



REPORT

Scoping study on circular and regenerative agriculture in target areas in Kenya and Rwanda of REALMS



Client: SNV Kenya & Rwanda

Author:

Elke Nijman (Ing., MSc.)

Date: 12.03.2021

Contact:

elke@circularafrica.com

www.circularafrica.com

List of acronyms

CIP: Crop Intensification Programme
CPIC: Centre for Cleaner Production and Climate Innovation
ICRAF: World Agroforestry Centre
IPM: Integrated Pest Management
GoK: Government of Kenya
GoR: Government of Rwanda
KARLO: Kenya Agricultural and Livestock Research Organisation
KCSAS: Kenyan climate Smart Agriculture Strategy
KEBS: Kenya Bureau of Standards
KOAN: Kenyan Organic Agriculture Network
MCC: Milk Collection Centre
MESPT: Micro Enterprises Support Programme Trust
MinAgri: Ministry of Agriculture
MoE: Ministry of Environment
NASMP: National Soil Management Policy
NIRDA: National Industrial Research and Development Agency
RAB: Rwanda Agriculture Board
ROAM: Rwanda Organic Agriculture Movement
SDC: Swiss Agency for Development and Cooperation
WETPA: Western Tree planters association

Contents

Executive summary	4
1. Introduction of the assignment	7
1.1 Project background and objective of the assignment	7
1.2 Methodology of the assignment.....	8
1.2.1 Task 1 Status quo of regenerative and circular agriculture in Rwanda & Kenya	8
1.2.2 Task 2 Stakeholder mapping	11
1.2.3 Task 3 Circular and regenerative business cases	11
1.2.3 Task 4 Policy Review	11
2. Status quo of circular and regenerative agriculture in Rwanda & Kenya	13
2.1 Rwanda’s Food system.....	13
2.2 Kenya’s food system	25
3.Stakeholder mapping.....	37
3. Policy review	41
3.1 Rwanda	41
4.1.1 Institutional framework	41
4.1.2 Relevant policies	41
4.1.2 Policy gaps.....	46
4.2. Kenya.....	48
4.2.1 Institutional framework	48
4.2.2 Relevant policies and regulations	49
4.2.3 Policy gaps Kenya	55
5.Business cases.....	57
6.Recommendations	58
Attachment	64
Attachment 1.	64

Executive summary

SNV recently launched a new 4-year project, called REALMS, Regenerative Agriculture practices for Improved livelihood and markets in Kenya and Rwanda. This project aims to improve the livelihood of farmers through the adoption of regenerative and circular farming practices. In preparation for the project implementation, SNV wishes to identify the current state of regenerative agriculture and policies, policy gaps, and the potential business cases and stakeholders in Kenya and Rwanda. Therefore, this scoping study is conducted to inform REALMS about the current regenerative agriculture practices and policies in place, but also to identify business cases and relevant stakeholders for potential partnerships. This abstract summarizes the different areas that are investigated, and highlight per topic some of the formulated recommendations. Other recommendations are included in **chapter 6**. The acronyms that are used in the abstract are explained in **the list of acronyms** (p.2).

State quo of circular and regenerative farming

It can be concluded that farmers in Kenya and Rwanda apply circular and regenerative farming practices such as the application of low quantities of home-made compost/animal manure, and biological pest control. However, most of the farmers are not introduced to biological pest control, since this has not been promoted among farmers. In Kenya, we identified a few farmers who apply home-made-biopesticides or buy biological pest control products, in Rwanda we only identified one cooperative (Kopedush) that applies home-made biopesticides. Different from Rwanda, in Kenya we also identified farmers that apply only organic inputs and shifted to organic farming. Furthermore, farmers also apply regenerative practices through mostly intercropping, crop rotation and agroforestry. The interviewed Kenyan farmers have more advanced agroforestry practices in place than the Rwandan farmers.

Despite the practices in place, there is a great opportunity to upscale these practices. At this moment, the majority of farmers apply hybrid farming techniques, whereby they combine organic farming inputs with mineral fertilizers (e.g. DAP/NPK) and pesticides – or in some cases in Kenya, they even only apply mineral inputs. There is a large need to upscale practices by extending the traditional knowledge of farmers about the production of high-quality compost, and how to apply compost. Especially in Rwanda, farmers are concerned about the productivity of organic farm inputs on their crops. One of the biggest challenges is that farmers have not enough access to biomass to produce compost. A solution to overcome this is to identify waste hotspots in the neighbourhood. It seems that the food markets/town could play a role in this, however, waste separation is a problem in both countries. This would require a common approach with the local government to solve this problem. Food markets and food processors could be easier entrée point since they are a hotspot of organic waste. Especially in Kenya, there are possibilities to utilize by-products of food processors (e.g. tea, coffee, and sugarcane processors) and to transform this into farming inputs and beyond, since there are several food processors in the target areas. For food processors, it would also make economic sense to reduce their costs for waste collection or to improve the work environment by “removing” the by-products from the production facility. Since the production of compost is time-consuming and some farmers are giving up on this, it would be recommended to work together with service providers. Service providers could take care of quality process and pay their full attention to the commercial production of high-quality compost and other organic farming products (e.g. biochar, bio-briquettes, insect-based animal feed etc.). Furthermore, organic farm inputs should be cheaper than mineral inputs to ensure that farmers adapt to these inputs.

SNV could play the role to demonstrate the impact of the organic farm inputs to farmers, by training farmers on how to apply organic farm inputs and biological pest control products of service providers, and by establishing financial mechanism so that farmers can apply these products in the long term. In

case, SNV would train farmers on how to produce compost, it would be recommended to do this step by step through regular and follow up trainings to make sure that farmers successfully adapt to these practices. For the complete analysis, this study refers to the in-depth sights in **chapter 2**, and the recommendations in **chapter 6**.

Stakeholders

This study has identified about 80 Kenyan and Rwandan stakeholders that are included in the stakeholder mapping (**chapter 3**) and in the submitted **excel spread sheet**. It is highly recommended to explore collaborations with partners that implement similar project to create comprehensive projects, and to increase the impact on the target groups. In Kenya, there is a great opportunity to work together with MESPT and KCIC that have similar goals. MESPT is in the inception phase to set up a 5-year project to introduce farmers to regenerative farming practices in counties that overlap with REALMS, and also to provide links between service providers and farmers. KCIC provide start-ups and existing companies with technical and financial support that focus on regenerative and circular solutions (e.g. organic fertilizers, biogas, insect-based animal feed etc.). Also, KOAN could play an essential role to assist with advocacy, legislation, training of farmers and the certification process organic farming. ROAM could play a similar role in Rwanda. In Rwanda, SNV could explore a partnership with the business incubator programme “the Lab of Tomorrow” that is focused private sector development towards circular food systems. Optional, SNV Rwanda could explore if it would be possible to collaborate with the sister company of NIRDA, called CPIC, to provide services to companies towards circular economy practices, industrial symbiosis and green production. CPIC has the objective to establish an innovation/technology hub to test green technologies, but in 2020 there was a lack of finance to do this.

A multi country-level collaboration could be investigated with ICRAF to tap on their work- and advocacy experience in regards to agroforestry in Rwanda and Kenya. Lastly, it is recommended to align REALMS with the resources of other SNV projects, such as the Biogas project and the Veggies for the Planet and People, which is funded by the same donor of REALMS. For the complete stakeholder analysis this study refers to **chapter 3**, and **chapter 6** for other recommendations.

Policy review and gaps

This study has identified several relevant agricultural, agroforestry and waste management policies in Kenya and Rwanda, that links with the objectives of REALMS that are presented in **chapter 4**. Waste management policies are included since they provide the ability to unlock potentials to transform organic waste into farm inputs, energy and beyond for service providers. The next following policies are the most relevant identified policies for REALMS:

Type of policy	Kenya	Rwanda
Agricultural policy	Kenya Climate Smart-Agriculture Strategy – MinAgri	Strategic Plan for Transformation of Agriculture phase 4 – MinAgri
Agricultural policy	Draft National agricultural soil management policy - MinAgri	National Fertilizer Policy - MinAgri
Waste management policy	Environmental and coordination act and regulation (current policy) - MoE	National Sanitation Policy - MinInfra
Waste management policy	Draft Sustainable waste management Act and policy (upcoming policy to replace the previous waste management policy) - MoE	National Environment and Climate Change Policy - MoE
Agroforestry policy	Draft National Forest Policy - MoE	Rwanda National Forestry Policy
Agroforestry policy	Draft Agroforestry Strategy	Agroforestry Strategy

In both countries, there are identified policy gaps that should be addressed by REALMS to improve the enabling environment. For instance, in Kenya, it is stressed that there is a gap between the national policy and implementation at the county level due to lack of resources, budget planning and allocation or national policies are too general for the counties. It is remarkable that several relevant policies are not finalized, such as the National Agriculture Soil Management Policy (NASMP), National Forestry Policy & Agroforestry Strategy, and Sustainable Waste Management Policy. According to the Ministry of Environment, the adaptation of the Sustainable Waste Management Policy that aims to improve the waste management infrastructure is blocked by politicians that have an interest in the current system. As a result, that new waste management policies are not yet adopted and that waste management and separation is poorly implemented. Therefore, REALMS could advocate on adopting the Draft Sustainable Waste Management Policy to enforce waste separation. Another strategy would be to focus on the waste infrastructure & policies at the county level, rather than national policies in case this is not feasible. Also, the National Agriculture Soil Management Policy is recommended for advocacy activities, especially since it wants to establish several relevant guidelines for REALMS.

This study also identified several policy gaps in Rwanda, such as the lack of enforcement of waste separation, and the spread of waste management arrangement over different ministries and institutions. Therefore, REALMS could advocate to enforce waste separation and to allocate resources for waste separation. Not only waste separation is a challenge, but also there is no regulatory framework for biological pest control, and the government promote organic /biofertilizers complementary to mineral fertilizers. The Directorate of Agriculture Development of MinAgri is concerned that organic farm inputs are not sufficient for productivity, followed by concerns about the introduction of regenerative farming practices that interfere with the priority crops of the CIP. Therefore, REALMS could consider advocating for more flexibility within CIP, to allow regenerative farming practices with priority crops such as intercropping with priority crops, and to enable farmers with more flexibility to apply agroforestry (e.g. planting fruit trees in the priority crop areas). Although, this would also depend on which crops REALMS would like to focus on. Also, organic farming inputs could be more on the Rwandan agenda, by testing and demonstrating the yield of commercial high-quality organic farm inputs to the government.

Lastly, it is also suggested to advocate for regulations/permits for new types of businesses such as black soldier farming, since regulations do not exist and hamper service providers. REALMS could also advocate to subsidize commercial, high-quality and affordable organic fertilizers/inputs, and biological pest control to reduce the price of inputs and increase the farmer's profit. This study refers to **chapter 4** (policy review), and **chapter 6** for other recommendations.

Business cases

This study provides a list of 10 potential business cases and a framework on how to analyse circular business cases (**chapter 5 & attachment 1**). During the workshop, it was stressed that SNV would like to support existing companies with capital. Therefore, the list is focused on existing companies and cases with suggestions for improvements. The identified business cases include solutions such as the production of insect-based animal feed through black soldier fly technologies – potentially through an out-grower model, to provide farmers with biological pest control products and to produce products locally, the commercial production of high-quality and affordable organic fertilizers. The study also provides 5 value chains that could be investigated for their potentials to transform by-products of the processing activities into farming inputs, energy and beyond. This include the maize, coffee, tea, sugarcane value chains, and the potential to transform the dominant water hyacinth of Lake Victoria into farming inputs.

1. Introduction of the assignment

1.1 Project background and objective of the assignment

SNV recently launched a new 4-year project, called REALMS, Regenerative Agriculture practices for Improved livelihood and markets in Kenya and Rwanda. This project aims to improve the livelihood of farmers through the adoption of regenerative and circular farming practices. The project has three outcome areas (1) adoption of regenerative agricultural practices by smallholder farmers, leading to improved soil and water quality and improved livelihoods of smallholder farmers, (2) increased investment, business growth and revenues for local service providers of products and services supporting regenerative agriculture; and (3) improved enabling environment, favourable to market driven regenerative agriculture.

In preparation for the project implementation, SNV wishes to identify the current state of regenerative agriculture and policies, policy gaps, and the potential business cases and stakeholders in Kenya and Rwanda. At this moment, there is a great lack of information, access to data and documentation about regenerative and circular farming practices in East Africa and even less in the specific project locations of REALMS. Therefore, this scoping study is conducted to inform REALMS about the current regenerative agriculture practices and policies in place, but also to identify business cases and potential partnerships. Figure 1 below provides an overview of the REALMS goals and the focus of the assignment.

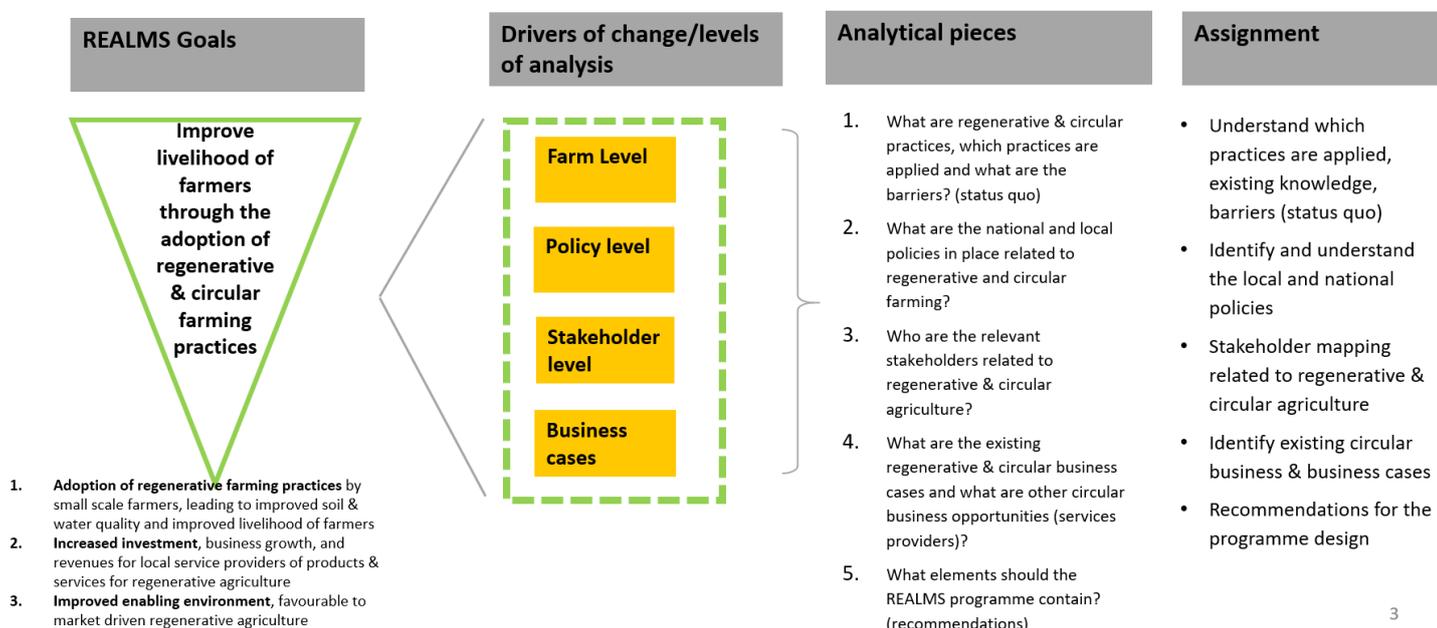


Figure 1. Overview of the goals of the REALMS project, followed by assignment goals.

1.2 Methodology of the assignment

The consultant worked on a series of tasks to achieve the assignment's objectives, as illustrated in figure 2. Each task provides outputs that in sequence build on each other. After completing the different tasks, all research findings are summarized in the final report, followed by a recommendation on the different outcome areas.

The final report has been delayed due to COVID-19 restrictions in the fieldwork activities in Rwanda, which means that fieldwork needed to be postponed due internal and government restrictions in December, January and February.

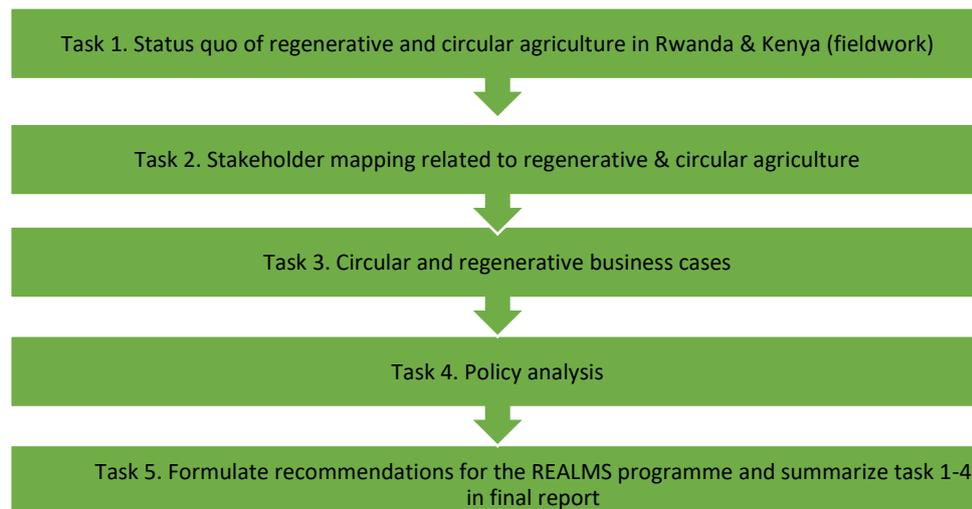


Figure 2. Overview of the different tasks of the TOR

1.2.1 Task 1 Status quo of regenerative and circular agriculture in Rwanda & Kenya

The concept: a circular food system approach

As described in the TOR, this project would like to focus on circular and regenerative farming practices with key elements such as to increase organic soil matter through practices such as composting (**regenerating soil**), **improve biodiversity and ecosystems** through agroforestry and environmentally friendly pest management, **optimum use of resources**, produce (farm) waste into **renewable energy**, **design out waste** through composting etc. The consultant used the circular economy concept and principles as input for the fieldwork, which includes the same suggested key elements of the TOR in the context of regenerative and circular agriculture and helps to identify gaps in the food system.

The circular economy approach aims to close the loop of resources, and focuses on three main principles: reduce resources (also called design out waste and pollution), re-use/keep products, resources and materials in use and regenerative natural systems (EMF, 2019). However, the REALMS project focuses on a particular subdivision of the circular economy concept, which is the circular food system concept. In our assignment, we can summarize the described concepts in the literature into three relevant principles for this assignment, which is (1) reduce waste produced, (2) re-use food/organic waste and agricultural by-products of the food system, (3) regenerative farming and food grown locally with environmentally friendly farming inputs which includes agroforestry, mixed farm

systems and the proposed regenerative practices of the TOR ([Jurgilevich et al., 2016](#); EMF, 2019). In the circular food system concept, there is a special focus to connect the rural-urban nexus, whereby organic/food waste streams of cities are transformed into organic farming inputs in the food production areas (EMF, 2019). On top of that, agricultural by-products/organic and food waste streams of cities can also be transformed into new business solutions beyond farming inputs (e.g. green energy sources, biofuel and package material).

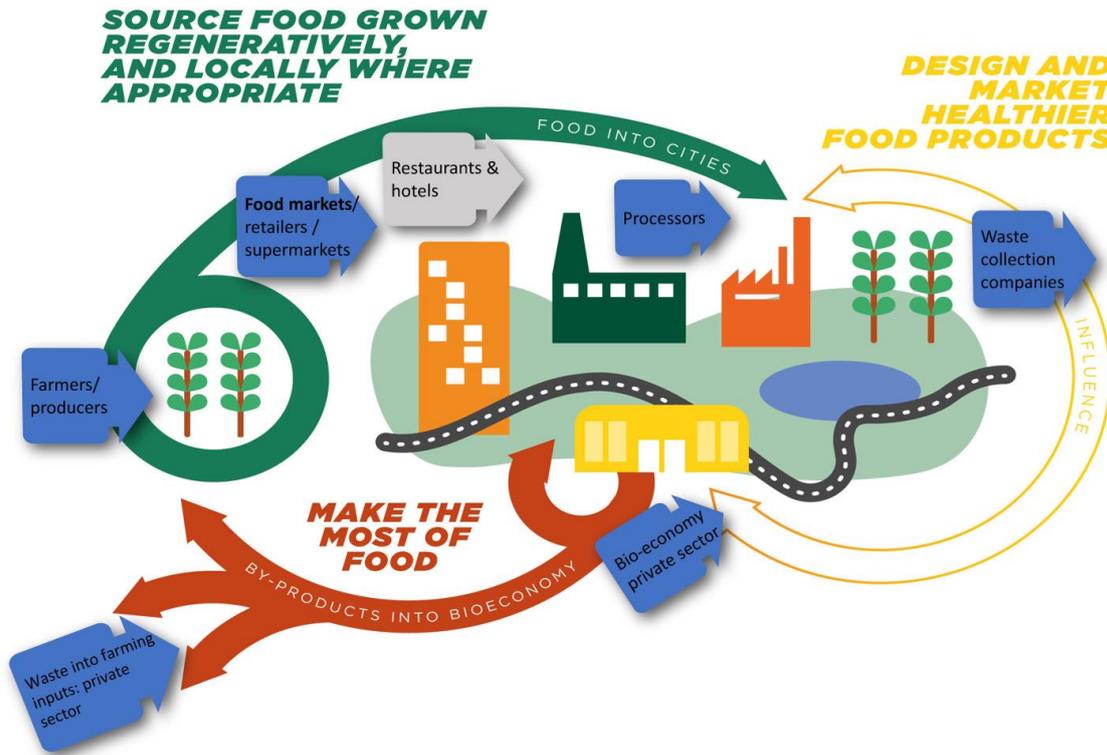


Figure 3. Overview of the circular food system, and the different stakeholders of the system (source: edited from [EMF, 2019](#)).

How can we compare the SNV concept with the circular food system approach?

The international circular food system approach focuses on their entire food system, while the term “circular and regenerative agriculture” refers mainly to the term agriculture. The circular food system approach allows us to identify gaps in the food system (figure 3). For instance, organic waste of food market, organic waste of households, agricultural by-products of food processors of the food system can be used again as farm inputs, waste into energy or beyond. This is especially relevant since most of the farmers stressed that they do not have enough access to farm - / organic waste and input services providers need access to organic waste to produce circular farming inputs. Furthermore, the global circular food system approach also covers aspects such as other types of regenerative farming practices such as intercropping, mixed farm systems and crop rotation. Although the circular food system approach covers a wider set of system dynamics, it still covers the main concept of regenerative and circular farming practices that are included in the TOR of SNV (table 1).

Table 1. Circular food system vs. regenerative and circular approach of SNV.

Circular food system approach – global concept	Regenerative and circular agriculture approach – as defined in the TOR by SNV
Reduce waste produced in the food system (also called design out waste and pollution), e.g. reduce post-harvest loss	Optimum use of resources at farm level
Re-use food/organic waste and agricultural by-products of the food system	Produce (farm) waste into renewable energy like biogas, cycling and designing out design out waste, regenerating soil
Regenerative farming and food grown locally with environmentally friendly farming inputs	Improve biodiversity and ecosystems through agroforestry and environmentally friendly pest management, regenerating soil

Fieldwork

At this moment, there is a great lack of information, access to data and documentation about regenerative and circular farming practices in East Africa and even less in the specific project locations. Therefore, the consultant collected the requested field data in the target areas and the value chains of the REALMS project in Kenya and Rwanda (figure 4). As discussed with the team, the fieldwork does not need to have an in-depth statistical analysis, but it has the goal to provide a quick scan of the status quo of circular and regenerative practices in the field.

The consultant conducted interviews with small scale farmers in the selected Project areas in Kenya and Rwanda, followed by field visits and observations. The earlier described circular food system concept and the suggested key elements of REALMS are used as the fundamentals to collect data in the field. In every county or district, 5-10 randomly selected farmers are interviewed about their current existing knowledge, understanding and implementation of regenerative and circular farming practices with a questionnaire. The questionnaire includes questions on topics such as the types of crops that farmers produce, the type of livestock that farmers keep, the types of waste produced (e.g. organic waste and agricultural by-products, manure of livestock), end-destination of waste (e.g. composting, organic fertilizers, energy, the dump of waste etc.), post-harvest loss at farm level, seasonal waste of particular farming commodities, type of farming techniques that are applied (mixed farm systems, intercropping, agroforestry etc.), existing manners of pest-management, and willingness/acceptance to work with regenerative and circular farming principles, existing policies that impact farmers related to waste management, regenerative and circular farming. During the field visit the consultant also observes which regenerative and circular practices are in place among farmers and local input providers, the environmental and local conditions of the selected areas of the REALMS project. All data are collected through a local SNV field assistant that could translate the different questions.

On top of that, the consultant also interviews stakeholders along the food system and observes locations in the field that produce high quantities of waste such as local food markets, local food processors, urban areas/or villages, waste of local restaurants/hotels (figure 3). For instance, waste from the cities, urban areas or food processors can be used as farm inputs for the production of compost/organic fertilizer (service providers). This is especially important since farmers report a lack of access to biomass to produce farming inputs such as compost. Therefore, the consultant did not

only focus on existing regenerative and circular farming practices among farmers but also focused on other existing stakeholders and their practices in the food system.

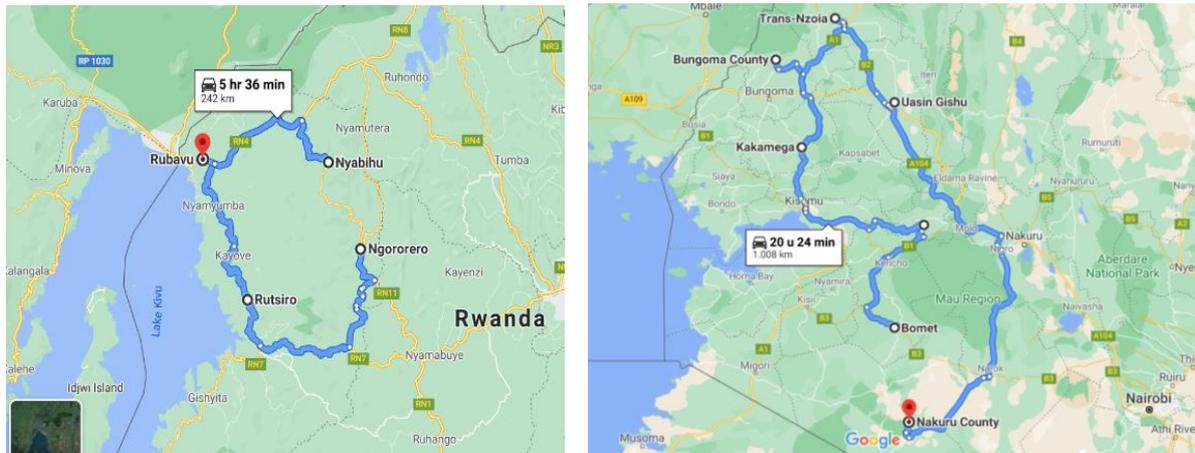


Figure 4. The project locations of the REALMS programme in Rwanda and Kenya according to the TOR, and selected areas by the team

1.2.2 Task 2 Stakeholder mapping

As stressed in the TOR, a stakeholder analysis needs to be conducted to map the key stakeholders related to regenerative and circular agriculture. The consultant identified the requested stakeholders (government, CSOs, farmer organizations, research institutions and multi-stakeholder platforms) by using the consultant network, online information, snowball methodologies by asking the SNV team and the consultant network about other relevant stakeholders. On top of that, the consultant also mapped other relevant stakeholders such as existing regenerative circular business cases, which also provides an overview of the existing circular business cases.

An infographic (figure 3) is used to map these different stakeholders and stakeholder groups along the local food system, which might help to provide a clear overview of the different stakeholders. The information of the stakeholders, such as activities and the contact information are included in an excel spreadsheet.

1.2.3 Task 3 Circular and regenerative business cases

As described in the TOR, SNV would like to receive an overview of potential business cases for regenerative and circular agriculture. During the workshop, it was stressed that SNV would like to support existing companies with capital that provide services to support small holder farmers. Therefore, the list of ten different business cases is mostly focused on opportunities that are implemented by existing companies or can be implemented by existing companies. These business cases are identified through the fieldwork, or network of the consultant.

1.2.3 Task 4 Policy Review

As addressed in the assignment, SNV would like to identify the different policies related to regenerative and circular agriculture for Rwanda and Kenya. As discussed with SNV most of the important policies are at the national level, due to the mostly top-down government structure in Rwanda and Kenya.

The consultant identifies the policies by reviewing the formal websites of the different ministries (ministry of agriculture, environment, infrastructure etc.) in Kenya and Rwanda. After that the consultant interviews the national and local government officials to identify other relevant policies, policy gaps, and relevant government activities and futuristic plans. In the policy analysis, there is a focus on policies and policy gaps related to regenerative and circular agriculture, farming inputs and organic/solid waste management.

2. Status quo of circular and regenerative agriculture in Rwanda & Kenya

2.1 Rwanda's Food system

Input providers

During the field visit the consultant also visited several input providers in the field, namely Kigali Farms (mushrooms & compost), Golden Insect (insect farming and vermi-composting), and Zamura (animal feed company). The selected input providers are located close to the target areas of SNV. Other stakeholders will be discussed in the stakeholder mapping.

Kigali Farms produce compost from chicken manure and straw for growing mushrooms in Musanze. After the utilization of compost for the mushrooms, compost can be sold to farmers, since mushrooms only have taken out their needed nutrients. The compost of the mushrooms is mixed together with cow manure and is left for decomposing before it is sold. Compost is sold to farmers in the neighbourhood (especially to popular among potato farmers) and individuals in Kigali (Kigali Gardens). Kigali Farms has the ambition to start with vermicomposting, however, more investigation is needed.

Another visited stakeholder is an insect farm (Golden Insect) in Musanze. The farmer breeds insects on local food waste at a small scale, such as black soldier flies mostly as animal feed, snails and crickets as human food, and organic fertilizers (vermicomposting). According to Golden Insects, there are no other insect growers in the neighbourhood other than insect growers in and around Kigali. One of the challenges of growing insects (especially black soldier flies) is the temperature in Musanze, which is now regulated by a small firepit.

Lastly, we visited Zamura, which is an animal feed company in Musanze. There are several types of animal feed for chicken (Layers & broilers), cattle, fish, rabbit and pigs for small scale and large farmers. The company produces animal feed mostly from imported resources since it is a challenge to receive resources for consistent price due to different seasons. The company uses maize bran, flour and rice, soya (mostly imported), sunflower seeds etc.

Table 2. Overview of animal feed prices manufactured by Zumura company in Musanze (source: Zumura company)

Type of animal feed	Average price in RWF per KG
Chicken feed	400
Cattle feed	300 - 390
Fish feed	660
Rabbit feed	400
Pig feed	290

It is remarkable from the fieldwork observations, local stakeholders, and from the stakeholder mapping that there are no stakeholders identified that produce commercial high-quality organic fertilizers or other environmentally friendly farm inputs in the selected districts. The only exception that can be made for Kigali Farms that sell compost to farmers, although it is located in Musanze. Also,

the enterprises that provide compost and limestone for the landscape project in Rutsiro are located in Musanze. Furthermore, there are some small-scale black soldier fly farms in Rwanda that produce organic fertilizer as by-products. However, it is stressed by Golden insect that farmers are not happy with the quality of organic fertilizers that are produced as a by-product at this moment. Therefore, Golden Insect produces compost through vermicomposting techniques. Other companies that produce organic fertilizer/compost usually produce compost from organic waste that is not fully separated at the source. For instance, there is a company that produces compost on the dumpsite in Rubavu after sorting out mixed waste from the dumpsite. However, the quality of the compost might be questionable. Table 3 provides an overview of the price of organic and mineral fertilizers to compare the costs.

Table 3. Overview of the costs of mineral and organic fertilizers.

Type of farm input	Price per 50 kg	Price per kg
DAP (Holland Greentech)	40,000 RWF / per 50 kg	800 RWF / per kg or 480 RWF subsidized
CAN (Holland Greentech)	40,000 RWF / per 50 kg	800 RWF / per kg
NPK (Holland Greentech)	40,000 RWF / per 50 kg	800 RWF / per kg or 610 subsidized
Urea (Holland Greentech)	37,500 RWF / per 50 kg	750 RWF / per kg or 480 RWF subsidized
Vermi-compost (Golden insect)		300 RWF / per kg
Compost (Rwanda Bio-solutions: produced from dumpsite)		100 RWF / per kg

Horticulture and fruit trees

During the fieldwork, several farmers and cooperatives are interviewed that are active in the maize, fruit trees (tree tomatoes and passion fruit), strawberries, Irish potato, maize, poultry, livestock/pasture and carrot value chains.

Horticulture – inputs

Similar to Kenya, about 72 percent of interviewed the horticulture farmers/cooperatives use hybrid farming techniques, whereby they apply mineral fertilizers such as DAP combined with compost (mostly cow manure). The other farmers apply only cow manure / chicken manure combined with the utilization of pesticides. Farmers pay between 480 RWF and 550 RWF per kilo for DAP. Some of the farmers also use NPK, which costs between 603 – 615 RWF per kg. One maize farmer also applies urea, which is subsidized by the GoR and costs 480 RWF per kg. There is one farmer cooperative (Karumbi site) in Rutsiro that grows crops such as maize and Irish potatoes, and apply mineral fertilizers, limestone and compost on their farms through the landscape project of SNV. Limestone and compost are provided by a company that is located in Musanze, called Multipurpose. This company is contracted through the Rutsiro District and provides limestone and compost for free to the farmers of the Landscape project. Farmers stress that the current mineral fertilizers are expensive, and in some cases, they are not able to find the right mineral fertilizers that can full fill the demands of the soil. For instance, Kopedush takes soil samples but cannot always find the right fertilizers. Therefore, they need to use alternative mineral fertilizers.

Table 4. Overview of the price per farm input indicated by interviewed farmers and Rutsiro District.

Type of farm input	Price indicated by farmers
DAP*	480 - 550 RWF per kg
NPK *	603 - 630 RWF per kg
Urea*	480 RWF per kg (subsidized)
Mineral calcium fertilizers*	4000 RWF per kg
Chicken manure*	3000 RWF per 50 kg (60 RWF per kg)
Cow dung*	30.000 RWF per truck (2-3 tonnes per truck)
Limestone**	provided for free through landscape project / in case the farmer wants to buy extra they pay about 2200 per 50 kg (44 RWF per kg)
Compost**	provided for free through landscape project

*source interviewed farmers

**source Rutsiro District

Most of the interviewed farmers collect cow manure from their cows (the quantity of cow manure that they apply on the farm depends on the number of cows that they own), or they have an exchange relationship with farmers to produce compost. For instance, they exchange cow manure for grasses or buy cow manure from neighbouring farmers. One tree tomato farmer buys cow manure from neighbouring farmers, 1 truck (2-3 tonnes) costs about 30.000 RWF, and applies every 4 months cow manure on the farm.

Depending on the location farmers mix cow manure with household waste, grasses, dry leaves. Some maize farmers also use the stem and leaves of the maize plant as input for compost. Some farmers also use the stem and leaves of the maize plant as input for compost, and the leaves of the Alnus tree are used. Compost is left for decomposing between 1 – 6 months, depending on the farmer. The members of Kopedush make compost from residues from maize brawn that is bought from a maize processor called Dazi Ltd (200 RWF/ per kg), cooking ashes, cow manure, kitchen waste and grasses. Furthermore, they apply yeast made from sugarcane or banana juice to accelerate the rotting process that takes about 1.5 month. A strawberry cooperative (COABUNYA) that receives support from HortInvest stress that is a challenge to find enough inputs (grasses), 3 trucks of grasses cost about 200.000 RWF. Interestingly, COABUNYA cooperative stresses that the quality of strawberries produced on only organic fertilizers is better compared to chemicals combined with inorganic fertilizers. However, the quantity of strawberries produced with chemical fertilizers is more. None of the interviewed actors applies only organic farming inputs. However, some farmers only produce their crops on compost in combination with pesticides (e.g. tree tomato farmers). Some farmers (maize) also stress that they have no knowledge about biological pest control, and need knowledge of how to make and apply compost, which is also confirmed by several local government officials. Also, farmers stress that there is a lack of biomass in their areas to produce compost. In general, it is stressed by farmers and local government officials that there is a lack of commercial organic fertilizers that is produced. Also, it is stressed that there is a lack of separated biomass in the neighbourhood that can be used to produce their compost.

Some of the farmers have an open mindset for the utilization of organic farming inputs, while other farmers have a negative mindset. In general, farmers are aware that organic fertilizers help to improve the soil. Farmers that have a negative attitude towards organic farm inputs are concerned about their productivity. Farmers are used to mineral fertilizer that immediately shows the impact on their productivity, while it takes time before farmers see the impact of organic fertilizers. Also, some of the interviewed farmers stress that they do not have access to organic farm inputs, while mineral farm inputs are easily available in their neighbourhood. Farmers that are concerned stress that they might get interested if there is mobilization for affordable high-quality organic inputs, which helps to improve their productivity. Kopedush stresses that the market is not selective in organic products, as a result, that organic farming is also not rewarded at this moment. Therefore, it is less attractive to go into organic farm inputs, especially since mineral fertilizers result in higher productivity. In general, farmers consider productivity as the key to which farming practices should be used. It is stressed by the Ngororero district official responsible for the Environment that the mindset of farmers is a concern since farmers want to use mineral farming inputs.

It seems like that the interviewed small-scale farmers are more open to using human waste fertilizers than Kenya. Although, attitudes within cooperatives can also differ. One member of the cooperative in Rutsiro already applied human waste fertilizer and followed training, while other farmers of the same group are not open to it. Kopedush already stressed that they apply human waste fertilizers, but consumers are not aware of this. They stress that consumers cannot eat their products and crops if they know that it is used, which is also confirmed by other farmers.

Pest control

The interviewed farmers are not familiar with biological pest control products, since they only buy commercial pesticides. Farmers use pesticides such as fungicide (Aithon), insecticide (Rocket), not all farmers know which pesticides they apply on their farms. The farmer cooperative in Rutsiro shares that they have not much lost if they use pesticides, but that the costs are high. For instance, farmers pay for Aithan 3600 RWF per litre or 2000 RWF for a small bottle of pesticide (Rocket). In case there is much rain they have not much loss, but when there is not much rain their crops are affected by armyworms (maize).

The farmers of Kopedush do apply home-made biopesticides based on ginger, garlic, hot pepper, mixed with cooking ashes and soap. The members of Kopedush cooperative are trained by Agriterra on how to produce these biopesticides that are applied to passion fruits to overcome Aphids (pest). Also, they plant trees around the plots that insects do not like such as Calliandra and Leucaena. This is done for both strawberry and passion fruits. Furthermore, they plant onions as intercropping practice with passion fruits to reduce pests. Kopedush also stresses that farmers do not always apply the right pesticides due to a lack of knowledge by the farmer and the input supplier. As a result, the pesticide does not respond to the pest. The same also applies to mineral fertilizers and other farm inputs.

In general, farmers stress that it is a challenge that farm inputs are expensive, while the price of their products is low. Farmers do not always need to apply irrigation or rainwater harvesting, since some of the farmers already face challenges due to much rain (e.g. cooperative in Rutsiro). Other farmer cooperatives such as Kopedush and the Strawberry cooperative (COABUNYA) use pumps to irrigate the farms at a small scale.

Regenerative farming practices

Some of the interviewed farmers apply agroforestry on a small scale through the landscape project. The observed trees are in a very early stage. A cooperative in Rutsiro applies agroforestry on created

terraces to grow Irish potatoes and maize. The project uses tree species such as Gravellia and Almoes, trees are planted at the edge of the plots. Also, these interventions are still new, since the farmers were still developing the terraces at the moment of the field visit. In Ngororero district, farmers apply agroforestry with tree species such as Manoes, Gravellia, Calliandra and Leucaena. Furthermore, depending on the region fruit trees such as avocado, passion fruit, tree tomato, mango and citrus are used for agroforestry (source district Ngororero).

Crop rotation is mostly applied with beans and maize, followed by potatoes and maize. The Kopedush cooperative applies crop rotation with beans after growing 3-year strawberries. Some of the horticulture farmers apply intercropping with beans, followed by cabbage and pumpkin. also applies intercropping with passion fruit and onions to reduce pests, and one tomato tree farmer applies intercropping with beans. A government official of Ngororero District responsible for Environmental stresses that small scale farmers in Ngororero district apply intercropping mostly with beans and maize. However, the official stress that there is a lack of appropriate techniques among farmers that they try to use their entire farm due to the small size of land. In other words, the official stress that intercropping is applied randomly with a lack of organization. Therefore, better intercropping practices are needed. Also, the same government official stresses that farmers are not willing to adopt terraces, since they believe that it will reduce their land size and productivity. However, some of the farmers stop using farm inputs once terraces are in place, which means that productivity decreases. Neighbouring farmers observe that the productivity decreases and therefore they believe that terraces decrease their land and yield. A few farmers apply a kitchen garden construction to increase yield on their land (Nyabihu).



Figure 6. A tree tomato farmer applies intercropping by growing beans between the tree tomatoes



Figure 7. Terraces that are developed by the landscape project of SNV in Rutsiro District.

Agricultural by-products

Some maize farmers use stem and the leaves as input for compost, while corn cobs are used as an energy source for cooking (like firewood). The farmer cooperative in Rutsiro uses the maize and potato plant as a source for animal feed (cattle), including the corn cobs. The members of the milk collection centre in Muhanda feed their livestock on maize residues (plant).

Kopedush use the seed of passion fruits as animal feed for poultry, while the outside “shell” of passion fruits is cut into pieces and are fed to cows.

Livestock

During the fieldwork, we interviewed two milk collection centres, namely one collection centre in Nyabihu (Arusha MCC) and one collection centre in Muhanda (Muhumyo MCC). The milk collection centre in Nyabihu has about 150 members, while the centre in Muhanda has about 230 members.

According to Arusha MCC, one cow produces about 2 – 8 litre of milk per day. The productivity of the milk is dependent on the type of animal feed that is provided to the cows. Most of the farmers that supply the milk collection centre keep their cow at the household level (115 members), followed by 15 farmers that keep their cows in a paddock system for more than 10 cows, and about 20 farmers keep their cows in a pasture of 10 hectares for 20 cows. Muhumyo MCC stresses that their members have about 5 hectares of land, and about 10 cows per family. For the milk collection centre in Nyabihu, there is a direct need for animal feed to increase the productivity of the dairy cows, especially for the cows that are kept at the household level. According to the chairman of the milk collection centre in Nyabihu, pastures provide enough animal feed, however, there is not enough animal feed for the cows at the household level. However, it is stressed by Muhumyo MCC that farmers cannot afford to buy additional animal feed, due to the low milk price (220 RWF per litre). Therefore, farmers can only afford to buy additional animal feed if the milk price will increase. As a collection centre, they are only interested in manufactured animal feed if the price is about 60.000 RWF per 10 tonnes of animal (6000 RWF per ton). Currently, dairy farmers in Muhanda keep their cows in pasture, and sometimes they feed their cattle additional maize plant residues. Individual farmers in Nyabihu that keep their animals mostly feed their cattle on grasses and leaves from trees (agroforestry).

Muhumyo MCC stressed that it is difficult to grow additional animal feed for their cattle since they are not allowed to grow additional crops in their pasture. Currently, they do not have access to additional land to grow crops. They are allowed to trees on their farm, but only certain species such as Umusave and Greveryon (local Rwandan names). Currently, the farmers that use pastures leave the manure in the pasture as a natural fertilizer for the pasture. Some farmers bring their cows temporarily to other lands for land preparations before other crops are planted. Farmers collect the cow manure to produce compost for their other lands. Farmers mix cow manure with grasses and urine and leave it for 2-3 months for decomposing.

During the scoping, we also interviewed one chicken farmer (HF business company) that has about 2500 chickens that are kept for eggs and meat. Similar to Kenya, one of the main challenges in poultry farming is access to affordable animal feed. Currently, farmers grow maize as animal feed and mix it with animal feed bought from the local market. The quality of animals in the market is not consistent and exists of soy, maize, and small fish. Furthermore, the farmer also buys animal feed from Zamura Ltd. The farmer is willing to be introduced to solutions as animal feed produced from black soldier flies.

The farmer does not only face challenges with the affordability of animal feed but also with challenges and diseases. Sometimes the chickens do not grow well and do not provide eggs consistently. The chicken manure is collected every week and left for decomposing. After 3 months, the chicken manure is sold to farmers for 3000 RWF/50 kg. Every week he produces about 2500 kg of chicken manure. On top of that, the farmer also uses his chicken manure to produce maize as animal feed, and other crops.

Market

Most of the farmers sell to the local market and traders in Kigali. In the case of the COABUNYA cooperative the strawberries are bought by the cooperative Kopedush. Kopedush experienced market challenges in the past, therefore they decided to process passion fruit and strawberry into juices. The juice of strawberries and passionfruit is sold to the market in Kigali and Goma. Fresh strawberries are sold to hotels in Karongi and Kigali. The market can be improved by improving the quality of passion fruits. The quality of passion fruit is not always consistent due to diseases. In some cases, fruits are so bad that even cannot be used for processing.

The milk collection centre in Muhanda sells milk to the milk processor Mukamira dairy (2500 litre per day), to Goma and local cheese processors. In case the milk collection will overproduce milk that cannot be bought by the contractor, they will reduce the milk price to have access to other markets. It is stressed by the collection centre that farmers that cannot meet the criteria of the milk collection centre sell their milk also to local cheese processors. The milk collection centre needs a higher milk price before it can provide other services such as animal feed to farmers.

Support

During field visit, we also interviewed farmers on their current support. It can be concluded that the interviewed farmers have a great lack of support for regenerative and circular practices (table 5), and that there is not much focus on these practices by other stakeholders that work with these farmers.

Table 5. Overview of the different support that the interviewed farmers receive in Rwanda.

Cooperartive farmer /	Type of support	Location
Irjamyukuru Gilbert individual maize farmer & farmer promotor	- support from RAB about post-harvest loss, timing harvest, drying, sorting and storage of maize. - support from the landscape project of SNV about climate-smart agricultural practices	Rubavu, Tanda/Nyundo
COABUNYA cooperative (strawberry)	- support from Hortinvest on human capacity, training on good agricultural practices, and investment to maintain the plots. - financial support from Agriterria (grant)	Rutisiro, Nyabirasi, Mubuga
Gapanda Mpum , Individual farmers in Arusha	- support from the landscape project of SNV on water management on the farm, agroforestry and climate-smart practices.	Nyabihu, Biogogwe, Arusha cell
Farmer cooperative in Rutisiro	-support to establish terraces and agroforestry through the landscape project of SNV. - support from Handcap International on training on Irish potatoes, and with the construction of a drying facility for maize.	Rutisiro, Murunda, Kirwa
Muhumyo MCC Muhanda	-The Ministry of Agriculture provided the milk collection centre in Muhanda with a facility, equipment, generator and training in testing in milk. Also, they received support to improve the breed of livestock through artisanal insemination. -Some of their members also received a short training on how to produce compost by the Ministry of Agriculture and RAB through a demonstration.	Ngorerero, Muhanda, Gapanda Mpum
Kopedush Cooperative	-support from SNV through Hortinvest. For instance, they received training on how to improve their productivity through training. Also, the cooperative received support from HortInvest on how to produce compost through ToT and demonstration farmers. However, farmers need to be reminded about the practices, and some farmers are doing it better than other farmers. -NAEB supported the cooperative to receive a certification for their products, and Agriterria provided some support through HortInvest	Rutisiro
Poultry farmer in Rubavu (HF business company)	- support from Rubirizi company that imports eggs from the Netherlands and trains farmers every two weeks. At this moment the poultry farmer does not receive any other type of support.	Rubavu, Regerero, Muhira
Emmanuel Sezibera, Individual tree tomato farmer	-no support on growing tree tomatoes, despite the farmer being part of a cooperative. The cooperative is focused on training for producing carrots and other crops not on tree tomatoes.	Nyabihu, Biogogwe, Gishoto

Regulations

Most of the farmers do not stress any regulations that affect their farming activities. However, Kopedush cooperative stresses that they face some challenges. Kopedush processes fruits into juices that are packed into bottles. The Rwandan government has introduced a ban on single-use plastics, therefore it becomes more complicated to buy plastic bottles. The Ministry of Environment restricts

Kopedush from using particular pesticides, such as Thiodan to protect the bees. Therefore, they use now a different type of pesticide, lamboa cyhalotherin. They need to spray the new pesticide more frequently compared to the previous pesticide since it is not so efficient. Kopedush also stress that they face challenges with the Crop Intensification Programme since they are not allowed to grow passion fruit trees on their land. According to CIP, they are supposed to grow maize.

Needs of farmers/cooperatives

A tree tomato farmer in Nyabihu would like to get access to organic farm inputs such as bio pest and biological interventions. Also, other farmers stress they need more knowledge on how to make and apply organic fertilizers. Furthermore, there is a need to have access to biomass to produce compost, and to high-quality and affordable organic fertilizers. Lastly, as stressed earlier farmers need to have access to affordable animals either for poultry or dairy.

The cooperative in Rutsiro stresses that they do not grow seedlings for agroforestry, which means that they only get seedlings through the landscape project. However, they stress that this is not enough for the farmers. This concern is also confirmed by a government official in Ngororero that there is a lack of seedlings and nurseries. Also, farmers do not have access to enough seed potatoes, they need to go to Nyabihu to buy seed potatoes.

The milk collection centre in Muhanda stresses that they need equipment for the milk collection centre (e.g. tanks) and additional training on how to improve the animal feeding opportunities to increase the productivity of their livestock.

Kopedush stresses that they need better processing equipment to improve the processing process and the production capacity. Also, they stress that farmers and input suppliers need to be trained to apply farm inputs that respond to the soil or disease. Furthermore, they stress that farmers need more training on how to make and apply compost. Some of the farmers received training in the past, however, there is a need to improve the quality of the compost. Also, farmers forget what they learned.

Collection centres / washing stations

During the field visit, we briefly visited two milk collection centres (Arusha MCC and Muhumyo MCC), and carrot collection centre owned by the KOGIMUIN cooperative to identify if there are any type of organic waste or other losses at the collection centres. The visited collection centres do not produce high quantities of waste. Milk that does not meet the criteria is refused at the collection centre, and agricultural by-products of the carrot centres and other crops are left at the farm. Therefore, it seems that these collection centres are not a hotspot for organic waste that could be transformed into farm products or potentials to reduce food waste.

However, we also visited a coffee washing station KOBAKAMA. It became clear that coffee washing stations do generate different types of agricultural by-products, such as pulps and husks. Currently, the pulps are transformed into compost. Coffee farmers come to collect the pulp which is transformed by the coffee farmers into compost for their coffee farm. At this moment, there is no pulp left that is not used by coffee farmers. The husks are sold to businessmen that use the husks as an energy source (it gets burned) to produce bricks as construction material. These husks have the potential to be transformed into compost. Currently, they are sold for 1700 RWF per 1 truck (300 – 400 bags of husks). They estimate that every season about 20 trucks are used to transport the bags, they estimate that every bag is about 20 to 30 kilograms. This would mean that about 9000 kg per truck is transported (30 kg x 300 bags) with a minimum total of 180.000 kg of coffee husk per coffee season (300 trucks).

Several other coffee washing stations in the country also produce the same types of waste. According to the Rutsiro District, there are about 19 coffee washing stations. The cooperative that is visited has some waste management practice in place, other coffee cooperatives might do it differently. They suggest that Bwigahaza coffee cooperative does not have good practices in place, which could be an opportunity. More research is needed to explore the full potential to transform coffee residues into organic farm inputs for all coffee washing stations.

Food processors

Despite the processors are not the core of the study, they can be a hotspot of generated organic waste that is separated at the source. Pfunda tea company in Rubavu is a perfect example since it is estimated by the person in charge of waste collection that the company generated about 60 tonnes of organic waste per month. This would mean that the company would produce in a year about 660 tonnes of organic waste, with a correction of one month. Currently, the company leaves the organic waste (burned leaves, sweepings of the tea) for 1 month at their side. After that, Pfunda tea company pays a company to collect their waste to bring the majority of their waste to their dumpsite. Occasionally, the waste is used as fertilizers, but this is rarely done. The person in charge stresses that the owner of the company has not been interested in the past in companies that wanted to buy the waste for other purposes. This is a great loss for the company since the company could reduce their waste collection costs significantly or could even earn money by selling their waste to third parties. In case SNV would be interested to follow up on this, it would be relevant to learn more about the barriers of the company towards this particular topic.

Another processor in the SNV target areas is the Nyabihu potato company. The consultant knows from earlier experiences that the company produces about 500 kilograms of potato peels per month that are transformed into a fertilizer. Currently, the fertilizers are provided for free to farmers in the neighbourhood. The company is working together with NIRDA and the University of Rwanda to see if they can use their waste in different ways.

Waste collectors

During the scoping mission, the consultant interviewed a local waste collector that collects waste from the food market (Rubavu district - Kanama sector – mahoko cell), a sector official responsible for waste management, and a waste collection company.

The waste collector is contracted by the Kanama sector in Rubavu district to collect waste from the local food market. The waste of the food market is collected without a waste separation infrastructure by individuals hired by the main waste collector. The main waste collector hired 17 individuals, each earn about 15.000 RWF per month. The collected waste is brought to a dumpsite, whereby the waste is dumped in the neighbourhood with a risk of spreading diseases. The person in charge of the waste collection estimated it to collect between 500 kg – 1 ton waste per market day. A lot of waste is collected on Tuesday and Friday, which are the main market days. The sector official in charge is an agronomist – who stressed that national policies towards waste management and separation are not strongly implemented. The official stressed that they follow the policies of the Ministry of Environment. The official stressed that waste separation is not implemented, since this is not specified in the contract with the waste collector – and they need extra resources for waste separation. Following that, the official also stressed that the farmers do not know about composting of organic waste. The farmers usually combine cow/livestock manure and chemical fertilizers as farm inputs. However, the agronomist does stress that there is an opportunity for organic fertilizers, especially since livestock/cow manure are only accessible in low quantities.



Figure 8. Mixed waste is collected from a food market in Rubavu (Kanama sector) and disposed at the dumpsite.

In Rubavu, we also visited the public dumpsite. The waste of restaurants, restaurants, hotels, households and commercial centres are collected and transported to landslide by the company Millenium savings & investment cooperatives. Every day, 8 to 10 trucks transport waste to landslide – every truck transport about 5 tonnes of waste. This means that in one week with 6 waste collection days, about 240 to 300 tonnes of waste are collected for 1 public dumpsite. The waste is not separation during waste collection, separation and at the dumpsite. It is estimated that in developing countries about 53 to 57 of the waste is organic waste. This would mean every week between 127 – 171 tonnes of organic waste are collected. The company does produce compost from the landslide, by separating the mixed collected waste into organic waste, however the process is inefficient and would reduce the quality of the compost. Compost is sold to farmers in the neighbourhood, 1 truck of compost is sold for 18.000 RWF.



Figure 9. Mixed waste is collected from Rubavu town and disposed at the dumpsite. A lady is sorting organic waste after collecting mixed waste, to produce compost.

In Ngororero and Rutsiro District, the waste of food markets and towns is collected by cooperatives. The district included in the contract the cooperative needs to separate waste, however, in practices, this does not take place. We visited one of the cooperatives in Ngororero that collects about 1 tonne of waste per day from the Kabaya market. The cooperative collects mixed waste from the food market and separates some of the organic waste after collection. This is done since the temporary dumpsite has limited capacity, and the waste transported after that to final disposal. The “organic waste” is separated from the mixed waste since it reduces transport costs by sorting organic waste from the other waste. Currently, some of the farmers collect the “compost” for free, however, farmers do not economically value the “compost”. Currently, the district government does not have funds to upscale and improve waste collection and separation in the districts. Ngororero District was not able to provide any concrete data about the quantities of waste that is collected across the district. The households are responsible for their waste collection.

In sum, there are great opportunities to improve the waste collection infrastructure and to transform organic waste into farming inputs, while it reduces the risks of spreading diseases and improves the livelihood of farmers and the community. It would be crucial to implement waste separation at the source, which could be potentially local food markets.



Figure 10. Mixed waste of Kabaya food market in Ngororero district is collected. Organic waste is sorted out after waste collection.

Other observations among the different areas

During the fieldwork, it is observed that the Rubavu district, Rubavu sector could also be an interesting area. The areas have lots of livestock (pasture) cows and pigs, already implementing intercropping with bananas and beans. Also, the area is very fertile due to the volcano ground and is close to the dumpsite and a local food market. These waste hotspots could be transformed into farming inputs, such as compost, organic fertilizers, and other circular farm inputs.

2.2 Kenya's food system

Kenya's food system is different from Rwanda's food system, especially concerning the landmass of Kenya compared to Rwanda – and the level of education in REALMS target areas. Furthermore, there are much more food processors located in Kenya that could be an entrée point to transform waste into farming inputs and beyond through service providers. The local team also requested to visit additional counties that were not included such as Transzonia and Nakuru county.

Input suppliers

There are a few services that provide environmentally responsive farm inputs and are closely located to the target areas. For instance, Vermitech Limited in Kisumu trains farms on how to produce vermicompost through consultancies with NGOs/research institutions. The company covers Kisumu, Vihiga, Kakamega and Nandi Counties. The company does not produce vermicompost that is directly sold to farmers. Farmers are trained to produce own compost. Other companies producing organic fertilizers include Agriflora Organic Solutions in Nakuru (licensed), and Homa Lime Company in Kericho which produce Calcium fertilizers. During this study, we also identified a Rotuba company that produce biofertilizers from municipality sludge in Trans-Nzoia County, however, the company does not comply for unclear reasons with the standards for organic/bio-fertilizers.

We have not identified any company that produces black soldier flies as input for animal feeds in the target counties. It is stressed by Vermitech that there is an interest to produce black soldier flies (BSF). Insectpro, the Kenyan-Dutch company is the only licensed BSF company in Kenya. It is currently based in Kiambu and is planning to open up another facility, which could be Kisumu.

REAL IPM company provides biological pest control solutions and bioinoculants in the target counties. Other companies providing the solution at the counties and at national level include Koppert Biological Systems, Juanco SPS, Dudu Tech, Flamingo Holdings, SAFINA EA among others. The [website Infonet Biovision](#) also shares information about companies that provide biopesticides.

According to the county government officials, there is a lack of input service providers that produce organic fertilizers or other organic farming inputs within the counties. Other identified input services providers that are located across Kenya are included in the stakeholder mapping in Chapter 3 of this report on page 39, and a list of service providers are included in the **excel spread**. The excel spread sheet is provided by submission of the report, and is uploaded on the google drive. This includes service providers ranging from organic fertilizers (e.g. Agriflora organic solutions, Taka Taka Solutions), biogas systems (e.g. Biogas international), and insect-based animal (e.g. Insectpro, Sanergy) among others.

Farmers / cooperatives

During our field visit, farmer cooperatives are interviewed on their farmer practices. Farmers that interviewed include farmer cooperatives that are focused on growing avocados (Beruru cooperative in Bomet), bananas (Ainamoi cooperative in Kericho), a farmer cooperative that implements agroforestry trained by ICRAF in Kericho, farmer of Western Tree planters association in Bungoma, Tarakwo dairy ltd and poultry farmer in Uasin Gishu, and Starlight dairy and potato cooperative in Nakuru county.

Most of the small-scale farmers have a mixed farm system, which means that they grow crops and have a few cows/chickens. Although there are also farmers that are more focused on a particular value chain (e.g. dairy). While these practices were evident in the cooperatives visited, it was not possible

to generalize the findings as being practiced across the county. This is so because in every target county, only 1 or 2 cooperatives were visited. For instance, In Bomet County, only Berur horticulture farmers Cooperative was visited. The cooperative focuses on producing avocados through the utilization of organic inputs, and pilots different farming technologies. The country director of agriculture in Bomet indicated that Berur was a bit advanced compared to other farmers in the county. Therefore, these results provide an overview of the existing practices, but not per se about how representative the different practices are among/across the counties.

Horticulture and fruit trees

Inputs in horticulture

The majority of the interviewed farmer cooperatives use chemical fertilizers, mostly DAP. Some of the farmers also apply CAN. The chemical fertilizers are regularly applied together with a low extent of animal manure/compost that is produced by the farmer/cooperative. There are no small-scale farmers and cooperatives identified that directly buy organic fertilizers or compost from commercial companies. In case farmers apply organic inputs, farmers produce their compost or apply animal manure. All farmers use cow-dung in their compost. Depending on the exact location, farmers mix cow-dung with other sources such as leaves of trees, ashes of firewood, kitchen waste and chicken manure. Some farmers of the Tarakwo cooperative use coffee residues in their compost. Farmers leave the compost for decomposing between 1 and 3 months. The farmer cooperative in Kericho county stress that the rainy season is a challenge since the compost is left in an area, they need a cover for the composting area. Other farmers stress that the time of decomposing before it can be applied at the farm is a challenge. Also, the transport of heavy cow manure is a challenge, which is currently done by tractor, truck or motorbike. Following that, farmers stress that there is a need for training on how to make compost and how to apply compost on the farm.



Figure 11. A banana farmer collects chicken manure as compost material in Kericho.

Farmers that apply chemical inputs, use pesticides to control pest and diseases at their farm. Farmers use the pesticides only on need basis. Some farmers apply it during the rainy season and after flowering. Interestingly, one farmer stresses that he started to use traps to control pests due to the lack of other solutions. However, the farmer shifted to pesticides once he identified the pest. The farmers underlined that the costs of the traps are too high compared to the utilization of pesticides, especially since the traps needed to be replaced weekly. The farmer stressed that they need about 6

traps per acre with a cost of 300 KSH per trap, which is cost about 18000 KSH per week. The chemical pesticides cost on average 225 KSH per 100 ml.

Some farmer cooperatives and individual farmers use organic farm inputs only. For instance, Berur farmers' cooperative in Bomet utilizes organic farm inputs on their avocado's. The cooperative makes compost by collecting the manure of goats, cows and hummus. According to the cooperative, one of the incentives to do organic farming is that organic products are requested by the market, although the farmer cooperative does not have a certification for organic farming. In contrast, for other crops, the cooperative does use chemicals since organic farming is time consuming (e.g. collecting of cow manure) and to ensure the productivity of their crops. The cooperative does not only support the utilization of organic inputs but also pilots other sustainable solutions, such as the production of briquettes of farm waste and some of their farmers already make use of biogas systems. A few farmers of this cooperative use cow manure as the inputs for biodigester.

This scoping mission also visited one of the farmers that is trained by Vermitech on vermicomposting techniques. The farmer shared that the utilization of inorganic farming inputs significantly reduced his productivity to an extent that the farmer was about to give up on farming (figure 12). Once the farmer was trained by Vermitech to adopt to vermicomposting his productivity increased significantly. As a result, the farmer continued to do farming. At this moment the farmer produces his vermicompost from farm and kitchen waste and utilizes home-made biopesticides. Farmer mixes his vermicompost with biochar with the purpose to hold water in the soil. Currently, the only challenge that the farmer faced are the attacks of red ants on his worms since the farmer produced compost on the soil. As a result, the farmer created a structure to do vermicomposting. The farmer stressed that also other farmers are trained in vermicomposting, but that other farmers give up since farmers do not know how to adapt to the techniques, and that farmers chose to go for quick wins in their productivity.



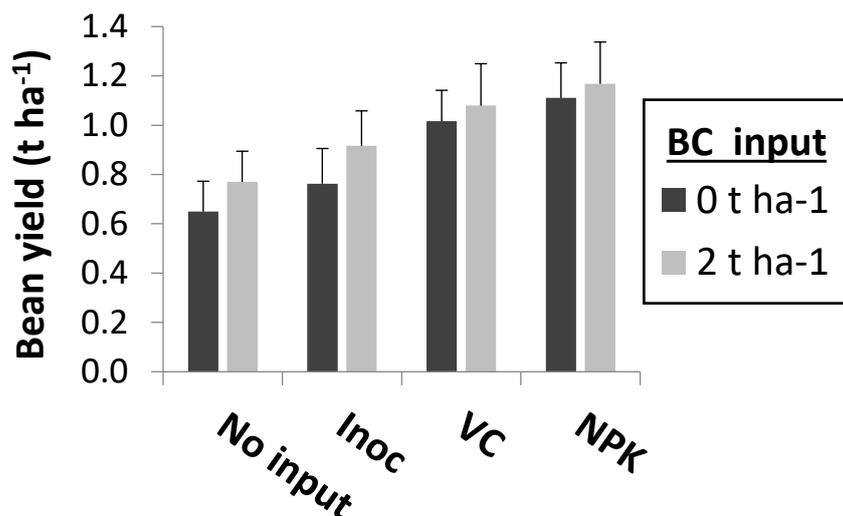
"I was about to give up farming, since my productivity of my farm dropped significantly. Vermi-composting changed my life, as result that the farm productivity increased – and I continued farming" – Farmer that is trained by Vermitech in vermicomposting, Kakamega.

Figure 12. A farmer is trained by Vermitech on how to make and apply vermicompost on his farm in Kakamega.

Vermitech has been part of a research programme together with IITA, University of Nairobi, and Cornell University. During the programme, they have researched the impact of vermicompost, biochar, NPK and DAP on the farm productivity of several farmers. Results demonstrate that NPK generate a slightly higher yield of beans (1.17 tonnes) compared to vermicompost (VC) (1.01 tonnes)

per hectare (figure 13). It is not clear from the results period that the fertilizers are applied on the farm. Organic fertilizers usually take time to be taken up by the soil, which could mean that the productivity could increase further. On top of that, we also do not know if the quality of the vermicompost is optimal or can be further improved. Lastly, to compare the results the costs of farm inputs should be included in the final calculations (inputs vs. outputs).

Figure 13. Overview of the impact of different types of fertilizers on the yield. The different fertilizers that are used include no input, Rhizobium inoculum (Inoc), Vermicompost (VC) and Mazao fertilizer (NPK). (source: Vermitech).



Cooperatives and members are open for the utilization of the use of organic inputs. Farmers realize that the utilization of chemicals in farming is not good for their health and that it has other negative side effects. Farmers are willing to buy high-quality organic fertilizers for mostly a price between 1000 – 1500 KSH per 50 kilograms, in some cases between 1500 – 2500 KSH per 50 kilograms. Inorganic fertilizers are mostly sold for 3000 KSH, and sometimes for 3500 per 50 kilograms. Frequently it is stressed that there is a need for training, how to make and apply organic fertilizers/compost. Also, it is stressed that the funding for more equipment, e.g. machine to do composting. Farmers also stress that they can be trained to train other farmers.

Table 5. Overview of the price of farm inputs according to interviewed farmer cooperatives

Product	Price
DAP	On average 3000 KSH/50 kg, one 1 outlier of 3500 KSH
Pesticides	225 KSH per 100 ml
High quality: organic fertilizers (willingness to pay)	1000 – 1500 / 50 kg, one 1 outlier of 1500 – 2500 KSH /50 kg

All interviewed small scale farmers in the field are sceptical about the utilization of human waste as a fertilizer on the farm. For some farmers it is not something that can be discussed, other farmers stress that it perhaps can be used once human waste is well treated, and it is not original human waste. Biogas international limited stresses that some farmers only want to apply human waste fertilizers for fruit trees, while other farmers are not willing to use it.

Farmers that apply organic farm inputs use biological interventions such as traps (e.g. from the company Koppert), rabbit urine that is used as fertilizer and as biopesticide (Berur cooperative – Bomet).



Regenerative farming practices

Majority of the farmers applies intercropping. This is attributed to the smaller pieces of land. Farmers mostly intercrop with maize and beans, followed by peas, coffee trees and avocado trees. Most of the farmers apply crop rotation with crops such as tomatoes, sorghum, vegetables, wheat, sunflower, beans, hay (cows) and potatoes. The only exception can be made for farmers that grow mostly avocado trees, whereby trees are growing for a longer period. Although, members of the farmer cooperatives Ainamoi that are focused on the banana production in Kericho county, do intercrop with banana trees, coffee and avocado trees. They either grow three lines of bananas followed by 3 tree lines of avocado trees, or two lines of coffee trees followed by two lines of banana trees. The challenge with intercropping with banana and avocado trees that are stressed by the cooperative is that banana trees next to avocado trees produce fewer fruits. Ainomoi Cooperative applies agroforestry, by planting trees (e.g. grevillea robusta) as the edge on the farm as a windbreaker, a source for firewood, natural fertilizer and additional animal feed.

Some cooperatives apply agroforestry at a more advanced level through the support of the World Agroforestry Centre (ICRAF). KORU cooperative in Kericho county has established its nursery to produce seedlings for the farmers in their community. Agroforestry is applied by planting different trees such as papaya and coffee trees across each other (figure x). During the growing season, other plants are planted between the trees. Furthermore, trees are planted on the edge of the farm to provide shade, a windbreak to protect their crops and to add extra nutrients through the soil. On top of that, wood lots of eucalyptus are planted at the end of the farm to provide farmers with resources for firewood and farmers can make furniture. Currently, the farmers mostly produce fruits for their consumption, and the challenge is that farmers only have one fruit season. Following that, some mango trees are affected by pests.

At Western Tree plants association (WETPA), an organization funded by Vi Agroforestry in Bungoma county, there is a great gap between the supply and demand of agroforestry crops. In one of the farmer's nursery, only 4 cooperatives of the association bought a few hundred seedlings in one year. The trees are sold for 5-10 KSH per tree.

At WETPA's woodlot, it was reported that some community members steal seedlings from the plantation that is used for futuristic mother trees for harvesting seeds. This points to a community that has a higher demand for agroforestry trees. This sharply contrasts the experiences at the farmers' tree nurseries where lack of customers was reported.



Figure 14: A farm of a member of the cooperative that is trained by ICRAF on agroforestry.

The farmers that apply irrigation use a generator to take up water and apply manual irrigation. The farmers that do not apply irrigation stresses that they do not need due to enough rain / have not yet facilities to establish water irrigation systems at their farm. The farmers that have not yet established irrigation indicate that there is a need for an irrigation system. In Bomet it stressed that the water quality of the river is sometimes an issue due to other activities in the region.

Agricultural by-products

Agricultural by-products such as leftovers of pruning avocado trees, including the leaves are used as animal feed (Berur cooperative – Bomet). A similar practice is applied among the members of the Ainomia cooperative in Kericho, whereby leaves and the large pieces of banana stems are used as animal feed. Also, the banana stems are left in the field to decompose. Leaves of seed potatoes are left on the farm (Starlight cooperative).

Livestock

Dairy

During the scoping, we visited two cooperatives that keep cows for dairy purposes, namely Tarakwo and Starlight farmers. The farmers of Tarakwo stress that the productivity of the cows decreases from 1000 litres during the raining season to 500 litres in the dry season, which is excluding the litres of milk that are consumed by the farmers themselves. The main challenge for milk productivity is that cows are underfed, and in some cases, the cows are affected by diseases such as foot and mouth disease and lump skin disease. Currently, the cows received vaccinations, as a result, that productivity increased incrementally.

The cows of the Tarakwo cooperative provide about 5 litres of milk a day, while farmers of the Starlight cooperative produce about 8/10 (with additional feed) litres a day. Both cooperatives supply milk to KCC and Starlight also sells milk at their shop. The other farmer cooperatives stress that animal feed is expensive. Farmers pay about 2000 KSH per 70 kilograms for low-quality animal feed (Unga feed/Turbo feed/Kitale industries). Therefore, dairy farmers of the Tarako cooperative produce their animal feed, by growing maize and feed their animal on grasses (hay). Farmers make animal feed by the utilization of grains and refused grains, and by processing straw into smaller pieces. About 10% of the members grow maize to feed to their cows. On top of that, the farmers buy additional animal feed. Farmers stress that they have difficulties to get access to water in dry areas. Farmers of the Starlight

cooperative make animal feed from maize jams, sunflowers, cotton by-products of a processor in Nakuru, fish meal, salt and lime. Animal feed of the cooperative is sold for 40 KSH per kilo to members of the cooperative. The farmer cooperative produces about 800 kilos of animal feed per month. Currently, it is challenging for the cooperative that they do not have a mixture to produce animal feed, as a result, that they need to do it manually. The milk productivity of the dairy cows increased from 5 litres to 8/10 litres a day due to the production of animal feed by the cooperative.

Figure 15. Members of Tarakwo cooperative produce their own animal feed. On right picture shows the corn cobs that are produced as a by-product.



Since cows of Tarakwo cooperative are kept in a pasture, not much of the cow-dung is collected for composting. Only cow – dung is collected in case a farmer has a central point to feed their animals. Remarkably, only 2-3 percent of the dairy farmers use compost on their farm, e.g. coffee residues. In contrast, the dairy cows of starlight farmers use a zero-grazing system. As a result, farmers do collect cow manure for growing crops.

Poultry

During the scoping mission, we have identified small scale farmers that have a few chickens on a mixed farm system, but we also identified small scale poultry farmers that have about 200 to 400 chickens per farmer in Uasin Gishu to produce eggs and meat. It is clear from the interview that the poultry farmers have a great lack of support ranging from animal feed challenges, organization of poultry farmers, and in the market for eggs and meat. The farmer uses animal feed from Kitale industries, and home-grown kale produced on chicken manure to feed the chicken. Currently, raw materials to make animal feed increased in price, therefore it is expensive to make your own animal feed. Also, manufactured animal feed increased in price. The farmer is open to being introduced to animal feed produced from black soldier flies, or even willing to grow black soldier flies herself.

Existing support of horticulture and livestock farmers

Farmer cooperatives receive support from different stakeholders. For instance, Berur receives support from DWF on water management and good agricultural practices, soil and water conservation, and extension services of the GoK. Following that the members of the Ainamoi cooperative received demand-driven training from the Ministry of Agriculture county extension officers on climate-smart agriculture. Within this training, they received a single training on composting. On top of that, Tarakwo Dairy cooperative has received earlier support from SNV and USAID (animal feeds cow rearing, 1-day training on composting). Starlight dairy and potato cooperative receive support from SNV (CRAFT project) on solar panels and water harvesting and from other stakeholders such as the Ministry of Agriculture to receive grants and training, and from the church.

Markets of horticulture and livestock farmers

Most of the markets of interviewed cooperatives are the local market, local traders and neighbouring communities. Berur cooperative also produces avocados for the markets in Nairobi and the export market. Starlight cooperative delivers seed potatoes to the ministry of agriculture and the national potato council of Kenya. The cooperative provides smaller quantities (2500 – 3000 bags) to the ministry of agriculture than requested (9000 bags).

Farmer cooperatives that apply organic farming expect that they will get a higher market price for certified organic farming. For instance, Berur Horticulture Cooperative indicates that the current market price of non-certified organic farming is 100 KSH per kilo, while farmers will receive 20 to 30% more for certified farming. The banana cooperative Ainamoi currently receives a market price between 300 – 600 KSH per bunch, while they expect to receive 800-1000 KSH per bunch for certified organic farming products. Berur cooperative that already does organic farming would like to learn how to become a certified organic farming cooperative. There is more research needed if these expectations are correct according to the market price for organic food products.

Other cooperatives also stress that they would like to be connected with the market. For instance, Ainamoi Banana cooperative grows a local banana variety, while the market requests a different variety (Williams) and a higher volume of bananas than the community can produce at this moment. Also, the interviewed poultry farmers are not well connected to the market. The chicken meat is imported from Nairobi to Uasin-Gishu, while the poultry farmer and fellow farmers cannot supply the local market in Uasin-Gishu.

Needs that are addressed by farmer cooperatives and individual farmers in livestock, horticulture and fruit trees

As stressed earlier, most of the farmer cooperatives stress that they need in-depth training on how to make and how to apply compost. Several cooperatives, farmers and the Kakamega youth in Agribusiness stress that they need demonstration farms to see the impact of organic farm inputs and other types of regenerative farming practices with emphasis on simple farming techniques in order to generate interest in young farmers. On top of that, farmers stress that they need consistent long-term training on how to apply new technologies. For instance, some farmer cooperative members receive training on composting stress that farmers need more consistent training since farmers did take up the information and skills from one-day field training on composting.

Furthermore, cooperatives stress that they need access to funding to invest in equipment that could accelerate the composting process (Berur cooperative). There is also a need to add value to avocados value chains, for instance, the rejected avocados could be processed into avocado oil. On top of that,

waste could also be reduced in the avocados value chain, but introducing packing at farm level through packhouse. As a result, waste and rejected avocados remain at the farm, and can be used as a source for composting. Also, simple interventions could be done such as introduction as the beehives to increase the pollination (Berur cooperative).

Dairy farmers would like to upscale their animal feed production with a miller (Tarakwo & starlight cooperative). On top of that, the starlight cooperative needs storage for the storage of seed potatoes. Poultry farmers in Usain-Gishu seem not to be well organized since there is no cooperative for poultry farmers, which means that there is a need for a poultry association. Also, there is a need for value addition to poultry meat for a fixed price, affordable animal feed and veterinarian services, need for financial and technical support to improve productivity.

Processors

As stressed earlier, food processors produce high quantities of organic waste or agricultural by-products that can be transformed into new farm inputs and other circular economy products (e.g. energy). A great example are the different tea companies that are present in Kericho. In Kericho county alone, there are five tea companies each with a number of tea factories. Under Kenya Tea Development Agency (KTDA) for instance, the organic waste that is produced by Tegat tea factory (tea dust, sweepings, residues of firewood) is left at the company side, without any use of the organic waste. Some farmers collect some organic waste from the company for free to use it as an input for compost. However, most of the waste is left at the company. The wastewater is released into lagoons, and most likely it is connected with the groundwater system (table 6). Waste water can be reused for other purposes. For instance, [James Finlays Kenya Limited](#) is currently piloting co-generation of electricity from factory wastes through a biodigester. The gas is converted into electricity for use within the factories while the bio-slurry is used to grow fuel trees. The utilization of tea processing residues is a great business opportunity (table 6). Other factories can adopt the same model where wastewater is transformed into biogas and biofertilizer through a biogas system. On top of that, wastewater can be recycled through a biodigester. Organic residues of tea processing can be transformed into organic fertilizers for farmers. Following that, residues of firewood can be transformed into briquettes as energy sources for the communities. The transformation of organic residues into briquettes and wastewater into biogas also helps the company to reduce the utilization of firewood. On top of that, the company utilize the water from the river with a pump, which means that the recycling of water would reduce the water uptake from the river and the energy and water costs to pump water.

There is more research needed about the exact data of the quantities of organic waste that is produced by the tea companies in Kericho (potentially also Bomet), and more information about the current utilization of tea residues among other tea companies.

Table 6. Overview of the different waste streams that are produced by 1 tea company. Please note that all numbers are an indication by the tea company.

	Quantity produced per production day	Quantity produced per week	Quantity produced per month	Quantity produced per year	Estimation of the total quantities for 5 companies with the same production capacity for 1 production year
Organic waste		300 kg	1200 kg	14,400 kg	72.000 kg
Waste water	20.000 litre	140.000 litre	560.000 litre	6.720.000 litre	33.600.000 litres
Waste of firewood	No numbers available				



Figure 16. The left picture shows tea residues, on the right picture shows the lagoon of wastewater that is generated by the tea company.

Apart from tea, the community in KORU Kericho county is surrounded by 4 coffee factories namely Swot-, Sorwot-, Sereng- and Koiseger. One coffee factory process about 251.000 kg/year, 20% of the production are coffee pulps, which is about 50.000 kg/year. Currently, some of the husks are used as charcoal, while the coffee pulp is mostly thrown away. The coffee miller that the cooperative is working with would like to make a fertilizer from the coffee residues. The Chief Executive committee member of agricultural in Nakuru County stressed the need to reuse coffee wastes by converting into farming inputs and beyond. The coffee miller would like to make organic fertilizers from the coffee waste.

In Bungoma, several sugarcane companies produce high quantities of sugarcane waste. A perfect example is Kuni Safi that collects a by-product (bagasse) from a nearby sugar cane company, called Butali Sugar. Kuni Safi transforms the sugarcane waste into briquettes as a source of energy. On top of that, they also produce compost as a by-product of the production process, which they currently do not use. Currently, about 100 employers are working to transform sugarcane waste into briquettes, which is only 5-10% of the sugar cane waste of 1 commercial sugarcane company. In the county there at least 3 other sugar cane companies, such as Busia sugar mills Ltd, Mumias Sugar Company, Nzoia Sugar Company ltd and at least two other sugar cane companies in the neighbouring counties West Kenya (Kakamega) and Muhoroni sugar company (Kisumu).



Figure 17. The by-product of sugarcane waste is transformed into briquettes.

In Uasin-Gishu county, one farmer of Tarakwo Cooperative processes about 90.000 kg of maize per year. About 23% of the production are corn cobs, which is about 207.000 kg of corn cobs (figure 15). Currently, these corn cobs are sold to coca-cola as an energy source for their production process (like firewood), although corn cobs can be used to produce animal feed and bio-ethanol.

Waste collection: food markets & dumpsites

During the scoping mission, it became clear that counties have different waste management strategies, which leads to different results. In Bomet, waste is collected through the government, while waste in Kakamega and Nakuru is collected through a contracted company that charges waste collection fees. The results can be seen since the county of Bomet has much illegal dumping along the road, while Kakamega has a clean environment. As a result, the streets are dirty, and cows are eating from the trash in Bomet. Bomet is still looking for a long-term waste dumpsite, which means that the dumpsite is on only temporarily.



Figure 18. the waste management infrastructure in Bomet.

In general county governments have not a waste separation infrastructure in place in the urban areas except Kakamega which indicated that it had waste separation at a few urban food markets. The scoping mission could not however verify this due to tight travel logistics. Kakamega has the ambition to establish waste separation infrastructure at source with the food markets, including during

transport. On top of that, the county has the ambition to set up a plant to transform inorganic waste into energy, which means that a waste separation infrastructure needs to be established.

Nakuru County has a plan to establish a new food market, which could be an opportunity for SNV to establish a waste collection infrastructure on the food market. Waste at the food market in Nakuru town (called Topmarket) is collected in baskets. Some of the market stands separate waste into plastics and organic waste by themselves. In contrast to other county governments, Nakuru already has land with a gate and security for their waste management, while most of the other county governments apply open dumping with any protection. Therefore, the county government in Kakamega and Nakuru seems a bit more advanced in their waste management infrastructure than other county governments.

In general, waste is not collected in the rural areas of the counties.

Table 7. Overview of the waste (organic and inorganic) that is produced

	Quantity produced a day
Sub-county 1 of Kakamega (7 food markets)	17.3 tonnes of mixed waste
Subcounty 2 of Kakamega	14.3 tonnes of mixed waste



Figure 19. The left picture shows waste collection at Kericho county, the right picture shows an open dumpsite in Transzonia county

3. Stakeholder mapping

The next following pages provide an overview of the different relevant stakeholder per stakeholder group for Kenya and Rwanda along the food system. For this stakeholder mapping, NGOs, (research) institutions, government authorities and private companies are identified along the food system.

The google drive includes an **excel spreadsheet** that provides a full overview of the names of the different organizations, the activities of the organization and the contact details of the organization. The **google folder “stakeholders”** also provide additional information that is provided by the stakeholders. This section briefly highlights the most potential partnerships for SNV Kenya and Rwanda.

Potential partnerships for Kenya

There is a great potential for SNV Kenya to explore a partnership with [MESPT \(Micro Enterprises Support Programme Trust\)](#) and [the Kenya Climate Innovation Centre](#) that have similar goals. MESPT is also in the inception phase to set up a 5-year project to introduce farmers to regenerative farming practices (already funded) in counties that overlaps with the REALM project, such as Usan Gishu, Nakuru, Kakamega, Bungoma, and Transzonia. The project also supports SMEs and farmer cooperatives on regenerative farming, including on how to reduce waste, agroforestry with fruit trees and good farming practices. They will also link with service providers (SMEs) and farmers. MESPT provides financial support for SMEs (in total about 400.000 USD) that can solve the identified problems in the food system that farmers are facing (e.g. organic fertilizers/compost / biological pest control). MESPT has an MoU with Kenya Climate Innovation Centre whereby both organizations can use each other's services and networks of existing companies and start-ups. Also, MESPT aims to make the linkage between farmers and SMEs. MESPT has an MoU with Kenya Climate Innovation Centre who has a network of circular service providers ranging from agroforestry, waste to energy and farming input and technology solutions. Kenya Climate Innovation Centre can support companies with technical and financial support. KCIC has established agricultural hubs in a few counties and is planning to open up more hubs across the county (e.g. Kiambu, Usan Gishu, Nakuru, Bungoma and Kisii). Both organizations are very supportive to explore collaboration, and MESPT is even willing to combine resources to increase the impact.

Also, the [Kenya Organic Agriculture Network \(KOAN\)](#) could be a very useful partner since it has been working with several stakeholders along the value chain to promote organic food and farming. It can also help to assist with the certification process of organic farming, including to provide access to organic food markets. KOAN also provides training to farmers on how to comply with organic farming standards, creates consumer research and awareness about organic food. The [World Agroforestry centre](#) could play an essential role to introduce farmer communities to more advanced agroforestry practices. Furthermore, the World Agroforestry Centre has research and advocacy experience with the Kenya Government. They are contributing to the National Agroforestry Strategy and have been working closely with the government to solve institutional barriers in policies (institutional development). Also, the World Agroforestry has developed a fruit portfolio for fruit trees that could provide farmers year-round with fruits and additional income, [and an application to collect data about trees](#). Furthermore, ICRAF has been working on a circular economy proposal to engage small scale farmers to transform crop residues into package and construction materials. They recently [launched a website](#) to engage more with donors on engaging farmers into the circular economy to reduce deforestation through smart energy solutions for Kenya and other African countries.

Lastly, SNV Kenya should work closely with government authorities that include the Ministry of Agriculture, the Ministry of Environment (agroforestry and waste management) and the authorities, followed by the local government bodies in the selected counties and their research institutions (e.g. KARLO).

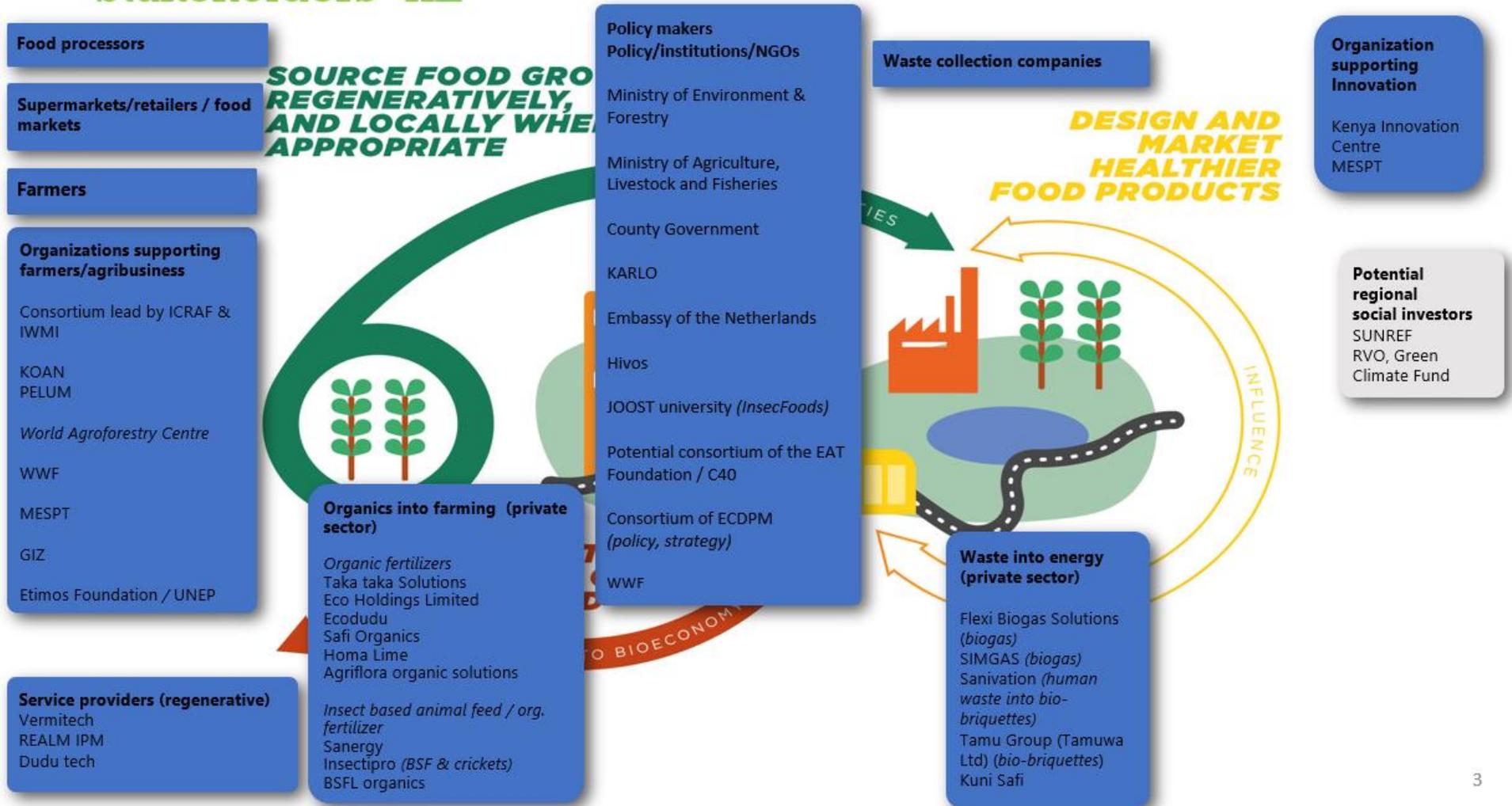
Potential partnerships for Rwanda

SNV Rwanda could explore a partnership with the Swiss St. Gallen University that works together with Kigali Impact Hub and SDC (Swiss Agency for Development and Cooperation) on a business accelerator project on circular food systems ([Lab of Tomorrow](#)). The project focuses on existing companies and start-ups. Although the Lab of Tomorrow focuses on wider circular food system challenges, there are still good synergies since they also focus on regenerative and circular agriculture, and potentially also on animal feed sources. Furthermore, SNV Rwanda could also explore a partnership with [ROAM](#) (Rwanda Organic Agriculture Movement) that promotes organic farming and is familiar with the potential market and legislation. The International Institute of Tropical Agriculture (IITA) Rwanda could potentially provide their research experience of the RUNRES project, that aims to introduce circular economy business innovations in the Rwandan Agriculture sector. Although, the main project is implemented in Kamonyi, which is a different target area in Rwanda.

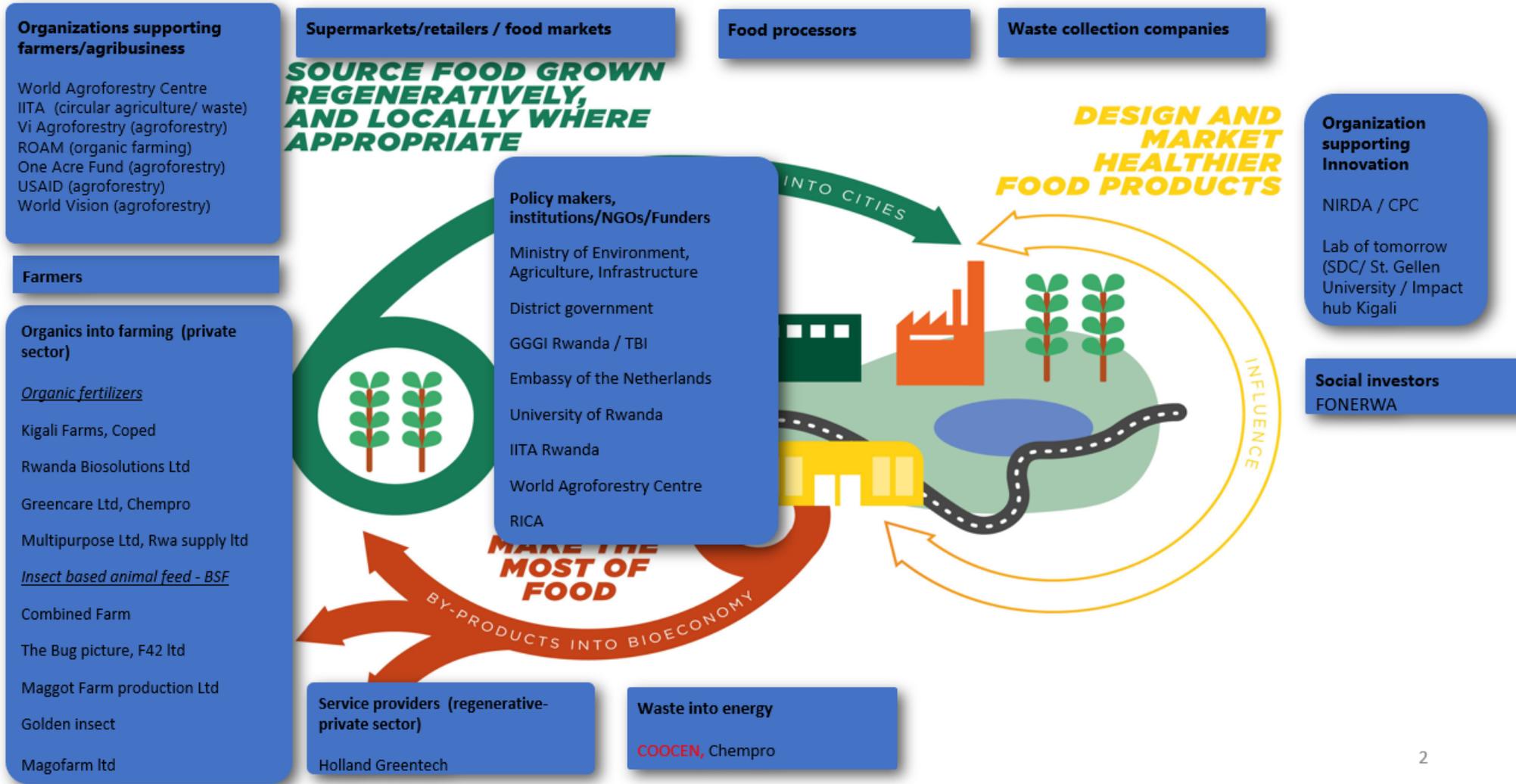
Similar to Kenya, the [World Agroforestry centre](#) could assist with research, advocacy and to introduce farmers to more advanced agroforestry practices. Optional, SNV Rwanda could explore if it would be possible to collaborate with the sister company of NIRDA, called CPIC (Centre for Cleaner production and Climate Innovation), to provide services to companies towards circular economy practices, industrial symbiosis and green production. In 2020, they have supported at least 43 companies, biomass is one of the focus areas, including composting and biogas systems. CPIC has the objective to establish an innovation/technology hub to test green technologies, but in 2020 there was a lack of finance to do this.

Lastly, SNV Rwanda should work with the relevant government bodies, such as the Ministry of Agriculture, Rwanda Agriculture Board and Ministry of Environment (agroforestry). The Director-General of Agriculture Development of the Ministry of Agriculture and Animal Resources (Dr. Murakezi) has been strongly encouraged to be involved from the beginning. In case interventions need to be made in the waste management infrastructure close collaboration is needed with the Ministry of Environment and Infrastructure since both Ministries are responsible for the waste management and recycling infrastructure. This will be further discussed in Chapter 4.

Stakeholders- KE



Stakeholders - Rwanda



3. Policy review

3.1 Rwanda

4.1.1 Institutional framework

Rwanda's government structure is top-down organized. The ministry designs the policies, while the authorities that fall under this ministry, regulates, evaluates and monitors the compliance of the different policies. Following that, the local government, such as Kigali City/district government, implements the different policies. An example of the Ministry of Environment is illustrated in figure 7. In Rwanda, every district government is further divided into sectors, cells and villages ([UK, 2018](#); [Republic of Rwanda, 2020](#)). The top-down government structure requires that the government at the national level should be informed about potential initiatives at local level.

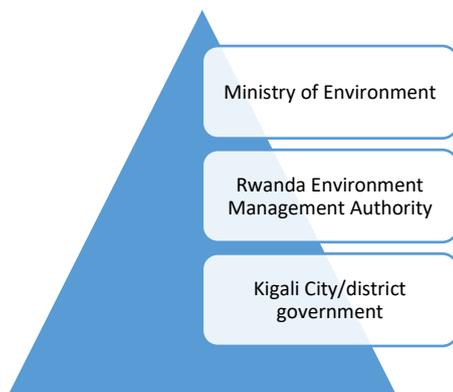


Figure 20. Overview of the structure of the Rwandan government.

4.1.2 Relevant policies

There are a couple of strategies and policies that are important towards the implementation of a circular economy in Rwanda's food system or regenerative and circular agriculture. This study provides an overview of the existing relevant policies, position papers, and government strategies (table 8). Since circular and regenerative agriculture is a cross-sectoral topic that is not covered in one policy, this study also identified general policy documents related to circular economy, green growth, waste management that might be relevant for REALMS. Since policy documents such as the circular economy position paper are not directly focused on circular and regenerative farming practices, they will not be discussed in detail. The Green Growth Strategy for Rwanda is cross-sectoral and has overlap with some agricultural policies, therefore it is decided to discuss the agricultural policies that provide more details.

This policy review discusses the most important policies that are relevant for REALMS, which the Strategic Plan for Transformation of Agriculture phase 4, National Fertilizer Policy, Rwanda National Forestry Policy 2018, and the agroforestry strategy. Following that, the most important waste management policies are the National Sanitation Policy, and the National Environment and Climate Change Policy.

After discussing these policies, this section will briefly discuss the current policy gaps in the policy environment in Rwanda.

Table 8. Overview of different policies that link with the REALMS objectives.

	Promote general circular economy principles	Waste management	Sustainable farming practices	Improve soil health and fertility	Promote organic farm inputs	Agroforestry
Green Growth strategy – MoE and other				x		x
National environment and climate change policy - MoE	x	x	x			
Circular economy position paper - MoE	x					
National Sanitation Policy and Strategy		x			x (compost)	
Strategic Plan for the transformation of agriculture - MinAgri				x	x	x
National fertilizers Policy - MinAgri				x	x	
National Forestry Policy - MiniLaf						x
Agroforestry strategy						x

Agricultural Policies – Ministry of Agriculture

No policy covers all aspects of regenerative and circular agriculture in Rwanda. The strategic plan for the transformation of agriculture covers some aspects, followed by the National fertilizer policy that promotes organic and biofertilizers. The Government of Rwanda (GoR) also indicated the crop intensification programme as an important policy document, since it stressed that regenerative and circular farming (e.g. intercropping / no tillage etc.) should not drastically interfere with priority crops in Rwanda. The government stresses that farm productivity is the focus of all policies and interventions with small scale farmers in Rwanda.

The Strategic Plan for the Transformation of Agriculture in Rwanda – Phase 4

The [Strategic Plan for the Transformation of Agriculture in Rwanda](#) - Phase 4 outlines investments in agriculture and estimates required resources for the agricultural development for the period 2018-2024. It aims to contribute to the economic, social and governance transformation towards the ambitions of Vision 2050. The strategic plan is an implementation plan under the National Agricultural Policy (NAP), which sets out the policy framework for a productive, green and market-led agriculture sector in Rwanda.

The Strategic Plan seeks to (action areas):

- Emphasize the adaptation of developing integrated soil fertility (ISFM) and integrated pest management (IPM) technologies. It also wants to prioritize research on bio-fertilizer technologies (e.g. vermicomposting, organic fertilizer and enriched compost).
- Support the increase of organic fertilizer production and utilization
- Support training is provided on the proper management of soil organic matter
- Focus on research efforts that will concentrate on tree/crop/soil interfaces and developing suitable models and technologies to increase agroforestry. The research undertaken in this area will support the implementation of the new agroforestry strategy
- Efforts will be made for domestic production and duplication of quality/certified planting material. This will improve the availability of seeds for cereals, fruits, and vegetables as well as seedlings for agroforestry trees.
- Provide Climate-smart and IPM extension services for farmers
- Enhance the productivity of crops cultivated in Rwanda in a sustainable and climate-smart way
- High priority to building productive resilience to climate change by promoting climate-smart practices

National fertilizer Policy

The [National fertilizer policy](#) promotes the utilization of organic fertilizers to improve and sustain soil fertility.

The policy promotes:

- Lime, organic and bio-fertilizers to compliment inorganic fertilizer use shall be encouraged to achieve an integrated approach to soil fertility management.
- The use of organic and bio-fertilizers together with inorganic fertilizers shall be popularised and an integrated approach to plant nutrient management that counters soil degradation and maintains soil fertility

It is important to note that the GoR promotes organic / biofertilizers together with inorganic fertilizers to compliment different farming inputs.

Standard on organic fertilizers

There is a standard for organic fertilizers that describes, which materials can be used for composting (animal manure and urine vermicomposting, green manure/green leaf manure/crop residues and kitchen waste) and which are not allowed (sludge - only sludge from farms/biodigester is allowed), agricultural by-products of plant organic of food and textile industries, blood, bone and other mean brought in from resources, and raw/not decomposed human excrement incl. urine). In case the project would like to learn more about the standard this standard can be purchased from the Rwanda Bureau of Standards.

Standard on organic farming

At the moment of this study, there is no specific standard identified for organic farming in Rwanda. According to a cooperative that is into organic coffee farming explained that the cooperative trains

farmers on organic farming. After that, a company called [Control Union](#) does an inspection every year on the compliance of farmers on organic farming.

Crop Intensification Programme

Although the purpose of the policy review is to review regulations, this study wants to highlight one government program that has a significant impact on farming activities in Rwanda, namely the Crop Intensification Programme (CIP). CIP is a flagship program that is implemented by the Ministry of Agriculture, that aims to significantly improve the food security and productivity of food crops across the country. CIP undertakes an approach that includes the facilitation of inputs (improved seeds and mineral fertilizers), consolidation of land use, provision of extension services, and improvement of post-harvest handling and storage mechanisms. The program focuses on six priority crops namely, maize, wheat, rice, Irish potatoes, beans and cassava. The program has selected per area in which priority crops should be cultivated.

Agroforestry Policies – Ministry of Environment

Rwanda National Forestry Policy 2018

The [National Forest Policy](#) defines the government's medium to long term intentions for the development and management of the national forest resources. The GoR has formulated 7 policy statements/policy focus namely (1) to improve institutional capacity (2) ensure sustainable forest management (3) private sector participation, (4) woody biomass energy, (5) forest ecosystem conservation, (6) participatory forest management, (7) agroforestry and trees outside forest development. The policy clarifies that the Ministry of Agriculture is responsible to develop and implement agriculture intensification programme using agroforestry practices.

The main policy objectives and statements that are interest of REALMS:

- The GoR wants to adopt agroforestry and trees outside the forest- techniques to contribute to overall forest resources and agricultural productivity. This includes trees in cities, on farms, along roads and other locations, which are not part of the forest. To do so, several policy actions are needed such as the establishment of incentive mechanisms to attract private landowners to plant trees, and to include trees outside the forest as the development and implementation of the agroforestry strategy.

Agroforestry strategy

The GoR has developed a National Agroforestry Strategy as an outcome of the National Forestry Policy. The National Agroforestry Strategy provides a roadmap for promoting leadership and synergies in agroforestry and engaging coordinated actions to improve the adoption of agroforestry in Rwanda.

The strategy has identified six action themes namely:

- Creating policy and institutional framework for agroforestry,
- Innovative research and knowledge for agroforestry development. As part of this objective, the strategy also aims to develop innovative, appropriate, sustainable agroforestry models and technologies adapted to the different agro-ecological zones of Rwanda.
- Strengthening communication and extension for agroforestry adaptation and scaling up. This includes educating farmers about agroforestry practices, awareness campaigns, and to strengthen extension services to farmers.

- Promotion of priority agroforestry practices for land restoration, and soil health. This also includes the diversification of species and fruit trees and animal fodder. Following that, it also supports to produce agroforestry fuelwood and timber.
- Marketing of agroforestry products and development of their value chains. This includes to mobilize investments in marketing and value chain agroforestry tree products.
- Empowering women and youth through agroforestry.

Waste management Policies – Ministry of Infrastructure / Environment

The current waste management arrangements are spread over different ministries and institutions, all these government institutions follow regulations that are only a small portion of their current mandate. As a result, there are several institutions responsible for different parts of the waste management infrastructure (figure 21). The backbone of all waste management policies is the Organic Law Determining the Modalities of Protection, Conservation and Promotion of the Environment. The Organic Law on Environment defines the legal framework and the responsibilities of the different institutions (Rajashekar et al., 2019).

Since the waste management regulations are fragmented over several institutions, this study used the research of Rajashekar et al. (2019) that is conducted in collaboration with the government, to get an understanding of the current waste management policies (figure 21). In the interest of REALMS, the National Sanitation Policy and the National Environment and Climate Change Policy are most relevant. The Ministry of Infrastructure and authorities is responsible for services around transport/waste collection/landfill (National Sanitation Policy), while the Ministry of Environment responsible for the environmental guidelines around the treatment of waste (the National Environment and Climate Change Policy) (source: Ministry of Environment).



Figure 21. Overview of the different policies and legal structures (Resource: [international Growth Centre](#), 2019). Note: The Rwanda Environmental Policy is revised into the National Environment and Climate Change Policy.

The National Sanitation Policy

The Policy has been developed as an umbrella policy to provide guidelines for all aspects of sanitation, including liquid, solid, industrial and nuclear waste, e-waste, healthcare waste and hygiene. In the interest of this study, policy also includes regulations for solid waste.

The next following regulations/actions of the policy are relevant for solid waste:

- Develop integrated approach for solid waste management in Rwanda
- Facilitate solid waste collection and transportation. Solid waste will be sorted, collected and transported for disposal. Effective waste collection & transportation systems should be put in place by the authority
- Encourage waste reuse and recycling - there should be waste prevention strategies where the total amount of waste may be significantly reduced through the implementation of recycling plans.
- Waste disposal: landfill and management guidelines will be put in place by the authorities

National Environment and climate change policy

The National Environment and climate change policy is another policy that briefly mentioned the waste management practices. However, the policy does not only mention waste management practices since the overall policy provides guidelines and responses to emerging issues, such as critical challenges in environmental management, and climate change adaptation. The National Environment and [National Climate Change Policy](#) is an updated version of the National Climate Change Policy mostly to include policy reforms, climate change and international & regional developments. It is stressed in the policy that one of the main challenges is that there are insufficient legal frameworks (laws) to enforce the environmental policies.

The main policy objectives and statements that link with REALMS:

- Develop a national integrated waste management strategy, including economic incentives to manage waste (policy objective 5, statement 2). Following that, the GoR wants to promote private sector investment, especially for the development of appropriate infrastructure for water, sanitation and waste management (policy objective 1, statement 4).
- Promote green and circular economy to advance sustainable consumption and production patterns in Rwanda. This includes to establish a legal framework to enable circular economy, reinforce strategy to implement circular economy, promote circular economy practices in the private sector. Also, the GoR wants to promote resource efficiency, greener, cleaner, environmentally friendly (production) technologies, practices and products (policy objective 1, policy statement 1, 2,3). Following that, the GoR wants to promote the establishment of facilities and incentives for cleaner production, waste recovery, recycling and reuse (objective 5, statement 2).
- Promote sustainable farming practices and educate Rwandan to ecological agriculture at all education levels (objective 2, statement 3).

4.1.2 Policy gaps

This study came across several policy gaps, therefore this study has categorized the policy gaps in three different categories, namely agricultural, environmental, and business policy gaps/barriers.

Agricultural policies

The next following agricultural policy gaps/concerns are identified:

- The current agricultural policies such as the Fertilizer Policy promote organic / biofertilizers together with mineral fertilizers as complementary farming inputs to increase crop

productivity. The Ministry of Agriculture is concerned that only organic farm inputs are not sufficient for productivity. The Ministry is worried about the long-term productivity impact of only organic fertilizers on Rwandan soil (Source: Ministry of Agriculture and Animal Resources, interview with the Director General Agricultural Development Dr. Murekezi).

- The Crop Intensification Programme (CIP) is developed to increase the utilization of farm inputs to increase productivity. The Ministry of Agriculture is concerned about regenerative farming practices that interfere with the priority crops of the CIP. Therefore, the Ministry of Agriculture is concerned about the introduction of regenerative farming practices in the priority crops of CIP (Source: Ministry of Agriculture and Animal Resources, interview with the Director General Agriculture Development, Dr. Murekezi).
- The priority crops of CIP somehow lead to an increase in monoculture among small scale farmers. As a result, the food security and income of farmers are dependent on a few crops, and that regenerative farming practices are not allowed with priority crops. For instance, in the Irish Potato value chains, it is not allowed to intercrop seed potatoes (potatoes that are grown for multiplication) with other crops (source: Seed Potato Fund).
- No-tillage practices can be introduced as regenerative farming practices, but research should prove that does not result in competition for resources for the cover crops, best practices should be discussed with RAB (Source: Ministry of Agriculture and Animal Resources, discussion with Director General, Dr. Murekezi).
- In case new biopesticides are introduced testing needs to be done with RAB. It is easier to introduce bio-pesticides that are proven in the EAC Framework e.g. in Kenya or Tanzania (Source: Ministry of Agriculture and Animal Resources discussion with Director General, Dr. Murekezi).
- There is no regulatory framework for bio-control in the terms of insects. In case this will be introduced this needs to be tested, experimented, carefully with research in collaboration with RAB (Source: Ministry of Agriculture, Director General).
- There is a lack of consultation of local government institutions and beneficiary when National policies and programmes (incl. NGOs) are introduced.
- There are not always sufficient funds to implement interventions at the local level, such as agroforestry.
- Since farmers have a lack of access to organic fertilizers and biomass the current productivity of organic farming is low among small scale coffee farmers. We can learn from the coffee cooperatives that apply organic farming, that it is essential the government arranges a higher market price for organic export products – and organic inputs need be promoted by GoR.

The next following waste management gaps are identified by the World Agroforestry Centre:

- It is not always clear at the district level who is responsible for agroforestry. The District does not always have the resources and capacity to work on agroforestry.
- There is no clear agroforestry extension scheme for farmers.
- There is no programmatic approach among NGOs, interventions are taking place in projects. Long term investment is needed for agroforestry
- At this moment mandate of agroforestry is shifted to MoE. MoE has the mandate for agroforestry, however, research is still under RAB. As a result, currently, limited research is conducted by the government.

The next following waste management gaps are identified:

- There is a lack of waste separation at source, collection and transport at city level, but also in rural areas. Despite that some of the districts have included in their contract to do waste separation, the waste separation is not taking place by the implementers. Ngororero district claims that the waste collector (cooperative) does apply waste separation of the food market to make compost. However, in reality the cooperative collects mixed waste from the food market. After the collection, waste is collected at a temporary place. The collected mixed waste is somehow sorted from the inorganic waste with the incentive to reduce transport costs/labour to bring organic waste from temporarily to the final disposal. The compost that is produced is not fully sorted, is low-quality, and farmers do not economically value the compost.
- The current waste management arrangements are spread over different ministries and institutions, all these follow regulations that are only a small portion of their current mandate. The Ministry of Infrastructure is responsible for services around transport/waste collection/landfill, while the Ministry of Environment is responsible for the environmental guidelines. In case organic waste is transformed into commercial farming inputs the MinAgri and authorities (e.g. RAB), and the Ministry of Environment are involved, while by transforming waste into energy the RURA, Rwanda Energy Group & Ministry of Environment needs to be involved.

4.2. Kenya

4.2.1 Institutional framework

Kenyan exist of the national government and the local government (counties). The local government exists of 47 county governments ([Kenyan government, n.d](#)). The recent decentralization makes counties responsible for local policymaking and implementation.

The Ministry provides the policy framework for the counties and advises the counties on how to implement these policies. Every ministry has different authorities (e.g. National management authority, NEMA) that monitors and evaluates the different policy frameworks. Every county needs to adopt the national policies from the national government, adapt them to county policies and is responsible for the implementation.

“The development of policies is going slow since policies need to be reviewed by different stakeholders”. – Kenya Climate Innovation Centre.

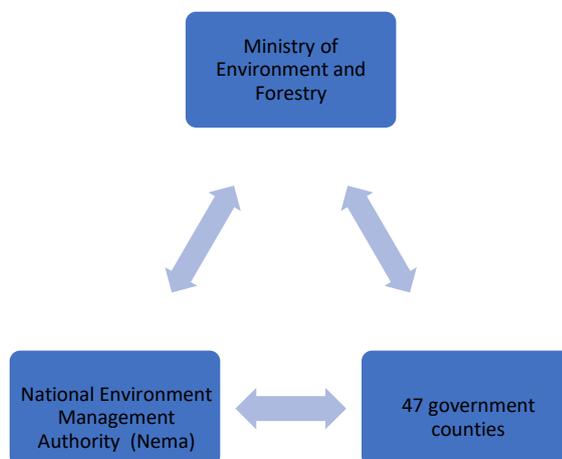


Figure 22. Overview of the government structure.

4.2.2 Relevant policies and regulations

This study has identified several policies that include aspects that link with the REALMS. These policies are presented in table 9.

This policy review will discuss the most important policies that are relevant for REALMS, which is the already adopted Kenya Climate Smart-Agriculture Strategy, and the Draft National agricultural soil management policy of the Ministry of Agriculture, Livestock and Fisheries. Following that, the most important waste management policies are the current waste management policy, called the Environmental and coordination act and regulation, and the upcoming Sustainable waste management Act and policy (draft) of the Ministry of Environment. The upcoming National Forest Policy and agroforestry strategy (draft) are relevant in regards to agroforestry.

After discussing these policies, this section will briefly discuss the current policy gaps in the policy environment in Kenya.

Table 9. Overview of the identified policies that include aspects that link with REALMS.

	Promote general circular economy principles	Waste management	Sustainable farming practices	Improve soil health and fertility	Promote organic farm inputs	Agroforestry
National Environment Policy - MoE		x	x	x		
Sustainable waste management policy and bill - MoE		x				
Kenya Climate-Smart Agriculture Strategy				x	x	x
Draft National agricultural soil management policy <i>MinAgri</i>			x	x	x	x
Draft National Forest Policy (MoE)						x
Draft Agroforestry Strategy						x

Agricultural Policies – Ministry of Agriculture

As stressed by the Ministry of Agriculture all agricultural policies are focused on three main pillars, which is agricultural productivity, income generation, and food security and nutrition. There is not one direct policy that covers circular and regenerative agriculture, although the Kenya Climate-Smart Agriculture seems to be the most relevant adopted policy for REALMS according to the Ministry. Furthermore, the Ministry is developing a policy that has the objective to improve soil health and fertility.

[Kenya Climate-Smart Agriculture Strategy 2017 - 2026](#)

The government of Kenya (GoK) acknowledges the increasing impact of climate change on the Kenyan climate Smart Agriculture Strategy (KCSAS). However, the existing national interventions such as the National Climate Action Plan are not aligned with the agricultural sector. Therefore, the Kenya CSA Strategy is to adapt to climate change, build resilience of agricultural systems while minimizing emissions for enhanced food and nutritional security and improved livelihoods. This also includes the promotion of practices such as agroforestry, conservation agriculture, soil and water conservation, to reduce post-harvest loss and minimal tillage. The specific objectives of the KCSAS are to (i) enhance adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change; (ii) develop mechanisms that minimize greenhouse gas emissions from agricultural production systems; (iii) create an enabling regulatory and institutional framework; and (iv) address cross-cutting issues that adversely impact CSA. The next four broad strategic areas have been identified as focus areas:

- Adaptation and building resilience by addressing vulnerability due to changes in rainfall and temperature, extreme weather events, and unsustainable land/water management and utilization. This includes agroforestry, promote sustainable management and utilization of natural resources (e.g. soil nutrient management, soil and water conservation, and conservation agriculture
- Mitigation of greenhouse gas emissions from key and minor sources in the agriculture sector
- Establish an enabling policy, legal and institutional framework for effective implementation of CSA;
- Minimizing the effects of underlying cross-cutting issues such as human resource capacity and finance would potentially constrain the realization of CSA objectives.

To include the climate change approach in the Kenya Climate Agriculture Strategy, the Ministry of Agriculture works together with the Ministry of Environment on this topic.

Agricultural Sector Transformation plan and growth strategy 2019 - 2029

Within the [Agricultural Sector Transformation Plan and Growth](#) Strategy, there is no strong emphasis on the utilization of organic farming inputs and regenerative agriculture. Similar to the Kenya Climate Smart Strategy, it does promote climate-smart agriculture with a focus on farm productivity, income generation, and to build resilience to climate change. Following that it promotes to reduce and remove greenhouse gas emission where possible through climate-smart agriculture and eco-friendly practices.

Draft National agricultural soil management policy (NASMP)

The GoK acknowledges that the current state of soil health and fertility is not sufficient for the projected 7% annual growth in the agricultural sector. The agricultural sector experienced several challenges related to soil health such as soil erosion and land degradation, inefficient use of fertilizers, inadequate and inappropriate soil and water measures, high costs of inputs such as fertilizers.

The GoK stresses that current agricultural policies and strategies failed to directly address the soil as an important source for agricultural production. Therefore, the GoK aims to develop a National Soil Management Policy (NASMP) to contribute to social - economically and environmentally viable development opportunities to improve productivity, food security and income through improved soil management. The policy will guide on how agricultural soils will be managed for increased crop productivity and production while at the same time conserving the environment. NASMP

encompasses sustainable agricultural soils concerning soil and water conservation, soil fertility management, agroforestry, soil restoration and rehabilitation, technology development, dissemination and utilization of soil management technologies and investments. Currently, the policy is not yet adopted and will be reviewed by the different counties in the next coming months.

Policy statements that are in the interest of REALMS:

- The national government will develop a regulatory framework for organic fertilizers, ensure standardization of organic fertilizers, develop standards and guidelines for organic fertilizers. The counties will sensitize farmers and service providers on organic fertilizers preparation and use, promote testing for the quality of organic fertilizers. The policy formulates organic fertilizers as substance or material of plant or animal origin that is added to the soil-plant system in its organic form or naturally decomposed form to supply plant nutrients.
- The national government will develop legal frameworks for bio-fertilizers, support capacity building on the use of bio-fertilizers in soil management, strengthening institutions like KEPHIS for testing the products identify, quality, safety and efficiency. The GoK will be strengthening relevant bodies to establish culture preservation centres to serve as reference banks for the biological material both locally collected and imported, and build technical capacity to address soil health. The county government will implement regulatory requirements for bio-fertilizers, and support capacity building on the use of biofertilizers in soil management.
- The GoK acknowledges the importance of organic agriculture practices. Therefore, the GoK will promote the making of organic farm inputs, develop a legal and regulatory framework for organic farming, standards and quality control for organic agriculture, enhance research and technology development in organic agriculture. The county government will strengthen research extension farmer linkage on organic agriculture, promote the use of organic farm inputs, build the capacity of extension officers and farmers in organic agriculture.
- The GoK will promote and facilitate capacity building on soil biodiversity, develop and maintain a comprehensive inventory of soil biota in the country. Following that, the county governments will develop a comprehensive inventory of soil biota in the country, support capacity building on the proper use of crop residues, promote and facilitate capacity building and training on practical advice in the field on biodiversity.
- The GoK will support agroforestry capacity building and research, encourage participation of the private sector in agroforestry, promote linkage ages between research and extension matters of agroforestry sans support agroforestry education. The local government will support agroforestry extension, improve access to high-quality agroforestry planting material, support private sector engagement, establish incentives for farmers to adopt agroforestry, and support agroforestry research.

Standards for organic fertilizers, biofertilizers, and organic farming

The Kenyan Bureau of Standards (KEBS) have introduced standards for organic and bio-fertilizers ([KEBS, n.d.](#)). The specification of the standards can be purchased on the website of the KEBS. There is no specific standard for human waste fertilizers, although they are not prohibited in the general fertilizer standard and policies. According to KEBS human waste can be used as a source, so long it is well treated. For organic fertilizers, a company needs to apply for the standard by KEBS, a sample needs to be taken, KEBS lab investigates the sample and will provide the company with a permit. For biofertilizers, biopesticides and biostimulants the Kenyan study technical committee on import and export of the Ministry of Agriculture needs to approve the products. In some cases, the Pest Control board also needs to approve the product (e.g. biopesticides). KEBS can provide more information about the process.

Currently, the certification of certified organic farming is private driven since organic farming is not an obligation (voluntary) in Kenya. This means that certification companies and Kenya Organic Agriculture Network (KOAN) are responsible for the certification process. KOAN provides training the farmers to comply with the [East African organic product standard](#) to produce food products for the domestic market. KOAN does not provide certification for the export market, which means that the certification for the export markets is only done by private certification companies. KOAN can provide more information about the certification process.

Agroforestry policies

Draft National Forest Policy (2020)

The overall purpose of the [policy](#) is to provide a legal framework to achieve sustainable development, management, utilization and conservation of forest resources and equitable sharing of benefits including flow of ecosystem services for present and next generations in Kenya. This is followed by the objective to support and promote agroforestry and forestry in Kenya. These efforts are especially needed since the GoK wants to achieve a national forest cover target of 10% of the land area, which means that the major afforestation effort needs to take place in community and private lands. The policy acknowledges that agroforestry and farm forestry play a significant role to improve farm productivity, soil fertility, soil and water conservation. This also includes that products as fuelwood or fodder from trees, shrubs or grass contribute significantly to improve the livelihood of farmer communities. At the moment of this study, the National Forest Policy is still a draft, and not yet completed. GoK needs to revise the Forests Conservation and Management Act of 2016 to implement this policy. The Ministry of Environment and Forestry is responsible for the policy-making of this policy.

The most important summarized statements/objectives that are in interest of REALMS (Draft National Forest Policy, 2020, p. 33-34):

- GoK wants to support agroforestry and farm forestry through a National Strategy and Action Plan to guide investment by the government and all key stakeholders. At the moment of this study, the National Strategy and Action plan is not yet in place. The World Agroforestry Centre has been asked to contribute to the **Draft of the National Agroforestry Strategy**, which will be reviewed by the Ministry of Agriculture and by a sectoral working group. At the moment of this study, this is still ongoing.
- The GoK wants to align the national forest policy with agricultural policies to promote agroforestry and farm forestry for private and community owners or occupiers of agricultural land.
- Incentivize the establishment of forest plantations, agroforestry, and farm forestry and promote public, private and community participation and partnerships in forest sector development.
- Awareness creation and encouragement of the private and community landowners to invest in agroforestry and farm forestry.
- Promote the processing and marketing of farm forestry products, followed by the promotion of agroforestry development through irrigation, forest extension and technical services.
- Promote agroforestry and farm forestry partnerships with private and community landowner to increase on-farm tree cover and to reduce pressure on reserved forest.

Waste management policies

The current waste management policies in place are focused on the linear “take-make-dispose” economy (Source: Ministry of Environment). The current waste management policy, also called the [Environmental and coordination act and regulation](#) only provide general regulations the mandates of different authorities, covers different environmental aspects (linear) and general guidelines such as:

- how the get access to waste licence for transport and waste disposal,
- regulations against dangerous handling and disposal of waste
- Every person whose activities generate wastes shall employ measures essential to minimize waste through treatment, reclamation and recycling.

Therefore, the Ministry of Environment is currently working on a new policy also called Sustainable Waste Management Act and Policy to introduce circular economy practices and reduce waste produced. The bill has the objective to provide a legal and institutional framework for the efficient and sustainable management of waste in the framework of the green economy, the realization of the zero-waste goal, the realization of the Constitutional provision on the right to a clean and healthy environment for all, and for connected purposes. The county governments play a key role in delivering the implementation of the act and policy. Currently, there is no enabling policy environment and regulatory environment in place that incentivizes and facilitates the establishment of multilink for circularity in the waste value chain. Both policies are still a draft, the adaptation of these policies are currently blocked by the politicians that have an own interest in the linear system and the existing policies in place (source: Ministry of Environment). The next table summarizes the main objectives of the act/policy.

	Objective	Relevant specifications
Sustainable waste management Act (2019)	provide a legal and institutional framework for the efficient and sustainable management of waste in the framework of the green economy, the realization of the zero-waste goal, the realization of the Constitutional provision on the right to a clean and healthy environment for all, and for connected purposes	<p><u>Measures & action</u></p> <p>Develop procedures for waste management:</p> <ul style="list-style-type: none"> - Promotion of health, safety and environmental standards incl. (a) quality and certification standards for organic compost, (b) facilitation of waste to energy and manure project, (c) Facilitation of collection of different types of waste (p. 13) <p><u>Duties:</u></p> <ul style="list-style-type: none"> ▪ The Ministry, through the national organs & agencies responsible for implementing this Act, shall put in place measures that seek to reduce the amount of waste that is generated and, where waste is generated, to ensure that waste is re-used, recycled and recovered in an environmentally sound manner. ▪ The national government shall develop a national sustainable waste management policy ▪ County governments shall, in consultation with relevant stakeholders, develop county legislation. This also includes to incentivize collection and separation of waste at source neighbouring hoods and informal settlements, and ensure cities plan for waste management facilities as part of city expansion ▪ Duty of private entities: any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under this Act and the regulations thereunder; (c) any person whose activities generates waste ensures that such waste is transferred to a person who is licensed to transport and dispose of such waste following the provisions of this Act ▪ Duty of citizens: they take all reasonable measures to avoid the generation of waste and where such generation cannot be avoided too— (i) reduce, re-use, recycle and recover waste (ii) to adopt circular economy in the management of waste; (iii) to segregate waste at source; (iv) to minimise the amount of waste that is generated;
The draft National Sustainable waste management policy (2019)	create a regulatory framework to protect public health and the environment, as well as to create wealth and prosperity by providing an enabling environment for integrated waste management and minimize waste generation, to contribute to a circular economy.	<p><u>Objectives:</u></p> <ul style="list-style-type: none"> ▪ Promote waste management through the implementation of the waste hierarchy and circular economy concepts ▪ Enhance mapping, planning, segregation, collection, transportation and audit of waste ▪ Strengthening the institutional framework that enables and enforces integrated planning, budgeting, decision-making and implementation, at both the national and county level ▪ Set up transparently managed financial mechanisms at the national and county level. ▪ engage, strengthen and build partnerships with all stakeholders, incl. private and informal sector, general public, education for responsible waste management behaviour. <p><u>Other relevant specifications:</u></p> <p>County governments have contracted private waste management firms to collect garbage, transport and dispose of waste and other related services. They also supply bins, liners and collection bags</p>

4.2.3 Policy gaps Kenya

This study came across several policy gaps, therefore this study has categorized the policy gaps in three different categories, namely agricultural, environmental, and business policy gaps/barriers.

Agricultural policies

The next following agricultural policy gaps are identified:

- A representative Ministry of Agriculture addressed that there are good policies and strategies in place, but that there is a great gap between the policy-making at a national level and implementation at the county level. The implementation and adoption of national policy goes slow due to the lack of resources, e.g. resources to work with farmers. Also, the farmers need to see the benefits before technologies are adopted (demo farms/other farmers that take the lead). Interestingly, at a county level (Bomet) the director of Agriculture does not see financial resources as constrain, but that counties need a plan to allocate budget for their activities on time.
- There is a lack of tools at the county level to enforce the adaptation of farmers to new practices and environmental constraints since county legislations are weak. A similar conclusion is made by the environment departments at the county level. An example that is provided is land use by farmers. An increasing number of farmers plant on areas that the farmers are not supposed to plant due to erosion, environmental conditions, while the counties do not have sufficient legislation in place to restrict farmers in their land use.
- National policies are too general for the county. Especially the Climate-Smart Agriculture strategy is indicated as too general for the counties since the conditions between counties differ significantly.
- It is not clear if the national or the county government is responsible for environmental issues related to farming. Therefore, there are fewer activities organized with the farmers and other relevant stakeholders. On top of that, the GoK is not focused on Environment, as a result, that there is less capacity and not much funding for activities (source: Berur cooperative, Bomet).

Environmental policies

The next following environmental policy gaps are identified:

- Several environmental act/policies are not completed, e.g. National Forestry Policy, National Agroforestry Strategy and the Sustainable Waste Management Policy/Act. According to the Ministry of Environment, the current adaptation of the Sustainable waste management policy and act that wants to improve the waste management infrastructure significantly is blocked by politicians that have an interest in the linear waste management system. As a result that the new waste management policies are not yet adopted and that waste management is poorly implemented in Kenya.
- Counties implement different waste management strategies. In Bomet, the county is responsible for waste collection and transportation, while in Kakamega the county government contracts with the private sector to collect waste. The results between the counties are quite different. In Bomet (and Kericho) you can find waste dumped along streets, while the streets in Kakamega are clean. Both counties only have a temporary dump side in place and are working to get one particular area for their waste. In Bomet, waste is dumped by a training centre of farmers. In contrast, in Nakuru, there is an official dumpsite including

a gate and security. In case waste management interventions are considered it is recommended to work with counties that already have more progressive waste management infrastructures in place, such as Kakamega and Nakuru.

- In Kakamega waste is collected by a private company, which charges citizens in Kakamega with a waste collection fee. In case citizens do not see the benefit of waste collection / cannot or are willing to pay waste collection fees, this can result in that citizen will bury and burn waste. Kakamega county government also stressed that they tried to introduce waste separation at the household level in the urban areas by capacity building. However, the county government stresses that this is not fully adopted by the households, the local county also lacks enforcement tools to establish this waste collection and separation infrastructure.
- Food markets are easy and entrée points to implement interventions in the waste management and separation infrastructure. Food markets are owned by counties, which means that the county government regulates their markets, including waste management. As a result, that government is checking their performance of their regulations, without an independent party (source: MESPT).
- According to the Ministry of Environment, there is a lack of collaboration between different ministries and a lack of environmental assessments of decision-making among the ministries.

Policy gaps addressed by the private sector active in the circular and regenerative agriculture sector

Companies stress that there are several gaps towards circular and regenerative farming practices, especially since some businesses are new for Kenya. The next following policy gaps are addressed by companies

- The introduction of new technologies is a challenge since there are no regulations in place for new technologies. For instance, Black soldier fly technologies are new for Kenya, which means that there are no regulations. Currently, it is in discussion if black soldier farms should be under the Ministry of Agriculture/Wildlife since butterfly farmers are under the Ministry of Wildlife. It is not easy to get a permit to do black soldier farming in Kenya, currently there is only 1 licensed black soldier facility in Kenya. Other black soldier farmers do not have a permit or work under a different permit that is not black soldier fly farming. The government first wants to see the market before they are willing to establish regulations for black soldier fly farming. Therefore, insect farming is not easy (resource: InsectiPro).
- The taxes on biogas systems have increased. Therefore, the price of the biogas system has increased, while some farmers already had challenges to afford the lower-taxed biogas systems.

5. Business cases

As part of the assignment, this study provided 10 potential business cases that are briefly discussed in **attachment 1**. During the workshop, it was stressed that SNV would like to support existing companies with capital. Therefore, the list is focused on existing companies and business models.

1. Production of commercial high-quality organic fertilizers
2. The production of insect-based animal feed through black soldier fly technologies – potentially through an out-grower model
3. The production of biogas and biofertilizers through biogas systems
4. Provide farmers with biological pest control products, and produce products locally to reduce costs
5. The production of calcium fertilizers from limestone
6. The production of briquettes from organic waste / agricultural by-products
7. The production of bio-char to improve the soil
8. Commercial tree nurseries
9. Organizing farmers to process fruits into juices or other added value products to promote agroforestry
10. Reduce post-loss and utilize agricultural by-products by taking over post-handling from farmers

We used the next following analysis criteria are used to discuss the 10 business cases (**attachment 1**). These criteria can also inspire SNV to use to select companies that implement different innovations:

	Improved livelihood of farmers: It helps to improve the livelihood of farmers: e.g. food security / income
	Circular: The business model <u>re-use</u> organic waste / agricultural by-products into new products such as farm inputs, energy and beyond
	Regenerative farming: business use/promote <u>regenerative</u> farming practices to improve biodiversity and ecosystems sourced
	Optimal use of resources: business helps to <u>optimize</u> available resources, and to <u>reduce</u> waste that is produced in the food system.
	Employment: The business case generate employment
	Profitable: The business generates profit – not depending on donors

Furthermore, this scoping mission also identified other potential business ideas that could be further explored, which is most likely not yet implemented by existing companies in Rwanda and Kenya. It is also recommended to check [the online portfolio of the different businesses](#) that are supported by the Kenya Climate Innovation Centre.

Value chain	Potential business solutions
Maize	Existing companies that buy maize on corncobs / are willing to buy maize on corn cobs can transform corn cobs into animal feed, bio-ethanol. There is even a potential to turn by-products in food products by transforming corn cobs into xylitol. Xylitol is a natural sugar substitute that tastes like sugar, that can be used to combat diabetes. Corn cobs are 23% of total maize production. Africa Improved Food is one of the companies that buys on maize on corn cobs.
Sugarcane	Transform by-products into bio-briquettes (bagasse), packaging material, animal feed (molasses), fertilizer/compost (e.g. mushrooms)
Tea	Extract caffeine from tea leaves, organic fertilizers from tea residues, transform waste water of tea companies into biogas / biofertilizer and recycle waste water through a biosystem. Products such as biofertilizers can be sold to farmers
Coffee	Transform coffee residues of coffee washing stations / processors into organic fertilizers
Water hyacinth of Lake Kivu	Harvest water hyacinth of Lake Kivu to transform it into animal feed

6.Recommendations

After conducting this scoping mission, this study has formulated a recommendation on three key outcomes of the REALMS project. These three outcomes are (1) adaptation of regenerative agricultural practices for smallholder farmers, (2) increased investment, business growth and revenues for local service providers of products and services supporting regenerative agriculture, (3) improved enabling environment, favourable to market-driven regenerative agriculture. On top of that, the consultant added another outcome area (4) research, data collection, monitoring and evaluation within REALMS.

Outcome area 1: adaptation of regenerative agricultural practices for small scale farmers

- Introduce organic farm inputs incrementally through demonstration plots and show farmers the difference between organic and non – organic inputs. Also, make farmers aware of their profits, costs of inputs vs. outputs for organic and inorganic farming inputs. The same should apply to other regenerative farming practices.
- Introduce farm products and technologies that have a proven impact on productivity. As stressed earlier it is already a step for farmers to shift inorganic to organic products. In case products of services providers that are introduced do not work, this will damage the adaptation to other farm products by farmers and the trust of government authorities. Research of farm products will play an important role.
- It is not recommended to introduce farmers to human waste fertilizers in the visited counties of Kenya at this moment. Farmers have a sceptical approach towards human waste fertilizers. Introduce interventions incrementally, since the adaptation from inorganic to organic farming inputs and regenerative practices is already a step for the farmers. On top of that, there is enough available waste – it is all about the management and separation of organic waste and agricultural by-products.
- It might be easier to start to work on biological interventions (integrated pest management) with crops before livestock is targeted. According to REAL IPM, it is not fully sorted how diseases can be controlled among livestock through biological interventions. On top of that, the legislation on livestock is more complex (REAL IPM).
- Establish a plant clinic whereby farmers can receive support from experts to identify diseases and which biological intervention should be introduced. The farmer need support to identify biological intervention on time, which is especially relevant for biological interventions. Farmers that apply pesticides act too late to control their pest and disease. This plant clinic could also function as a platform to connect farmers that apply regenerative and circular farming practices. REAL IMP has already established some of these labs, more labs could be introduced in other counties in Kenya, and potentially could be introduced in Rwanda. REAL IPM could advise on this and interventions could be made to improve the services to identify the diseases of the crops.
- It could be explored to set up a black soldier fly out-grower model (BSF) with small scale farmers, whereby they sell eggs to farmers, and train farmers how to grow BSF, and will buy back the final products. Insectlpro in Kenya is already experimenting with this type of business model.
- Farmers already have experience with circular and regenerative farming practices could be a lead farmer. The lead farmer could train other farmers, and be an example for other farmers. This is especially relevant in the adaptation of new technologies.

- In case SNV wants to work with poultry farmers in Kenya, there is a great need to organize poultry farmers. According to our visit, poultry farmers are not organized in cooperatives/associations and have a great lack of services, including affordable animal feed solutions. Solutions such as black soldier flies could help to reduce the costs of animal feed.

Agroforestry

- Focus on the market aspect of agroforestry: link farmers to markets for seedlings, link farmers that have their nurseries with customers. Currently, farmers are not or not well connected to markets, also existing stakeholders do not focus on the market aspect of agroforestry. Market research is also needed: Kenyan farmers that have their nursery are not well connected with markets, but at the same time neighbouring farmers steal trees from other mother tree plantations that are used to harvest seeds.
- Upscale the production of fruit trees by organizing farmers, and create a market for these farmers (e.g. fruit processors). Farmer cooperatives can play a role to organize farmers to supply higher quantities of fruits. The interviewed agroforestry farmers that are trained by ICRAF only produce for their consumption (attachment 1, business case 9).
- Make sure that farmers have access to different fruits during the different growing season for food security, nutrition and additional income during the year. Different trees could be planted to provide fruits during different seasons. World Agroforestry Centre could advise on this since they have working on a fruit tree portfolio.
- Upscale agroforestry interventions to more advanced systems, which also includes intercropping with crops between the trees, different types of trees and beehives to increase pollination on the farm.

Outcome area 2; increased investment, business growth and revenues for local service providers of products and services supporting regenerative agriculture

Market

- Get a better understanding of the domestic and international market price and demand for crops that are grown through (certified) organic farming. Farmers expect that their price will be higher, while input providers such as REAL IPM do not confirm these expectations. It could be more interesting for farmers to grow crops organic when they have a higher market price in the domestic or export market. Therefore, SNV could select crops that are grown organically for a high market price as the REALMS focus crops.

Business cases

- For new business cases related to the utilization of organic waste/organic by-products focus (1) on high quantities of organic waste produced – (2) and entree points that are easy to coordinate to ensure waste separation. These hotspots can be identified by focusing on food processors and food markets. It would be recommended to focus on the dominant processor industries in the different counties and to add value to these waste streams. Only in Kericho, there are 5 tea companies – excluding the tea companies in Bomet that potentially produce high quantities of organic waste and agricultural by-products. In Kericho and Nakuru there are several coffee millers/factories to produce high quantities of coffee residues that could be transformed into farm inputs.
- Explore the possibility to work with existing fruit processors or establish a start-up (e.g. juice) to create a market for the farmers for fruits of fruit trees to promote agroforestry (attachment 1, business case 9).

- Farmers are used to chemical fertilizers, especially in Kenya. It is recommended to first focus on organic and biofertilizers before human waste fertilizers are introduced. It is already a step for farmers to apply organic fertilizers in Kenya. Therefore, focus first on organic fertilizers, since farmers indicate they are sceptical about human waste fertilizers, but that they are willing to adopt organic fertilizers. Also, there is enough organic waste available either in the urban or food processing areas. Rwanda might be more open to human waste fertilizers.
- Include SMEs and start-ups to improve the policy framework, and identify the needs of the companies to regulate their products and process. Circular and regenerative business cases are often new technologies, whereby not all regulations or even permits are in place. For instance, there is no legal framework for black soldier farms.

Outcome area 3: improved enabling environment, favourable to market-driven regenerative agriculture

Value chains and project locations

- Narrow down the number of county locations in Kenya. During the scoping mission, we visited 7 counties (Bomet, Kericho, Bungoma, Kakamega, Trans-Nzonia, Uasin-Gishu and Nakuru county). Focus on the counties whereby SNV can ensure a long-term impact, especially since some interventions such as waste management infrastructures require efforts of the county government. For instance, Bomet still has a long way to go in their waste collection infrastructure (waste is dumped around the streets) and the county government seems to be less organized. In contrast, county governments such as Kakamega already try to do waste management and aim to establish waste separation at the food markets. Furthermore, Nakuru is in the process to set up a new food market, and some on market vendors on the “Topmarket” already apply waste separation / collection. Another opportunity is to focus on counties that have quite some industries, such as Nakuru, Trans-Nzonia, and Uasin Gishu. These produced (organic) waste streams of these industries could be transformed into new farming inputs and beyond, which might be a business opportunity for service providers – and for the farmers. More research is needed to identify what currently is happening with these waste streams that are created by these industries.
- Counties such as Nakuru have an important role to play in the protection of biodiversity, wildlife and the security of the quality of water bodies. For instance, at this moment it is not recommended to eat fish from Lake Nakuru due to the poor water quality. Regenerative and circular farming could help to reduce the environmental impact on the Lake. On top of that, Nakuru is one of the counties that has a large processing industry, which means that potential waste streams could also be re-used into farming inputs and potentially reduce the environmental impact – depending on the current state of the utilization of organic waste.
- Narrow down the term horticulture, and which horticulture value chains the project would like to cover. SNV could focus on the priority crops of the country, however, SNV could also focus to stimulate the production and market of new crops. The focus on other crops could also help to create new markets and to increase diversification, and biodiversity in the county (e.g. monoculture crops). SNV could potentially focus on horticulture value chains whereby crops have a higher economic value if they are organically produced. For instance, in Kenya, there is a domestic market for certified organic fruits (excluding bananas) and vegetables, and poultry, while there is an international market for certified organic avocados, Moringa and Macadamia (source KOAN). The focus on the certified organic market could also improve the income and could be an extra incentive for the farmer to focus on organic inputs. This would

require some extra research on potential the market of organic crops for local, regional and international demand.

Policies / governments

- Advocate to subsidize commercial organic fertilizer and inputs, and biological pest control for farmers to reduce the price of inputs and increase the profit for farmers that do organic farming. Also, a higher market price for export products – could reward the efforts of farmers.
- Organize stakeholder workshops/discussions to identify the policy gaps for farmers, cooperatives and the private sector that the REALMS project want to support. For instance, some circular business cases are new for the countries, which means that there are no policies and standards in place. For example, there are currently no clear guidelines/standards and permits for black soldier fly farming. It is important to advocate for these policy gaps, to improve the enabling environment for the private sector.
- Work together with stakeholders that have an advocacy voice to address policy gaps and restrictions. For instance, World agroforestry centre, Kenya Organic Agriculture Network (KOAN), Rwanda Organic Agriculture Movement (ROAM), and the Kenya Climate Innovation Centre, KALRO.
- Get insights on the certification process of organic farming, and how farmers/cooperatives can meet the criteria. KOAN (Kenya) and ROAM (Rwanda) can assist with this.
- Involve the government authorities from the beginning. For instance, in Rwanda, the director-general of Agriculture Development, Dr. Murekezi of the Ministry of Agriculture and Animal Resources is concerned about the impact of organic farming inputs on the agricultural productivity of small-scale farmers. This is especially relevant for the cover crops of the crop intensification programme since the Ministry is concerned about interventions in these value chains (source: Dr. Murekezi). Also, certain regenerative farming practices such as intercropping are not allowed among all cover crops. For instance, intercropping with Irish seed potatoes is not allowed (source: Seed Potato Fund). Dr. Murekezi also recommend to discuss REALMS with Dr. Charles Bucagu Deputy Director General of Agriculture Research and Technology Transfer/ RAB, Jean Claude Izamuhanye / Head Crop Production and with Dr. Solange Uwituze DDG Animal Resources Research and Technology Transfer / RAB.
- In Kenya, REALMS could advocate adopting the Sustainable Waste Management Bill & Act to enforce waste separation. Another strategy would be to focus on the waste infrastructure & policies at the county level, rather than national policies in case this is not feasible with the current challenges to hamper the adaptation. Following that, the Agricultural Soil Management Policy would also be recommended for advocacy activities. Since agroforestry is already high on the agenda of county governments, it would be better to focus on the two other policies.
- In Rwanda, REALMS could advocate to enforce waste separation of the National Sanitation Policy and the National Environment & Climate Change Policy– and to allocate resources for waste separation. Furthermore, REALMS could consider advocating for more flexibility within CIP, to do intercropping with priority crops and to provide farmers more flexibility to apply agroforestry (e.g. growing fruit trees). Although, this would also depend on which crop REALMS would like to focus on. Also, organic farming inputs could be more on agenda, by testing and demonstrating the yield of commercial high-quality organic and biological inputs to the government.

Stakeholders

- Collaborate with partners on what to do to implement similar projects to create comprehensive projects and partnerships and reduce overlap among different NGOs. In Kenya, there is a great opportunity to work together with [MESPT](#) and the [Kenya Climate Innovation Centre](#) that have similar goals. Especially since MEPST is in the same inception phase as SNV. There could be a potential to combine resources, especially concerning SMEs, which could increase the impact of the project.
- [KOAN](#) and ROAM could assist with advocacy, legislation and certification process for organic farming. KOAN could also train farmers on how to comply with the East African standards on organic farming.
- A similar strategy could be explored for Rwanda. There is a new business incubator programme that will be established in Rwanda called the [Lab of Tomorrow](#), focused on circular food systems. Explore collaboration with FONERWA to receive extra investment/funding for the companies.
- A multi country-level collaboration could be explored with the [World Agroforestry Centre](#) to tap on their work and advocacy experience in regarding to agroforestry in Rwanda and Kenya.

SNV projects

- Make the SNV project comprehensive with Veggies for the planet and people in Kenya. Although the projects have different intervention areas, there are some similarity, since both projects aim to introduce farmers to regenerative and circular farming practices – and are funded by the same funder (IKEA Foundation). Therefore, it would be recommended to make both projects comprehensive. For instance, the project Veggies for planet people will research regenerative farming practices, including the economic feasibility of these technologies in Kenya. Following that, the project will develop training material (e.g. ToT), and REALMS can tap from the stakeholders that they already engaged with, such as YALTA. Veggies for Planet and People could also benefit from REALMS since REALMS also aims to support circular service providers (SMEs and start-ups) with technical and financial support. As a result, more services providers and services could be available for both stakeholders of REALMS and Veggies for People and Planet.
- Utilize the available knowledge and expertise within the biogas project for potential biogas interventions to produce bio-energy and biofertilizers.

Outcome area 4: Research, data collection, monitoring and evaluation

- Baseline study to receive in-depth information about the current farm practices. The interviewed farmers do not represent their practices across the different counties. The focus of this assignment was to provide a quick scan on the existing farming practices. Especially in Kenya the practices can differ between the counties and the value chains.
- Also, this baseline study should include more specific data that should be collected from waste producers, waste collectors and the quantities of waste produced. This can be done for towns (e.g. food markets), and also for food processors (e.g. tea companies in Kericho). It might be an easier entry point to focus on food processors in some counties since waste separation is

likely easier to be applied at a commercial company. Also, there is a direct economic incentive for the company to separate their waste, if they can reduce their cost / or even make additional profit. In case interventions are done in the waste management infrastructure of towns/food markets, also interview consumers on their waste management behaviour, potential incentives for waste separation, and their willingness to pay for waste collection fees. In case there is no support for waste collection fees, citizens might start to burn / bury / dump their waste. There is more accurate data needed about the quantities of waste produced.

- Conduct several evaluations of the introduced interventions of the REALMS project to improve the implementation process.

Attachment

Attachment 1.

1. Production of organic fertilizers from organic waste

Food system challenge: farmers have a lack of access to fertilizers, while the application of mineral fertilizers contributes to environmental challenges. Furthermore, mineral fertilizers are expensive for farmers. In contrast, organic waste accumulates in cities, contribute to emissions and the risks of spreading diseases.

Solution: transform organic waste of cities, food markets, food processors or other waste hotspots into organic fertilizers.

	Improved livelihood of farmers: Positive impact at farm level through improvement of soils and resulting yield stability. Ideally organic fertilizers would be more affordable than mineral fertilizers, whereby the costs of farm inputs will be reduced for the farmer.
	Circular: The business model re-use organic waste of cities, food markets and other waste hotspots into new farming inputs.
	Regenerative farming: business helps to reduce the utilization of mineral fertilizers, and helps to improve the soil health.
	Optimal use of resources: business model helps to reduce the application of mineral fertilizers.
	Employment: The business case generates employment by providing jobs to waste transformers. Also, the informal sector can be involved by generating income opportunities through improving the waste and separation infrastructure.
	Profitable: There already companies in place across East Africa, that are able to make profit from organic fertilizers.

Potential needed interventions: access to biomass through interventions in the waste collection and separation infrastructure (e.g. food markets), or agreements with food processors that produce high quantities of agricultural by-products to upscale the production of commercial organic fertilizers. Also, there is a need to ensure quality control to provide farmers with consistent high-quality organic fertilizers. Furthermore, mineral fertilizers have been heavily promoted by the East African governments, which caused a mindset among farmers that mineral fertilizers are better than organic fertilizers. Commercial organic fertilizers could be subsidized to reduce price and promote organic fertilizers actively through the government.

Inspirational companies: [Taka Taka Solutions](#) in Kenya transform organic waste of Nairobi into organic fertilizers, Kigali Farms that sells mushroom compost to farmers and has plans for vermi-composting, small scale company [Golden insect](#) that produce vermi-compost and Vermi-tech that does not produce vermi-compost yet, but provide training to farmers on how to produce vermi-compost.

2. The production of insect-based animal feed through black soldier fly technologies

Food system challenge: Farmers use low inputs for livestock and cannot afford expensive animal feed that is frequently imported. Costs of animal feed increase due to higher oil prices & reduced crop harvests. Poultry sector animal feed costs are 70% of the total production costs.

Solution: Several small companies in East Africa use waste of local food markets, leftovers from food processing companies (e.g. breweries) & similar sources to process waste into high protein insect-based animal feed by growing black soldier flies (BSF) on organic waste. Compost is a by-product and also can be sold to farmers.

	Improved livelihood of farmers: Positive impact at farm level through improvement of soils and resulting yield stability by using the by-product of BSF as an organic fertilizer. Furthermore, an out-grower model could be used to increase the impact on farmers, whereby farmers buy the pupa and the company buys back the final product from the farmer.
	Circular: waste of food markets, and by-products of processing can be used to transform waste into insect-based animal feed and organic fertilizers as a by-product.
	Regenerative farming: business helps to reduce the utilization of mineral fertilizers, and helps to improve soil health. Furthermore, farmers do need to grow crops / or fish (e.g. poultry) as a source for animal feed, which reduce land use.
	Optimal use of resources: business cases helps to reduces land use, since there are no crops needed to grow animal feed.
	Employment: The business case generates employment and income opportunities, since (1) waste needs to be collected (2) staff to grow insects and (3) companies such as insect
	Profitable: Not all black soldier fly companies have been profitable yet, especially since it is a new business. However, the market for insect-based animal has been increasing across East Africa.

Potential needed interventions: there are no regulations in place since black soldier farming is new business. Therefore, the legal framework is lacking and the majority of BSF companies in Kenya breed insects without a license. Companies need assistance to set up the legal framework. Furthermore, farmers have not yet been widely introduced to this type of animal feed, which means that more promotion is needed.

Inspirational companies: [Insectipro](#) in Kenya grows black soldiers by the company, but also through an **out-grower model** with small scale farmers. Furthermore, Insectipro is growing crickets as a source for human consumption. Combined Farm in Rwanda collect food waste from restaurant to produce BSF for own poultry that sold back to the restaurants. Furthermore, they will sell animal feed to farmers. Farm 42, breed eggs, provide training, and is planning to set up training centre on BSF in Rwanda.

3. The production of biogas and bio-fertilizers through a biogas system

Food system challenge: farmers use unsustainable materials as a source for cooking (e.g. firewood), which contributes to emissions and put forest under additional pressure. Furthermore, farmers are not well connected with energy for their daily activities. Also, the collection of firewood costs time in the daily activities.

Solution: the use of biogas systems to transform organic waste into energy and it produces a bio-fertilizer as a by-product. Furthermore, there is additional time for other activities within the household, since firewood does not be collected.

	Improved livelihood of farmers: Positive impact at the livelihood of farmers, since the household access to clean energy for daily activities and can use the bio-fertilizer on the farm.
	Circular: farm – and house waste can be transformed into biogas and biofertilizers.
	Regenerative farming: business helps to reduce the utilization of mineral fertilizers, and helps to improve the soil health. Furthermore, farmers do need to grow crops / or fish (e.g. poultry) as a source for animal feed, which reduce land use.
	Optimal use of resources: business case helps to reduce deforestation
	Employment: The business case generates employment and income generation for the potential employers of the business.
	Profitable: the biogas system is expensive for farmers, most likely farmers need financial support to be able to afford the biogas system.

Potential needed interventions: Biogas systems are and expensive investment for farmers. A payment schedule / instalments could help to make it affordable for farmers. Farmers also need training on how to use biogas systems.

Inspirational companies: [Biogas international](#) provide moveable biogas systems for farmers and households.

4. Provide farmers with biological pest control solutions, and produce products locally to reduce the costs

Food system challenge: farmers use chemicals and pesticides to control pest on the farmers. Pesticides and chemicals pollute the environment and potentially the water. Furthermore, farmers do not always have the right equipment to spray pesticides on the farm, which could also lead to health problems. Also, pesticides harm insect and bee – populations that are key for the pollination of crops and fruits. There is a lack of services providers that provide biological pest control products to farmers. Lastly, farmers that apply chemicals to control pest and diseases, frequently respond last minute to pest and diseases.

Solution: the utilization of biological pest control products that do not harm the environment, the health of farmers and biodiversity. It will help to improve the biodiversity. The price of the products could be produced by producing the pest control products locally.

	Improved livelihood of farmers: Long term positive impact of the livelihood of the farmer, since the farm control pests through biological solution that attract biodiversity (e.g. insects) and it will reduce the health risks through the utilization of safe solutions. Trade-offs on pest and diseases need to be reduced through timely acting on pest- and diseases.
	Circular: the business model is not per se a circular business model
	Regenerative farming: sustainable farming practices that help to improve the biodiversity around the farm.
	Optimal use of resources: business model helps to reduce the application of pesticides.
	Employment: The business case generates employment by staff that provide services to farmers, and more jobs could be created once biological pest control products are produced locally.
	Profitable: the business could potentially increase profit by producing products locally.

Potential needed interventions: stimulate companies to produce the products locally to reduce the price of biological pest control products. This would also require that there are local regulations in place that enables companies to produce products locally. Furthermore, farmers are not widely introduced to these products, which means that farmers need to be trained and awareness creation is needed (awareness campaign). Farmers need to learn to observe pest and disease on time to act on disease and pest on time so that farmers do not need to apply pesticides.

Inspirational companies: [REAL IPM](#) provide low-cost biological solutions and Holistic Real IPM Projects to proactively reduce the use of chemical pesticides.

5. The production of calcium fertilizers

Food system challenge: some soils are acid, which makes plant less tolerant to draught.

Solution: the utilization of natural calcium fertilizers to improve the soil health.

	Improved livelihood of farmers: Positive impact at farm level through improvement of soils and resulting yield stability. Ideally, calcium fertilizers would be more affordable than mineral fertilizers, whereby the costs of farm inputs will be reduced for the farmer.
	Circular: The business model uses natural resources (limestone) to produce calcium fertilizers.
	Regenerative farming: business helps to reduce the utilization of mineral fertilizers, and helps to improve the soil health.
	Optimal use of resources: not per se applicable.
	Employment: The business case generates employment by providing jobs to produce calcium fertilizers.
	Profitable: -

Potential needed interventions: farmers need to be introduced to calcium fertilizer, which requires training and promotion.

Inspirational companies: [Homa lime ltd](#) in Kenya produce calcium fertilizers from limestone.

6. The production of briquettes of organic waste / agricultural by-products of processing companies

Food system challenge: farmers use unsustainable materials as a source for cooking (e.g. firewood), which contributes to emissions and put forest under additional pressure. Furthermore, farmers are not well connected with energy for their daily activities. Also, the collection of firewood costs time in the daily

Solution: transform organic waste / agricultural by-products into bio-energy. Furthermore, there is additional time for other activities within the household, since firewood does not be collected. For instance, by-products of sugarcane – and tea companies can be transformed into bio-energy.

	Improved livelihood of farmers: Positive impact on the livelihood of farmers, since the household access to clean energy for daily activities.
	Circular: agricultural by-products/organic waste is transformed into bio-energy, rather than leave / burning organic waste without purpose which causes emissions.
	Regenerative farming: business helps to reduce the utilization of mineral fertilizers, and helps to improve the soil health. Furthermore, farmers do need to grow crops / or fish (e.g. poultry) as source for animal feed, which reduce land use.
	Optimal use of resources: business models helps to reduce deforestation.
	Employment: The business case generates significant employment since (1) by-products / waste need to be collect (2) and briquettes need to be produced. One briquette company can produce about 100 jobs (e.g. Kuni Safi).
	Profitable: agricultural by-products / organic waste can be provided for low price / free by processing companies. The production of briquettes is relatively easy.

Potential needed interventions: providing cooking stoves that can be used on the energy of briquettes.

Inspirational companies: [Kuni safi](#) produces briquettes from by-products of one 5-10% of one sugarcane company in Kenya.

7. Production of commercial biochar to improve the soil quality – and to keep water in the soil

Food system challenge: soil degradation due to deforestation and cultivation has led to the reduction of carbon and nitrogen in the soil, which results in a reduction of soil nutrient retention and supply for **the plant grow**.

Solution: biochar is a charcoal that is produced from carbonised biomass from sustainable sources, it can be used for carbon sequestration and soil health benefits. Biochar helps to improve the soil quality by retaining water and nutrients, which stimulate plant growth. Due to the ability to retain nutrients in the soil, biochar reduces the needs for fertilizers. Some biochars even have the potential to immobilise heavy metals, pesticides and hormones due to the adsorption ability.

	Improved livelihood of farmers: Positive impact on the livelihood of farmers, since biochar helps to improve the soil, and to retain nutrients and water in the soil.
	Circular: biochar can be produced from sources such as agricultural residues, animal manure, and sewage sludge. Besides biochar, also biogas can be collected from the process.
	Regenerative farming: trees help to improve the soil on the farm, and most likely micro-organism in the soil.
	Optimal use of resources: business case helps to reduce the loss of farming inputs – and pollution.
	Employment: The business case can generate jobs by producing commercial biochar.
	Profitable: the technique is relatively simple and does not require a lot of investments

Potential needed interventions: farmers are not widely introduced to biochar, therefore promotion of biochar is needed among farmers. Farmers also need to be trained on how to apply it.

Inspirational companies: This study could not identify commercial biochar companies, although the [World Agroforestry Centre / Biochar for Sustainable Soil](#) or Vermi-tech might be aware of any companies in this area.

8. Commercial tree nurseries to provide seedlings for agroforestry

Food system challenge: the soil is under pressure of erosion due to cultivation and deforestation. Trees play an essential role to keep water in the soil, holding the soil together and healthy, providing shade and transform carbon into oxygen. There is a lack of commercial tree nurseries that can provide tree seedlings that can be planted on and around farms.

Solution: commercial tree nurseries to provide farmers, communities, local governments and other stakeholders with seedlings to plant trees. Fruit trees can play an addition benefits, since it can provide farmers with food security and income by selling fruits. To add more benefits to agroforestry, it would be recommended to promote different tree species.

	Improved livelihood of farmers: Positive impact at the livelihood of farmers, since trees help to improve the soil and farm biodiversity. Fruit trees can provide additional benefits such as food security and additional income by selling fruits.
	Circular: business model is not per se circular.
	Regenerative farming: trees help to improve the biodiversity on the farm, soil health and maintain water in the soil.
	Optimal use of resources: not per se applicable.
	Employment: The business case can generate jobs by growing and selling seedlings to the market.
	Profitable: the technique is relatively simple and does not require a lot of investments

Potential needed interventions: make sure that nurseries are well connected with the market and that they are located at an easily accessible location (e.g. along the main roads). Promote the importance of agroforestry and the benefits of trees.

Inspirational companies: World Agroforestry Centre promoted agroforestry from the farmer up to government level, [Tree bags Africa Limited](#) provide seedling bags made from biodegradable packing material.

9. Organizing farmers to process fruits of trees into juices / other added-value products

Food system challenge: the soil is under pressure of erosion due to cultivation and deforestation. Trees play an essential role to keep water in the soil, holding the soil together and healthy, to providing shade and transform carbon into oxygen. Furthermore, farmers are seeking additional income to improve their livelihood.

Solution: introduce fruit trees more widely among small farmers, and organize farmers to set up a market for farmers by processing fruits. For instance, fruits can be processed into juice or other added value products depending on the market demand.

	Improved livelihood of farmers: Positive impact on the livelihood of farmers, since trees help to improve the soil and farm biodiversity. Farmers generate additional income by selling fruits to fruit processors.
	Circular: business model is not per se circular.
	Regenerative farming: trees help to improve the biodiversity on the farm, soil health and maintain water in the soil. Other interventions such as bee-keeping could improve pollination in and around the farm, which can also result in additional farm products for farmers.
	Optimal use of resources: business model helps to reduce post-harvest loss
	Employment: The business case can generate jobs by processing fruits and selling them to the market.
	Profitable: the business need investments in processing equipment.

Potential needed interventions: Companies such as Inyange in Rwanda cannot source all their fruits locally and import some of their fruits. There is a need to organize farmers to source fruits locally. Farmers need be trained in agricultural practices of growing fruit trees, and how to manage pest and diseases. Also, other interventions such as bee-keeping could improve pollination in and around the farm, which can also result in additional farm products for farmers. In Rwanda, there is a need to be discussed with the government authorities where fruit trees can be planted, e.g. Kopedush is not always allowed to grow passion fruit trees due to CIP.

Inspirational companies: Kopedush cooperative process passion and strawberries at small scale to provide more benefits to farmers the business need upscale, process also other types of fruits.

10. Reduce post-harvest loss and utilize agricultural by-products by taking over post-harvest handling from farmers

Food system challenge: farmers use traditional drying techniques and poor storage facilities to store and dry crops. As a result that food can spoil and that diseases can spread among the harvest.

Solution: processors buy directly the harvest from farmers and take over the post-harvest handling to reduce post-harvest loss and the spread of diseases. Currently, this model is applied by the sister company of Africa Improved Foods (AIF), which is Kumwe Harvest. AIF in Rwanda buys the maize from small scale farmers through contract farming and takes over the post-harvest handling by using local drying / processing facilities that dry maize and remove grains from the corncob. Also, there is a potential to process by-products into new products by buying the farm products with the agricultural by-products. In the case of corn cobs, cobs can be transformed into animal feed, bioethanol, or even Xylitol (a natural sugar substitute that tastes like sugar).

	Improved livelihood of farmers: Positive impact on the livelihood of farmers, since farmers do not lose the same quantities of their harvest – they can sell a higher yield to the processor. This results in a higher income. Furthermore, cooperatives can be introduced to contract farming to ensure the market for the products.
	Circular: The business model helps to reduce post-harvest loss. On top of that, there is a potential to utilize the by-product (e.g. buy grains of maize on the corn cob) into new products (e.g. corn cobs can be transformed into animal feed / bio-ethanol
	Regenerative farming: business model does not contribute immediately to regenerative farming, but the processor could stimulate regenerative farming among their small-scale farmers.
	Optimal use of resources: business model helps to reduce post-harvest loss.
	Employment: The business case can generate jobs by processing food into added-value products. Furthermore, there is a potential for additional employment by transforming by-products of food processors into new products.
	Profitable: the required technique depends on the food processors, in general, food processors need investments in processing equipment.

Potential needed interventions: additional investments to transform by-products into new products such as transforming corn cobs into animal feed, bio-ethanol. Introduce the “Kumwe Harvest Model” in other value chains to reduce post-harvest loss and to utilize agricultural by-products.

Inspirational companies: The sister company of Africa Improved foods, [Kumwe harvest model](#) in Rwanda.

