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O-Farms Landscape Report Ethiopia

Scoping the potential of circular agribusiness in Ethiopia



O-Farms



Report

Landscape Report Ethiopia

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O-Farms

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Acknowledgements

This report was developed under the O-Farms project to inform the implementation of the project in Ethiopia. O-Farms is an initiative by Bopinc and Village Capital, supported by the IKEA Foundation. The goal of the wider initiative is to accelerate the next generation of innovative circular agribusinesses in Kenya and Ethiopia. In doing so, O-Farms will build innovation support infrastructure that enables circular agribusiness to grow and develop. While also gathering and sharing key insights, within the broader agribusiness ecosystem in both countries. As of Q3 2021, in collaboration with local entrepreneur support organisations, O-Farms will launch its first call for proposals for SMEs. In total, two cohorts of ten companies will be supported to grow their circular business models. The cohort will launch in January 2022.

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1

Executive summary

EXECUTIVE SUMMARY

There is a vast, untapped potential in Ethiopia's agricultural sector, as well as considerable challenges around environmental sustainability and the need to create more jobs. The main question posed by O-Farms is: how can Ethiopia sustainably feed a growing population, without depleting the planet's resources, and at the same time keep contributing to economic growth and create jobs, and other income-generating opportunities? One of the promising answers to this question lies in circularity. There is an urgent need to make the most of food and the resources needed to produce it. Circular agriculture is considered as an important approach to building a more sustainable food system.

After identifying the strong rationale for fostering circular agribusiness, Bopinc and Village Capital set up O-Farms, with IKEA Foundation's support. A project that

will leverage the growing interest in going circular. Tapping into its huge potential and helping to accelerate the next generation of innovative, circular agribusinesses in Ethiopia. This publication demonstrates the potential for circular agribusiness in Ethiopia.

In chapter two of this publication, we define what a circular agribusiness is: A for-profit company or farmer group, that is officially registered and preferably locally founded, with an innovative solution for bringing food losses, or the by-products generated in food production or processing, back into the food system. Key use cases are to process food losses and by-products into: (1) ingredients for food for human consumption, (2) ingredients for animal feed, (3) sector inputs other than agriculture, (4) compost or organic fertiliser or (5) sources of energy.



In the third chapter, we describe the current circular landscape in Ethiopia, as well as the agricultural sector's interest in circular agribusiness.

In the fourth chapter, five relevant food categories in Ethiopia are discussed: how can food losses and by-products from cereals, edible oil, coffee, breweries and livestock be brought back into the food system?

Furthermore, the three key challenges for circular agribusiness to thrive in Ethiopia are highlighted in chapter five: (1) an underdeveloped SME sector and lack of favorable policies, (2) low levels of technological development and (3) supply and demand in the market for circular products are immature. In the fifth chapter, different enablers for scale are presented to address these key challenges.

In the sixth chapter different entry points are explored to accelerate circular agribusiness in Ethiopia, such as Centres of Excellence for Entrepreneurship (CoEE), Integrated agro-industry parks (IAIP) and rural transformation centres (RTC), startup hubs, and donor-based incubators. In addition, ecosystem support for circular agribusiness by funding agencies and impact investors is discussed.

In conclusion, the next steps for the O-Farms accelerator program are outlined in chapter seven. Near the end of 2021, we will launch our first call for proposals to SMEs to apply to join the first accelerator cohort, where we have room for the ten most promising circular agribusinesses.

In Annex B of this publication, four detailed case studies of circular agribusinesses can be found that illustrate the type of SMEs we're looking for.



WHAT IS O-FARMS

O-Farms is the first African SME accelerator completely focused on circular agribusiness. It is an initiative supported by the IKEA Foundation to help scale circular agribusiness innovations in East Africa. Working towards making circularity a mainstream approach for entrepreneurs in East African food systems by 2025.

O-Farms is led by Bopinc and Village Capital. Together, our organisations aim to accelerate the next generation of innovative circular agribusinesses in Ethiopia and Kenya. O-Farms will build an innovation support infrastructure that enables circular agribusinesses to grow and develop. The initiative challenges, inspires and capacitates East African entrepreneurs to present commercially viable circular agribusiness innovations. Together with local entrepreneur support organisations, we work with entrepreneurs to scale their business case, prove its sustainability and make the entrepreneurs investment-ready. Finally we disseminate learnings and evidence of our approach, to inspire other entrepreneurs and relevant stakeholders in the region. To collectively make circularity a mainstream approach in East African food systems.

RESEARCH METHODOLOGY

For this research publication on the potential for circular agribusiness in Ethiopia the following research methodology was used. 50 agribusiness SMEs were interviewed, via an online survey, as well as 30 key stakeholders. In addition, two validation workshops were held with experts, stakeholders and companies to validate the main findings of this publication. Furthermore, a broad scan of the agricultural sector was done through desk research and analysis of primary data sources. In Annex C of this publication a list of the interviewed organisations can be found.

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Introduction to circular agribusiness

THE POTENTIAL OF CIRCULAR

Circular agriculture is an important approach to building a more sustainable food system. It is not acceptable that in certain food sectors up to 50% of food is lost or wasted and left to rot.¹ Globally, less than 2% of the valuable nutrients in food by-products and losses currently recycled. Valorising these waste streams does not only create a more sustainable food system, it also drives new innovation, establishes new business sectors and creates more economic opportunities and jobs. Not surprisingly, the World Economic Forum, in a recent publication², ranks agriculture as the most relevant sector (among 19 sectors) to materialise on opportunities for a circular economy in Africa.



CRITICAL GAPS

Traditionally, many agricultural livelihoods programs have supported smallholder farmers (smallholders) to increase their productivity and efficiency, resulting in incremental improvements to their income and resilience. We also observe that programs are increasingly taking a wider approach, for instance by addressing the issue of postharvest losses. However, we believe critical gaps remain in the creation of truly circular and regenerative food systems. The three key principles of a circular economy recommended by the Ellen MacArthur Foundation: design out waste and pollution, keep products and materials in use, and regenerate natural systems – are still insufficiently addressed in food systems worldwide.



WHAT IS A CIRCULAR ECONOMY?

Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles: design out waste and pollution, keep products and materials in use, and third regenerate natural systems.

In a circular economy, economic activity builds and rebuilds overall system health. The concept recognises the importance of the economy needing to work effectively at all scales – for large and small businesses, for organisations and individuals, globally and locally.

Transitioning to a circular economy does not only amount to adjustments aimed at reducing the negative impacts of the linear economy. Rather, it represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits.

The model distinguishes between technical and biological cycles. Consumption happens only in biological cycles, where food and biologically-based materials (such as cotton or wood) are designed to feed back into the system through processes like composting and anaerobic digestion. These cycles regenerate living systems, such as soil, which provide renewable resources for the economy. Technical cycles recover and restore products, components, and materials through strategies like reuse, repair, remanufacture or (in the last resort) recycling.

Source: Ellen MacArthur Foundation



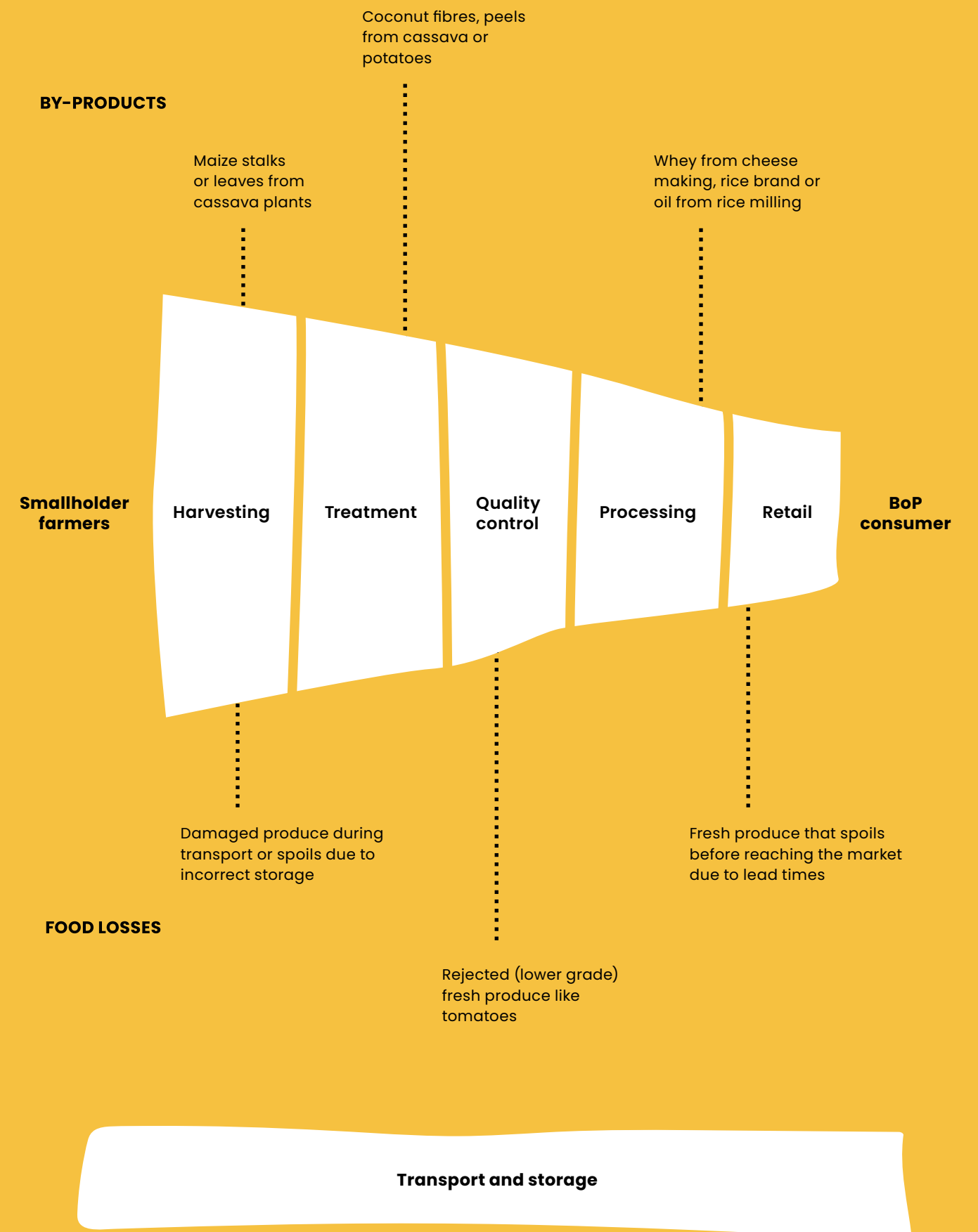
WHAT IS A CIRCULAR AGRIBUSINESS?

In O-Farms we see circular agribusiness as a for-profit company or farmer group, that is officially registered and preferably locally founded, with an innovative solution for bringing food loss, or the by-products generated in food production or processing, back into the food system. The figure on the right further specifies the different stages in agricultural value chains where these losses and by-products occur.

When zooming into food losses and by-products, these streams are created at different stages in the value chain and can either be the result of regular harvesting and processing steps (by-products) or the result of inefficiencies throughout the value chain (food losses). Food losses in industrialised countries are as high as in developing countries. However, in developing countries more than 40% of the food losses occur at post-harvest and processing levels, while in industrialized countries over 40% of the food losses occur in retail and consumption.¹

Where opportunities in some agricultural sectors are dominated by by-product streams (think of cereals, that have relatively low losses but generate considerable volumes of by-products), other sectors generate opportunities for circularity mostly because of food losses (like in horticulture, where the short shelf-life of products can lead to relatively high losses).

Agricultural value chains generate many by-products that are often left wasted



3 The circular landscape

CIRCULARITY IN ETHIOPIA

Ethiopia, as a member country of the African Development Bank (AfDB), has contributed to the bank's initiative: Development of a Green Growth Investment Program in Africa focused on waste management and the circular economy. Under this initiative, the Africa Circular Economy Facility (ACEF), a multi-donor trust fund, is currently being developed. The ACEF supports the adoption of circular practices in AfDB member countries. ACEF has already raised an initial €4 million grant from the Government of Finland and the Nordic Development Fund – and is in the process of getting started and raising more funding.³

One of the most notable efforts to work on a circular economy is the establishment of the Climate-Resilient Green Economy (CRGE) strategy in 2011. In this strategy, one of the key pillars for a green economy is the improvement of crop and livestock production practices for higher food security and farmer income, while reducing emissions. Overall, the CRGE strategy sets out an ambitious vision to become a middle-income country by 2025 through zero net carbon growth. Ethiopia emitted 150 megatons of CO₂e in 2010. Using this as a baseline, a business-as-usual trajectory would see annual emissions reach 400 megatons by 2025. But almost ten years into the CRGE strategy, annual emissions remain close to 2010 levels⁴.

A good example of the ambitions under the CRGE is the waste-to-energy plant called Reppie^{5,6}, that is transformative to Addis Ababa's approach to dealing with waste. The plant, which started operations in 2018, can process roughly 80% of the city's waste, and supply up to 30% of Addis Ababa's household electricity needs. It's the first waste-to-energy plant in Africa. It is worth mentioning though that when looking at Moerman's Ladder, which is used to define levels of innovation related to circular agribusiness (page 25), waste to energy is one of the least efficient models.



CIRCULAR AGRIBUSINESS

Agricultural production in Ethiopia is characterised by subsistence orientation, low productivity, low level of technology and inputs, lack of infrastructure and market institutions, as well as vulnerability to rainfall variability^{7,8}. However, it is also the most dominant sector in the country. According to the CSA⁹, a total cropland area of about 12,979,460 hectares is covered by grain crops i.e., cereals, pulses and oilseeds, from which a total volume of about 341,828,693 quintals of grains are obtained. With this cropland area, Ethiopia ranks 20th on a global scale; it has the third largest cropland area in Africa, after Nigeria and Sudan.

Out of the total crop area, 81% was under cereals. Teff, maize, sorghum and wheat take up respectively 24%, 18%, 14% and 14%⁹. When looking at production volumes, we see a similar picture with cereals contributing 88% of total crop production. The country is also endowed with considerable livestock resources. The total livestock population

comprises of around 70 million cattle, 42 million sheep, 52 million goats and 57 million poultry¹⁰, which makes it the largest African country in terms of livestock. Because of the vast size of the crop and livestock sectors in the country, considerable streams of by-products are created, amplified by the increasing levels of processing of agricultural goods. There is however little information about the exact size of these streams of by-products.



A GROWING ECONOMY IN AFRICA

Ethiopia is the second largest country in Africa in terms of population, and the steady economic growth over the past decade – an average of 9.4% annual economic growth from 2010–2011 to 2019–2020¹¹ – has made it one of the fastest growing economies in East Africa, now ranking the eighth largest African economy. For a considerable part, this growth is still dependent on the agricultural sector, accounting for almost 40.5% of the country's GDP, 81% of exports, and 85% of the labour force.¹²



FOOD LOSSES

Food loss or post-harvest loss (PHL) occurs along the value chain from harvest through to the point at which food is made available to consumers, whereas food waste refers to food that is wasted by consumers themselves or at retail level. As food losses in Ethiopia are considerably larger than food waste, our research did not delve into food waste at retail, food market and consumer levels.

Studies indicate that post-harvest losses in the agricultural production system of the country are significant^{13,14}. Typical reasons include poor market access, poor post-harvest handling practices, poor quality of equipment and material usage causing crop damage, and the lack of adequate storage and transportation facilities. The levels of post-harvest losses vary across

the main food sectors, and are highest in the fresh food segments, especially in horticultural crops. For horticultural crops, the losses range from 21% with haricot beans, to 43% or 45% with mango and tomato respectively. In general, in cereals, by far the largest agricultural sector in Ethiopia, an average of 15% crops are lost during production and processing, see also the table below. The largest losses occur in maize, sorghum wheat and teff production. Even in well organised, export-oriented sectors such as coffee, the losses are still considerable at around 16%.¹⁵



Food losses in Ethiopia per cereal type

CEREAL TYPE	TOTAL PRODUCTION (2019)	TOTAL LOSSES	PERCENTAGE LOSSES
Maize	6,317,174	1,261,966	20.0%
Rice	79,688	9,889	12.4%
Sorghum	3,652,267	456,992	12.5%
Wheat	4,343,027	614,474	14.2%
Millet	765,157	83,522	10.9%
Barley	1,844,893	185,724	10.1%
Teff	3,778,089	475,401	12.6%
Oats	63,205	1,414	2.2%

Source: APHLIS Database. All volumes in metric tonnes.

BY-PRODUCTS

For volumes of by-products, even fewer data sources are available. However, a 2018 FAO report¹⁶ (focused mostly on by-product use for animal feed production), does give an initial indication. In the report, sugar cane processing is seen as the agricultural activity that generates the most by-products, with a total volume of close to three million tonnes of dry matter by-products, with most of it consisting of bagasse. So far, bagasse is used relatively little for value-adding activities. In cereal processing, over two million tonnes of by-products are produced annually. By far the largest stream of by-products is generated in the processing of wheat, with wheat bran accounting for almost 90% of the total volume of by-products from cereal processing. Also in the processing of fruits and vegetables, 1.4 million tonnes of dry matter in by-product streams are created. This is noteworthy as, compared

to other by-product streams, this stream is perhaps most underutilised and mostly dumped or burned. Another important source of by-products are the breweries and malt factories. A total of 635,343 tonnes of dry matter is being produced, local breweries in Oromia, where the by-product is also called Atella. In slaughterhouses, substantial amounts of by-products are generated, close to 400,000 tonnes, and this is even excluding the smaller, informal slaughterhouses of which there are many throughout Ethiopia. A final relevant source, also because of the relatively high retention of nutrients in the by-products, is oil milling. In the processing of oilseeds, more than 200,000 tonnes of dry matter by-products are generated.

USE CASE CATEGORISATION

From the sources in our research, and based on the concept of Moerman's ladder¹⁷, we have identified the following use cases for valorising losses and by-products. In ascending order of value added at SME level, see also the visual on the next page.



Processing into sources of energy

Burning for energy we consider as a use case with minimal added value and with too many side effects. However, the processing of losses and by-products into briquettes or biogas can both be relevant sources of energy, ideally to power other agricultural activities such as processing or cold storage (see case study on Waste Transformers). In addition, bio-slurry, the residue of biogas, can easily be collected and used as a potent organic fertiliser for crops and aquaculture. In case biogas replaces dried animal manure ('dung cakes') for the purpose of cooking, the bio-slurry has an obvious added value as it can still be used as fertiliser.¹⁸ These are relatively well-established practices, with existing examples in Ethiopia.



Processing into compost or organic fertiliser

Different sources of losses and by-products can be used to produce compost or organic fertiliser. The good thing about this type of application is that the end-products are used in the agricultural sector. They bring back nutrients which were extracted from the soil and generate it. Also these are relatively well-established practices with different examples in Ethiopia such as soil and more.



Processing into ingredients for animal feed

A good example for this use case using soybean cake as a protein source for animal feed, such as poultry feed. Other opportunities are the production of protein-rich insects (such as Black Soldier Flies) for processing into animal feed. Several companies in Ethiopia, such as Guts Agro, sell the by-products from cereal, soybean and oilseed processing directly to farmers or feed companies. So far there are few examples of SMEs that play an aggregating and value adding step in between these companies.



Processing into ingredients for food for human consumption

The ultimate use of losses, especially looking at valuable nutrients, is the retention of these streams for human consumption. An example is the use of whey, a by-product from cheese making, which is very high in nutrients and can be used as an input for the production of (other) dairy products or drinks. In Ethiopia, so far we have identified relatively few examples of cases where losses and by-products were used for production for human consumption, other than the two case studies that are described in detail in Annex B.



Processing into materials

Such as the example of Zafree, where by-products are being processed into paper pulp. Even though many different applications can be considered like bioplastics, building materials, etc. From a food system point of view, we would ideally like to see these products introduced into agricultural production. For instance, using coco fibre to develop growing plugs or substrates for the horticultural sector. Another example (Lifepack) is to make biodegradable packaging from pineapple seeds, that can be planted again by consumers.



Hierarchy of reusing food losses and agricultural by-products

Each step of the O-Farms Ladder helps in reusing food losses and agricultural by-products. This is done as to an attempt to bring food wastage back to zero.

4 Business opportunities

MOST PROMISING SECTORS

In Ethiopia, not all use cases show a similar level of business potential, and some of the use cases can be applied to different agricultural sectors. As part of a broad scan of the agricultural sector through desk research and analysis of primary data sources, validated by qualitative interviews with experts, stakeholders and companies, we have identified the following five agricultural sectors as the most promising ones for circularity.





Brewery and malt factory by-products

Ethiopia has a steadily growing national production of beer. Recent investments by international breweries such as Heineken and Bavaria, and the fast growing national consumption, indicate that this growth will continue for the coming years.

One of the main by-products from beer brewing are the spent grains (such as spent barley grains) that come from the breweries. Currently the 12 modern breweries, and the many smaller scale breweries, in Ethiopia produce a total of 635,343 tons of by-product, which is mostly spent grain, but also spent yeast. Most of this is sold directly by the brewers to animal feed companies or directly to farmer cooperatives.

The broader impact on farming in Ethiopia is also considerable, as barley is one of the major crops in the highlands of Ethiopia. With a total of 4.1 million smallholder farmers producing up to 1.9 million tons annually. These farmers could benefit from (and perhaps be involved in) circular developments around spent (barley) grains from breweries.



Coffee by-products

Where coffee grounds are a popular waste stream for different circular startups in Europe and the US, coffee washing, and hulling stations are a great place to look for circular opportunities in Ethiopia. In one of the larger coffee growing areas, Jimma, already 134,400 metric tons of coffee husk is disposed of per year¹⁹. On a smaller scale and semi-commercially, some of the coffee husk is being used already to produce briquettes or biogas. Also the dehydrated coffee pulp can be used as an additive for livestock feed, composted, used as mulch, or as an organic fertiliser to be applied to coffee tree plantations. Another interesting application is the drying of the coffee cherries for human consumption. These dried cherries are used to make cascara, an infusion which makes for a fruity, herbal tea with caffeine levels similar to black tea. One company that is doing this on a more commercial scale is Galani Coffee (see case study).

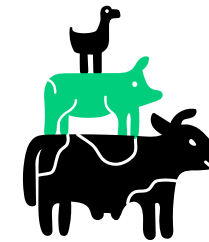
Over recent years, researchers and business organisations have increased their focus on the use of coffee by-products. For example, different universities offer programs on processing opportunities, while organisations like Technoserve and IDH have implemented projects to stimulate farmers and hulling station owners, to develop new products from the coffee processing by-products. At the same time, the processing of these by-products has not quite taken off, and we recognise that there is an untapped opportunity here. With only a fraction of total by-products created, actually used for valorisation purposes.



Edible oil production

Even though considerable volumes of cooking oil, or other edible oil, is imported – Ethiopia produces an increasing volume of these same oils. The main crops being used for this include soybeans, groundnut, Noug- and Niger-seeds, as well as seeds from sunflower, sesame and cotton. Collectively, the processing of these crops to oil produces a volume of around 202,134 tonnes of cake annually. The production and processing of these crops is likely to significantly increase, due to the high demand for cooking oil and animal feed. Although part of the cake is being commercialised through sales to animal feed producers, there is considerable untapped business potential. A substantial amount of the cake is directly exported, without any value addition. We see a missed opportunity here, to tap into the commercial potential of the animal feed sector, and also for human consumption. Companies like Tasty Sosya, Vitabites and Benu Foods have jumped into the market of soybean chunks derived from these oilcakes (see case studies in Annex B).

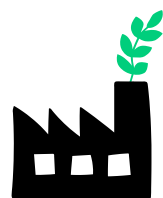
The chunks are gradually gaining popularity with Ethiopian consumers as a cheaper alternative for protein, compared to poultry meat. Other examples of interesting by-products of oil pressing are vegetable ghee, margarine or shortening – often used in the baking industry. The company Shemu Oil sells these by-products commercially, with their main business activity being the pressing of oil for the production of soap and detergents.



Processing of livestock products

As outlined earlier, in terms of livestock and number of heads, Ethiopia has the largest livestock sector in Africa. Such a big sector also creates considerable amounts of losses and by-products. One of these by-product streams is the offal that comes from slaughterhouses. Next to the many informal, smaller slaughterhouses, around 14 new and modern export-oriented abattoirs are operational across Ethiopia. Most of them throw away the offal and blood into septic tanks, only some of them process it. One of the more advanced examples of processing of offal is the Addis Ababa Abattoir, where offal, bones and other by-products are being processed into pet foods and poultry feed.

Another sector with considerable volumes of processing is the dairy sector. Also here, several international investors have moved into the sector that is steadily growing. According to some of the more recent numbers (from 2016 to 2017) around 200,000 litres of milk is processed per day, by around 25 larger dairy processors. Milk is amongst others being processed into traditional cheeses, and increasingly also into popular international types of cheese, such as Gouda, with an increasing demand from the growing hospitality sector. An interesting by-product from this cheese-making is whey, which is high in nutrients and can be used to increase the nutritional value of other dairy products, or serve as an ingredient to other foodstuffs (for example, sports drinks).



Cereal processing

Already for wheat alone, around two million tons of bran is produced annually in Ethiopia as a by-product from wheat milling. Bran is one of three layers of the kernel. It's stripped away during the milling process and often discarded. Yet, it's rich in many plant compounds and minerals and an excellent source of fibre. Only for wheat, there are already 300 wheat milling industries in Ethiopia, of which 140 in and around Addis Ababa. The total milling capacity of these factories (both from local wheat production and imported wheat) is estimated to be 3.7 million tons.

So far, only few companies use the bran for new product development. It can for instance be a great source to enrich the nutritional value of the flour produced. One example of a company in Ethiopia that does this, is Grand Bakery. Studies have shown that refined milling at 68% extraction significantly reduces the nutritional and antioxidant activity of the wheat flours.

Bread of good nutritional qualities (such as protein, fat, fibre, ash, iron and zinc) can be produced from 10% bran supplements²⁰. In addition to Grand bakery, other bakery chains like Mulmul and Roba also add bran to increase the nutritional content of bread and other products.

In addition to the bran, the husks can be used, especially the ones for rice, as a source of substrate for the horticultural sector, or as an ingredient to make briquettes for bioenergy. And these are not the only by-products of cereal processing. The largest volumes of biomass are mostly in the stalks and straw of the cereals. Perhaps the best-known circular company in Ethiopia is Zafree. The company produces 100% tree-free, paper pulp using agro waste, mostly crop residues, as an alternative to cutting down trees for paper. For this, they mostly use straw from wheat and barley, saving it from the normal purpose it has, being burned in the field by farmers.



CASE STUDY 1



Galani Coffee

Valorising by-products in the coffee sector

With an annual capacity of more than 260,000 metric tons, Ethiopia is the world's seventh largest producer of coffee, and Africa's top producer. In addition to the overall loss in production and processing of coffee, the processing (drying, dehusking etc) also creates considerable streams of by-products. In fact, to make a cup of coffee only 0.2% of the coffee bean is used and the remaining 99.8% goes to waste. However, this waste, which for a large part consists of coffee husks (dried skin of the coffee cherry), can be converted into energy (biogas or briquettes), compost or raw material, for instance for the production of boards.

One coffee company in Ethiopia, Galani Coffee uses dried, coffee cherries to make a completely new product, called cascara. Galani Coffee collects and dries the coffee cherries in their processing stations, where it is mixed with a variety of spices to create a unique tea-like infusion that is fruity and herbal and has caffeine levels similar to black tea. The high-end market demand for this product is growing, and 300 grams of cascara is sold for 75 Ethiopian Birr, which is around €1.40. Even though the use of coffee husks to make cascara is a rather traditional practice, Galani Coffee is one of the first to commercialise its production and sales. This saves valuable waste streams from being dumped and creates new income-generating opportunities for farmers.

5 Challenges for going circular



Underdeveloped SME sector and absence of conducive policies

Overall, the level of development of SMEs in the Ethiopian economy is lagging behind with that of other countries in Eastern Africa. Many SMEs still operate informally, meaning that they are not officially registered with the relevant authorities, and also often they do not run their business full-time. Non-registered companies will have less access to relevant services. In terms of circularity, currently there are no national government policies that specifically help circular agribusiness SMEs or give them particular (tax or financial) benefits. There is also no system in place that incentivises the recycling or reuse of products. In other words, there is no specific policy supporting circular companies, other than the CGRE.

Second, universities, Technical and Vocational Education and Training (TVET) institutions and (government) extension services do not yet provide specific support or implement projects focused on circularity. For early development, such as the implementation of circularity, it is critical that these institutions support SMEs and farmer organisations. Providing relevant knowledge and research support, to innovate on circular food solutions.

Finally, there are limited initiatives stimulating learning amongst companies on circularity. The governmental Agricultural

Transformation Agency aims to achieve a shift to sustainable and circular production and consumption patterns, by enabling companies to learn from each other. Non-government actors such as the Africa Agribusiness Academy, Agriprofocus (now the Netherlands Food Partnership) and Entrepreneurial Support Organisations (such as Blue Moon), are also launching various projects in Ethiopia to stimulate cross-learning between companies.





Low levels of technological development

The development of circular agribusiness models requires the right levels of technology and technology-enabled services, to develop and innovate on products. Looking at the case study of Inseco and the other case studies in this research, we know that R&D processes for the development of circular agricultural products can be long and challenging, especially when the right technology and related support is missing. Overall, for the Ethiopian agricultural sector, there is a lack of access to modern technology, due to challenges with financing and importation. As well as the lack of skills on how to operate the right technology, and lack of skilled staff to maintain machinery and other equipment.



Supply and demand in the market for circular products are immature

Overall, in society, the interest in circularity is still relatively limited. Also, the influence of cultural and religious factors, has a big impact on agricultural circular products in Ethiopia. Hindering the acceptance of food products that are produced from “waste”. In turn this limits the production of circular agri-food products, destined for human consumption.



Expensive logistics

For SMEs, organising the collection and the transport of by-products and losses can become quite costly. Companies such as Inseco and Waste Transformers (see case studies), are providing solutions for this by enabling the processing of losses and by-products at closer proximity to the source. The relatively high level of middlemen and other brokers in the Ethiopian agricultural sector²¹ and their ambition to maintain the status quo further prevents significant change in the sector.

CASE STUDY 2



Inseco

An alternative source of protein

One of the key challenges for livestock farmers is the price of animal feed, which can comprise up to 65% of total production costs. Not only is it expensive, producing the proteins needed for animal feed, but it also comes at a high environmental cost. With its high levels of land and water usage, greenhouse gases and overfishing for fishmeal. At the same time, the same agricultural value chains are producing considerable amounts of organic waste that are getting increasingly difficult to manage by farmers, companies and municipalities.

Inseco, a company that's operating in South Africa, has come up with a solution for this, through the production of Black Soldier Fly (BSF) larvae. Applying a rigorous R&D process, Inseco has developed high quality and protein-rich animal feed, oil and compost derived from BSF, that is being fed with organic waste. To organise the production of the BSF closer to the source, especially for organic waste being produced in rural areas by farmers, Inseco developed a decentralised production process, where a shipping container-based production unit can process 30 to 90 tons of waste per month. It can be independently operated by farmers.

Next to creating income-generating opportunities for these farmers, Inseco's animal feed shows a 25 to 55% increase in livestock production yields. Furthermore, Inseco claims its feed uses 160x less water than soybean meal, and the insect fertiliser emits 47 times less greenhouse gases than regular composting.



6

The circular ecosystem

Overall funding and SME support

On a higher level, we see a growing interest by government donors on the topic of circular economy. Especially the Nordic donors, such as DANIDA, SIDA and the Finnish have a circular economy on the agenda at a strategic level, and are interested to do more with the circular economy. This is gradually leading to targeted donor support for (SME) support to grow the circular economy. A general example is the support of the Finnish government to the development of the Africa Circular Economy Facility by the AfDB, which so far has raised an initial €4 million in funding.

In terms of more specific support to agribusiness SMEs in Ethiopia, the ecosystem is slowly but steadily growing, with more business development support organisations in Ethiopia, increasing their focus on agriculture. The best example in Ethiopia is BlueMoon, a business incubator that is fully focused on agribusiness. Another example is the Ethiopia Sustainable Agribusiness Incubator (ESAI) funded by USAID, which presents itself as the first agribusiness incubator in Ethiopia. This program has the aim to transform Ethiopian agriculture sector-by-sector, with a focus on honey, sesame and dairy products.

Currently, this program is part of the Agriculture Transformation Agency (ATA).

ATA has also established an Ethiopian Agribusiness Accelerator Platform (EAAP) that aims to test and validate the agribusiness incubator and accelerator concept for Ethiopia. This program supported by GIZ and Bill & Melinda Foundation is for now only focused on the honey, and wax value chain. EAAP will consider moving into other priority value chains.

The World Bank has also been working to set up the Ethiopia Climate Innovation. However, recently it assessed the outcomes of the project as “Moderately Unsatisfactory” (World Bank, 2021). It is therefore not clear if and how the initiative will be continued. Since 2013, the Ethiopian government has been running the Entrepreneurship Development Centre (EDC) in partnership with United Nations Development Programme (UNDP). EDC aims to identify growth-oriented enterprises and provide them with direct support to enhance their entrepreneurial skills and competencies to establish and operate profitable, competitive businesses on a sustainable basis. The EDC does not have a particular focus on circularity and/or agriculture.



Furthermore, the EU has launched the “Switch Africa Green” programme to support the circular economy, private sector development in Ethiopia, which is for now mostly focusing on supporting SMEs in the manufacturing sector. Lastly, the Swiss Agency for Development Cooperation (SDC) also promotes a circular economy in the agriculture sector by providing support to RUNRES and the Lab of Tomorrow. RUNRES is a research project that aims to introduce circular economy, business innovations. In Ethiopia, its focus is on horticulture in and around Arba Minch. The Lab of Tomorrow so far is only active in Rwanda, implemented by Impact Hub Kigali and Swiss University St. Gallen as a pilot on circular food systems. The program is considering setting up a similar approach in Ethiopia. Decisions about that are pending, and will be based on current experiences in Rwanda.

Impact capital

Looking at other sources of funding for SME support, such as philanthropic organisations or impact investors, the opportunities for support are more limited. In general, via the impact investing landscape, there are currently no impact investors that have a dedicated focus on circularity in Africa. Even though some do focus on sustainable agriculture, such as the Eco Business Fund and Acumen’s Resilient Agriculture Fund. And quite a few broader impact investment funds with a focus on agriculture, such as the Africa Agriculture Trade and Investment Fund, the ABC Fund and Phatisa’s Food Fund are open to investments in Ethiopia.

Nevertheless, most of these funds currently don’t have active investments in Ethiopia. This is partly due to the strict regulations in Ethiopia around foreign exchange, and the relatively high-ticket sizes for investments. More in general, the question is how relevant impact investors at this moment are for the development of circular agribusiness in Ethiopia. Most of the investments (also in other East-African countries) that are made

by impact investors, focus either on larger scale, often export-oriented companies, or on tech-enabled companies with an agricultural focus (such as Twiga Foods in Kenya).

For philanthropies, the landscape seems to be quite scarce. Except for the Ikea Foundation, with an active portfolio of sustainable agriculture projects in Ethiopia. And the Bill and Melinda Gates Foundation, who have extensively supported the Agricultural Transformation Agency (ATA). Outside of this, we could only identify the potential interest of the Rockefeller Foundation to include Ethiopia under one of their upcoming food initiatives.

Centres of Excellence for Entrepreneurship

The Entrepreneurship Development Centre (EDC) is a government entity which is currently running the Entrepreneurship Development Program (EDP). The objective of this program is to identify growth-oriented enterprises as well as potential entrepreneurs, unemployed youth and women nationwide, and provide them with direct support to enhance their entrepreneurial skills and competencies. Under this program, five Centres of Excellence for Entrepreneurship (COEEs) have been established in five different cities: Addis Ababa University College of Business of Economics, Adama Science and Technology University, Bahir Dar University, Hawassa University and Mekelle University. The objectives of these centres is to support students to develop their entrepreneurial skills to start a business, build relevant networks, and commercialise research ideas and innovations that are developed in the research and development facilities of the universities. Since its establishment in 2013, this EDC has created more than 95,000 jobs through startups and new businesses.

Integrated agro-industry parks (IAIP) and rural transformation centres (RTC)

The Ethiopian government is heavily involved in the set-up of these IAIPs. Currently there

are three operational in Ethiopia, which are Yirgalem, Bure and Bulbula Parks, with a focus on the processing of diverse crops and other products such as wheat, barley, sorghum, sesame, fava beans, tomato, potato, dairy, coffee, fish, poultry, honey, meat and other animal products. Within a 100km radius of these industry parks, RTCs will be established to improve logistics for farmers towards the IAIPs. The RTCs will feature storage warehouses, extension and financial services, as well as sales points of agricultural inputs and facilities for pre-processing activities, like sorting and grading. These RTCs could become key aggregation points, to collect food losses and by-products for further processing into circular products.

Farmer Cooperatives and Unions

The agricultural sector in Ethiopia is for a large part “built” on cooperatives and unions. In general, they are well organised and form strategic entry points for engaging smallholder farmers into circular business models. In total 94,000 primary cooperatives, 395 cooperative unions and about 10 cooperative federations are in existence across the country, often organised around particular crops or products, and they are supported by the Federal Cooperative Agency. Another relevant government actor in this regard is the Agricultural Transformation Agency (ATA). This agency supports cooperatives, unions and private companies to accelerate the growth and transformation of Ethiopia’s agricultural sector, and is an important actor in the further commercialisation of Ethiopian agribusiness.

MSME Agencies

In partnership with different development partners and investors, the Micro and Small Enterprises Program provides training, market linkage, working facility and finance support to individuals and groups citizens wishing to start their own business. The Federal Micro and Small Enterprises Development Agency has centres to provide integrated and coordinated support services

for MSE operators at woreda level. The centres provide licensing and registration, advisory, and training facilitation services like market and credit access provision, through microfinance institutions.

Startup hubs and donor-based incubators

Innovation hubs and business accelerators provide ecosystem services to these entrepreneurs to innovate products and services, to start new business ventures and also accelerate existing business. This includes mentoring and coaching, advisory services on business model development, financial management, leadership, human resources and other topics. The number of hubs and incubators in Ethiopia is still relatively small, but they are gaining a substantial amount of support from development partners, private sectors and government bodies like the Jobs Creation Commission. Almost half of them are concentrated in Addis, and focus on various sectors such as waste management, renewable energy, agriculture and digital technology. The largest and most well-known are Bluemoon, Xhub Addis and Ice Addis. From the side of the government, the Agriculture Transformation Agency (ATA) has set up the Ethiopia Sustainable Agribusiness Incubator (ESAI) and the Ethiopian Agribusiness Accelerator Platform (EAAP), with support from USAID.



7

What's next?

WHERE TO FROM HERE?

As O-farms, we believe this research provides the right basis to start working with SMEs, farmer cooperatives and entrepreneur support organisations (ESOs) to help realise different business opportunities and circular use cases. The project has now selected a local ESO who will receive extensive capacity building, both on general business development principles, as well as in-depth circularity principles. Based on the findings in this report, the capacity building will also focus on the ecosystem, creating a pipeline and stronger advocacy. Together with selected experts from both Bopinc and Vilcap, the ESO will run a cohort of business acceleration with selected circular agribusinesses. In the first quarter of 2021, we will launch our first call for proposals to SMEs to apply to join the project's first accelerator cohort, where we have room for ten promising SMEs.

These agribusinesses will not only strengthen their business skills and equip themselves to better access financial resources, they will also benefit from in-depth innovation support to optimise the implementation of their circular agribusiness ideas. From this landscaping study, we've learned that the development of circular agribusiness in both Kenya and Ethiopia is really at its infant stages. As we expect to significantly contribute to the maturing of circular agribusiness, we will put a strong emphasis on drawing learnings from the progress these agribusinesses make, as well as from the ESOs that are supporting them and from O-farms as a whole.

In the second half of the project, different activities will be implemented to disseminate these lessons learned, and show the best practices that the agribusinesses and the ESOs have developed on circular agribusiness. With this dissemination, we aim to trigger other companies, ESOs and other support

organisations to replicate the best practices from the project, and to positively influence researchers to do more applied research on circular agribusiness. We hope to inspire the development of policies that can create a (better) enabling environment for circular agribusiness.

Collectively, we believe that this should lead to a generation of agribusiness SMEs that are capacitated and recognised as drivers to transition towards a more circular food system in Kenya and Ethiopia.

Would you like to know more about this research, O-Farms as a project, or are you interested to join us as a mentor, business coach or in any other meaningful way? Please do not hesitate to reach out to our team in Kenya. For further details, please check out our project partner websites.



8 O-Farms partners



IKEA Foundation

The IKEA Foundation is funded by INGKA Foundation, owner of the Ingka Group of companies. The IKEA Foundation focuses on creating brighter lives on a liveable planet through philanthropy and grantmaking.

www.ikeafoundation.org



At Bopinc, we believe that the best products should be available, where they matter most. Fulfilling aspirations and needs is key. Through the power of entrepreneurship, every new idea is turned upside down and inside out. Until we find the right innovation, right for low-income communities. From startups to multinationals, we help organisations to design and deliver inclusive, commercially viable business models. Our diverse team of global innovators and entrepreneurs, bridge the gap between private and development sectors.

www.bopinc.org



Village Capital partners with sector-aligned leaders to inclusively identify and holistically support entrepreneurs addressing critical challenges in climate change and economic empowerment through targeted venture development programs proven to help entrepreneurs build stronger companies. Since 2009, Village Capital has supported more than 1,200 entrepreneurs around the world. Those entrepreneurs have gone on to raise more than \$4 billion in follow-on investment, create over 13,000 jobs, and reach more than 40 million people with critical products and services.

www.vilcap.com

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INTERNAL SECTION

9 Insights for O-Farms

NOT FOR PUBLICATION

O-Farms aims to successfully scale the business models of twenty Ethiopian SMEs between 2021 and 2023. We also intend to strengthen the capacities of ESOs and other business development service providers. To work with many more agribusiness SMEs in Ethiopia on circular business models, increase the appetite of impact investors, and other funders. To finance circular agribusinesses, and where possible influence policymaking through demonstrating tested and proven business models for circular agribusiness. Looking at the key outcomes of the research, O-Farms will consider adopting the following ideas or initiatives.

MAINTAIN BROAD SECTORAL APPROACH TO CIRCULAR AGRIBUSINESS

Even though in this research, five concrete business opportunities for circular agribusiness were identified, its recommended that O-Farms is not limited to these sectors in the search for promising circular agribusiness SMEs. The main reason for this is that relatively few existing examples of SMEs or farmer cooperatives taking up these business models were found. Focusing only on these five business opportunities would limit the potential pipeline of SMEs to successfully select twenty promising SMEs. The limited number of proven circular agribusiness models identified in Ethiopia is also an important reason to bring inspiration and case studies from successful circular agribusiness active in other geographies into the project. This can be done as part of the curriculum, but it can also be considered to get them involved in the project as (remote) mentors to participating SMEs.

ACTIVELY ENGAGE GOVERNMENT ACTORS

Even though the primary focus is and should continue to be on working with SMEs and ESOs, the active role that the government of Ethiopia plays in the agricultural sector cannot be underestimated. On the one hand the government can play a facilitating role in making the connection and leveraging the potential of government-led initiatives, such as the development of the earlier mentioned agro-industrial parks and the collaboration with university programs. On the other hand, potential successful business cases for circularity under O-Farms can and should be leveraged, to convince the government to reconsider certain policy decisions. Such as the current reluctance to accept business activities around the production of insects as a source of protein for animal feed.

WIDER APPROACH CAPACITATING THE BUSINESS SUPPORT ECOSYSTEM ON CIRCULARITY

The original intent of O-Farms was to train one selected ESO that will also work with O-Farms founders Bopinc and Vilcap, to implement the business accelerator activities with the twenty companies. However, in the assessment of the capacities of different ESOs, it became clear that the relatively “young” ecosystem of business support to SMEs could considerably benefit from further capacity building, not just on the concept of circular economy and circular business models, but also on general business development curriculum.

BUILD AN ACTIVE KNOWLEDGE MANAGEMENT AGENDA

Being the first business accelerator program specifically focusing on circular agribusiness in Ethiopia, it is critical that the lessons learned in implementing the project and working with a diversity of SMEs, are actively captured and disseminated with a wide variety of stakeholders. The project should also actively involve member-based organisations in the agricultural sector such as the Africa Agribusiness Academy, but also with government actors such as the Federal Cooperative Agency and through expert organisations such as the Africa Circular Economy Network (ACEN) chapter in Ethiopia.

EARLY INVOLVEMENT OF FINANCIAL SERVICE PROVIDERS AND GRANT MAKING PROJECTS OR ORGANISATIONS

It is clear that the development of circular business models with Ethiopian agribusiness SMEs needs funding. At the same time, few opportunities for this in Ethiopia were identified. This might have to do with the overall lower levels of financial support and access to finance for Ethiopian SMEs, but it is also likely caused by limited understanding with these providers on the business potential for circular agribusiness.

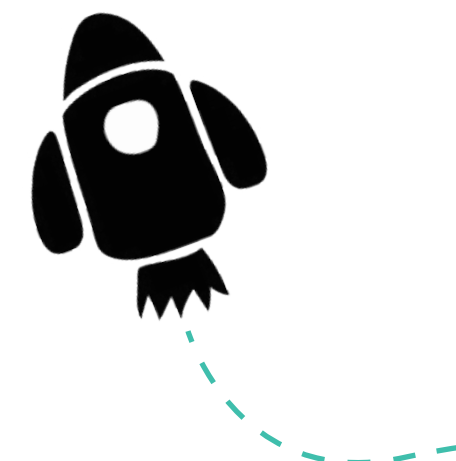
For this reason, it is advised that these organisations where possible are involved early on in the implementation of the project. This can for instance be done through involvement in selection committees, as mentors or as contributors to the business training curriculum. Building an active relationship with financial institutions and grant makers will help to close the gap in understanding between them and the circular agribusiness SMEs that O-Farms will work with.

INVOLVING SMALLHOLDER FARMERS AND THE WIDER FOOD SYSTEM

One of the main challenges during this research was to better understand what role smallholder farmers could exactly play in the different circular business models identified. This partly had to do with a lack of data on smallholder involvement in different value chains, but also with the limited information that SMEs were able and willing to disclose in various interviews conducted.

Nevertheless, the role of smallholder farmers in the Ethiopian agricultural sector is considerable and should be leveraged by O-Farms to increase the social impact of the project. Relevant entry points for this, that were also identified in this report, are the main farmer cooperatives and unions spread across the country. Another important point to take into consideration is the wider food system in which these different circular business opportunities are embedded.

It was clearly identified that challenges such as the reliability and consistency of supply of food losses and by-products (a critical source for circular business models) can be a considerable barrier for many companies. Such barriers can only be overcome by wider collaboration in value chains and across food systems. For this reason, O-Farms will actively collaborate with the different relevant agricultural development projects and organisations in Ethiopia.



A

Resources

- 1:** [FAO & National Geographic \(2016\)](#)
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- 3:** [African Development Bank Group, Africa Circular Economy Facility \(ACEF\)](#)
- 4:** [IIED, Transitioning to a low-carbon economy. Lessons from Ethiopia's progressive climate policy](#)
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- 8:** [Challenges and prospects of agricultural production and productivity, Munich, GRIN Verlag](#)
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- 10:** Federal Democratic Republic of Ethiopia Central Statistical Agency Agricultural Sample Survey 2020/21 [2013 E.C.] Volume II, Report on livestock and livestock characteristics.
- 11:** [World Bank Country Overview, Ethiopia, March 2021](#)
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- 13:** How big are post-harvest losses in Ethiopia? Evidence from teff. ESSP II Working Paper 93. Washington, D.C. and Addis Ababa, Ethiopia: International Food Policy Research Institute (IFPRI) and Ethiopian Development Research Institute (EDRI).
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- 18:** [WUR, The residue of the Process, Fertiliser for Crops and Aquaculture](#)
- 19:** Coffee Husk Highly Available in Ethiopia as an Alternative Waste Source for Biofuel Production. International Journal of Scientific and Engineering Research.
- 20:** Effect of conventional milling on the nutritional value and antioxidant capacity of wheat types common in Ethiopia and a recovery attempt with bran supplementation in bread. Food Science and Nutrition.
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B

Full case studies

To illustrate the potential of circular agribusiness in Ethiopia, throughout the report we have been referring to four case studies we developed, two from Ethiopia (Sossi and Galani Coffee) and two from elsewhere in Africa (Inseco and Waste Transformers). The full versions of the case studies can be found in this Annex.



Galani Coffee

Valorising by-products in the coffee sector

Introduction

In the land of its origin, Ethiopia, coffee plays a significant cultural, economic and livelihood role. With an annual capacity of more than 260,000 metric tons, Ethiopia is the world's seventh largest producer of coffee, and Africa's top producer. Half of the coffee is consumed domestically with the remaining exported, contributing to the nation's top commodity for earning foreign exchange. Next to the overall level of losses in the production and processing of coffee, the processing (drying, dehusking etc) also creates considerable streams of by-products.

The challenge

Processing coffee is a lengthy, multi-step process. It's still mainly done manually either by sun-drying of un-pulped cherries or by wet processing. Washed (wet processing) coffee accounts for 29% while sun-dried accounts for 71% of all processed coffee. To make a cup of coffee only 0.2% of the coffee bean is used and the remaining 99.8% goes to waste. This is also where the lifecycle usually ends – beans are harvested, roasted, ground, and the coffee is made.

The main by-product of the washing stations, the coffee husk and wastewater are discharged into rivers, causing significant pollution to river bodies and affecting broader water ecosystems. To prevent this and of course to meet environmental standards, many coffee processors are introducing agricultural waste management on coffee husks through conversion into energy source, compost or raw material for production of boards. Notable examples include Coffee Processing and Warehouse Enterprise (CPWE), making briquettes from the husk for local markets.

A solution

In terms of volumes, the coffee cherries (pulp, husk etc) are the biggest source of by-products coming from coffee production. Galani Coffee, owned by Moplaco plc, is one of the companies that is using (dried) coffee cherries to make a completely new product, called cascara. Even though the use of dried coffee cherries to make beverages is part of a long and old tradition in Ethiopia, its commercialisation is quite new.

Moplaco collects and dries the coffee cherries in their processing stations in Yirgacheffe and Sidamo Bensa, for further processing at the central facilities in Addis Abeba, where it is mixed with a variety of spices to create a unique taste. The product that comes from it, simply called cascara, can be used to brew a tea-like infusion that is fruity and herbal and has caffeine levels similar to black tea. The market demand for this product is growing, and 300 grams of cascara is sold for 75 Ethiopian Birr, which is around €1.40.

The production of cascara and the national market sales (note small volumes are sold internationally, but strict product standards make it difficult to increase this volume), has been one of the outcomes of a broader trial by the company to valorise the coffee cherries. As the drying of the cherries is quite intensive, and big volumes of cherries are needed to create final dried products, it is a challenge to find the sweet spot for the business model.

Next to making the cascara tea, the company has also looked into making cakes, biogas, compost or other products from it, together with the farmers. Biogas or briquettes from the coffee cherries could also help to provide clean energy for powering the processing stations. At the time of writing, Galani Coffee is continuing to explore the opportunities for alternative uses, engaging more with other companies, and the broader coffee-growing community.

The benefits

Next to treating the wastewater created by coffee processing (which is out-of-scope for this particular research summary) there is a great environmental need, and also great circular economy potential in valorising the by-products from coffee processing. As you can see in this case study, the ideas around valorisation (beyond the production of compost at farmer level) are still in very early stage and have significant potential, not only as higher-end products like the cascara tea, but also for the production of briquettes and other potential use cases. The potential benefits can be considerable, for instance on a social level, where these (new) business activities will create more jobs and more income for farmers. And obviously, on an environmental level, it helps to combat the pollution of rivers, and the use of the cherries for composting helps to restore the level of nutrients in the soil. Galani plans to install a biogas digester at the washing stations to further create opportunities for processing the coffee husks, as the supply is currently outpacing the opportunities for development of products like cascara.





Inseco

Producing animal feed, oil and compost from insects fed with food waste

Introduction

Inseco is a South African company founded in 2017 and produces insect-derived proteins from food waste. It has its main factory in Cape Town and is the largest insect protein facility in the southern hemisphere. Using their team of industry experts, they have developed an interesting business model offering decentralised production of animal feed, oil and compost.

The challenge

One of the key challenges for livestock farmers is the price of animal feed. As Inseco puts it, animal feed is the single most expensive variable in livestock production, comprising approximately 65% of total production costs. Livestock farmers are looking for animal feed that is promoting the health and growth of their livestock, combined with affordable and less volatile pricing.

A second challenge is that current environmental costs of producing animal feed, composts and oils is high, with its land and water usage, greenhouse gases and overfishing for fishmeal. Finally, there's the challenge of how to manage food waste that is coming from local food factories, supermarkets, farms and restaurants. This to prevent the food waste from ending up in landfill and emitting more damaging gases.

A solution

Inseco offers protein-based products, derived from Black Soldier Fly (BSF). Through a rigorous R&D process of over five years, the team of Inseco and its Cape Town factory have developed high quality and protein-rich animal feed, oil and compost.

The animal feed is a sustainable, quality insect protein derived from BSF larvae that can be fed to all monogastric animals including fish, chickens, pigs and pets. It is a 55% protein feed ingredient with a digestible blend of essential amino acids, demonstrated by feed trials and peer reviewed literature.

The oil is extracted from Inseco's larvae with a high concentration of lauric acid. It is suitable for use in aquaculture feed, pet food and as a replacement for less sustainable oils such as fish oil, coconut and palm oil. In another format, Inseco's larvae can also be used for industrial purposes in pharmacy, food processing and agriculture.

The compost is the larval residue or compost that is left over at the end of Inseco's process. High in nitrogen, phosphorus and potassium (N-P-K), it is an organic soil conditioner.

Currently, Inseco has just finalised its new decentralised insect protein process, whereby a shipping container production unit processes 30 to 90 tons of waste per month. The Cape Town factory will supply these decentralised units with the eggs from the insects. The units can be operated autonomously by livestock farmers or agribusinesses, and it can produce animal feed, oil and compost. This model was developed to reduce costs for agribusinesses to start producing with BSF.

The benefits

The animal feed shows a 25 to 55% increase in livestock production yields and is healthier than conventional feed products. Furthermore, research has shown that insect feed reduces the need for antibiotics. This leads to a 20% cost reduction for livestock producers. With its decentralised units, Inseco is offering agribusinesses the opportunity to produce their own high quality animal feed, oil and compost from local food waste, without depleting land and water sources. This leads to improved food and nutrition security. By valorising local food waste, Inseco is creating business and employment opportunities for local food waste collection.

Zooming in on the environmental benefits, per ton of insect protein used in place of fishmeal, five tons of wild fish are left in the ocean. Furthermore, Inseco's insect feed uses 160x less water than soybean meal and the insect fertiliser emits 47x less greenhouse gases than regular composting.





Ethiopian BBZ Foods

Making nutritious foods from soya processing by-products

Introduction

For the 2020/2021 season, soybean production in Ethiopia is estimated at 200,000 MT in response to growing local demand for cooking oil, soy-based foods, and corn-soy blend for emergency food assistance programs (World Food Program alone has a total annual demand of 60,000 tons), poultry and livestock feed.

New edible oil manufacturing plants like Phiblea plc and Richland plc will also expand soybean demand. Sourcing soybeans from the local market, the recently inaugurated Richland oil processing has a capacity of producing 1,400 tons of edible oil daily and is expected to cover 60% of the country's oil demand.

The challenge

The sizable volumes of soybean produced in Ethiopia are mostly used to extract oil from. This is the primary product coming from soybean processing. The leftover product, soybean cake, is also still very rich in dietary fibre, proteins and compounds – with antioxidant properties. However, it's only minimally processed into food products for human consumption. Most of the cake goes into animal feed, but also certain volumes are exported.

At the same time, the levels of undernutrition are still high across the Ethiopian population. The Cost of Hunger in Africa, a report by the World Food Program, estimates that Ethiopia loses 16.5% of its GDP annually due to malnutrition-associated health and productivity issues. Sources of protein, such as red meat or dairy, are relatively expensive and prices are substantially increasing.

A solution

The Ethiopian BBZ Foods, under the licence of Promasidor I.P Holdings Ltd, is processing soybean cake into a consumer product that is called Sossi soybean chunks. The product contains an average of 40% protein and is high in omega-3, vitamin B9, iron, magnesium, calcium and dietary fibre. Other flour processing and nutritious biscuit making companies are also following suit to use the defatted soybean press cake as a protein ingredient.

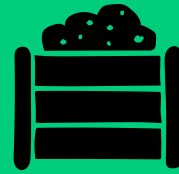
From a consumer point of view, Sossi is a highly attractive protein alternative to meat. A pack of 100 gram is sold for 14 Ethiopian Birr or around €0.25. At current market prices, 100 gram of red meat costs around 35 Ethiopian Birr, which is considerably more expensive. The company invests intensively on advertising cooking recipes to bring awareness and consumer behavioural change to switch to this plant-based alternative to protein.

The benefits

The Sossi soy chunks provide consumers an affordable source of protein that is tasty and can be easily used as a meat replacement. The demand for the product is increasing due to its attractive pricing and intensive marketing campaigns. The set price makes it almost three times as affordable as buying red meat, which will also make the product attractive to low-income consumers.

At the same time, the growing demand for the chunks gives farmers and processors an extra market pull. Farmers will be able to sell more soybeans whereas oil processors have a steadily growing and more reliable alternative for selling their soybean cake.

The final benefit worth mentioning is that the different nutrients in soybean cake are now retained directly for human consumption, and not being fed to animals, which is a more suboptimal use, or being exported to other markets. For a country like Ethiopia, that is still struggling with malnutrition despite the strong economic growth rates, this is essential for a healthier and more productive population. This case is a great example of where human nutrition and circular business models go hand in hand.



Waste Transformers

A decentralised solution to turn food waste into biogas and fertiliser

Introduction

Waste Transformers is a social enterprise with a presence in the Netherlands, South Africa and Sierra Leone. It's helping businesses and municipalities turn their own organic food waste streams into biogas and fertiliser, on site without the need to transport the waste.

The challenge

Currently, food waste is at the centre of many global challenges. A reduction in food waste rotting on landfill leads to less natural resource depletion and degradation and less greenhouse gas emission. Examples of food waste producing organisations are restaurants, hotels, malls, food production companies, office buildings, universities and public buildings. Organic waste (such as consumer food waste, abattoir / agricultural production, and garden waste) is currently one of the largest waste streams in South Africa, and by 2022 the government is looking to halve the organic waste that ends up in landfill. However, municipalities and other relevant stakeholders are not at all prepared to address this huge challenge, whereas the streams of organic waste could be great inputs for renewable energy but also for producing affordable compost and fertiliser, which are needed by smallholder farmers, who struggle to improve their soil fertility without using expensive chemical fertilisers.

A solution

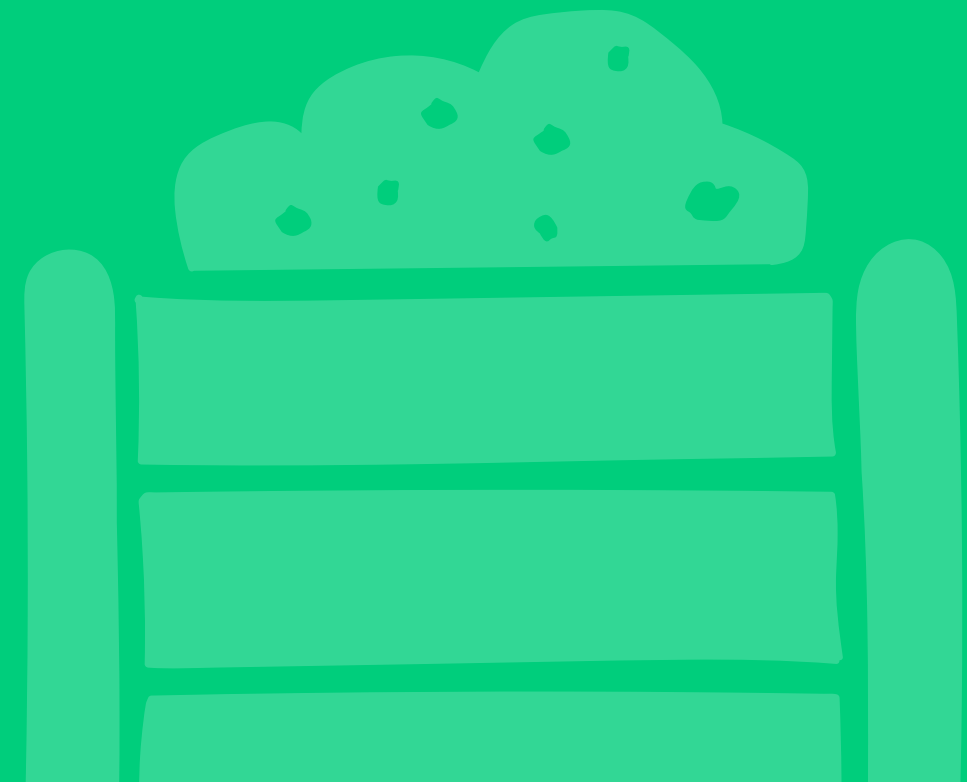
Waste Transformers provide an on-site, containerised, modular anaerobic digester, in which organic waste can be digested and turned into biogas and organic fertiliser. It is placed next to companies or in communities who produce considerable volumes of food waste. As it is a modular solution, different sizes of the containers can process between 600 kg to 3,600 kilograms organic waste per day. The biogas is converted into biogas or electricity and heat and can be fed back into the same "infrastructure" where the waste is being produced. Consequently, the biogas digestate, also known as the "brown gold", can support local farmers with their current poor nutrient supply and poor soil structures. By using it as a natural fertiliser, nutrient cycles are closed, eventually leading to increased fertility, functionality, microbial activity, aeration, and water storage capacity of the soil.

In South Africa, a Cape Town city mall has placed a Waste Transformer next to their garbage collection hub at the back of the shopping mall, for a part of their energy supply. Each tenant throws away only non-consumable, organic, food waste into separate recycling bins, which are collected daily. In addition, in Johannesburg and in Sierra Leone, the Waste Transformers are piloting their model to work with 40 local entrepreneurs that operate the Waste Transformer units as franchisees, managing (sourcing waste, processing and selling products) independently.

The benefits

The Waste Transformers can transform food waste from local businesses into biogas and organic fertiliser. They are plug-and-play: the process is entirely on site without expertise required. They offer local youth entrepreneurs an income opportunity by selling and managing units. To make this concrete: the smallest unit (processing 600 kilograms a day) could lead to the following annual savings: 197,000 kilograms of waste

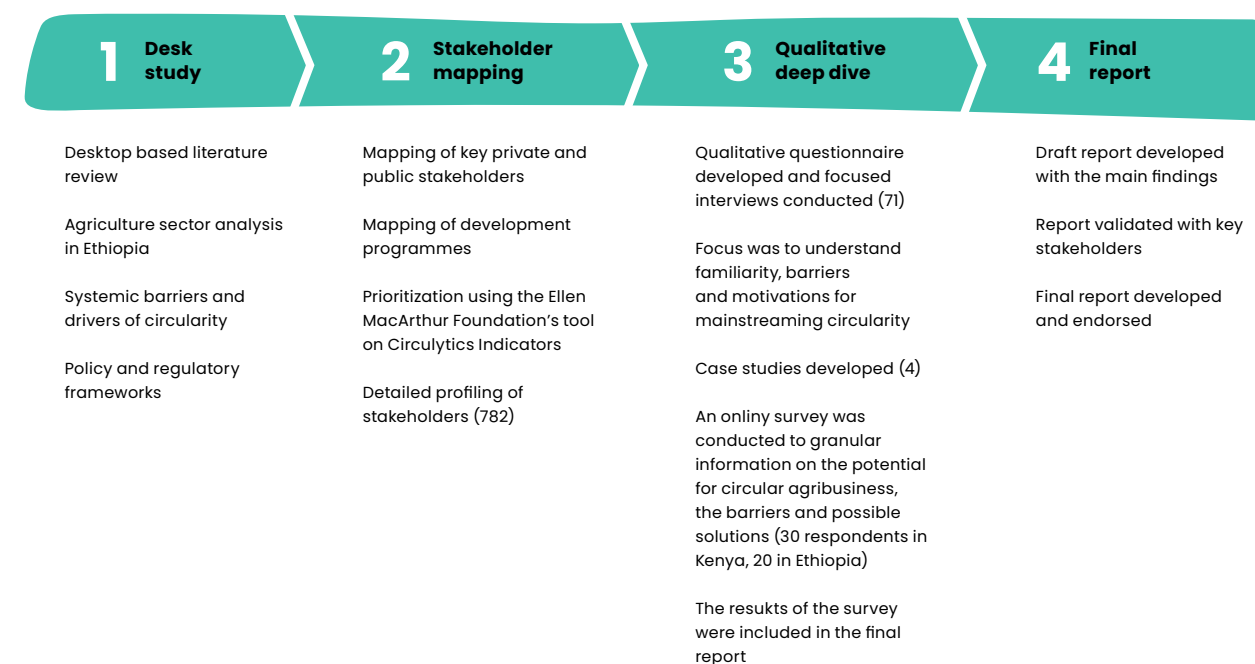
not being transported to landfill, combined heat and power savings of 120,000 kWh and 165 tonnes of fertiliser and compost for replacement of bought fertiliser. To date, in Amsterdam, Freetown and Cape Town, the Waste Transformers have recycled 438,000 kilograms of waste, saved 365,000 litres of water and extracted 512,000 litres of organic fertiliser.



C

Research process

Research process



Interviews and workshop participants

For the interviews and during the validation workshop, the following institutions were involved:

Abyisinia Honey
 Addis Ababa Waste Management Agency
 ADDIS KETEMA SWEETS FACTORY PLC
 Addis Modjo Edible oil company
 Agriterra
 Association of Ethiopian Microfinance Institutions
 BeNu Foods
 Beza Mar agro plc
 Blue Moon Ethiopia
 CALS & XHUB Ethiopia
 City Government of Addis Ababa Job Creation and enterprise Development office
 Coffee Processing and Warehouse Enterprise
 Dil Edible Oil
 Entrepreneurship Development Centre
 Ethio Agrinet
 Ethiopian Animal feed Industry association
 Ethiopian Aquaculture Association
 Ethiopian Chamber of commerce and sectoral Association
 Ethiopian Fruit and Vegetables Processing Industry Association
 Ethiopian Honey and Beeswax Production and Export Association

Ethiopian Horticulture Producer Exporters Association
 Ethiopian Investment Commission
 Ethiopian Leather Industries Association
 Ethiopian Leather Industry Development Institute
 Ethiopian Meat Producer-exporter Association
 Ethiopian Pulses Oilseeds and Spices processors exporters
 association
 Ethiopian Seed Association
 Ethiopian Sugar and Suits Producers Association
 Ethiopian Youth Entrepreneurs Association
 Family milk
 Federal Cooperative Agency (FCA)
 Food secure circular schools
 GAIN
 Galani coffee
 Grand bakery
 Grohydro
 Growth Africa
 Guts Agro plc,
 Ice Addis
 IFDC
 Industry Park Development Cooperation
 Jobs Creation Commission
 Melaku Poultry – farm and feed processing
 Ministry of Agriculture
 Ministry of Innovation and Technology
 Ministry of Trade and Industry
 Ministry of Urban Development and Construction
 Prime Plc
 Sheba Socks
 Shemu oil
 Silew Mushroom and Spawn Production
 SNV
 Soil and More
 Sosi Soya
 Technoserve
 Tsefa Girma – coffee and spice plantation
 UNDP
 UNEP Addis Ababa Liaison office
 UNIDO
 VitaBite
 Yordanos coffee consultancy
 Yunus Environment Hub
 Zaffree Paper



O-Farms

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