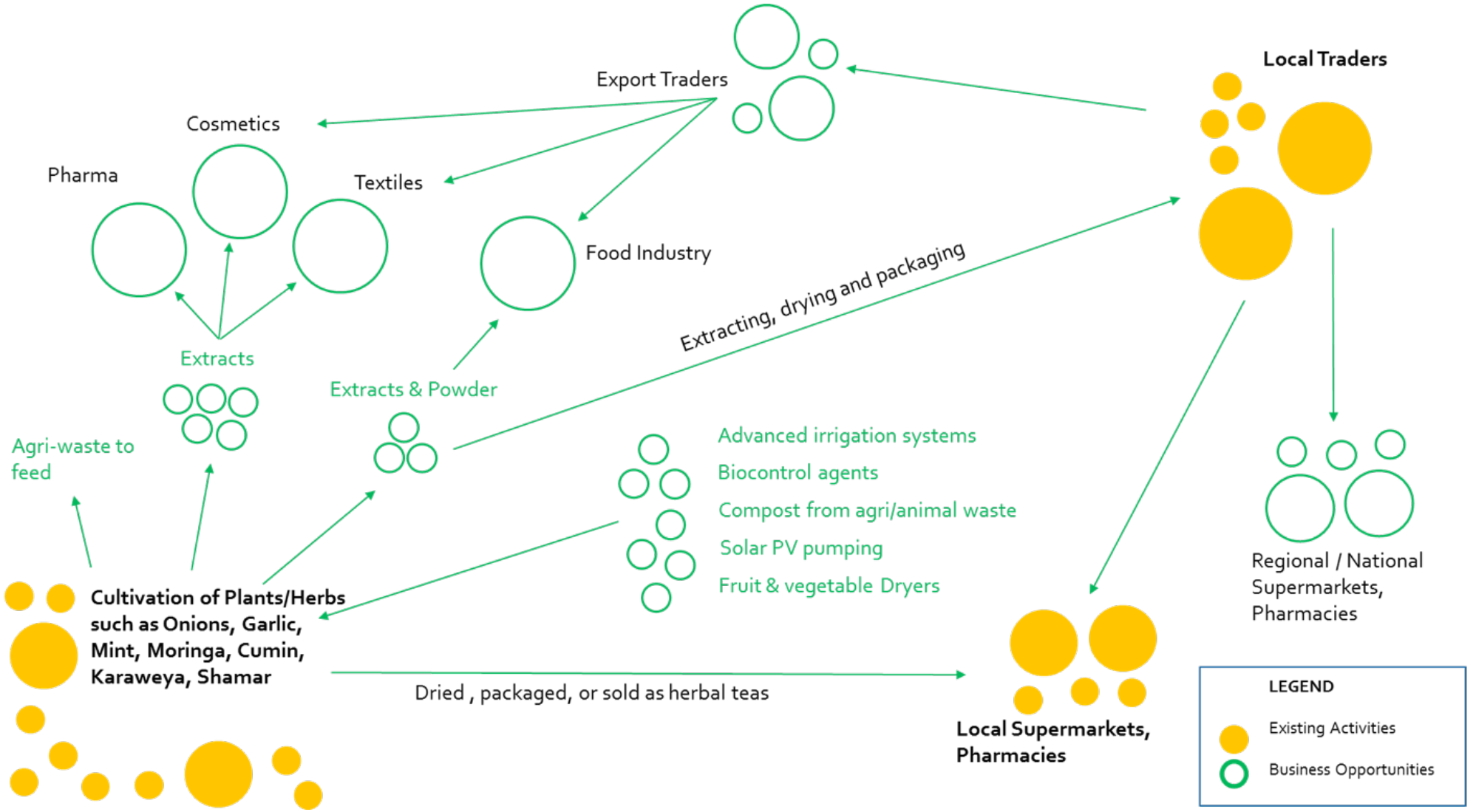


Figure 5 Potential cluster of herbal and aromatic plants that could develop on very limited value added activities

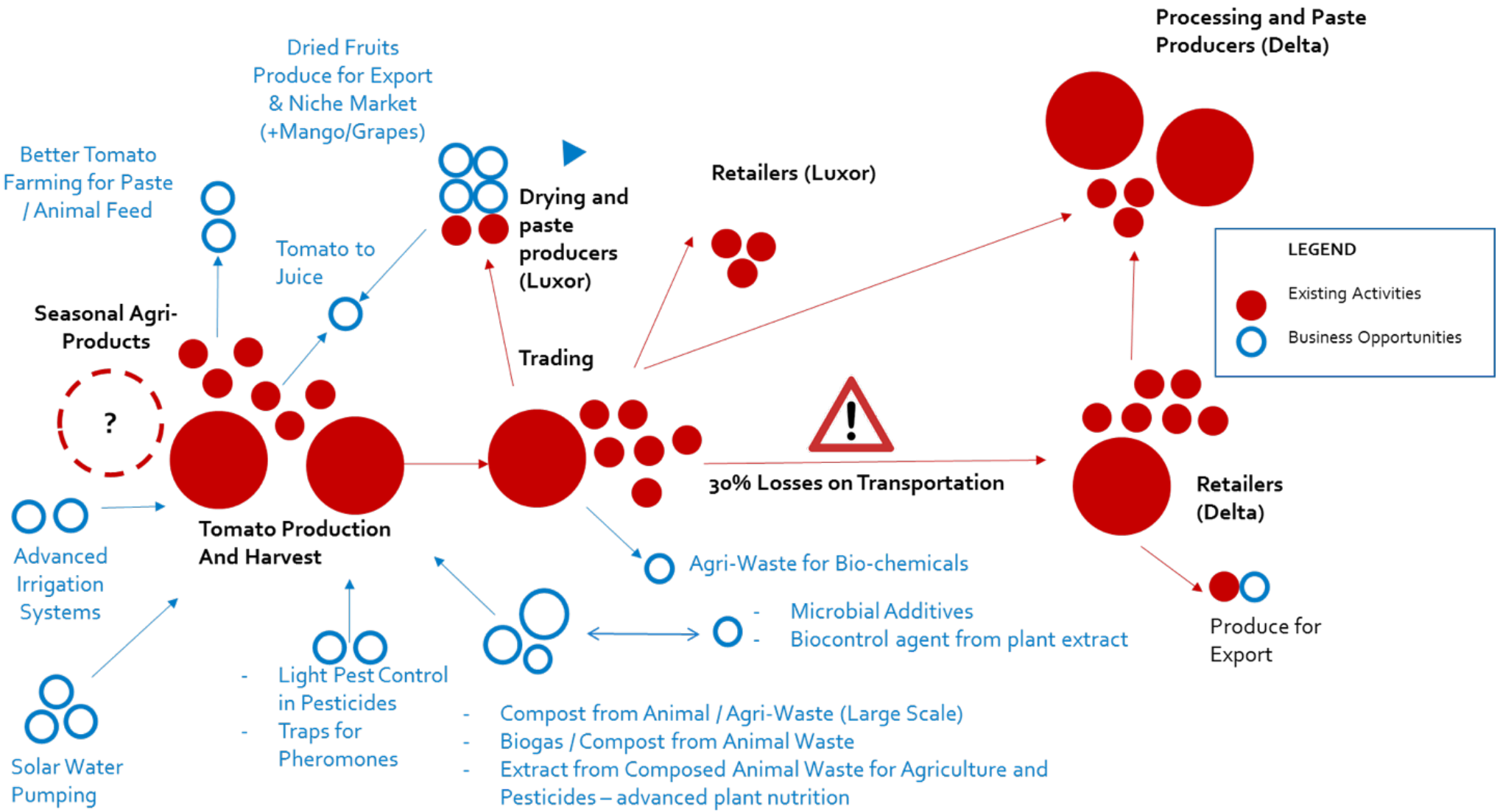


Figure 6 Potential cluster of tomato that could develop on very limited value added activities

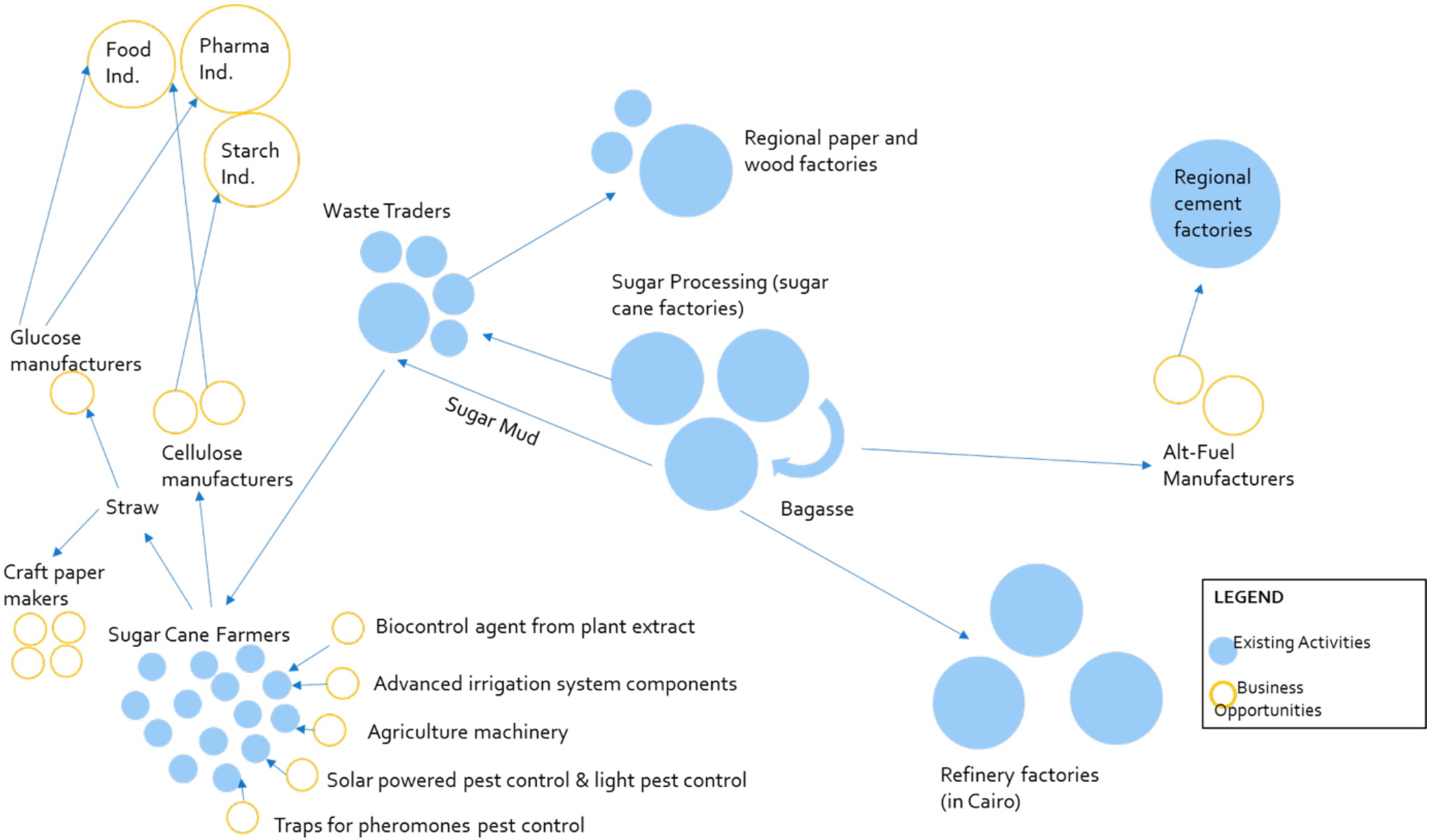


Figure 7 Potential cluster of sugar cane that could develop on very limited value added activities

2.7 Business Opportunity Assessment and Short-listing

Based on the methodology described in 2.2 and 2.3, a total score was provided for each business opportunity. The above was programmed in an excel sheet where the weight of each factor can be defined by the user.

The weight each indicator was given was left to users to define in an excel sheet. Balanced criteria (all factors are given the same weight) leads to the order shown in Figure 8. For the purpose of the present project it was recommended to focus on the following opportunities which ranked higher in balanced criteria of assessment when it comes to indicators weight, not in a particular order:

- TRAPS USING PHEROMONES PEST CONTROL FOR AGRICULTURE
- ALTERNATIVE FUEL FOR ENERGY INTENSIVE INDUSTRIES
- SMALL SCALE HOUSE HOLD BRANDED FOOD PRODUCTS
- AGRIWASTE TO FERMENTED ANIMAL FEED FOR AGRICULTURE
- LARGE-SCALE AEROBIC COMPOST FOR AGRICULTURE
- LOW COST SOLAR HEATERS
- AGRICULTURE MACHINERY FOR FARMS
- DRIED ONION AND GARLIC PLANTS FOR CONSUMERS AND RETAILERS
- SUN DRIED LEAVES FROM AROMATIC/HERBAL PLANTS FOR LOCAL MARKET
- AGRIWASTE TO ARTISTIC PAPER FOR CONSUMERS
- HOT AIR DRIED LEAVES FROM AROMATIC/HERBAL PLANTS FOR NICHE MARKETS AND CONSUMERS
- BIOGAS & COMPOST FROM ANIMAL WASTE FOR AGRICULTURE, HOMES, POULTRY & LIVESTOCK FARMS
- POWDERED GARLIC AND ONION FOR CONSUMERS, FOOD INDUSTRY AND EXPORT
- BIOMASS PELLETS AND HEATERS FOR POULTRY FARMS
- PACKED DRIED HERBAL DRINKS
- SUN DRIED FRUITS AND VEGETABLES FOR LOCAL MARKET
- PV POWERED EQUIPMENT (PV PUMPING FOR DESERT IRRIGATION, PV POWERED LIGHTING AND VENTILATION SYSTEMS FOR POULTRY FARMS)

	Weights	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
BO Serial #	Descriptive Title	Forward Proximity	Backward Proximity	Availability of Supply	Existence of Demand	Supply Chain Simplicity	Growth Potential	Market Saturation	Capital Intensity	Value Added	Simplicity of Technology	Clarity of Regulations	Access to Knowledge	Existing Competition	Labor Intensity	Favorability to Unemployed	Favorability to Women	TOTAL SCORE
1	Traps for pheromones pest control	10	10	7	7	10	7	7	10	7	10	10	7	7	7	10	10	146
2	Small scale house hold branded products	10	10	10	7	10	3	10	10	1	10	10	10	3	10	10	10	144
3	Selling fruit and vegetable dryers to be included with generic agri machinery	10	10	7	7	7	7	10	10	7	3	10	7	10	10	7	7	139
4	Compost from animal/agriwaste (large-scale)	10	3	10	10	7	7	7	7	7	10	10	10	7	10	10	3	138
5	Alternative fuel for energy intensive industries	10	10	10	10	7	10	7	7	7	10	10	10	7	10	10	1	137
6	Low cost solar heaters	10	10	10	7	7	7	10	7	7	7	10	7	7	10	7	3	136
7	Agriculture machinery	10	7	10	10	10	7	7	10	10	7	10	7	3	7	7	3	135
8	Sundried aromatic plants and spices for local markets	10	10	10	7	7	3	7	10	3	10	10	7	7	10	10	3	134
9	Solar powered pest control (combine with general PV powered agri)	10	7	10	7	7	3	7	10	7	10	10	7	7	7	7	7	133
10	Solar powered ventilation for poultry farms	10	7	7	7	10	7	7	10	7	10	10	10	7	3	7	3	132
11	Biogas/ compost from animal waste	10	10	7	7	7	7	7	10	3	10	10	10	7	3	10	3	131
12	Dates to animal feed from pits (add to general grinded feed)	10	10	3	7	7	7	7	10	3	10	10	10	3	10	10	3	130
13	General fermented animal feed	10	10	10	7	7	10	7	10	7	7	10	7	3	7	10	7	130
14	Dried fruits and vegetables for local sun dried (combine with vegie/ onion)	10	10	7	7	7	7	7	10	3	7	10	7	3	7	7	10	129
15	Solar pumping	10	7	7	7	10	7	7	7	7	10	10	10	3	7	7	3	129

Figure 8 Snap shot of excel sheet showing the top-ranking opportunities when balanced criteria is used for ranking

Shown in Figure 9 is the top-ranking opportunity when focus on growth potential and value addition was increased by using higher weights for the two aspects while removing the capital intensity as an indicator. This is meant to reflect opportunities suitable for large-scale investments.

	Weights	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
BO Serial #	Descriptive Title	Forward Proximity	Backward Proximity	Availability of Supply	Existence of Demand	Supply Chain Simplicity	Growth Potential	Market Saturation	Capital Intensity	Value Added	Simplicity of Technology	Clarity of Regulations	Access to Knowledge	Existing Competition	Labor Intensity	Favorability to Unemployed	Favorability to Women	TOTAL SCORE
1	Alternative fuel for energy intensive industries	10	10	10	10	7	10	7	7	7	10	10	10	7	10	10	1	198
2	Agriculture machinery	10	7	10	10	10	7	7	10	10	7	10	7	3	7	7	3	193
3	Traps for pheromones pest control	10	10	7	7	10	7	7	10	7	10	10	7	7	7	10	10	192
4	Aromatic plants extract for perfumes	7	10	10	3	7	10	3	7	10	10	10	3	7	7	7	7	192
5	Dried fruits and vegetables for export	1	10	7	7	7	10	7	3	10	7	7	7	7	7	7	10	192
6	General fermented animal feed	10	10	10	7	7	10	7	10	7	7	10	7	3	7	10	7	188
7	Hot air dried aromatic plants	10	10	10	7	7	7	7	3	10	7	10	7	7	7	10	3	188
8	Compost from animal/agriwaste (large-scale)	10	3	10	10	7	7	7	7	7	10	10	10	7	10	10	3	187
9	Aromatic plants extract for food	3	10	7	7	7	10	10	3	10	3	7	3	7	7	7	7	186
10	Selling fruit and vegetable dryers to be included with generic agri machinery	10	10	7	7	7	7	10	10	7	3	10	7	10	10	7	7	185
11	Low cost solar heaters	10	10	10	7	7	7	10	7	7	7	10	7	7	10	7	3	185
12	Aromatic plants extract for dying	3	10	10	3	7	10	10	3	10	3	7	3	7	7	7	7	185
13	Sugar cane cellulose to packing material for food / starch industry	3	10	10	7	3	10	10	1	10	3	7	3	7	3	10	7	184
14	Powdered onion/ garlic (potentially other products)	7	10	7	3	7	10	7	7	7	7	10	7	7	7	10	7	182
15	Agro-industry bi-products to special food biochemicals	3	10	7	7	7	10	10	1	10	3	1	3	10	3	10	7	182

Figure 9 Snap shot of excel sheet showing the top-ranking opportunities when a criterion is used for ranking that favours major investments (more weight to value added and grow

The two figures above demonstrate that the short listing is subjective to the user criteria in certain aspects.

SECTION 3 – HOW TO UTILIZE THE DOCUMENT

All the 56 opportunities represent potential successful businesses. The degree of success varies on the short-listing criteria and geography of implementation.

The information in the factsheet is supposed to act as a starting point for developing a business model. It isn't supposed to provide comprehensive data and its content is most beneficial when used in comparisons (such as in the short listing) below are comments on each type of information.

Market	
Final Products	This provides a general description of the final product, exact product design is based on the customer segmentation
Required Inputs	One needs to ensure that the inputs are abundant and accessible for the firm
Competing Products	This is not a full list of competitors types but rather a listing of the most visible ones
Process	
Type of Process	Represents the categorical type of the production process
Technology	Mentions what is perceived to be the most appropriate technology but others may equally perform as well
Equipment & Material	Not an exhaustive list but only main equipment and material are mentioned
Human resources	Focuses on the operational team only, management and founders contribution are to be decided by the start-ups
Business Linkage	
Forward Linkage	Refers to client, if client exists in other geographical location
Geographical proximity	Refers to the proximity of clients (location of demand) High = Means available in Luxor/Qena, Medium, medium = means available in Upper Egypt/Red Sea, Low = means available in Lower and Middle Egypt or outside Egypt
Local/Regional/Nation-wide	Local = refers to Luxor/Qena , Regional = refers to Upper Egypt/Red Sea, Nationwide = Outside Upper Egypt/Red Sea
Backward Linkage	Refers to the proximity of supplier (location of supply) High = Means available in Luxor/Qena, Medium, medium = means available in Upper Egypt/Red Sea, Low = means available in Lower and Middle Egypt or outside Egypt
Local/Regional/Nation-wide	Local = refers to Luxor/Qena , Regional = refers to Upper Egypt/Red Sea, Nationwide = Outside Upper Egypt/Red Sea
Geographical proximity	Refers to the proximity of suppliers (local of demand) High = Means available in Luxor/Qena, Medium, medium = means available in Upper Egypt/Red Sea, Low = means available in Lower and Middle Egypt or outside Egypt
Economic Features	
Revenue Stream	Refers to main revenue streams, others could exist
CAPEX	High Above 500,000 EGP, Medium between 150,000 EGP and 500,000 EGP, Low = Less than 150,000 (Exchange rate of 1 USD = 20 EGP) - Mentions main capital expenditures item
OPEX	Only relative to one another – mentions main operational expenditures
Considerations	
Key Challenge	Refers to key challenges which the business model must tackle
Advantages	Refers to main competitive edge of the opportunity
Impact	
Environmental	Refers to environmental impact in its wider context of resource preservation or pollution reduction – all opportunities have a positive environmental impact
Social	Refers to direct social impact – all opportunities have a positive social impact

Outside Luxor/Qena: While the opportunities are primarily identified for Luxor/Qena, many can be relevant to other governorates in Egypt or places in the world. For each business opportunity, one needs to ensure the existence of supply and demand, and absence of legislative barriers in the location where the business is to operate. If so, the business opportunity becomes a potential one. A feasibility analysis of the business model is what will ultimately decide whether the entrepreneur should proceed or not. Many of the opportunities are widely applicable to Southern Upper Egypt (Sohag, Qena, Luxor, and Aswan) since the economic profile has similarities.

Large-scale investment in the short listing it was assumed that the business opportunities are favoured if they have low CAPEX as it might be easier to start-ups to approach. Many of the business opportunities have high chance of success in Luxor/Qena but have also high CAPEX. In case high capital is available, some of the opportunities become highlight favourable.

Start-ups utilizing the document must realize that the factsheet is just a starting point that is meant to bring them few steps closer to the right business model. It is up to the start-up to develop the details around the base provided by the factsheet. Start-ups and MSEs wishing to expand their activities in the mapped business opportunities must also realize that this document does not cover all possible innovations and there may still be a wide spectrum of opportunities outside the mapped ones. Technology driven start-ups can benefit from the BOM directing their technical innovation in the identified opportunities. In the governorate of Luxor and Qena the short-listed opportunities (top ranking) are guaranteed to provide a high chance of success.

Supporting Entities Incubators and start-ups support programs can choose to support firms which work in the 56 opportunities identified in the factsheets if they address challenges well and they demonstrate the availability of supply and demand in their area of operation. Supporting entities can utilize the data in the factsheets to help their beneficiaries improve their business models by addressing competition and challenges. In the case of Luxor/Qena it is advisable to focus on the short listed opportunities since they are guaranteed to have high chances of success and achieve a positive social and environmental impact.

Investors and Financing Entities may utilize the factsheet in a similar manner as supporting entities. Moreover, they can benefit from the factsheets by having an estimate for the CAPEX needed for each business opportunity. They may also request to UNIDO the prefeasibility analysis for the short-listed opportunities for more information.[7]

Policy Makers may expand on the concept of BOM direct support and entrepreneurial activities in various regions in Egypt to predetermined sectors, clusters, value chains that ensure social and economic impact. They could also view the support for the opportunities in the factsheet as a means to achieve the social and environmental impact indicated.

[7] Office.egypt@unido.org

ANNEX I - BUSINESS OPPORTUNITY FACTSHEETS

BUSINESS OPPORTUNITY FACT SHEET 1: LARGE SCALE AEROBIC COMPOST FROM BIOMASS (CHICKEN LITTER, CATTLE MANURE, AND/OR PLANT RESIDUE (PARTICULARLY BANANA) FOR AGRICULTURE	
Market	
Final Products	Low cost organic fertilizer
Required Inputs	Bedding mixed with litter, cattle manure, plant residual (banana particularly), or possibly additives (bacterial additives)
Competing Products	Chemical fertilizers, traditional manure based fertilizers
Process	
Type of Process	Simple - manual and mechanical processing
Technology	Shredding and aerobic digestion
Equipment & Material	Manual tools, shredders, loaders and access to land
Human resources	Manual labour, technical operation, agriculture specialist
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers, municipalities, landscaping in hotels
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of compost
CAPEX	Low - mainly cost of machinery
OPEX	Low - processing of material
Considerations	
Key Challenge	Long processing time – access to land
Advantages	High demand on organic fertilizers, competitive edge in quality and pricing compared to other types of fertilizers
Impact	
Environmental	A source of bio-fertilizers that ensure sustainable and organic produce, safe disposal of waste
Social	Increase returns of agriculture sector by selling waste and provide affordable organic fertilizers that reduce costs for agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 2: VERMI-COMPOST FROM ANIMAL WASTE FOR AGRICULTURE	
Market	
Final Products	Low cost bio fertilizer
Required Inputs	Bedding mixed with litter and /or cattle manure, specials species of worm (as a starter), additives
Competing Products	Chemical fertilizers and compost from other sources
Process	
Type of Process	Moderate - worm digestion
Technology	Vermi-composting (using specific mix of species of worms and special containers)
Equipment & Material	Plastic containers (cement/brick containers)
Human resources	Manual labour for installation, operation & maintenance, agriculture specialist
Business Linkage	
Forward Linkage	Agriculture lands, landscaping, worm producers, additives
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Poultry, cattle, and sheep farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of bio fertilizer
CAPEX	Low - mainly cost of machinery
OPEX	Low – mainly processing of material
Considerations	
Key Challenge	Long processing time
Advantages	High demand on organic fertilizers, in addition to competitive price
Impact	
Environmental	A source of bio-fertilizers that ensure sustainable and organic produce, safe disposal of waste
Social	Increase return of agriculture sector by selling waste and provide affordable organic fertilizers that reduce costs for agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 3: BIOGAS AND COMPOST FROM ANIMAL WASTE FOR AGRICULTURE, HOMES, POULTRY AND LIVESTOCK FARMERS	
Market	
Final Products	Low cost bio fertilizer, energy (methane)
Required Inputs	Bedding mixed with litter, cattle manure, (possibly bacterial starter additives)
Competing Products	Fertilizers, compost from agriwaste, butane tanks, fresh manure
Process	
Type of Process	Simple - construction (bricks) and piping (< 10 m^3)
Technology	Anaerobic digestion
Equipment & Material	Construction tools, manual tools, different digesters' designs
Human resources	Manual labour for installation, technical operation & maintenance
Business Linkage	
Forward Linkage	Agriculture, homes, poultry and livestock farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Agriculture lands, thermal self-use farm, home, landscaping
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of units or fertilizers
CAPEX	Low mainly cost of machinery
OPEX	Low processing of material
Considerations	
Key Challenge	Long starting time of biogas production
Advantages	High demand of organic fertilizers, in addition to competitive price and reliefs users from dependence of butane tanks
Impact	
Environmental	Provides a sustainable source of energy and organic fertilizers
Social	Increase return on breeding activities and reduce cost of livestock production and agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 4: BIOMASS PELLETS AND HEATERS FOR POULTRY FARMS	
Market	
Final Products	Low cost bio fertilizer, energy (methane)
Required Inputs	Bedding mixed with litter, cattle manure, (possibly bacterial starter additives)
Competing Products	Fertilizers, compost from agriwaste, butane tanks, fresh manure
Process	
Type of Process	Simple - construction (bricks) and piping (< 10 m^3)
Technology	Anaerobic digestion
Equipment & Material	Construction tools, manual tools, different digesters' designs
Human resources	Manual labour for installation, technical operation & maintenance
Business Linkage	
Forward Linkage	Agriculture, homes, poultry and livestock farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Agriculture lands, thermal self-use farm, home, landscaping
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of units or fertilizers
CAPEX	Low mainly cost of machinery
OPEX	Low processing of material
Considerations	
Key Challenge	Long starting time of biogas production
Advantages	High demand of organic fertilizers, in addition to competitive price and reliefs users from dependence of butane tanks
Impact	
Environmental	Provides a sustainable source of energy and organic fertilizers
Social	Increase return on breeding activities and reduce cost of livestock production and agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 5: ARTIFICIAL INSEMINATION OF CATTLE FOR ANIMAL PRODUCTION	
Market	
Final Products	Animal production (cattle)
Required Inputs	Vet tools, equipment, spermatozoon (imported)
Competing Products	Traditional breeding
Process	
Type of Process	Advanced – veterinary service
Technology	Artificial insemination, special freezing (liquid nitrogen)
Equipment & Material	Medical equipment – freezer
Human resources	Manual labour, highly skilled vet (follow up and insemination)
Business Linkage	
Forward Linkage	Cattle farms
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Spermatozoon producers
Local/Regional/Nation-wide	Nationwide, international
Geographical proximity	Low
Economic Features	
Revenue Stream	Artificial insemination fees
CAPEX	High
OPEX	Low
Considerations	
Key Challenge	Continuously import species to keep quality
Advantages	High demand on service
Impact	
Environmental	Increases efficiency of meat production
Social	Higher returns for small breeders

BUSINESS OPPORTUNITY FACTSHEET 6: EXTRACTS FROM COMPOSTED ANIMAL WASTE TO FERTILIZERS FOR AGRICULTURE	
Market	
Final Products	Liquid bio-fertilizer
Required Inputs	Composted animal waste
Competing Products	Fertilizers and other types of compost
Process	
Type of Process	Simple - manual mixing, self-utilization on site
Technology	Manual mixing, electric machinery mixing, decantation
Equipment & Material	Manual mixers, electric mixers, containers
Human resources	Manual labour, technicians
Business Linkage	
Forward Linkage	Farms
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of bio-fertilizers
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Access to knowledge in storing and preservation
Advantages	Easy to produce
Impact	
Environmental	High quality bio fertilizers and pesticides
Social	Decreases cost of farming

BUSINESS OPPORTUNITY FACTSHEET 7: AROMATIC PLANTS EXTRACT FOR PHARMACEUTICAL INDUSTRY	
Market	
Final Products	Extracts from caraway, cumin, fennel and hibiscus
Required Inputs	Aromatic plants (pharmaceutical grade supply)
Competing Products	Synthetic alternatives, imported material
Process	
Type of Process	Advanced - green chemicals, thermal, distillation, purification
Technology	Drying, mixing and evaporation, distillation (low temperature, high pressure, purifiers) – possibly CO2 extraction
Equipment & Material	Dryers, pressurisers, distillation units, heaters or CO2 extraction container
Human resources	Manual labour, technical, chemist (or engineers)
Business Linkage	
Forward Linkage	Pharmaceutical industry
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of extracts
CAPEX	High - mainly cost of equipment and licensing (> 3 Million EGP)
OPEX	Moderate - processing of material
Considerations	
Key Challenge	Perfecting production technique and meeting industry specifications (quality control), licensing of pharmaceutical grade product
Advantages	Local substitute for industry which is financially competitive
Impact	
Environmental	Reliance on green chemicals reduce pollutants of synthetic chemicals
Social	Increase value added on agriculture produce, decrease imports of chemicals required for high value added industry

BUSINESS OPPORTUNITY FACTSHEET 8: AROMATIC PLANT EXTRACTS FOR TEXTILE INDUSTRY	
Market	
Final Products	Organic dyes from extracts
Required Inputs	Aromatic plants (leaves of: henna, guava, mango, onion & turmeric)
Competing Products	Synthetic dyes
Process	
Type of Process	Advanced (green chemicals, thermal, distillation, purification)
Technology	Drying, mixing, evaporation, and distillation (low temperature, high pressure, purifiers)
Equipment & Material	Dryers, pressurisers, distillation units, heaters, dryers
Human resources	Manual labour, machines operators, chemist/engineer
Business Linkage	
Forward Linkage	Textile factories
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of dyes
CAPEX	High - mainly cost of machinery (1-1.5 Million EGP)
OPEX	Moderate - processing of material
Considerations	
Key Challenge	Perfecting production technique and meeting industry specifications (quality control)
Advantages	Local substitute for industry feedstock which is financially competitive
Impact	
Environmental	Reliance on green chemicals reduce pollutants of synthetic chemicals
Social	Increase value added on agriculture produce, decrease import of chemicals required for high value added industry

BUSINESS OPPORTUNITY FACTSHEET 9: AROMATIC PLANT EXTRACTS FOR FOOD INDUSTRY	
Market	
Final Products	Extracts for flavors, fragrance, and preservatives
Required Inputs	Aromatic plants
Competing Products	Synthetic alternatives
Process	
Type of Process	Advanced (green chemicals, thermal, distillation, purification)
Technology	Drying, mixing, evaporation, and distillation (low temperature, high pressure, purifiers)
Equipment & Material	Dryers, pressurisers, distillation units, heaters, dryers
Human resources	Manual labour, machines operators, chemist/engineer
Business Linkage	
Forward Linkage	Food industry
Geographical proximity	Low
Local/Regional/Nation-wide	Nation–wide
Backward Linkage	Farms,
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of extracts
CAPEX	High - mainly cost of machinery
OPEX	Moderate - processing of material
Considerations	
Key Challenge	Perfecting production technique and meeting export specifications (quality control)
Advantages	Local substitute for industry feedstock which is financially competitive
Impact	
Environmental	Increase value added on agriculture produce, decrease import of chemicals required for high value added industry
Social	Increase value added on agriculture produce, decrease import of chemicals required for high value added industry

BUSINESS OPPORTUNITY FACTSHEET 10: AROMATIC PLANTS EXTRACT FOR COSMETICS	
Market	
Final Products	Extracts (from caraway, cumin, mint, etc.) for skin and hair care
Required Inputs	Aromatic plants
Competing Products	Synthetic alternatives
Process	
Type of Process	Advanced (green chemicals, thermal, distillation, purification)
Technology	Drying, mixing, evaporation, and distillation (low temperature, high pressure, purifiers)
Equipment & Material	Dryers, pressurisers, distillation units, heaters, dryers
Human resources	Manual labour, machines operators, chemist/engineer
Business Linkage	
Forward Linkage	Cosmetic industry
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of extracts
CAPEX	High - mainly cost of machinery
OPEX	High - processing of material
Considerations	
Key Challenge	Perfecting production technique and meeting export specifications (quality control)
Advantages	Local substitute for industry feedstock which is financially competitive
Impact	
Environmental	Reliance on green chemicals reduce pollutants on synthetic chemicals
Social	Increase value added on agriculture produce, decrease import of chemicals required for high value added industry

BUSINESS OPPORTUNITY FACTSHEET 11: FRAGRANT OILS FROM AROMATIC PLANTS FOR PERFUMES	
Market	
Final Products	Natural fragrant oils
Required Inputs	Aromatic plants
Competing Products	Synthetic fragrance oils
Process	
Type of Process	Simple - thermal processing
Technology	Material handling, boiling, steam distillation, separation
Equipment & Material	Clevenger apparatus, boilers, distillers
Human resources	Manual labour, machine operator
Business Linkage	
Forward Linkage	Fragrances & perfume manufacturers
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Aromatic plants farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of fragrance oils
CAPEX	Moderate
OPEX	Low
Considerations	
Key Challenge	Perfecting production technique and quality control
Advantages	Higher quality and less production cost than synthetic imported material
Impact	
Environmental	Cutting transportation cost of aromatic plants
Social	Increase value added on agriculture produce, decrease import of chemicals required for high value added industry

BUSINESS OPPORTUNITY FACTSHEET 12: SUN DRIED LEAVES FROM AROMATIC/HERBAL PLANTS FOR LOCAL MARKET	
Market	
Final Products	Dried plants to packing factories, traders (caraway, cumin, mint, etc.)
Required Inputs	Aromatic plant from farmers
Competing Products	Local dried leaves
Process	
Type of Process	Simple manual
Technology	Direct sun drying
Equipment & Material	Racks and nets
Human resources	Manual labour
Business Linkage	
Forward Linkage	Traders and local markets
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of sun dried aromatic plants
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Maintaining quality and scaling up close to farm land
Advantages	Cost competitive product and simple technology
Impact	
Environmental	Reduce waste in agriculture produce and utilization of sustainable energy
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 13: HIGH QUALITY HOT AIR DRIED LEAVES FROM AROMATIC/HERBAL PLANTS FOR NICHE MARKETS AND EXPORT	
Market	
Final Products	Dried plants to export, packing factories, niche markets (caraway, cumin, mint, etc.)
Required Inputs	Aromatic/ herbal plant from farmers (organic farms)
Competing Products	Local dried material and products from major companies
Process	
Type of Process	Moderate – thermal
Technology	Forced hot air drying
Equipment & Material	Drying chambers, boilers, heat exchangers
Human resources	Manual labour
Business Linkage	
Forward Linkage	Traders, niche markets, export
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of dried herbal and aromatic plans
CAPEX	Moderate
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply
Advantages	High profit margins
Impact	
Environmental	Reducing waste of herbal and aromatic plants and decrease transportation cost of undried produce
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 14: PACKED OF DRIED HERBAL DRINKS	
Market	
Final Products	Packed herbal drinks to consumers or retailers (speciality drinks for health, babies, dietitian)
Required Inputs	Dried aromatic plants (caraway, cumin, mint, etc.)
Competing Products	Various hot drinks
Process	
Type of Process	Simple - mechanical processing
Technology	Packing (locally manufactured)
Equipment & Material	Packing machines
Human resources	Manual labour, machine operators
Business Linkage	
Forward Linkage	Retailers and consumers
Geographical proximity	High-medium
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	Medium
Economic Features	
Revenue Stream	Sale of packed herbal drinks
CAPEX	High
OPEX	Low
Considerations	
Key Challenge	Difficult competition with well-known brands
Advantages	Large market size and high profit margins
Impact	
Environmental	Providing natural medicinal drinks and alternative to artificial drinks
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 15: DRIED ONION AND GARLIC FOR CONSUMERS AND RETAILERS	
Market	
Final Products	Dried onion and garlic
Required Inputs	Garlic and onions
Competing Products	Other locally produced and imported dried onion and garlic
Process	
Type of Process	Simple - thermal process
Technology	Hot air drying
Equipment & Material	Drying chambers, boilers, heat exchangers
Human resources	Manual labour
Business Linkage	
Forward Linkage	Consumers and retailers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of dried onion and garlic
CAPEX	Moderate
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply
Advantages	High profit margins
Impact	
Environmental	Decrease loss in agriculture produce by providing dried longer shelf life produce
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 16: POWDERED GARLIC AND ONION FOR CONSUMERS, FOOD INDUSTRY OR EXPORT	
Market	
Final Products	Powdered garlic and onion
Required Inputs	Fresh onion and garlic
Competing Products	Powdered onion and garlic from other producers
Process	
Type of Process	Simple - processing thermal and mechanical
Technology	Hot air drying – grinding
Equipment & Material	Drying chamber, boiler, heat exchanger, grinding
Human resources	Manual labour
Business Linkage	
Forward Linkage	Consumers, food industry and export
Geographical proximity	Medium
Local/Regional/Nation-wide	Regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of dried powdered onion and garlic
CAPEX	Moderate
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply
Advantages	High profit margins, competitive edge in quality
Impact	
Environmental	Decrease waste in produce by providing longer shelf life product
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 17: AGRIWASTE TO ARTISTIC PAPER FOR CONSUMERS	
Market	
Final Products	Niche paper
Required Inputs	Bagasse, agriculture waste
Competing Products	Artistic paper
Process	
Type of Process	Simple - manual shredding and pulping
Technology	Manual shredding and pulping
Equipment & Material	Shredders and pulping tools
Human resources	Manual labour
Business Linkage	
Forward Linkage	Consumers and retailers
Geographical proximity	Moderate
Local/Regional/Nation-wide	Regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of artistic paper
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Maintaining quality and entering niche markets
Advantages	Low CAPEX
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture produce and high job creation

BUSINESS OPPORTUNITY FACTSHEET 18: PULP FROM SUGAR CANE BAGASSE FOR PAPER AND CARDBOARD MANUFACTURING	
Market	
Final Products	Pulp
Required Inputs	Sugar cane bagasse and other agriwaste
Competing Products	Imported pulp
Process	
Type of Process	Chemical treatment
Technology	Oxygen delignification, bleaching and pulping
Equipment & Material	Batch/ continuous digesters
Human resources	Manual labour and trained labour to operate digesters
Business Linkage	
Forward Linkage	Paper mills and cardboard manufacturers
Geographical proximity	Low
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Sugar mills
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of pulp
CAPEX	High
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply
Advantages	Replacement of imported products
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture and agro-industry waste

BUSINESS OPPORTUNITY FACTSHEET 19: SUGARCANE STRAW TO CELLULOSE FOR PACKING MATERIAL FOR FOOD / STARCH INDUSTRY	
Market	
Final Products	Cellulosic fibres
Required Inputs	Sugar cane straw
Competing Products	Imported cellulose
Process	
Type of Process	Advanced - thermal and chemical
Technology	Pulping and bleaching
Equipment & Material	Steaming system (boiler, circulations unit), mixers, stainless and steel tanks
Human resources	Chemists, engineers and labour
Business Linkage	
Forward Linkage	Food and starch industries
Geographical proximity	Medium
Local/Regional/Nation-wide	Regional and national
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local
Geographical proximity	Low
Economic Features	
Revenue Stream	Sale of cellulose
CAPEX	High
OPEX	Moderate
Considerations	
Key Challenge	High CAPEX (3-6 Million EGP)
Advantages	High value added product, high profit margin
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture produce

BUSINESS OPPORTUNITY FACTSHEET 20: SUGARCANE OR SUGARCANE STRAW TO GLUCOSE FOR FOOD/PHARMA INDUSTRY	
Market	
Final Products	Glucose
Required Inputs	Sugarcane or sugarcane straw
Competing Products	Imported glucose as well as corn syrup
Process	
Type of Process	Advanced - chemical thermal hydrolysis
Technology	Vaporization, purification and chemical conversions
Equipment & Material	Steam systems, purifiers, stainless steel tanks separators
Human resources	Labours, machine operators, chemists and engineers
Business Linkage	
Forward Linkage	Food and pharmaceutical industries
Geographical proximity	Medium
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of glucose
CAPEX	High
OPEX	Moderate
Considerations	
Key Challenge	High CAPEX, quality control
Advantages	High profit margins
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 21: AGRIWASTE TO FERMENTED ANIMAL FEED FOR LIVESTOCK FARMERS	
Market	
Final Products	Animal feed
Required Inputs	Mix of agriculture waste, additives
Competing Products	Processed animal feed
Process	
Type of Process	Simple – manual and mechanical
Technology	Collecting, shredding, anaerobic fermentation and packing
Equipment & Material	Shredder, plastic packing material
Human resources	Manual labour, agriculture experts
Business Linkage	
Forward Linkage	Livestock farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of animal feed
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply, avoiding the contamination of feed
Advantages	High profit margins
Impact	
Environmental	Environmentally friendly use of waste
Social	Decreases cost of meat production and replace imported feed

BUSINESS OPPORTUNITY FACTSHEET 22: SUGAR CANE STRAW TO ANIMAL FEED FOR LIVESTOCK FARMERS	
Market	
Final Products	Animal feed
Required Inputs	Sugar cane straw
Competing Products	Processed animal feed
Process	
Type of Process	Simple – mechanical processing
Technology	Collecting, shredding, pressing and packing
Equipment & Material	Shredders and pressing machines
Human resources	Manual labour
Business Linkage	
Forward Linkage	Livestock farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of animal feed
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Seasonality of supply, managing supply chain
Advantages	Simple processing, abundance of raw material
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture produce, lower costs of meat production

BUSINESS OPPORTUNITY FACTSHEET 23: TOMATO WASTE TO ANIMAL FEED SUPPLEMENT FOR LIVESTOCK FARMERS AND POULTRY FARMS	
Market	
Final Products	Animal feed supplement
Required Inputs	Tomato waste (market left over)
Competing Products	Imported supplement (vitamins, minerals, dietary fibers)
Process	
Type of Process	Simple drying and shredding
Technology	Sun drying, shredding
Equipment & Material	Drying racks and shredders
Human resources	Manual labour
Business Linkage	
Forward Linkage	Poultry and livestock farms
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale as animal feed supplement
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Awareness to livestock farmers and poultry farmers
Advantages	Simple process
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture waste and decrease cost of meat production

BUSINESS OPPORTUNITY FACTSHEET 24: DATES PITS TO ANIMAL FEED FOR LIVESTOCK FARMS	
Market	
Final Products	Animal feed with different protein levels
Required Inputs	Dates pits and second grade dates
Competing Products	Processed animal feed
Process	
Type of Process	Simple - manual and mechanical processes
Technology	Collection, grinding and packing
Equipment & Material	Grinders, packing material
Human resources	Manual labour – machine operator
Business Linkage	
Forward Linkage	Livestock farms
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of animal feed
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Management of supply chain
Advantages	Cost competitive project
Impact	
Environmental	Environmentally friendly use of waste and second grade dates
Social	Increase return on agriculture activities and reduce cost of meat production

BUSINESS OPPORTUNITY FACTSHEET 25: TOMATO FARMING FOR FOOD INDUSTRY	
Market	
Final Products	Tomato produce for paste
Required Inputs	Tomato seeds, agriculture equipment, fertilizers
Competing Products	Tomato produce from large farms
Process	
Type of Process	Simple - using specific tomato variety for paste processing
Technology	Traditional farming
Equipment & Material	Land, agriculture machinery
Human resources	Manual labour
Business Linkage	
Forward Linkage	Food industry (paste and ketchup)
Geographical proximity	Low
Local/Regional/Nation-wide	Nationwide
Backward Linkage	Seed providers
Local/Regional/Nation-wide	Regional
Geographical proximity	Medium-Low
Economic Features	
Revenue Stream	Sale of tomato produce
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Maintaining quality of produce and selection of proper species
Advantages	Simple process, competitive edge in weather conditions
Impact	
Environmental	Better utilization of water resources
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 26: TOMATO WASTE TO JUICE FOR FOOD INDUSTRY	
Market	
Final Products	Tomato juice
Required Inputs	Tomato (market left overs and fresh)
Competing Products	Imported and locally produced juice
Process	
Type of Process	Simple – thermal and mechanical
Technology	Cleaning, peeling, heat treatment, distillation, evaporation, pasteurization (food safety regulations)
Equipment & Material	Washer, peeling machine, heat exchanger, evaporator, pasteurization machine.
Human resources	Manual labour, machine operators, production engineers
Business Linkage	
Forward Linkage	Food industry
Geographical proximity	Medium
Local/Regional/Nation-wide	Nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of tomato juice
CAPEX	High – mainly cost of machines
OPEX	Moderate – processing of material, transportation
Considerations	
Key Challenge	Marketing; certification of products – high CAPEX food safety regulation
Advantages	High profit margins, competitive edge due to weather conditions
Impact	
Environmental	Decrease waste in produce due to high value added processing
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 27: FOOD INDUSTRY BY-PRODUCTS AND FRESH MARKET LEFT OVERS TO SPECIAL BIOCHEMICALS FOR FOOD AND PHARMACEUTICAL INDUSTRIES (PECTIN FROM MANGO & LYCOPENE FROM TOMATO)	
Market	
Final Products	Special biochemicals (Pectin to jam and juice) (Lycopene to ketchup) (Lycopene to pharma) (Pectin to pharma binding or fillers)
Required Inputs	Tomato, tomato waste (not pathogen infected), mango peel
Competing Products	Synthetic Lycopene and Pectin
Process	
Type of Process	Biochemical processing
Technology	Fermentation or thermal treatment
Equipment & Material	Fermenter, separator (distillation), heat exchanger, purifiers
Human resources	Chemist, operators, chemical technicians, manual labour
Business Linkage	
Forward Linkage	Food and pharmaceutical industries
Geographical proximity	Low
Local/Regional/Nation-wide	Nationwide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of biochemical
CAPEX	High – cost of machinery
OPEX	Low – cost of raw materials, processing of materials, transportation
Considerations	
Key Challenge	High CAPEX process, meeting regulations of food and pharmaceutical industry
Advantages	Cost effective organic ingredient to replace synthetic alternatives
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return on agriculture activities, increase local manufacturing inputs of food and pharmaceutical industries

BUSINESS OPPORTUNITY FACTSHEET 28: ULTRAFILTRATION OF MILK FOR FOOD INDUSTRY	
Market	
Final Products	Cheese milk, protein-enriched milk (permeate)
Required Inputs	Raw milk
Competing Products	Imported similar alternatives
Process	
Type of Process	Moderate – thermal and mechanical processing
Technology	Collection – ultrafiltration
Equipment & Material	Ultrafiltration equipment
Human resources	Manual labour - machine operator – chemical technicians
Business Linkage	
Forward Linkage	Food industry specially for cheese and yogurt production
Geographical proximity	Low
Local/Regional/Nation-wide	National
Backward Linkage	Livestock farms
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High- moderate
Economic Features	
Revenue Stream	Sale of cheese milk and protein enriched milk
CAPEX	High
OPEX	Low
Considerations	
Key Challenge	High CAPEX
Advantages	High profit margins
Impact	
Environmental	Decrease transportation cost of raw milk
Social	Higher returns for livestock producers

BUSINESS OPPORTUNITY FACTSHEET 29: DATE PALMS TRIMMING	
Market	
Final Products	Trimming service (rent)
Required Inputs	Tools (trimmers)
Competing Products	Traditional trimming
Process	
Type of Process	Moderate – manual
Technology	Design and manufacturing and trimming
Equipment & Material	Trimmer
Human resources	Manual labour
Business Linkage	
Forward Linkage	Date palms farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Suppliers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Trimming service
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Access to trained labour for scaling up
Advantages	Service is in high demand
Impact	
Environmental	Increase quality of dates production
Social	Increase productivity and decrease costs of agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 30: SECOND GRADE DATES TO FRUCTOSE FOR FOOD INDUSTRY	
Market	
Final Products	Fructose to laboratories, dessert industry, jam
Required Inputs	Second grade dates (left overs from fresh market)
Competing Products	Other sources of sugar (corn syrup)
Process	
Type of Process	Moderate - thermal
Technology	Extraction, filtration, clarification, concentration and filling
Equipment & Material	Extractor, filters, separators, evaporators
Human resources	Manual labour –machine operators- chemists/agronomists
Business Linkage	
Forward Linkage	Food industry
Geographical proximity	Medium
Local/Regional/Nation-wide	Regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of fructose
CAPEX	High
OPEX	Moderate
Considerations	
Key Challenge	Marketing and certification of product
Advantages	Organic ingredient to replace chemicals in food industry
Impact	
Environmental	Utilization of second grade dates
Social	Increase return on agriculture second grade dates

BUSINESS OPPORTUNITY FACTSHEET 31: DATES TO POWDER FOR FOOD INDUSTRY (MILK AND JUICE FACTORIES)	
Market	
Final Products	Dates powder
Required Inputs	Fresh dates
Competing Products	Sugar
Process	
Type of Process	Advanced - thermal processing (food safety controlled)
Technology	Extraction, spray drying (fluidized bed drying)
Equipment & Material	Extractor, filters, evaporators, mixers, dryers
Human resources	Manual labour –machine operators- chemists
Business Linkage	
Forward Linkage	Milk and juice factories
Geographical proximity	Moderate
Local/Regional/Nation-wide	Regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of date powder
CAPEX	High
OPEX	Low
Considerations	
Key Challenge	Marketing and certification of product
Advantages	Cost competitive organic ingredient to replace chemical
Impact	
Environmental	Utilization of second grade dates
Social	Increase return on agriculture dates

BUSINESS OPPORTUNITY FACTSHEET 32: FRESH DATES TO DATES POWDER FOR BAKERIES	
Market	
Final Products	Dates powder to bakeries, dessert shops, juice shops
Required Inputs	Fresh dates
Competing Products	Simple sugars from cane and beets
Process	
Type of Process	Simple - mechanical
Technology	Drying, grinding, sieving
Equipment & Material	Sun drying – grinder – sievers
Human resources	Manual labour – machine operators
Business Linkage	
Forward Linkage	Bakeries
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of dates powder
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Marketing of relatively new product
Advantages	Low cost substitute of sugar
Impact	
Environmental	Decrease waste by utilization of various date types
Social	Increase return on agriculture dates and reduce stress on sugar industry

BUSINESS OPPORTUNITY FACTSHEET 33 : DATE PITS FOR COSMETICS	
Market	
Final Products	Date-pits oils extraction
Required Inputs	Date-pits
Competing Products	Chemicals used in cosmetics
Process	
Type of Process	Simple processing
Technology	Washing, drying, grinding, extraction
Equipment & Material	Washers, dryers, extractor
Human resources	Labour, operators, technician
Business Linkage	
Forward Linkage	Cosmetic industry
Geographical proximity	Low
Local/Regional/Nation-wide	National
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of Date-pits oil
CAPEX	Moderate – cost of machinery
OPEX	Low
Considerations	
Key Challenge	Managing the logistics of supply chain and quality control
Advantages	Organic ingredient to replace chemicals
Impact	
Environmental	Environmentally friendly use of waste
Social	Increase return agriculture activities and exports

BUSINESS OPPORTUNITY FACTSHEET 34 : DATE PITS TO FIBRES FOR FOOD AND PHARMACEUTICAL INDUSTRIES	
Market	
Final Products	Date-pits fibres
Required Inputs	Date-pits
Competing Products	Synthetic alternatives
Process	
Type of Process	Simple processing
Technology	Washing, drying, grinding, separation
Equipment & Material	Washing machines, dryers, grinders
Human resources	Labour, operators, technician
Business Linkage	
Forward Linkage	Food processing plants, pharmaceutical companies
Geographical proximity	Food - moderate, pharma – low
Local/Regional/Nation-wide	National
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of date-pits fibres
CAPEX	Moderate – cost of machinery
OPEX	Low
Considerations	
Key Challenge	Managing supply chain and maintaining quality of production
Advantages	Cost competitive organic ingredient to replace synthetics
Impact	
Environmental	Organic replacement of synthetic material
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 35 : DATE SYRUP FOR DOMESTIC USE, RETAIL AND FOOD INDUSTRY	
Market	
Final Products	Syrup and dips
Required Inputs	Second grade dates
Competing Products	Various syrups and sugar
Process	
Type of Process	Moderate - thermal processes
Technology	Extraction, filtration, concentration
Equipment & Material	Extractor, filters, boilers
Human resources	Labour, operators, technician, engineer
Business Linkage	
Forward Linkage	Homes, local super markets, bakery, food industry
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of date syrup/dips
CAPEX	Low
OPEX	Low
Considerations	
Key Challenge	Possible competition with suppliers over the same feedstock
Advantages	Healthy replacement for other types of syrup
Impact	
Environmental	Better utilization of second grade dates
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 36 : PACKED AGRICULTURE PRODUCTS FOR EXPORT (MANGO, GRAPES, BANANAS, DATES, TOMATOES)	
Market	
Final Products	High quality packed agriculture products (mango, grapes, bananas)
Required Inputs	Agriculture products (mango, grapes, bananas, dates, tomatoes)
Competing Products	International producers
Process	
Type of Process	Simple processing
Technology	Collection, packing, modified (atmospheric packing system)
Equipment & Material	Modified atmospheric packing
Human resources	Manual labour
Business Linkage	
Forward Linkage	International fruit markets
Geographical proximity	Low
Local/Regional/Nation-wide	Local, regional and nation-wide; export
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of agriculture products
CAPEX	Moderate
OPEX	Moderate
Considerations	
Key Challenge	Meeting certification and gaining markets trust
Advantages	Competitive edge in quality of produce
Impact	
Environmental	Decrease waste in agriculture produce
Social	Increase return on agriculture activities, intensive job creation

BUSINESS OPPORTUNITY FACTSHEET 37 : SMALL SCALE HOUSEHOLD BRANDED FOOD PRODUCTS	
Market	
Final Products	Packed household products
Required Inputs	Household products
Competing Products	Food products from major producers
Process	
Type of Process	Simple processing
Technology	Collection, preparation, cooking, and packaging
Equipment & Material	Cooking equipment
Human resources	Household labour
Business Linkage	
Forward Linkage	Retail and consumers
Geographical proximity	High
Local/Regional/Nation-wide	Local
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of household products
CAPEX	Low
OPEX	Low – packing materials
Considerations	
Key Challenge	Scaling up production
Advantages	Low CAPEX and OPEX
Impact	
Environmental	Decrease transportation by reliance on local produce
Social	Job intensive

BUSINESS OPPORTUNITY FACTSHEET 38: TRAPS USING PHEROMONES PEST CONTROL FOR AGRICULTURE	
Market	
Final Products	Pheromone pest control traps
Required Inputs	Pheromones, material
Competing Products	Pesticides (chemical)
Process	
Type of Process	Simple – machining
Technology	Design and machining of traps (from bottles, plastics or metals)
Equipment & Material	Plastics and metals, pheromones
Human resources	Manual labour
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Material suppliers and pheromones
Local/Regional/Nation-wide	National and international
Geographical proximity	Moderate – low
Economic Features	
Revenue Stream	Sale of traps and service to maintain them
CAPEX	Low – cost of machine
OPEX	Moderate – materials
Considerations	
Key Challenge	Competition with traditional pesticides and scaling up production and services
Advantages	Low cost organic pest combat
Impact	
Environmental	Preventing harmful effects of chemical pesticides on agriculture
Social	Low cost pesticides decreasing cost of agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 39: BIOCONTROL AGENT FROM PLANT EXTRACTS	
Market	
Final Products	Biocontrol agent (environmentally accepted)
Required Inputs	Special plants
Competing Products	Pesticides
Process	
Type of Process	Simple - thermal processing
Technology	Distillation, extraction
Equipment & Material	Boilers, distillers
Human resources	Chemists, agriculture specialists, technical labour
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sale of high quality biological pest controls
CAPEX	Moderate
OPEX	Low
Considerations	
Key Challenge	Upscaling production
Advantages	Cost competitive replacement of pesticides for organic farming
Impact	
Environmental	Preventing harmful effects chemical pesticides on agriculture
Social	Lower cost of agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 40: DRIED FRUITS AND VEGETABLES FOR NICHE MARKETS (ONIONS, GARLICS, TOMATOES, MANGOS, BANANAS, GRAPES, ETC.)	
Market	
Final Products	Dried fruits and vegetables for niche markets (onions, garlics, tomatoes, mangos, bananas, grapes, etc.)
Required Inputs	Agriculture produce (onions, garlics, tomatoes, mangos, bananas, grapes, etc.)
Competing Products	Locally dried fruits and vegetable using sun drying as well as imported alternatives
Process	
Type of Process	Moderate
Technology	Solar dryer (or hot air)
Equipment & Material	Solar collector, chamber dryer, boilers, heat exchangers
Human resources	Manual labour
Business Linkage	
Forward Linkage	Niche market
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of dried fruits and vegetables
CAPEX	Moderate - cost of equipment
OPEX	Low - processing material
Considerations	
Key Challenge	Maintaining quality of production
Advantages	High value added product
Impact	
Environmental	Reduction of agriculture waste
Social	Increase revenues on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 41: SUN DRIED FRUITS AND VEGETABLES FOR LOCAL MARKET (TOMATOES, MANGOS, BANANAS, GRAPES, ETC.)	
Market	
Final Products	Dried fruits and vegetables for local markets
Required Inputs	Agriculture produce (onions, garlics, tomatoes, mangos, bananas, grapes, etc.)
Competing Products	Locally dried fruits and vegetable using solar or hot air drying as well as imported alternatives
Process	
Type of Process	Simple - manual
Technology	Sun drying
Equipment & Material	Solar racks
Human resources	Manual labour for installation and maintenance
Business Linkage	
Forward Linkage	Local market
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of dried fruits and vegetables
CAPEX	Low
OPEX	Low-processing material
Considerations	
Key Challenge	Control of infection while solar drying
Advantages	Low costs of production
Impact	
Environmental	Reduction of agriculture waste
Social	Increase revenues on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 42: DRIED FRUITS AND VEGETABLES FOR EXPORT (TOMATOES, MANGOS, BANANAS, GRAPES, ETC.)	
Market	
Final Products	Dried fruits and vegetables for export
Required Inputs	Agriculture produce (tomatoes, mangos, bananas, grapes, etc.)
Competing Products	Dried fruits and vegetables from international markets
Process	
Type of Process	Moderate - thermal
Technology	Hot air drying, freeze drying and texturing
Equipment & Material	Boilers, heating chambers, freeze dryers and DIC (Détente Instantanée Contrôlée) **-** instant controlled pressure drop texturing equipment
Human resources	Manual labour for installation and maintenance
Business Linkage	
Forward Linkage	International market
Geographical proximity	Low
Local/Regional/Nation-wide	International
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Sales of dried fruits and vegetables
CAPEX	High - cost of machinery
OPEX	Low - processing material
Considerations	
Key Challenge	Seasonality of produce and quality control
Advantages	Competitive edge in quality of produce and high profit margins
Impact	
Environmental	Decrease waste of agriculture produce
Social	Increase return on agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 43: EFFICIENT ANIMAL FEEDER SYSTEM FOR LIVESTOCK PRODUCTION AND POULTRY FARMS	
Market	
Final Products	Efficient animal feeder system
Required Inputs	Plastic, metal, tools
Competing Products	Traditional feeder systems
Process	
Type of Process	Simple – manual and machining
Technology	Design and machining
Equipment & Material	Machining tools, plastic moulds
Human resources	Manual labour for installation and maintenance
Business Linkage	
Forward Linkage	Livestock and poultry farms
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Material suppliers, plastic producers
Local/Regional/Nation-wide	Regional and nation-wide
Geographical proximity	Moderate
Economic Features	
Revenue Stream	Sales of animal feeders
CAPEX	Moderate - cost of machinery
OPEX	Low - processing material
Considerations	
Key Challenge	High quality designs
Advantages	Product in high demand
Impact	
Environmental	Reduce feed wastes and increase feed intact
Social	Increase competitiveness of meat production

BUSINESS OPPORTUNITY FACTSHEET 44: AGRICULTURE MACHINERY FOR FARMS	
Market	
Final Products	Agriculture machinery
Required Inputs	Material and component suppliers
Competing Products	Imported machinery
Process	
Type of Process	Advanced - machining
Technology	Design and machining
Equipment & Material	Material, parts, wheels, engines
Human resources	Manual labour and technical labour
Business Linkage	
Forward Linkage	Farm owner
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Material and component suppliers
Local/Regional/Nation-wide	Nationwide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales of machines and tools
CAPEX	Low – working capital
OPEX	Moderate - processing material
Considerations	
Key Challenge	Scaling up production
Advantages	Low CAPEX
Impact	
Environmental	None
Social	Lower expenses of agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 45: ADVANCED IRRIGATION SYSTEM COMPONENTS FOR FARMS	
Market	
Final Products	Components of modern irrigation systems
Required Inputs	Material and component suppliers
Competing Products	Imported irrigation components
Process	
Type of Process	Moderate – installation
Technology	Design and integration
Equipment & Material	Material, pumps, impellers, sensors, controllers and other component
Human resources	Manual and technical labour
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Irrigation components suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales of irrigation system
CAPEX	Low – working capital
OPEX	Low – processing material
Considerations	
Key Challenge	High quality product and quality control
Advantages	Competitive edge cost wise
Impact	
Environmental	Water saving
Social	Decrease imports and expenses of agriculture activities

BUSINESS OPPORTUNITY FACTSHEET 46 BEDDING FROM WOOD SOD FOR POULTRY FARMS	
Market	
Final Products	Low cost bedding
Required Inputs	Wood sod from factories and agriculture waste
Competing Products	Bedding alternatives
Process	
Type of Process	Simple mechanical
Technology	Collection, sorting and shredding
Equipment & Material	Shredders
Human resources	Manual labour
Business Linkage	
Forward Linkage	Poultry farms
Geographical proximity	High
Local/Regional/Nation-wide	Local
Backward Linkage	Industrial facilities
Local/Regional/Nation-wide	Local and nation-wide
Geographical proximity	High, moderate
Economic Features	
Revenue Stream	Sales of Bedding
CAPEX	Low - cost of machinery
OPEX	Low - processing material
Considerations	
Key Challenge	Supply chain management
Advantages	Simple technology
Impact	
Environmental	Environmentally friendly waste disposal
Social	Decrease cost of meat production by providing low cost bedding

BUSINESS OPPORTUNITY FACTSHEET 47: MICROBIAL STARTERS FOR BIOGAS/COMPOST PRODUCTION	
Market	
Final Products	Microbial starter additives
Required Inputs	Microbial strains
Competing Products	Imported bacterial starter additives
Process	
Type of Process	Advanced – biological
Technology	Bacterial propagation
Equipment & Material	Incubators, autoclave, laminar flow (local) packaging system under vacuum
Human resources	Biologist, laboratory technicians
Business Linkage	
Forward Linkage	High
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Low
Local/Regional/Nation-wide	International
Geographical proximity	Low
Economic Features	
Revenue Stream	Sale of microbial additives
CAPEX	High
OPEX	Moderate - (lab maintenance expenses, and consumables)
Considerations	
Key Challenge	High CAPEX, difficult access to knowledge and technical skills
Advantages	High profit margins on small scale production
Impact	
Environmental	Increases efficiency of biogas units / composting thus increasing the sustainability of production
Social	Empower rural biogas and composting businesses

BUSINESS OPPORTUNITY FACTSHEET 48: PV PUMPING FOR DESERT IRRIGATION	
Market	
Final Products	Solar energy operated pump
Required Inputs	Electric components and equipment
Competing Products	Diesel pumps
Process	
Type of Process	Moderate – electrical design, wiring, and installation
Technology	Moderate – design, wiring, and installation
Equipment & Material	Electrical tools, PV panels, electric pumps, electric inverters
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Farm owners
Geographical proximity	high
Local/Regional/Nation-wide	Local and regional
Backward Linkage	Electric equipment suppliers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Cost of transportation and speed of procurement
Advantages	Payback on PV pumping is constantly decreasing due to the increase of diesel prices – provides more reliability for systems
Impact	
Environmental	CO2 emission reduction
Social	Sustainable and more reliable energy for better farming

BUSINESS OPPORTUNITY FACTSHEET 49: PV POWERED LIGHTING SYSTEMS FOR POULTRY FARMS	
Market	
Final Products	PV powered lighting system
Required Inputs	Electric components and equipment
Competing Products	Electric grid lighting
Process	
Type of Process	Moderate – design, wiring, and installation
Technology	System integration
Equipment & Material	Electrical tools, PV panels, electric inverters, LED lighting, batteries
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Poultry farm owners
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Electric equipment suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Cost of transportation and speed of procurement
Advantages	Payback on system is constantly decreasing due to the increase of electricity prices
Impact	
Environmental	CO2 emission reduction
Social	Sustainable energy increases sustainability of farming

BUSINESS OPPORTUNITY FACTSHEET 50: PV POWERED VENTILATION SYSTEM FOR POULTRY FARMS	
Market	
Final Products	PV powered ventilation system
Required Inputs	Electric components and equipment
Competing Products	Electric grid ventilation
Process	
Type of Process	Moderate - design, wiring, and installation
Technology	System integration
Equipment & Material	Electrical tools, PV panels, electric inverters, fans
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Poultry farm owners
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Electric equipment suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Cost of transportation and speed of procurement
Advantages	Payback is constantly decreasing due to the increase of electricity prices
Impact	
Environmental	CO2 emission reduction
Social	Sustainable energy increases sustainability of farming

BUSINESS OPPORTUNITY FACTSHEET 51: LOW COST SOLAR THERMAL HEATERS FOR LIVESTOCK PRODUCTION	
Market	
Final Products	Solar thermal heating system
Required Inputs	Material and components
Competing Products	Butane tank heating
Process	
Type of Process	Moderate - mechanical design and machining
Technology	Design, manufacturing and assembly
Equipment & Material	Collector, pipes
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Livestock production
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Equipment and components suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	High initial cost of system for breeders
Advantages	Payback is constantly decreasing due to the increase of butane tanks prices
Impact	
Environmental	CO2 emission reduction
Social	Cheaper and more reliable energy for better poultry farming

BUSINESS OPPORTUNITY FACTSHEET 52: LOW COST SOLAR THERMAL HEATERS FOR HOUSEHOLDS	
Market	
Final Products	Solar thermal heaters
Required Inputs	Material and equipment
Competing Products	Electric heaters and gas heaters
Process	
Type of Process	Moderate - mechanical design and machining
Technology	Design, manufacturing and assembly
Equipment & Material	Collector, pipes, tanks
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Households
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Equipment and components suppliers
Local/Regional/Nation-wide	Nationwide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	High initial cost of system for consumer
Advantages	Payback is constantly decreasing due to the increase of butane tanks prices
Impact	
Environmental	CO2 emission reduction
Social	More affordable and sustainable source of energy

BUSINESS OPPORTUNITY FACTSHEET 53: OFF-GRID PV SYSTEMS FOR FARMS	
Market	
Final Products	PV systems
Required Inputs	Equipment and components
Competing Products	Diesel generators
Process	
Type of Process	Moderate - design and installation
Technology	Design and system integration
Equipment & Material	PV panels, cables, inverters and batteries
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Farm owners in rural areas
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Electric equipment and components suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - starting working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	High initial cost of system for farmers
Advantages	Payback is constantly decreasing due to the increase of butane tanks prices
Impact	
Environmental	CO2 emission reduction
Social	Cheaper and more reliable energy for rural agriculture

BUSINESS OPPORTUNITY FACTSHEET 54: PV POWERED PEST CONTROL FOR AGRICULTURE	
Market	
Final Products	PV powered pest control system
Required Inputs	Electric components and equipment
Competing Products	Various pest control alternatives
Process	
Type of Process	Moderate - system integration
Technology	PV panels and ultra violet lamps
Equipment & Material	Electrical tools, PV panels, electric inverters, ultra violet lamps
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Electric equipment suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Convincing clients with a relatively new product
Advantages	Payback is constantly decreasing due to the increase of diesel prices
Impact	
Environmental	CO2 emission reduction and substitute of chemical pest control
Social	Cheaper and more pest control

BUSINESS OPPORTUNITY FACTSHEET 55: SELLING DRYERS FOR AGRICULTURE	
Market	
Final Products	Drying machines
Required Inputs	Material and components
Competing Products	Sun drying
Process	
Type of Process	Moderate - mechanical design and machining
Technology	Design, manufacturing and assembly
Equipment & Material	Collector, pipes, tanks, racks
Human resources	Manual labour, technical labour, engineers
Business Linkage	
Forward Linkage	Farmers
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Equipment and components suppliers
Local/Regional/Nation-wide	Nation-wide
Geographical proximity	Low
Economic Features	
Revenue Stream	Sales and maintenance of systems
CAPEX	Low - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Upscaling production
Advantages	Product in high demand
Impact	
Environmental	CO2 emission reduction and decrease of produce waste
Social	Provides a tool for farmers to increase revenue streams

BUSINESS OPPORTUNITY FACTSHEET 56: ALTERNATIVE FUEL FOR ENERGY INTENSIVE INDUSTRIES	
Market	
Final Products	Alternative Fuel (AF) in the form of shredded and compacted Bagasse
Required Inputs	Sugar cane bagasse or biomass from (palm dates fronds also wood waste, bagasse)
Competing Products	Fossil fuels
Process	
Type of Process	Moderate - processing material handling
Technology	Shredding, pressing and cutting
Equipment & Material	Shredders and compaction equipment
Human resources	Manual labour, machines operators, drivers
Business Linkage	
Forward Linkage	Energy intensive industries (e.g. cement industry)
Geographical proximity	High
Local/Regional/Nation-wide	Local, regional and nation-wide
Backward Linkage	Farmers
Local/Regional/Nation-wide	Local, regional and nation-wide
Geographical proximity	High
Economic Features	
Revenue Stream	Selling alternative fuel
CAPEX	Moderate - working capital
OPEX	Moderate – salaries and maintenance
Considerations	
Key Challenge	Upscaling production
Advantages	Very cost competitive
Impact	
Environmental	CO2 emission reduction and decrease of produce waste
Social	Decrease reliance on energy imports

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION