

INVESTING IN THE WASTE AND CIRCULARITY SECTOR IN KENYA

Organic Waste Management Guide





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The Aspen Network of Development Entrepreneurs (ANDE) is a global network of organizations that propel entrepreneurship in developing economies. ANDE members provide critical financial, educational, and business support services to small and growing businesses (SGBs) based on the conviction that SGBs create jobs, stimulate long-term economic growth, and produce environmental and social benefits.

As the leading global voice of the SGB sector, ANDE believes that SGBs are a powerful, yet underleveraged, tool in addressing social and environmental challenges. Since 2009, ANDE has grown into a trusted network of over 250 collaborative members that operate in nearly every developing economy. ANDE grows the body of knowledge, mobilizes resources, undertakes ecosystem support projects, and connects the institutions that support the small business entrepreneurs who build inclusive prosperity in the developing world. ANDE is part of the Aspen Institute, a global non-profit organization committed to realizing a free, just, and equitable society.

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IKEA Foundation

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TABLE OF ABBREVIATIONS

▶ ABBREVIATIONS

B2B:	Business-to-business	GHG:	Greenhouse gas
B2C:	Business-to-consumer	NEMA:	National Environment Management Authority
CapEx:	Capital expenditures	NGOs:	Non-governmental organisations
CO2e:	Carbon dioxide equivalent	OpEx:	Operational expenses
DFIs:	Development finance institutions	PPPs:	Public-private partnerships
EPR:	Extended producer responsibility	PROs:	Producer responsibility organisations
ESOs:	Enterprise support organisations	SGBs:	Small and growing businesses
GDP:	Gross domestic product	SWMA:	Sustainable Waste Management Act

▶ DEFINITIONS¹

- 1 Idea stage**
The business is little more than an unproven idea, so the focus is on testing the idea and identifying a product-market fit.
- 2 Start-up stage**
The business is in the early stages of operations.
- 3 Early stage**
The business may have initial market traction and early revenues but will likely not yet be generating profit.
- 4 Growth stage**
The business demonstrates steady growth or scaling and likely profitability.
- 5 Mature stage**
The business has likely reached stable profits; growth may have slowed.

1. ANDE, Green Entrepreneurship in Kenya, 2023

INTRODUCTION

Organic waste, which amounts to 5.72 million tons every year in Kenya, spans diverse sub-categories including food waste, yard waste, animal waste, agricultural waste, wood waste, organic sludge, biodegradable waste and human waste (faecal sludge). Rural households typically compost around 75% of their organic waste, but only 25% is composted in urban areas.² Although organic waste degrades quickly and does not stay in the environment, it emits methane emissions during degradation or incineration. The high prevalence of open defecation due to inadequate sanitation systems further contributes to these challenges, as only 30% of the population has access to safely managed sanitation services.³

Effective organic waste management can reduce greenhouse gas (GHG) emissions, deforestation and soil degradation by providing sustainable alternatives to fuel, charcoal, wood and chemical fertilisers. For instance, transforming organic waste into biogas saves about 370–400 kg of carbon dioxide equivalent (CO₂e) per ton, while turning it into fertilisers saves 350 kg CO₂e per ton. Moreover, converting organic waste into biogas helps decrease both deforestation, by reducing demand for firewood, and dependence on fossil fuels.⁴ Additionally, organic fertilisers provide a sustainable alternative to chemical fertilisers, which negatively affect soil health.⁵

Given the large volumes of recyclable material and its numerous applications, organic waste management is one of the most developed waste management sub-sectors in Kenya. Out of 122 waste management and circularity businesses identified through this study, 30 deal with organic waste, most of which were established over the past decade. Several companies have secured Seed and Series A, B and C funding, with certain businesses raising up to US\$ 30m.

Figure 1 - Positive impact of organic waste management businesses



2. UNIDO, Country Report Plastic Value Chain in Kenya, 2021

3. USAID, Research and Learning for Rural Sanitation in Kenya, 2021

4. Nordahl et al., Life-Cycle Greenhouse Gas Emissions and Human Health Trade-Offs of Organic Waste Management Strategies, 2021

5. Key informant interviews with businesses.

METHODOLOGY

This study employed a mixed-methods approach to conduct a deep dive into the organic waste management sub-sector in Kenya. The primary data collection consisted of 13 in-depth interviews with representatives of relevant businesses to explore their business models and with financiers and enterprise support organisations (ESOs) who have already supported and/or invested in organic waste management businesses. Specifically, the interviews focused on the value propositions of each business in the market context, their target customer segments and channels, key activities and resources required, revenue streams and models, and cost structures. The interviews also sought to gather information on the impact of each business, their financing needs, secured investments, growth trajectories and timelines to profitability.

To complement these interviews, secondary research was conducted to gather additional information from publicly available sources, such as industry reports, academic studies and government documents. This secondary research provided a broader context and helped to triangulate the findings from the interviews. The secondary research data were integrated with the interview data to provide a more nuanced understanding of the organic waste management sub-sector in Kenya.

The use of a mixed-methods approach provided a richer understanding of Kenya's organic waste management sub-sector. The findings of this study provide valuable insights for policy makers and investors who are seeking to understand the organic waste management sub-sector in Kenya, its entrepreneurial activity, and its investment opportunities and strategies.

SUB-SECTOR OVERVIEW

Overview of the entrepreneurship ecosystem

► ASSESSMENT OF KEY REGIONAL, NATIONAL AND SUB-NATIONAL LEGISLATIVE AND POLICY FRAMEWORKS

Kenyan authorities have recently introduced measures related to organic waste,⁶ but these remain relatively underdeveloped compared to provisions addressing other types of waste in Kenya. Additionally, unlike some other African countries, households in Kenya are not obliged to segregate organic waste from non-organic waste.

Figure 2 – Main legislation and policies on organic waste in Kenya⁷

<p>2019 The Energy Act</p>	<p>Puts forward the use of renewable energy and technologies, including biomass municipal waste (biodiesel, bio-ethanol, charcoal, fuel-wood, biogas).</p>
<p>2021 The Sustainable Waste Management Policy</p>	<p>Aims to promote compost and organic fertilizers. The National Government must develop guidelines and standards for compost and organic fertilizers and support the market development of compost as an alternative to synthetic fertilizers, by allocating at least 40% of national and county fertilizer subsidies to organic fertilizer options. The County Government must ensure waste service providers provide separate containers for organic, recyclable, and non-recyclable waste and educate waste generators on sorting categories and methods.</p>
<p>2022 The Sustainable Waste Management Act</p>	<p>Requires public and private entities to segregate non-hazardous waste into organic and non-organic. Segregated waste must be placed in labelled and color-coded receptacles, bins, containers, and bags. Waste service providers who fail to comply may face fines or imprisonment.</p>

6. Kenyan law defines 'organic waste' as compostable materials derived from plants and animals.

7. The Energy Act, 2019; The Sustainable Waste Management Policy, 2021; The Sustainable Waste Management Act, 2022

► OVERVIEW OF OPPORTUNITIES FOR ENTREPRENEURSHIP

5.72m tons of organic waste are generated in Kenya every year. Food markets, farms, agro-industries, sanitation facilities, hotels and restaurants produce large amounts of waste daily, which could be used and repurposed by organic waste management businesses.



Waste Prevention

Reduction of food waste: 15% of products from agriculture in Sub-Saharan Africa never leave the farms where they were produced, and 95% of waste generated by food markets is organic waste (the rest being packaging).⁸ There are significant opportunities for entrepreneurs to set up the logistics to collect this organic waste, improve food transportation, and use refrigerated storage containers and reusable, heat-resistant bags to reduce organic waste during distribution. Digital advancements can also connect growers directly with markets, helping to minimise waste. Additionally, advanced tracking and data analytics systems can monitor and manage food waste more effectively.⁹



Waste Recycling

Recycling to produce insect protein: Currently, in Kenya, most animal feed protein is imported soy-based protein. The use of insect protein, produced using organic waste, provides a nutritious alternative which could replace soy-based protein, thereby decreasing deforestation and reducing dependence on imported animal feed from foreign countries.



Waste Recovery

Conversion into energy: Because of its rapid urbanisation and development, Kenya's energy needs are growing annually by 5%.¹⁰ Moreover, the national grid and solar systems face frequent interruptions. Therefore, biogas, briquettes and biofuel can constitute a reliable energy source for industries requiring constant energy and for farmers and households.

Conversion into organic fertiliser: Demand for fertilisers in Kenya is high as agriculture accounts for a third of Kenya's gross domestic product (GDP) and employs more than 40% of the country's population. However, most fertilisers used by farmers in the country are imported, creating an opportunity for local fertiliser production.¹¹ Moreover, organic fertilisers are a promising alternative for smallholder farmers with low revenues and larger cooperatives and corporates as they tend to be cheaper and more sustainable than mineral fertilisers, which severely affect soil health and farm yields in the long term.¹²

8. WWF, Driven to Waste: The Global Impact of Food Loss and Waste on Farms, 2021

9. Ellen MacArthur Foundation, Circular Economy in Africa: Food and Agriculture, 2021

10. IREA Kenya Spearheads Landmark Renewable Energy Initiative at Africa Climate Summit, 2023

11. AfricaFertilizer, Fertilizer Statistics Overview Kenya 2017-2021, 2022

12. Key informant interviews with businesses.



► CHALLENGES HINDERING THE GROWTH OF THE ORGANIC WASTE MANAGEMENT SUB-SECTOR IN KENYA

The organic waste sub-sector in Kenya is facing significant challenges that hinder its growth and development. One of the major hurdles is the nascency of regulations in this sub-sector. The government is struggling to implement and enforce the policy of segregation at source, which is mandatory for all public and private sector organisations. Moreover, regulations do not clarify whether businesses, governments or consumers are responsible for organic waste. As access to dumpsites remains cheap and unregulated, most waste collection businesses dispose of their waste without segregating organic and non-organic waste (which sometimes includes hazardous waste), which often makes waste non-reusable. Consequently, businesses face difficulties in sourcing clean organic waste. To avoid contamination, organic waste businesses generally source waste directly from farmers and food markets where large quantities of organic waste are generated daily.¹³

Businesses focused on converting organic waste into new products face challenges around a lack of consumer awareness and low willingness to switch to more environmentally friendly products. Adoption of new products by consumers and businesses, such as shifting to organic fertilisers or briquettes, is often limited due to consumer concerns about products' lack of effectiveness compared with common sources of energy and fertilisers.

Finally, companies face difficulties accessing affordable capital to operate and scale their business. To be profitable, organic waste management companies need to operate at a large scale to generate sufficient revenues to cover their capital expenditure (CapEx) and working capital needs. However, a lack of access to affordable capital and local banks' limited understanding of the sub-sector's potential make it difficult for companies to secure the necessary funding.¹⁴

13. Wageningen, Using Organic Waste Streams for Up-scaling Composting and Biogas Production in Nairobi, n.d.

14. Key informant interviews with businesses.

DESCRIPTION OF COMMON BUSINESS MODELS

The following table highlights the key business models identified in the organic waste management sub-sector, together with illustrative businesses for each of those models.

Figure 3 – Illustrative businesses segmented by business model

Business Model	Illustrative Businesses
Prevention of food waste	   
Recycling to feed insect protein	   
Conversion into energy	   
Conversion into fertilizer	   

Prevention of food waste

► DESCRIPTION

In Sub-Saharan Africa, about 50% of fruits and vegetables are never sold,¹⁵ despite 32% of the Kenyan population facing food insecurity.¹⁶ These considerable losses exacerbate food insecurity for populations through reduced production and increased prices, increase financial losses for farmers and intermediaries and contribute to additional GHG emissions.¹⁷

By increasing the shelf life of food, better connecting people in the value chain and offering channels to sell imperfect fruits and vegetables, food prevention businesses allow farmers and food shops to increase their sales and allow consumers (B2B and B2C) to obtain quality products at cheaper prices. Businesses can act in the first-mile post-harvest management (farm to collection point), the last-mile post-harvest management (collection point to consumer), or both. They will typically address food loss by increasing shelf-life, for example by improving the cold chain, providing food dehydrators or addressing post-harvest losses by more efficiently connecting actors in the value chain. The value chain includes sourcing, transporting, storing, selling and delivering produce more effectively to reduce unnecessary food waste.

These businesses have high logistics costs and therefore require significant investments to establish and scale operations. Logistics (e.g., trucks, warehouses, fuel and labour) are required to source food from farmers, markets and other collection points, transport it to aggregation or processing centres, and deliver it to consumers. Further efforts need to be made to ensure that the produce collected is high quality and to sell produce that would have otherwise gone to waste.

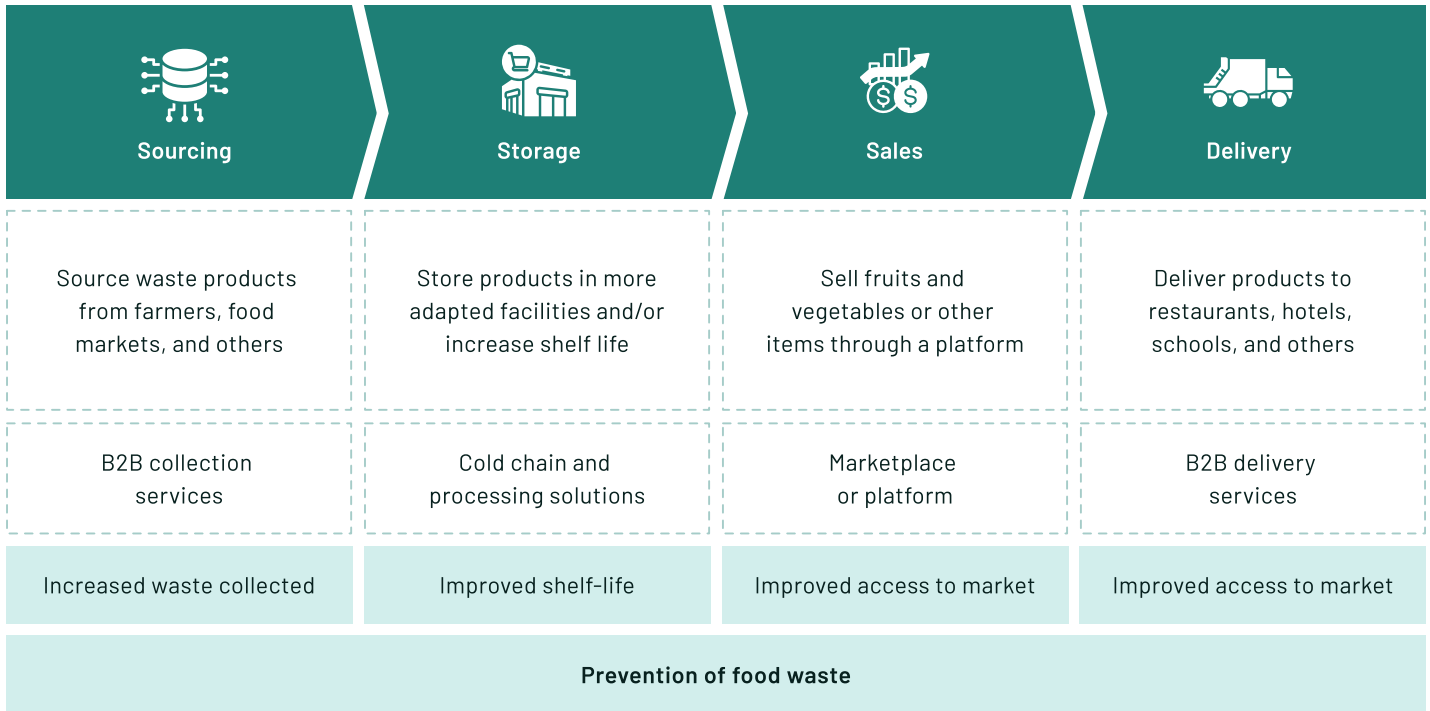
Moreover, high working capital is required to pay farmers for produce before receiving revenue from end customers. Revenues may be realised after one or two months, while farmers need to be paid promptly due to low cashflows. Interviewees shared that working capital loans were particularly appropriate to cover these cashflow challenges.

15. Farm to Feed, The Odd-looking Solution to Food Loss, n.d.

16. European Commission, Kenya: Acute Food Insecurity Situation February 2023 and Projection for March - June 2023, 2023

17. Our World in Data, Food Waste is Responsible for 6% of Global Greenhouse Gas Emissions, 2020

Figure 4 - Overview of the value chain



► **MAPPING OF BUSINESSES USING THIS MODEL**

This study identified four businesses preventing food waste in Kenya. They have all secured total investments of more than US\$ 500k. Financiers in the field include the Doen Foundation, Gray Matters Capital, Acumen, UK Aid and the IKEA Foundation. Most identified transactions consisted of grants, but Farm to Feed and Taimba Limited reportedly secured debt and equity investments.

Figure 5 - Mapping of businesses by stage of maturity and amount raised

Stages of Maturity	Amount Raised (USD)	Number of Businesses	Illustrative Businesses
Start-up stage/ Idea stage	<200k	0	
Early stage	200k - 500k	0	
Growth stage	500k - 5m	4	
Mature stage	>5m	0	

► FARM TO FEED – CASE STUDY



Origin: **Kenya**

Year of foundation: **2020**

Number of employees: **19**

Monthly revenue (2024): **US\$ 40k**

Break-even: **Expected at the end of 2025**

Revenue projections: **Up to US\$ 20m**

“The odd-looking solution to food loss”

MARKET PROPOSITION

- 1 Reduces food loss by **sourcing and rescuing fresh products from its network of farmers**, including products that usually do not completely fit the specifications expected by the market, and **selling them at a cheaper price to restaurants, schools, and food processors through a B2B platform**.
- 2 Tackles one of the main drivers of food waste in Sub-Saharan Africa, where **15% of fruits and vegetables never leave the farms, and 50% are never sold**.
- 3 **Fights food insecurity that is faced by 32% of Kenyan**.
- 4 Offers door-to-door delivery to **60 regular customers in Nairobi**.

IMPACT



Increased farmers' income by 41% increase, by selling their fruits and vegetables that would not be sold via traditional channels.



Makes fresh and healthy food more available and affordable by **providing fresh produce at below market price**.



Enables farmers to shift to more sustainable agricultural practices by **creating demand for imperfect products, allowing to take more risks in adopting different growing methods like regenerative agriculture**.



Has **avoided over 920 tons of waste and thus avoided greenhouse gas emissions of over 1,000 tons of CO2 equivalent**.



RECOGNITION

- ✓ Bayer Foundation Women Empowerment Award (2022)
- ✓ Cartier Women's Initiative (2024)
- ✓ Nominated for the Earthshot Prize (2024)

Recycling organic waste to produce insect protein

► DESCRIPTION

Converting organic waste into insect protein offers a sustainable and nutritious solution for animal feed and potentially human food. Black soldier flies, crickets, mealworms and grasshoppers' larvae ingest organic waste to grow. These insects are then converted into powder or pellets or kept in their natural form to be sold as a source of protein for livestock and fish farms, responding to the high demand for feed resulting from the growth of the livestock and fish farming industry in the country.¹⁸

Insect-based proteins compare favourably with soy-based proteins, which currently make up the vast majority of animal feed in Kenya. Currently, 70% of animal feed in Kenya is imported. Most soy-based protein is produced in China, while insect protein is produced locally, which could reduce the reliance on imports and avoid the impact of price volatility. Additionally, insect protein production is less land-intensive than soy, therefore contributing to decreased deforestation. Moreover, insect protein has a higher nutritional value which optimises the growth of livestock and fish.¹⁹ Finally, it contributes to addressing waste challenges in the country by using organic waste to feed insects and create a new source of protein.²⁰

Businesses in this field source organic inputs from a variety of sectors to feed insects before selling their protein to livestock and fish farmers, cooperatives and businesses. By sourcing from farmer networks, cooperatives, markets, restaurants, hotels and non-sewer sanitation companies, companies ensure a consistent supply of chemical-free organic waste. Insects are then bred (which takes approximately 44 days for black soldier flies), converted into powder or pellets or kept whole and sold.

Insect protein businesses' costs are mainly driven by operating costs, including payments for organic waste, labour, power, administrative costs and marketing costs. Compared with the other business models described in this guide, insect protein businesses require less equipment and technology to operate.^{21,22} Capital expenditure for these businesses includes land acquisition or leases, and they also face high regulatory costs as they must obtain a permit from the Kenya Wildlife Services to farm insects, a licence from the Kenya Bureau of Standards to sell their feed and a licence from the National Environmental Management Authority (NEMA) to certify their environmental impact.²³ Since the initial investment required for infrastructure and equipment is relatively small, grants or concessional capital represent suitable financing options to support these businesses to establish their operations.

18. It is important to know that all businesses that produce insect protein also produce fertilisers, coming from the residuals.

19. Foss, Soya versus Insects as a Protein Source for Feed, n.d.

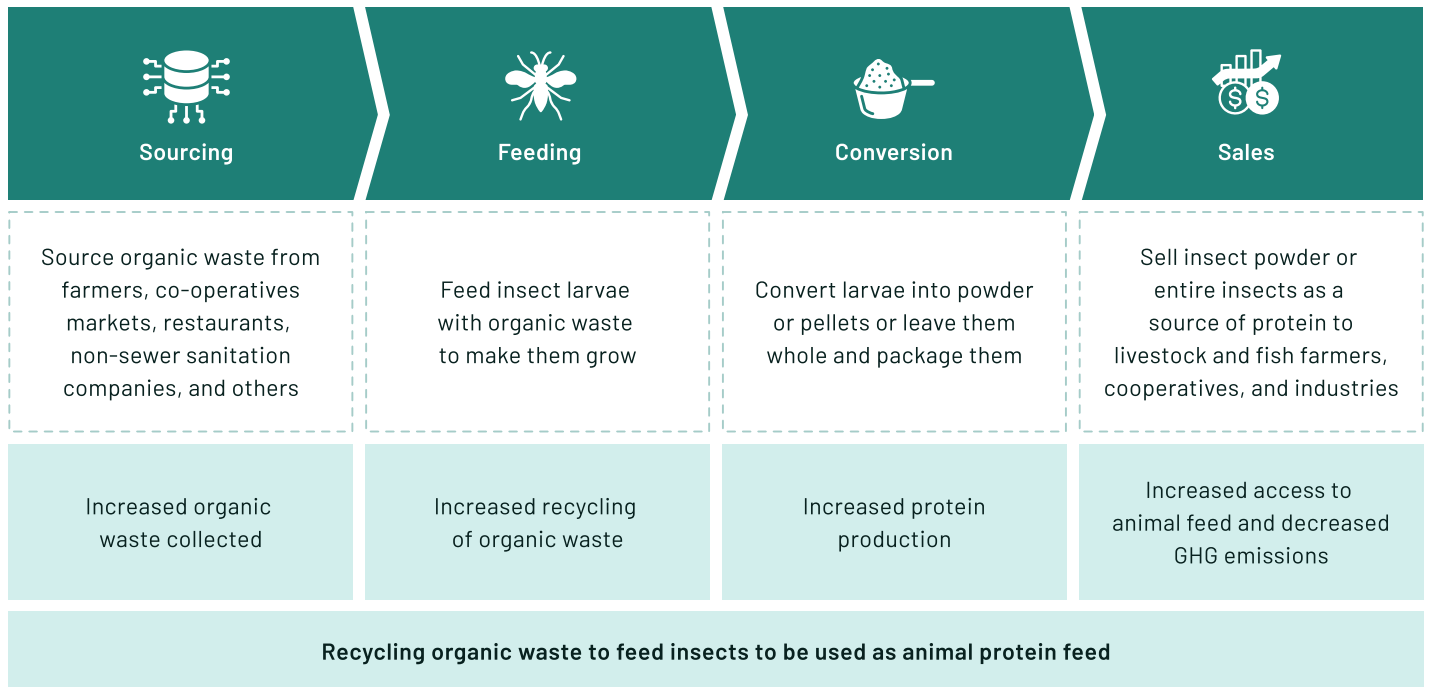
20. Which creates GHG emissions due to decomposition.

21. Asia Farming, Black Soldier Fly Farming: Setup and Profit Analysis of Black Soldier Fly Farming, 2023

22. The infrastructure and equipment set-up costs vary according to the scale; for small-scale infrastructure, costs typically range between US\$ 5,000 and US\$ 15,000, but they can go up to US\$ 50,000 for larger operations.

23. Subnational Climate Fund, Global Study on Black Soldier Fly Sector, 2022

Figure 6 - Overview of the value chain²⁴










24. Decreased GHG emissions because methane emissions from decomposition and deforestation from soy exploitation are avoided.

► **MAPPING OF BUSINESSES USING THIS MODEL**

This study identified eight businesses converting organic waste into protein. This is still a new field, with all businesses except Regen Organics having been established since 2017.²⁵ Three businesses have entered the growth stage, including Ecodudu which raised more than US\$ 500k. Financiers that contributed to the field include GreenTec Capital Partners, the Opes Impact Fund and the Circular Catalyst Fund.

Figure 7 - Mapping of businesses by stage of maturity and amount raised

Stages of Maturity	Amount Raised (USD)	Number of Businesses	Illustrative Businesses
Start-up stage/ Idea stage	<200k	1	
Early stage	200k - 500k	2	 
Growth stage	500k - 5m	4	  
Mature stage	>5m	1	

25. Food and Agriculture Organization of the United Nations, Mapping of the Black Soldier Fly Value Chain in East Africa, 2023

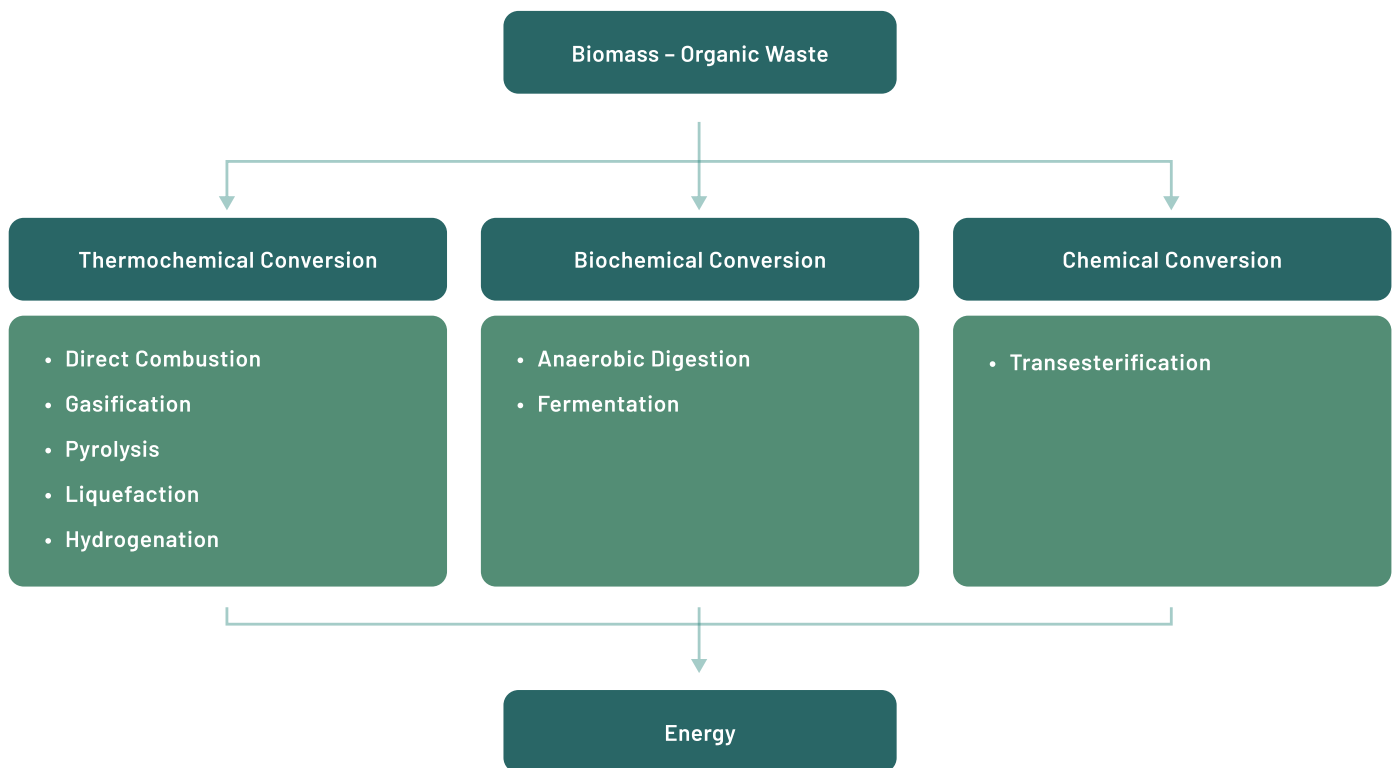
Conversion of organic waste into energy

► DESCRIPTION

Converting organic waste into energy (biofuels, biogas or briquettes) contributes to reducing GHG emissions and resource usage while generating efficient, affordable and renewable energy. In Kenya, smallholder farmers spend about 40% of their income on energy for cooking and other appliances and often use firewood for heating purposes, contributing to deforestation.²⁶ These solutions offer them an opportunity to invest in cleaner energy sources and reduce their reliance on kerosene or charcoal. Such solutions also offer a reliable energy source for companies with high energy consumption, as the national grid and solar systems often face frequent interruptions.²⁷

Several technologies enable the production of energy from organic waste.

Figure 8 – Processes for organic waste conversion into energy²⁸



26. Key informant interviews with businesses.

27. Key informant interviews with businesses.

28. Afotey & Sarpong, Estimation of Biogas Production Potential and Greenhouse Gas Emissions Reduction for Sustainable Energy Management Using Intelligent Computing Technique, 2023

Conversion into new energy sources

Companies that convert organic waste into energy sources in Kenya typically source organic waste from networks of farmers and cooperatives, particularly from sectors producing high volumes of waste, such as coffee and tea.

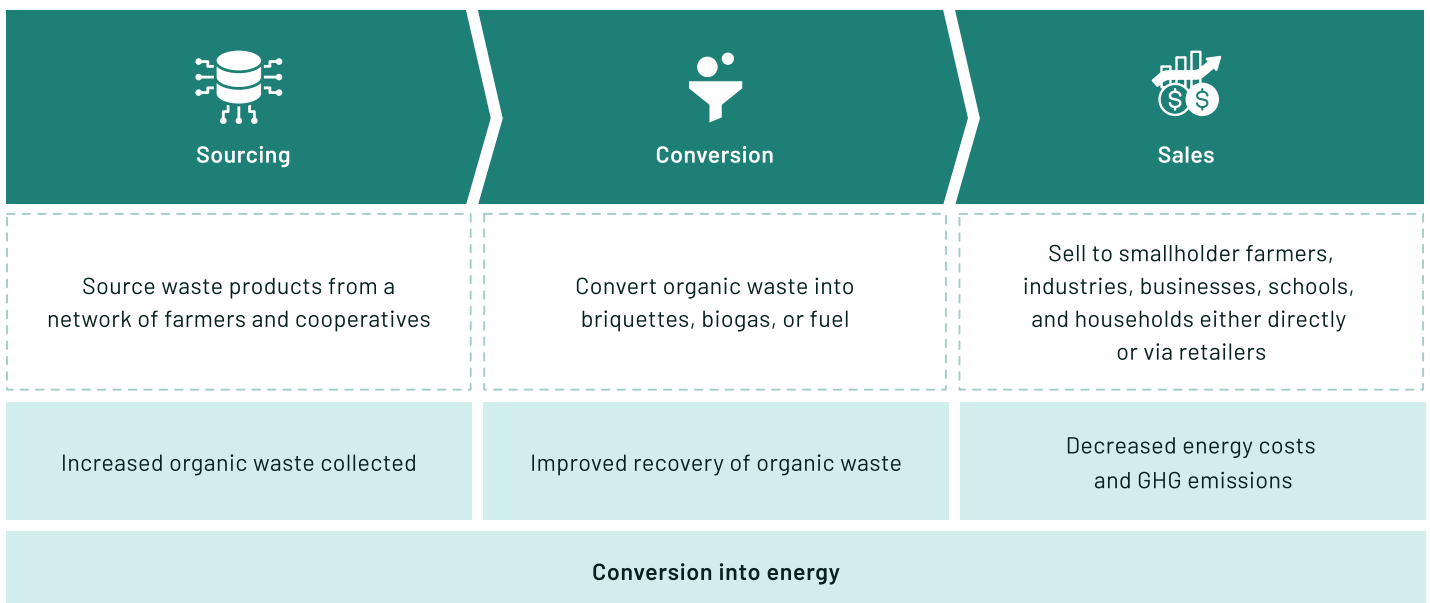
This waste is then converted into biogas, biofuel or briquettes in the companies’ facilities, involving labour, energy and organic waste sourcing.

The converted biogas, biofuels or briquettes are distributed to a diverse range of customer segments, including smallholder farmers, industries, businesses, schools and households. To ensure successful sales and distribution, companies require tailored distribution channels to meet the specific needs of each segment, thereby achieving a wide-reaching impact.

To increase their financial viability, these companies often use a dual revenue stream approach, through selling energy products and carbon credits. For example, direct sales of briquettes generate around US\$ 200 per ton. Supplementary revenues are generated through carbon credits.

These businesses often have particularly high CapEx needs for technology, manufacturing plants and delivery trucks. Operating expenses (OpEx) are also high due to fuel, energy and other indirect costs associated with the sourcing and conversion of organic waste.

Figure 9 – Overview of the value chain



Technology to produce new energy sources

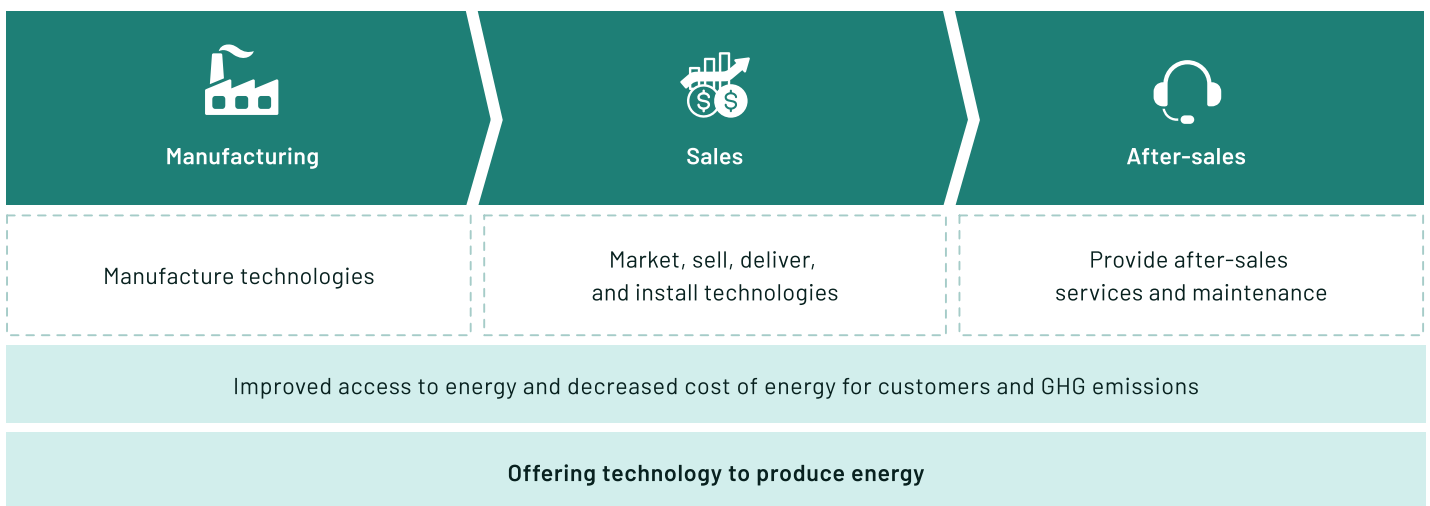
In addition to direct sales of energy products, companies also sell the technology used to produce biogas or briquettes. The key activities of this business model revolve around marketing to reach potential customers, on-site diagnostics to identify and respond to customers’ needs, contracting, manufacturing, setting up, and monitoring biogas and briquette production technology.

Companies target smallholder farmers, productive farmers and other organisations that generate organic waste and need energy. To reach these customers, businesses often have to establish distribution channels to reach rural areas (often via selling points or agents) and develop adapted marketing strategies, such as product demonstrations.

The costs of this business model are primarily driven by high CapEx due to technology and plant acquisition but also by OpEx including labour, energy, maintenance, and costs related to sales, such as marketing and diagnostics.

This business model also benefits from access to dual revenues from production technology and carbon credits. Prices for the sale of biogas and briquettes production technology range from US\$ 300 to US\$ 6,000 depending on the size of the technology,²⁹ or it can be leased monthly for about US\$ 25 per month.³⁰

Figure 9 – Overview of the technology to produce new energy sources value chain








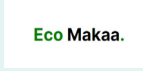



29. Blueflamebiogas, Biogas in Kenya, n.d.

30. Lawi, HomeBiogas Eyeing 1 Million Homes by 2028, 2023

► **MAPPING OF BUSINESSES USING THIS MODEL**

This study identified 13 businesses in the organic waste-to-energy field, with two of them in their mature stage and six of them in their growth stage. Among these, several businesses have reached profitability, such as Sistema.bio and Olivado.³¹ These businesses originated from Mexico and New Zealand, respectively, but expanded their operations to Kenya. Bharat Bio East Africa Limited is also a notable example of a company in the sub-sector that raised funds from a large pool of investors, including Novastar Ventures, Acumen, Gray Matters Capital and Endeavor. Organic waste-to-energy companies are part of one of the most developed business models across the waste management sector in Kenya.

Figure 8 – Mapping of businesses by stage of maturity and amount raised

Stages of Maturity	Amount Raised (USD)	Number of Businesses	Illustrative Businesses
Start-up stage/ Idea stage	<200k	2	
Early stage	200k – 500k	5	  
Growth stage	500k – 5m	3	  
Mature stage	>5m	3	 

31. It is important to mention that the core business model of Olivado is to produce and sell oils, mostly made from avocado, but they invested in a biogas plant to collect their factory’s waste and turn it into fuel, powering the factory and vehicles and making their entire operation completely sustainable.



► SISTEMA.BIO – CASE STUDY



Origin: **Mexico**
 Year of foundation: **2010**
 Number of employees: **350**
 Break-even: **2014**

Monthly revenue (2024): **US\$ 2.03m**
 Revenue projections (by 2025): **US\$ 3.33m**

“Creating value from waste”

MARKET PROPOSITION

- 1 Sistema.bio’s biodigester enables users to **convert their organic waste into renewable biogas and fertilisers** (via anaerobic digestion), **offering a solution to farmers to increase their access to affordable and renewable energy.**
- 2 Exploits **largely available organic waste** (5.72m tons generated yearly only in Kenya), to **meet low- and middle- income countries clean energy’s needs, particularly for agriculture and cooking.**
- 3 Responds to market pain points in Kenya, where **energy needs are growing by 5% each year, farmers are spending 40% of their revenues in energy,** and populations face **frequent grid interruptions.**
- 4 **Runs 0-interest loan programs to allow farmers to acquire a biodigester.**
- 5 Leverages **carbon finance in Kenya and other countries on the continent to fund its expansion.** They registered their biogas program with Gold Standard in 2018, partnering with South Pole to sell avoided GHG emissions.

IMPACT



Has **positively affected over 600,000 livelihoods in the farms globally,** by **increasing crop yields and income by up to 50%.**



Provides **increased access, affordability, reliability, and sustainability of energy.**



Has **treated about 40.5m tons of waste** (has still a huge market potential in Kenya with 5.72m of organic waste generated yearly and only 10% that is treated), **avoided over 1m tons of CO2,** and **saved 1.5m trees globally.**

AWARDS

- ✓ BiD Challenge International Winner (2010)
- ✓ Ashoka Fellowship and Iniciativa Mexico (2011)
- ✓ New Ventures Scholarship (2012)
- ✓ Clinton Global Initiative Recognition (2013)
- ✓ MIF IDB Technical cooperation (2014)
- ✓ UN Leadership Award for SDG7 (2017)
- ✓ Ashden Award winner, category for clean cooking (2019)
- ✓ Schawb Foundation Social Innovation by the World Economic Forum (2019)
- ✓ Top Cooking Impact Award in 60 Decibels' Energy Impact Index (2024)

KEY MILESTONES ACHIEVED

- ✓ **2010:** Sistema.bio is **established with equity from founders and angel investors**, obtaining US\$300k in funding
- ✓ **2011:** Opened first regional office and created **Sistema.bio's Loan Program Revolving Fund** with a US\$ 500k grant
- ✓ **2014:** **Achieved break-even with US\$ 1m revenue**
- ✓ **2015:** Closed US\$ 1m Investment round and **was certified B-Corp**
- ✓ **2017:** **Expanded to Kenya**, establishing local teams to develop value chains, partner networks, and understand the regulatory framework
- ✓ **2018:** Expansion to India, growth in Latin America and East Africa and **products diversification by providing biodigester to larger farmers**
- ✓ **2019:** Closed US\$12m investment and scale markets and **launched its first carbon program**
- ✓ **2020:** Closed US\$ 4.5m in convertibles notes
- ✓ **2021:** Closed US\$ 15m Series B fundraising
- ✓ **2023:** Was part of the first Clean Impact bond and **inaugurated the world's largest biogas plant manufacturing facility in India**



FUNDING SECURED

Amount	Types of Instrument	Select Investors
More than US\$ 30m	Grants, equity, debt, non-dilutive capital	
US\$ 300k	Clean Impact Bond (loan)	

GROWTH PLANS

- ✓ **Plans to double its global annual revenue from US\$ 25m** (including US\$ 10m on the African continent) **to US\$ 40m by the end of 2024**, notably by **scaling operations and carbon programs in Africa**. Sistema.bio aims to rapidly scale its operations in Africa by expanding its geographic presence in countries with existing markets and favorable carbon market regulations, such as those that align with Article 6, to capitalize on the growing demand for sustainable agriculture solutions and carbon credits.

FUNDING NEEDED

Amount	Types of Instrument	Needs
US\$ 50m	Serie C - mezzanine debt financing	Expand its geographic presence in Africa

KEY SUCCESS FACTORS IDENTIFIED

- ✓ **Working in partnership with businesses or municipalities:** has notably partnered with International Renewable Energy Institute Mexico, BAIF-Development Research Foundation, and the Amazon Conservation Team.
- ✓ **Selling to businesses and industries:** has tailored its sales approach to each country. In India, Sistema.bio adopted a B2B (business to business) approach.
- ✓ **Scaling to new markets:** has successfully expanded to other countries and even continents, with activities now running in about 31 countries, showing the high replicability of the business model.
- ✓ **Impact measurement:** was certified B Corporation since 2015 has continuously improved its methodology to estimate amounts of avoided carbon emissions.

Sistema.bio has used result-based financing to leverage funding through the International Finance Corporation's (IFC) Clean Impact Bond, which was launched in 2022. This development impact bond (DIB) aimed to improve local health outcomes and increase women's quality time through the use of biogas digesters in Kenya. BIX Capital provided a US\$ 300k loan for working capital needs and the Osprey Foundation is the outcome payer, committing up to US\$ 500k to health and gender outcomes. These outcomes come, respectively, from reduced exposure to particulate matter and reductions in time spent on cooking and domestic activities.

Conversion of organic waste into fertiliser

► DESCRIPTION

Converting organic waste into fertiliser provides a sustainable and cost-effective solution for farmers in Kenya, where demand for fertilisers is high and most fertilisers are imported. Agriculture accounts for a third of Kenya's GDP and employs more than 40% of the country's population, leading to high demand for fertiliser. The sector currently consumes 750,000 megatons of fertilisers every year (95% of which are imported), however, a significant number of farmers still do not have access to affordable fertilisers to enhance their yields.

Local organic fertilisers, including those derived from organic waste, offer a competitive alternative to chemical and mineral fertilisers, which can negatively affect soil health and farm yields in the long run. In addition to being cheaper than inorganic fertilisers, with prices ranging from US\$ 300 to 400 per ton, using organic fertilisers could result in a 30% yield increase. These products therefore respond to demand from both smallholder farmers with limited resources looking for cheaper sustainable solutions to increase their production and larger cooperatives and corporates, which can benefit from the environmental and social benefits of using sustainable agricultural practices.³² Assuming the adoption at scale of integrated soil fertility management practices,³³ organic fertiliser could increase from its current market size of US\$ 3m (which represents a 6% share of the overall fertiliser market) to between US\$ 45–75m in absolute value by 2030.³⁴

The potential market for organic fertilisers is significant, but there remain barriers preventing Kenyan farmers from adopting them. As organic fertilisers only arrived in Kenya in the last 15 years, there is still a lack of awareness and understanding among farmers, agro-dealers and extension workers about their efficacy and their comparative advantages for soil health relative to chemical fertilisers. Therefore, in addition to sourcing and processing organic waste, organic fertiliser producers must increase marketing and networking efforts to secure growing sales to farmers' networks, cooperatives, mineral fertiliser producers and others.

The conversion process, technology and biomass source vary depending on the type of fertiliser being produced. Organic fertiliser can take the form of compost, frass,³⁵ agricultural by-products³⁶ and biochar. The process can take the form of biological treatment, physical treatment or thermos-chemical treatment.³⁷

32. Commercial Agriculture for Smallholders and Agribusiness, Scalable Alternatives to Inorganic Fertiliser in Kenya, 2023

33. A comprehensive approach to soil fertility management that integrates the use of fertilisers, organic inputs and improved germplasm. This strategy is combined with the knowledge required to tailor these practices to local conditions, with the goals of maximising the agronomic efficiency of nutrient application and enhancing crop productivity.

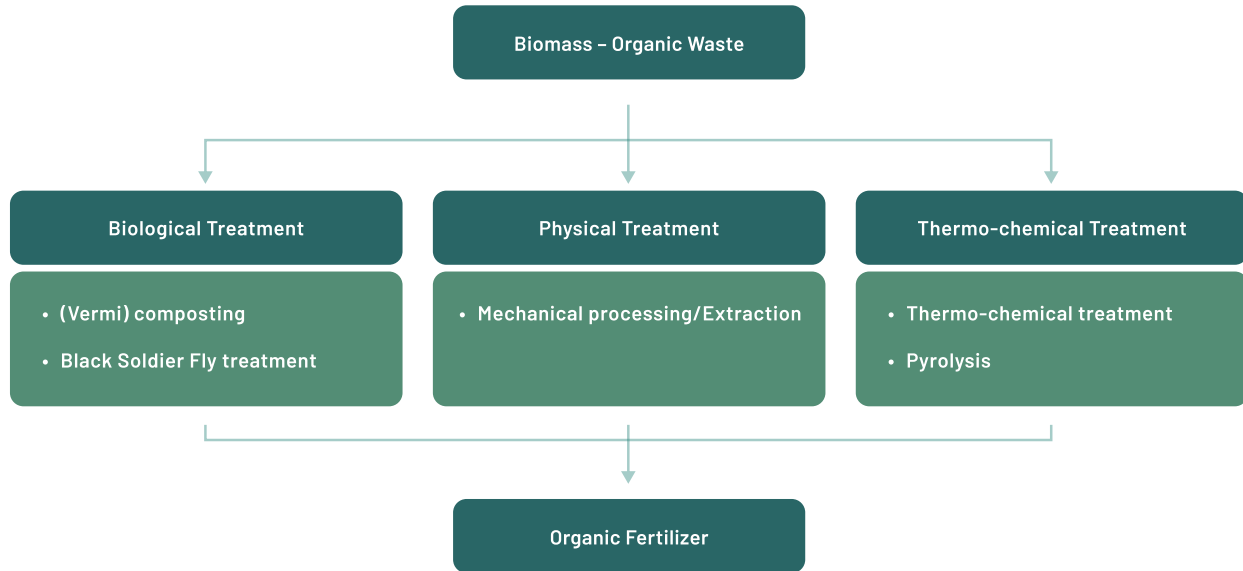
34. Commercial Agriculture for Smallholders and Agribusiness, Scalable Alternatives to Inorganic Fertiliser in Kenya, 2023

35. Frass is the debris or excrement produced by insects, including larvae droppings, sawdust and wood shavings.

36. By-products particularly from agricultural value chains and processing e.g., oilseed cake meal.

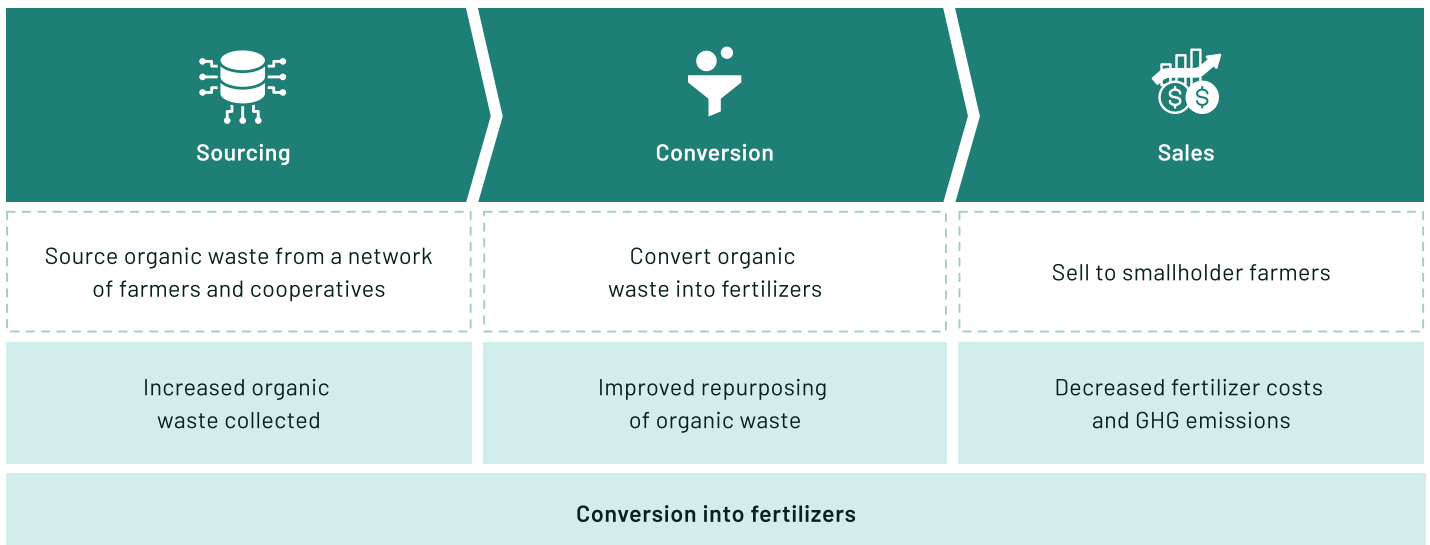
37. Commercial Agriculture for Smallholders and Agribusiness, Scalable Alternatives to Inorganic Fertiliser in Kenya, 2023

Figure 10 – Processes for organic waste conversion into fertilisers



These companies have high CapEx and working capital needs. High upfront investments are needed for technology and plant acquisition. Moreover, managing the production process and securing payments from farms can take up to five months, forcing businesses to pre-finance the operations. However, additional revenue can be generated through the sale of carbon credits.









Figure 13 – Overview of the value chain



► MAPPING OF BUSINESSES USING THIS MODEL

This study identified 16 businesses involved in the conversion of organic waste into fertilisers, most of which are in the growth stage. Regen Organics and Safi Organics, who raised more than US\$ 35m and more than US\$ 1m, respectively, are the leaders in the field in Kenya. Financiers who have contributed to businesses in the field include Novastar, USAID, the Citi Foundation, Norfund and the Catalyst Fund.

Figure 11 – Mapping of businesses by stage of maturity and amount raised

Stages of Maturity	Amount Raised (USD)	Number of Businesses	Illustrative Businesses
Start-up stage/ Idea stage	<200k	3	 
Early stage	200k – 500k	3	 
Growth stage	500k – 5m	9	  
Mature stage	>5m	1	

▶ REGEN ORGANICS – CASE STUDY



Origin: **Kenya**

Year of foundation: **2010**

Number of employees: **Over 500**

“Building a prosperous, climate-smart agriculture through a circular economy approach”

MARKET PROPOSITION

- 1 **Converts organic waste into an organic fertilizer** called Evergrow (80% of Regen Organics’ current revenues), **insect protein** called Kuzapro (15%), and **briquettes** called Evermoto (5%), thanks to thermophilic composting and black soldier flies.
- 2 **Exploits largely available organic waste** (5.72m tons generated yearly only in Kenya), while **supporting farmers** (around 60% of the workforce in Kenya) **by increasing the productivity of their fields.**
- 3 Regen Organics currently is the **largest producer of organic fertilisers in Kenya.**
- 4 **Demand for fertilizers in Kenya is high, but 95% are imported, making them costly and inaccessible for many farmers** (import price of generic products doubled between 2021 and 2023 which significantly affected consumptions). **The market of organic fertilizer could represent US\$ 45-75M in Kenya in 2030, a significant increase from 2022, where it was worth around US\$ 3M.** Moreover, Regen Organics’ solution can help reduce Kenya’s dependence on imported fertilizers.
- 5 **Avoids negative effects of inorganic fertilizers use.** The large use of inorganic fertilisers have led to depleted nutrients and acid soils and counts for 1% of Kenyan GHG emissions.

IMPACT



Increased income for more than 8,900 farmers (average income increase of US\$ 1,486) due to improved production and yields as a result of fertilizer use.



Increased access, affordability, reliability, and sustainability of energy while Kenyan energy needs are growing by about 5% each year and farmers are spending about 40% of their revenues in energy.



Decreased soil's health degradation that occurs with the use of chemical fertilizer, **increased yields** (decreasing soil exploitation) **and produces' quality**.







Has **treated over 30,300 tons of waste in 2023** and **avoided 13,600 tons of CO2 equivalent in 2023**.

RECOGNITION

- ✓ MTI Business Plan Winner (100k)
- ✓ Fonds Suez Environment Initiative
- ✓ Winner of BiodiverCities challenge (World Economic Forum)
- ✓ Winner of the Food Planet Price (2020)
- ✓ Finalist Earhshot Prize (2021)



FUNDING SECURED

Amount	Types of Instrument	Select Investors
~US\$ 30m	Equity	  
~US\$ 7m	Debt (concessional loans)	Unknown
Unknown	Grants	

GROWTH PLANS

- ✓ Looking to expand regionally and into South Africa, building facilities and footprint in these new geographies.

FUNDING NEEDED

Amount	Types of Instrument	Needs
US\$ 15 to 20m	Mostly in equity	Expand its geographic presence regionally and into South Africa

KEY SUCCESS FACTORS IDENTIFIED

- ✓ **Working in partnership with businesses or municipalities:** has notably joined the Regenerative Agricultural practices for improved Livelihoods and Markets (REALMS) project and partnered with K+S, the Europe’s leading producer of potassium fertilizer.
- ✓ **Selling to businesses and industries:** distributes products through its network of retailers, feed millers, and distributors.
- ✓ **Impact measurement:** has engaged with three third parties to evaluate its impact.

FINANCING LANDSCAPE ASSESSMENT

Mapping of financing needs

► FINANCING NEEDS BY STAGE OF MATURITY

Organic waste management businesses typically experience the following financing needs:

Figure 14 – Financing needs by stage of maturity³⁸

Idea/Start-up Stage	Early Stage	Growth Stage	Mature Stage
<p>US\$ 50-200k</p> <p>Conduct rigorous testing and scientific studies to refine the product</p>	<p>US\$ 200-500k</p> <p>Build production capacity and product supply, and drive marketing to acquire customers</p>	<p>US\$ 0.5-5m</p> <p>Scale production capacity to increase volumes and achieve economies of scale</p>	<p>More than US\$ 5m</p> <p>Expand to new geographies and replicate the model in new markets</p>

► SPECIFIC FINANCING NEEDS

Businesses managing organic waste generally require both significant working capital and upfront capital to invest in production technology and infrastructure. High working capital is often necessary to manage accounts receivable and accounts payable due to long repayment cycles. Flexible financing solutions are therefore needed to accommodate the unique cash flow dynamics of each actor in the value chain. Additionally, significant upfront capital investments are required for initial equipment and infrastructure, as well as to expand production capacities at later stages of growth. As highlighted in previous sections, waste-to-energy and waste-to-fertiliser have particularly high CapEx requirements as the expansion of their production capacities depends on investments in technologies and infrastructure.

To respond to these financing needs, patient capital and flexible financing solutions are necessary. Businesses that require advanced technologies and costly infrastructure need higher amounts to start operations, whereas others can start with smaller amounts in the form of grants or concessional capital.³⁹

38. Businesses preventing food losses by connecting people in the value chain have different financing needs. In general, they need the same amounts by stage of maturity, but their costs drivers are mainly related to the food production costs, then logistics and warehousing.

39. CCAP, Blended Finance Mechanisms for Projects on Organic Waste Management, 2023

Opportunities for innovative finance



Support Mechanisms and Concessional Capital

Concessional capital can be further leveraged for organic waste management businesses in Kenya to attract private investors, reducing risks for small private businesses. Blended capital stacks for funds can be leveraged to catalyse investments for commercial investors in senior tranches. For example, junior and subordinated tranches, such as first-loss capital or junior equity, can be covered by public or philanthropic funds or impact-first investors. Concessional capital also helps to bridge the funding gap for small-scale projects. Tax incentives, such as tax credits or tax exemptions, can also guarantee the pricing of products above prevailing market prices.



Risk Mitigation Instruments

Risk mitigation instruments can help fund organic waste management start-ups in Kenya by providing loans or repayment guarantees from public donors, DFIs or development agencies. These reduce the perceived risk of this sub-sector for investors, making it more attractive for them. De-risking guarantees motivate private investors to enter the market.



Climate Finance

Climate finance is a critical component that serves as an enabler, lifting projects off the ground and ensuring successful execution and scaling. Several businesses in the organic waste management sub-sector are already leveraging carbon credits as an additional revenue stream. Eligibility for carbon credits is governed by Article 6 of the Paris Agreement. Businesses must show the additionality of their impact by proving that carbon would have been emitted in the absence of their product.⁴⁰

40. CCAP, Blended Finance Mechanisms for Projects on Organic Waste Management, 2023

CONCLUSION

Given the large amount of recyclable organic material and its numerous applications, the organic waste management sub-sector is one of the most developed sub-sectors in Kenya, offering diverse opportunities to investors. Out of 122 waste management and circularity businesses identified through this study, 30 are operating within the organic waste sub-sector. Most of these companies were established within the past decade and several companies have secured Seed and Series A, B and C funding, with some businesses raising up to US\$ 30m.

In addition to responding to the challenge of food waste generation, there are numerous applications for recycling and converting food waste into valuable products. Prevention of food waste fights food precarity and reduces the GHG emissions associated with food decomposition. Additionally, the conversion of organic waste into briquettes, biogas and biofuel enables farmers, households and businesses to procure a sustainable and affordable source of energy. Furthermore, the conversion of organic waste into fertilisers allows farmers to increase production, which raises their income and reduces the negative effects of inorganic fertilisers on soil quality. Finally, recycling food waste to breed insects as a source of protein for animal feed and human food reduces GHG emissions from other protein sources.

The financing needs of these businesses vary depending on the business model. Generally, converting organic waste into energy and fertilisers requires significant upfront CapEx to initiate production. In contrast, the prevention of waste and the conversion of organic waste into protein may require more capital as they scale. Moreover, these businesses often face high working capital requirements due to delays between outgoing expenditure for organic waste inputs and incoming revenue from the sales of products.



**ASPEN NETWORK
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