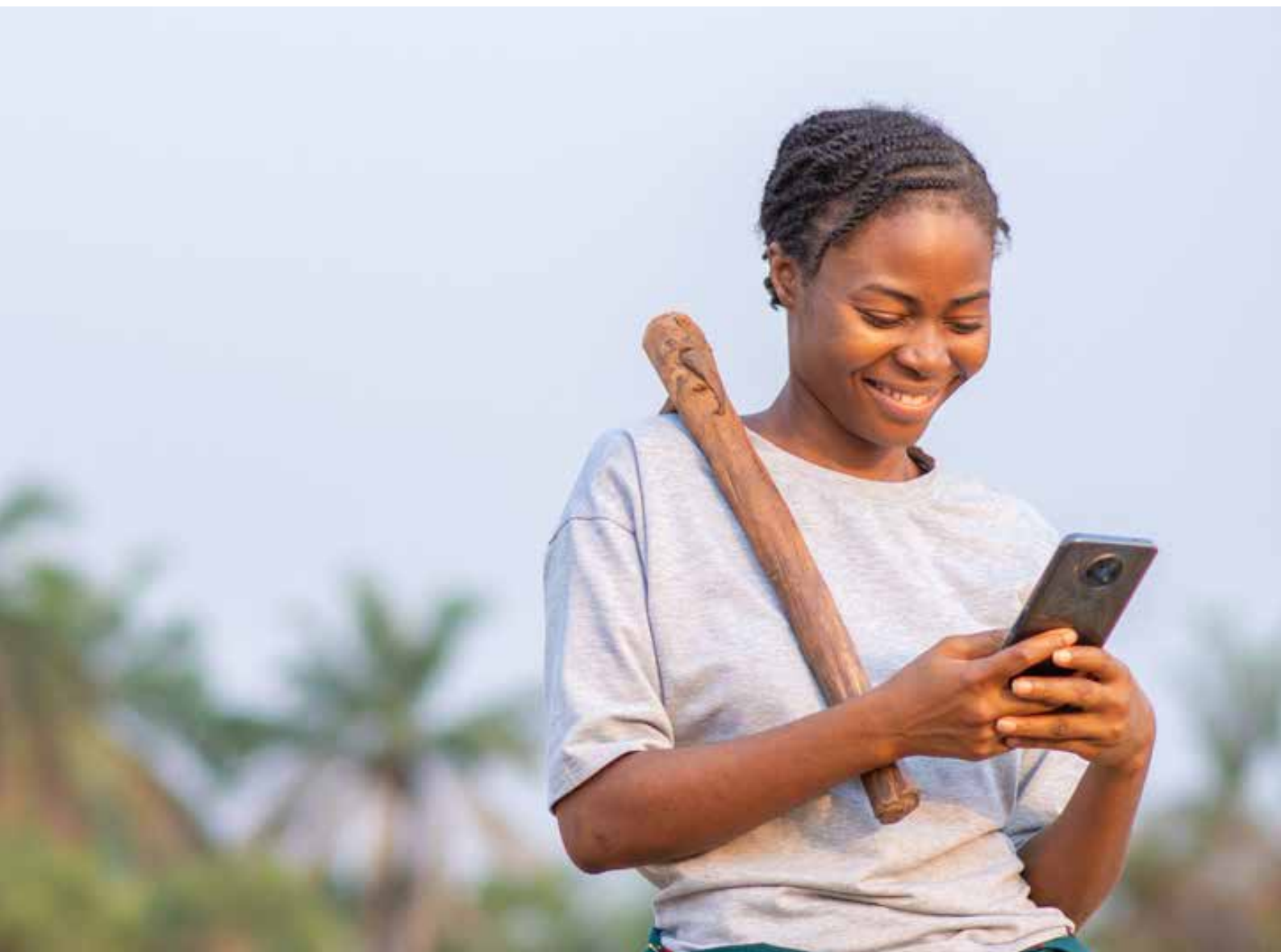


# REORIENTING THE PRIVATE SECTOR TO ENABLE CLIMATE-SMART AGRICULTURAL SOLUTIONS TO ADDRESS GENDER INEQUALITIES



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# Abbreviations

<b>AI</b>	Artificial Insemination
<b>B2B</b>	Business to Business
<b>B2C</b>	Business to Consumer
<b>BMU</b>	Beach Management Unit
<b>BSF</b>	Black Soldier Fly
<b>CSA</b>	Climate Smart Agriculture
<b>FAO</b>	Food and Agriculture Organization
<b>FFS</b>	Fish For Sex
<b>FPO</b>	Farmer Producer Organization
<b>FSP</b>	Financial Service Providers
<b>GAP</b>	Gender Action Plan
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Green House Gas
<b>GLI</b>	Gender Lens Investing
<b>GLOW</b>	Gender equality in a Low-carbon World
<b>HR</b>	Human Resource
<b>IoT</b>	Internet of Things
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>KES</b>	Kenya Shilling
<b>M&amp;E</b>	Monitoring & Evaluation
<b>MFI</b>	Micro Finance Institution
<b>MNO</b>	Mobile Network Operators
<b>MOU</b>	Memorandum of Understanding
<b>MSME</b>	Micro, Small and Medium Enterprise
<b>MT</b>	Metric Ton

# Abbreviations

<b>MVA</b>	Mobile Village Agents
<b>MVP</b>	Minimum Viable Product
<b>NGO</b>	Non-Government Organization
<b>PPP</b>	Public Private Partnership
<b>PSE</b>	Private Sector Enterprise
<b>RWF</b>	Rwandan Franc
<b>SDG</b>	Sustainable Development Goal
<b>SOM</b>	Share of Market
<b>SOP</b>	Standard Operating Procedure
<b>TA</b>	Technical Assistance
<b>TAM</b>	Total Addressable Market
<b>TOC</b>	Theory of Change
<b>UGX</b>	Uganda Shilling
<b>USD</b>	United States Dollar
<b>USSD</b>	Unstructured Supplementary Service Data
<b>WEE</b>	Women's Economic Empowerment



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# Executive Summary

East Africa struggles with recurrent droughts, floods, and erratic rainfall that impact crop production and lead to food insecurity. 75% of East Africa's agriculture is rainfed, making the sector vulnerable to the effects of climate change. Women, who comprise over 50% of East Africa's agricultural workforce, are particularly vulnerable to the effects of climate change. However, the agricultural sector is also part of the problem as it is a major contributor to greenhouse gas emissions and thus contributes to climate change. While it is important to reduce the carbon intensity of the sector, it is also crucial to ensure that reduction efforts do not affect food security for low-income populations. To solve this dual challenge of transitioning to a low-carbon economy and mitigating gender inequalities, Intellecap, with support from IDRC, designed an implementation research program to strengthen Private Sector Enterprises (PSEs) and scale solutions that make agriculture climate-smart and gender-inclusive.

The program supported PSEs providing climate-smart solutions (which support low-carbon development) at the intersection of agriculture/ food systems and climate change. The program targeted PSEs across Kenya, Rwanda, Uganda, and Tanzania, and considered enterprises across all agricultural sub-sectors including crop farming, fishery, livestock & animal husbandry, and other related areas. The program focused on assisting PSEs to use gender-transformative approaches to scale up their business. To this end, Intellecap selected 11 PSEs that would be supported over the duration of the project in using gender-transformative approaches to scale their climate-smart innovations and, consequently, their businesses. However, only 8 PSEs participated in the program for its entire duration.

**Table 1:** PSEs that completed the support program

#	Enterprise name	Country	Key products/services
<b>Cohort 1</b>			
1	Aquarech Ltd	Kenya	Fish farming platform for farmers, traders, and feed producers
<b>Cohort 2</b>			
2	RAQCCOL (formerly Ugavoil)	Uganda	Waste to organic agricultural inputs
3	Griincom Innovate Ltd	Kenya	High-yield organic fertilizer
<b>Cohort 3</b>			
4	DMA Limited	Tanzania	Agritech platform, marketplace, clean energy
5	Usomi Limited	Kenya	Agricultural technical services company
6	GenePlus Global Limited	Kenya	Dairy genetics for improved productivity
7	NjordFrey Limited	Rwanda	Aquaponics technology
8	Green Harvest Limited	Rwanda	Hydroponic green fodder system and greenhouse systems

Intelcap created customized Gender Action Plans (GAP) for each selected PSE and worked with the enterprise to enhance its understanding of the business case for increasing women’s engagement in the sector. Intelcap offered support in creating action plans to guide the design and implementation of gender-focused interventions and showcase the enterprise’s gender and climate impact with the aim of increasing the ecosystem’s awareness of emerging solutions.

Based on the evidence gathered during the engagement, the program also established a case for channeling capital to PSEs offering climate-smart solutions and highlighted the need for enabling policies/incentives. Intelcap adopted a solutions-oriented research approach, examining existing operations and the level of women’s participation for each PSE to identify areas with the potential for improved participation of and for positively impacting women.

Baseline, midline, and endline assessments were carried out for each PSE during the training period to ascertain progress/change in gender integration over time as well as the PSE’s impact on women and climate. The program significantly advanced gender integration within the PSEs, leading to notable improvements in workplace culture, workforce diversity, and financial performance as highlighted below.

## Gender mainstreaming in the PSEs’ business model

### Increased adoption of gender-inclusive HR policies

86% of PSEs adopted new gender-inclusive HR policies, enhancing workplace practices such as recruitment and flexible working arrangements.

### Improved gender balance in the workforce

By the end of the program, women made up 51% of the PSEs’ workforce, with 70% holding full-time roles. The percentage of female leaders increased from 8% to 11%, reflecting progress in gender representation at leadership levels as well.

### Increased participation of women in training and capacity building:

65% of PSEs conducted regular gender-focused training, benefitting 193 employees. Female employees demonstrated higher engagement in these sessions.

### Enhanced investment attractiveness

71% of PSEs attracted impact investors, raising USD 1.8 million. The program’s support towards gender-focused investment readiness contributed to this success.

### Gains from business process improvements

28% of PSEs adopted last-mile delivery models to increase the participation of female farmers, while 57% developed new products and services tailored for women. Marketing strategies were also revamped to be more gender-sensitive.

### Improved financial performance

71% of PSEs experienced an average revenue growth of 27%, driven by gender-transformative approaches and business diversification.

## Positive impact on women value chain actors

### Increased engagement of women in the value chain

71% of PSEs enhanced the involvement of women in their value chains by offering them preferred transaction terms and accessible products.

### Access to training for women value chain partners

71% of PSEs increased training for women value chain partners; moreover, the proportion of female participants across all trainings increased to 78%.

### Enhanced financial support

43% of PSEs formed financial partnerships, providing credit to over 15,000 women smallholder farmers. This support positively impacted community perceptions about women's capability and financial stability.

### Improved Productivity and Income for Women

86% of PSEs reported increased productivity and income for women value chain actors, demonstrating the effectiveness of targeted support and training.

The program successfully integrated gender considerations into PSEs' business models, resulting in more inclusive workplaces, enhanced business performance, and significant positive impacts on women within the value chain. These outcomes underscore the value of gender mainstreaming in achieving operational and financial success.

The outcomes from this research were multi-fold: first, it supported climate-smart agricultural enterprises mainstream gender across their value chain. Second, it built the capacity of climate-smart agricultural enterprises across East Africa to aid low-carbon development, and finally it created a discourse around the business case for investing in such enterprises for the wider ecosystem. Intelicap also disseminated program learnings through various channels:

1. A dedicated page on the GLOW (Gender Equality in a Low Carbon World) website highlighting the purpose and specific objectives of the program as well as the activities carried out during the program and expected outcomes;
2. Publication of multiple articles featuring the engagement on the GLOW and Intelicap websites; and
3. Sessions at the 9th, 10th and 11th Sankalp Africa Summits to provide a platform for participating PSEs to network with intermediaries and investors in the sector, as well as gather insights from and share learnings with the wider ecosystem.

The outcomes for individual PSEs resulting from the program's support are highlighted through detailed case studies under Chapter 5. The aim of these case studies is to create a knowledge base that allows impact and gender lens investors to understand the financial and social impact of climate-smart PSEs in the region and encourages them to adopt an explicit gender lens in their investment thesis. Such evidence creation is also expected to enhance gender-awareness amongst ecosystem stakeholders, ultimately directing capital towards meeting SDG targets.







Photo Courtesy : Intellecip's team taken at Green Harvest customer location in Rwanda.

# 1. Introduction

**An Overview of East Africa's Agricultural sector and the Impact of Climate Change on Agriculture in East Africa**

## Overview of the agricultural sector in East Africa

**Agriculture is one of the key sectors responsible for the economic development of East Africa, since it contributes to more than 30% of the region's GDP.<sup>1</sup>**

However, despite agriculture's economic importance, the region still suffers from hunger and malnutrition. One critical element hindering the achievement of food security is unfavorable climatic conditions. Approximately 95% of the food in East Africa is grown under rain-fed agriculture<sup>2</sup> which is highly vulnerable to adverse weather events. Given that the region's population is expected to more than double by 2050,<sup>3</sup> climate-smart agriculture has the potential to address the intertwined challenges of food security, poverty eradication, and pro-poor economic development



Photo Courtesy : Intellecip's team taken at RAQCCOL in Uganda.

**Table 2:** Key characteristics of agriculture in East Africa

#	Parameter	Kenya	Uganda	Rwanda	Tanzania
1	Contribution to GDP (2018)	33% <sup>28</sup>	24%	31%	28.2% <sup>29</sup>
2	Small farm holdings <sup>30</sup> (2018)	81%	88%	83%	83% <sup>31</sup>
3	Contribution of smallholder farmers in production (2018)	60-70%	80% <sup>32</sup>	75% <sup>33</sup>	75%
4	Irrigation percentage <sup>34</sup> (2012)	<7%	<1%	1%	<2%

**Agriculture continues to account for more than 65%<sup>4</sup> of employment in the region.**

Despite agriculture being a crucial provider of jobs, most employment in the sector is characterized by subsistence activities and is highly informal. A salient feature of agricultural employment in Africa is that it is women-dominated.

Women are highly dependent on the sector for their livelihoods, and over 50% are directly or indirectly employed in agriculture.<sup>5</sup> However, women employed in the sector contend with low pay, informality, poor working conditions and lack of social protection. Additionally, women farmers lack effective ownership of land, which impacts their role as active decision-makers, especially about long-term investments, as well as affects their ability to access formal financial services.<sup>6</sup>

**Table 3:** Employment generation from agriculture in the focus countries

Parameter	Kenya	Uganda	Rwanda	Tanzania
Export earnings from agricultural products (2018)	65% <sup>7</sup>	31% <sup>8</sup>	70% <sup>9</sup>	30% <sup>10</sup>
Workforce employed in agriculture (2022) <sup>11</sup>	33%	66%	56%	66%
Women farmers as % of total agricultural workforce (2022) <sup>12</sup>	34%	72%	65%	67%



**The sector also continues to face both demand and supply-side challenges, which affect its ability to grow to its full potential.**

On the supply side, agricultural input providers find it difficult to predict demand from farmers and are thus unable to meet their needs on a timely basis, resulting in either a lack of agricultural inputs or a supply of sub-standard inputs. On the demand side, farmers have low purchasing power and rely on lenders to provide financing for purchasing inputs.

Furthermore, the sector remains chronically under-financed, with agriculture SMEs receiving less than 10% of available commercial lending in most countries across the region –as little as 2% in Rwanda.<sup>13</sup> Some factors that restrict lending to agricultural enterprises are lack of collateral, absence or poor credit and bank history, and non-verifiable financial information. Additionally, many farmers lack information and training on good agricultural practices, which increases their cost of production.

**Table 4:** Key challenges in the agricultural sector of the focus countries

Kenya	Uganda	Rwanda	Tanzania
<ul style="list-style-type: none"> <li>Decreasing land holding size</li> <li>Heavy reliance on rain-fed agriculture</li> <li>Low productivity due to poor soil fertility</li> <li>Poor agricultural infrastructure and market linkage</li> </ul>	<ul style="list-style-type: none"> <li>Low production</li> <li>Prolonged drought conditions</li> <li>Poor post-harvest handling as a result of limited storage facilities leading to 15%-30% post-harvest losses</li> </ul>	<ul style="list-style-type: none"> <li>Limited availability and use of inputs like fertilizers and high-yielding varieties of seeds</li> <li>Low levels of mechanization</li> <li>Inefficient logistics</li> <li>Poor storage</li> <li>Limited access to finance</li> </ul>	<ul style="list-style-type: none"> <li>Lack of quality inputs</li> <li>High post-harvest losses</li> <li>Poor proximity to services</li> <li>Lack of access to affordable financing</li> </ul>

**The COVID-19 pandemic further exacerbated challenges that already existed in the sector.**

During pandemic-induced lockdowns, supply chains were severely affected, and many food / agricultural producers, especially those located in rural areas lost the ability to distribute their produce. Many small traders and retailers of seeds/fertilizers who relied on public transportation for daily market visits were left stranded. Farmers faced challenges in procuring inputs, accessing extension services, and accessing processing facilities. Livestock farmers also reported a disruption in veterinary services leading to a decline in productivity. Additionally, foreign demand for commodities such as flowers, coffee and fish, plummeted, affecting key export industries and leading to mass layoffs and pay reductions. These challenges were even more pronounced for women operating in the agriculture sector, who faced greater financial uncertainty, longer working hours and increased domestic chores.

**Impact of climate change on the agricultural sector**

**While agriculture is essential to East Africa’s economic sustainability, climate change is disrupting local markets, restricting economic growth, and increasing investment risk in the sector.**

East Africa struggles with recurrent droughts, floods, erratic rainfall and other climatic fluctuations that impact crop production and lead to food insecurity. Furthermore,

rising temperatures and changing rainfall patterns have made weather conditions less favorable for the sector. Moreover, there is a possibility that many indirect effects of climate change will adversely affect the agricultural sector. For instance, the health of livestock may be affected by changes in the quality of feed, availability of water, and changing temperatures. Climate change may also hasten the advancement of diseases, weakening the defensive mechanism of crops and livestock. Overall, the agricultural sector in East Africa, of which 95% is rain-fed,<sup>14</sup> is highly vulnerable to climate change, which may lead to food insecurity in the region.

Conversely, agriculture places a serious burden on the environment—it is the largest consumer of water in the region, one of the main sources of surface water and groundwater pollution, and a major emitter of greenhouse gases (GHGs). The pressure to increase the region’s food production has also led to the overexploitation of agricultural resources, which has in turn, led to land and soil degradation and resulted in reduced productivity growth.



**Table 5:** Key indicators highlighting climate change in East Africa

Indicator	Change
Temperature	Average temperatures have increased from 1°C per decade to 2.5°C per decade since the 1960s.
Rainfall	5%-20% more rainfall than average from December to February, and 5%-10% less rainfall than average from June to August (Hulme et al., 2001; IPCC, 2007).
Drought and dry spells	Increased frequency and severity of droughts since the 1990s.
Floods	Increased spell and intensity of floods. For instance, in 2020, 6 million people were affected by floods in East Africa.

### The adoption of climate-smart agriculture (CSA) solutions is critical to reducing East African farmers' extreme vulnerability to climate change.

Some CSA solutions relevant to smallholder farmers include: (i) using improved seeds that are resistant to adverse climatic impact; (ii) using a mix of traditional and modern approaches for farming and crop production; (iii) leveraging technology solutions; and (iv) availing support services based on strengthened extension networks and index-based insurance, etc.

However, the adoption of CSA is highly dependent on access to institutional facilities, a good extension system that provides timely support to farmers, and the dissemination of information on adopting recommended practices among farmer cooperatives, government, and non-governmental organizations. Additional efforts from governments and policymakers are needed to ensure that a significant portion of smallholder farmers adopt climate smart solutions and realize their impact on income levels, productivity and overall efficiency.

### Role of the private sector in the agricultural sector

The private sector plays a catalytic role in promoting climate-smart agricultural practices. Given agriculture's vulnerability to climate change, there is a need for extensive investments in the sector, for it to adapt to or become resilient to changing climatic conditions. However, it is not feasible for the public sector alone to bridge the existing gap between the capital available and the investment required to facilitate adaptation.<sup>15</sup>

In Kenya, there are 7.41 million private enterprises, of which approximately 2.4 million operate in agriculture and allied sectors.<sup>16</sup> Tanzania has over 3 million businesses,<sup>17</sup> a majority

of which are involved in agriculture. Finally, in Uganda, 14%<sup>18</sup> of 1.1 million MSMEs<sup>19</sup> operate in agriculture. Given the large opportunity size of enterprises operating in the agricultural sector, enabling and encouraging private sector investment is key for Sub-Saharan Africa's agriculture sector to adapt to the changing climate as it- (i) allows a better understanding of challenges, (ii) prioritizes areas for action, and (iii) ensures that solutions are scalable.

Several private sector enterprises across East Africa are already working with such innovations and showing us what is possible through the adoption of innovative practices and technologies in the sector.

### Involvement of women in the agricultural sector

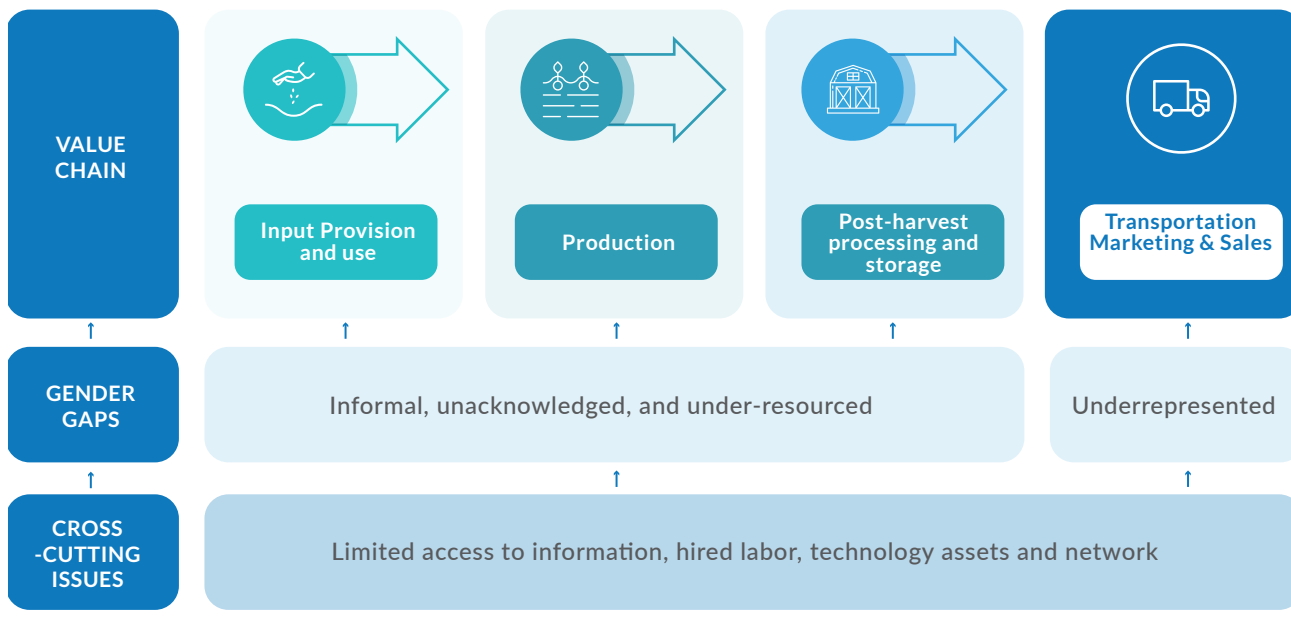
Women play a pivotal role in food production, distribution/access, and food utilization in the region.<sup>20</sup> Women smallholder farmers in Sub-Saharan Africa produce 80% of the food consumed by households and sold in local markets.<sup>21</sup> However women farmers are 20%-30% less productive than men, not because they are less efficient farmers,<sup>22</sup> but because they do not have equal access to agricultural inputs, land rights, and product markets; challenges that have deepened as a result of the COVID-19 pandemic. An FAO study suggests that agricultural productivity in Sub-Saharan Africa could rise by 20% if women had equal access to inputs and land.<sup>23</sup> Women also have limited access to educational resources that can help them build technical and digital skills, and face a range of socio-cultural constraints.

Although the female share of the agricultural labor force in Sub-Saharan Africa is the highest in the world (50%),<sup>24</sup> and 62% of all economically active women in Africa work in agriculture,<sup>25</sup> they are mostly involved in lower-paying or temporary agricultural jobs, or remain unpaid and thus,



receive a disproportionately low share of income (wage gap ranges from 15%-60% across countries in Africa).<sup>26</sup> Finally, as consumers, women are more likely than men to be food insecure.<sup>27</sup> The figure below highlights the agricultural value chain and overarching gender gaps therein.

**Figure 1:** Gender gaps across the agricultural value chain



They also have little to no access to assets and resources to plan for or recover from crises like crop failure and are therefore disproportionately affected by climate change. Women’s diminished ability to recover from climate shocks is primarily due to three key challenges faced by them:

1. Lack of decision-making power over agricultural practices results in a slower uptake of beneficial agricultural practices;
2. Lack of access to and control over productive resources, such as land and irrigation services, among others, results in a limited ability to access finance; and
3. Time poverty and mobility limitations resulting from socio-cultural norms and traditional expectations of gender roles as well as unequal distribution of domestic and care responsibilities restricts opportunities to establish market networks accessible by women in agriculture.



**Photo Courtesy :** Intellecap’s team taken at greenhouse installation on outskirts of Nairobi, Kenya.

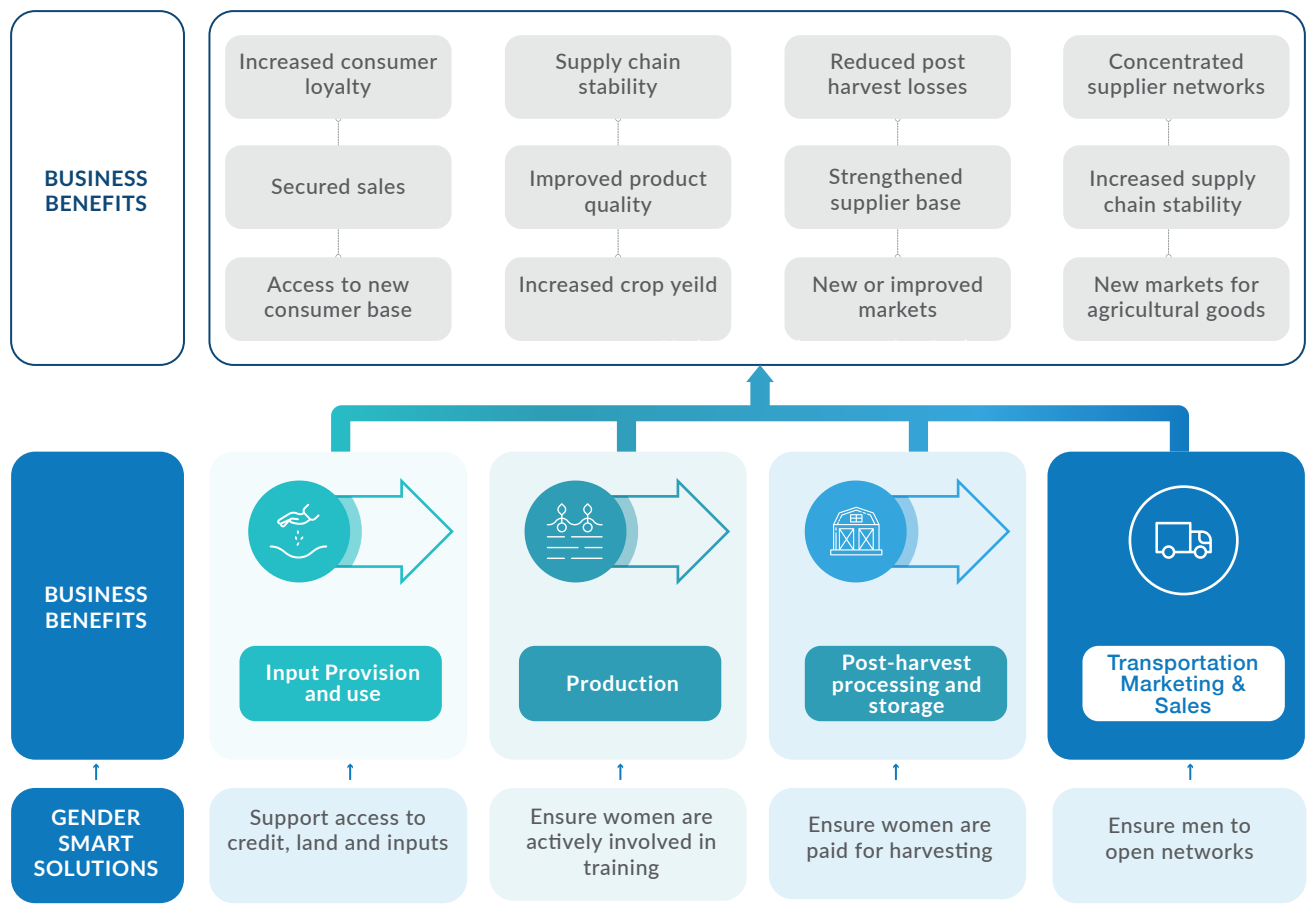


**Advancing a gender lens in agricultural enterprises has the potential to create a catalytic impact on making agriculture practices climate smart.**

While such an approach reduces women’s barriers to agency and control over resources, it also boosts yield, which, given their lower productivity, has a much larger impact on women farmers.

Since climate change affects both men and women differently, it is imperative to consciously include more women in climate-smart interventions through participatory and inclusive approaches such as farmer-to-farmer extension or farmer-led innovations that build their adaptive capacity.

**Figure 2:** How can the private sector help bridge gender gaps in agriculture?



Climate-smart agricultural enterprises have the potential to significantly impact women; hence, it is important to include a gender lens in their business design. Sustainable / climate-smart agriculture has the potential to create decent employment opportunities. Since rural women already have a high level of engagement in agriculture and energy sectors, they stand to benefit most by converting reliance on natural resources into economic opportunities. In addition, given that the majority of agricultural labor force across East Africa comprises women, integrating gender-related specificities into the sector and providing supportive interventions has the potential to boost agricultural productivity and improve sustainability.



Photo Courtesy : Stock photo.





Photo Courtesy : Intellecap's team taken at NjordFrey demo farm in Kayonza, Rwanda.

## 2. Rationale and Goals of the Implementation Research Program

## 2.1 IDRC’s ‘Gender Equality in a Low Carbon World (GLOW)’ program

Gender Equality in a Low Carbon World (GLOW) is a three-year (2022-2025) program funded by the International Development Research Centre, Canada. The program supports research on promising solutions for green economies and climate action that have the potential to economically empower women.

It is estimated that the COVID-19 pandemic reduced global economic output by more than USD 12.5 trillion and erased decades of economic gains for women. Communities, especially in Africa and in least developed countries, are increasingly affected by the shocks and stresses of climate change, such as extreme weather events. Although International financial institutions and governments have been pledging funds for economic recovery and stabilization, few policies and investments are truly socially inclusive. There is a need for ecosystem stakeholders to design recovery measures such that they also boost Women’s Economic Empowerment (WEE). However, there is a long way to go in ensuring that low-carbon policies and strategies take gender equality into account. Based on and in response to this need, IDRC started the GLOW program to address the most pressing issues related to climate and gender equality. The GLOW program supported solutions-oriented local research to understand and address the specific and systemic barriers faced by women during the pandemic and the recovery period, particularly while exploring opportunities in low-carbon economic investments.

As part of GLOW, 12 action research projects were funded based on their focus on local/regional gender and climate challenges, and their plans to influence policies and actions. These 12 research projects span 17 countries across South and Southeast Asia, the Middle East and North Africa, Sub-Saharan Africa, and Central and South America. Projects explore innovations for WEE and climate action in agriculture, forestry, land restoration, and tourism. The key objectives of GLOW are:

- **Support women’s economic empowerment and improve the availability of decent employment opportunities in COVID-19 responses and recovery, while addressing the growing climate crisis and creating a pathway for a climate-resilient economy.**
- **Promote opportunities for women in sectors that have the highest potential to accelerate the transition towards a low-carbon economy, such as energy, transport, infrastructure, tourism, agriculture, and natural resource conservation.**
- **Promote cross-border trade, value chains, and innovative private sector models that create quality opportunities for women while contributing to decarbonization and climate resilience.**

The projects were led by local research experts and structured as implementation research projects—which means the project teams worked hand-in-hand with the people/enterprises to implement solutions and gather evidence (in the form of learnings and best practices) for the broader ecosystem. IDRC also created the GLOW Knowledge Translation Hub, which seeks to a) synthesize knowledge on policy responses, interventions, business and investment initiatives, and women-led action from across the program; b) support peer learning among the projects; and c) engage relevant international audiences on the findings.



**Photo Courtesy :** Intellecap’s team taken at greenhouse installation on outskirts of Nairobi, Kenya.



## 2.2 Overview of ‘Business Acceleration through Gender Mainstreaming’ project

Intellectap’s ‘Reorienting the private sector to enable climate-smart agricultural solutions to address gender inequalities’ was selected as one of the implementation research projects under the GLOW program. As part of the implementation research program, Intellectap sought to support and scale PSEs operating at the ‘intersection of sustainable agriculture / food systems and climate change sectors’ to achieve positive outcomes for women’s economic empowerment. This implementation research aimed to gather data and evidence of each PSE’s impact on women’s economic empowerment and transition to low-carbon economy, develop a business case for investing in these PSEs, identify the need for capital to be channeled to such enterprises, and highlight the need for enabling policy/incentives.

**The program took the following approach to achieve objectives stated above:**

- **Design and implement a ‘private-sector-led approach’ to mainstream and scale climate-smart innovations that can assist the region’s transition to a low-carbon economy.**

The private sector is a major contributor to employment creation and economic growth and can improve market access and reduce risks and vulnerabilities for stakeholders operating at the intersection of agriculture / food systems and climate change sectors. However, these ‘PSEs face challenges around product design (trade-off between developing affordable products and achieving profitability) and access to capital and talent, while scaling up. They require support in capacity building, networking, community outreach and securing financing. **The ‘private-sector-led approach’ entails supporting and scaling PSEs that are providing climate-smart solutions at the intersection of the above-mentioned sectors.**

### Box 1: Definition of low-carbon technologies

Agricultural products and solutions facilitating climate change adaptation and mitigation, beyond farmer training on good agricultural practices, are considered as low-carbon technologies for this program. Some examples include:

- **Access to farm inputs and/or credit, or service provider models** that work with farmer clusters to provide a combination of products services and facilitate collective adoption of climate-smart agricultural practices.
- **Integrated/controlled production systems** such as aquaponics and hydroponics that allow precise control over environmental factors and help reduce

resource wastage, minimize the need for mechanical tilling, reduce pressure on land resources, and promote crop diversification.

- **Appropriate land management** through recycling waste as inputs, leads to enhanced soil health, carbon sequestration, and reduced dependence on chemical fertilizers.
- **Efficient water-use** through sensors and smart greenhouses to reduce dependence on rainfall, reduce water required for farming, manage irrigation schedule, and use available water more efficiently.
- **Aggregation and technology platforms**, providing farmers with real-time climate data and access to marketplaces to better manage cropping schedules, reduce post-harvest losses, and build their resilience to climate-related market fluctuations.

- **Enable private sector enterprises in the targeted sectors to embed gender-transformative solutions in their business models for women’s economic empowerment.**

Women farmers continue to have lower levels of agricultural productivity than men, not because women are less efficient farmers, but because they do not have equitable access to agricultural inputs, land rights, and product markets; a challenge which has only deepened during the COVID-19 pandemic. **By providing gender-transformative solutions to women stakeholders (consumers, beneficiaries, employees, value chain partners etc.) in the above-mentioned sectors, PSEs will enable their improved productivity and economic empowerment while ensuring that the transition is low-carbon in nature.**

- **Demonstrate gains from incorporating gender-transformative practices in PSEs to inspire various enterprise-support programs (implemented by donors, bilateral agencies, foundations, governments etc.) to incorporate these approaches in their programs.**

The impact of programs that focus on climate-smart private sector enterprises and use gender transformative approaches can thus be enhanced, resulting in a faster transition to low-carbon economy.

## 2.3 Program methodology

In order to advance the adoption of a gender lens in the agricultural sector alongside the transition to a low-carbon economy, Intellectap launched an implementation-research-focused acceleration program, 'Business Acceleration through Gender Mainstreaming'. The program supported 10 climate-smart agricultural enterprises to simultaneously scale and mainstream gender across their supply chain. The following activities were conducted as part of this program:

### 1. Enterprise sourcing:

Private sector enterprises offering climate-smart agricultural products/services and focused on integrating women into their value chains, were identified and selected through a 'Call for applications'. The first call focused on sourcing PSEs operating in Kenya, Rwanda, Tanzania, and Uganda, and resulted in 151 applications from across the 4 target countries. The second call for applications targeted PSEs in Rwanda and resulted in 26 applications.

### 2. Enterprise selection:

PSEs with the potential to create an impact across various aspects of women's economic empowerment and enable a transition to a low-carbon economy, were selected. Additionally, PSEs were evaluated on the following:

- a. **Relevance:** How relevant is the PSE to the sector/challenge, especially for women stakeholders in the sector?
- b. **Innovation:** How innovative or creative is the product/service provided by the PSE, and how can it be instrumental in accelerating the transition to a low-carbon economy?
- c. **Potential:** Does the PSE's business model demonstrate potential for delivering the required social and/or environmental impact at scale?
- d. **Sustainability:** Is there clear evidence of market demand for the climate-smart products or services offered by PSE?
- e. **Motivation:** How much would the entrepreneur benefit from the program? Is the entrepreneur willing to adopt gender-transformative approaches while scaling the business?

### Box 2: Definition of women's economic empowerment

For this study, we focused on the following components of women's economic empowerment:

- Engaging women farmers equally in agricultural value chains to improve their livelihoods and support participation in decision-making—by easing access to farm inputs and credit for women farmers.
- Mainstreaming women across key roles in farm employment—by exploring potential opportunities for value-addition.
- Increasing engagement of women as traders/agent—by simplifying access to markets or end consumers and reducing vulnerabilities faced by women in value chains.
- Enhancing participation of women as leaders in agribusinesses—by integrating gender considerations in the business model and operations.

### 3. Needs assessment and baseline:

For the selected PSEs, we conducted a baseline analysis and needs assessment. This exercise established the current status of the PSEs' business operations, its products/services, women's engagement across various roles, marketing channels used by the PSE, its efficiency in reaching target segments, as well as the business' needs and challenges, etc. Key aspects covered by the baseline analysis and needs assessment are outlined in the table below.



Photo Courtesy : Stock photo.

**Table 6:** Key thematic areas for the baseline analysis and needs assessment

#	Key themes	Areas of assessment
A	About the business	<ul style="list-style-type: none"> <li>• Management team and staff—the share and participation of women in the leadership and as employees in the enterprise.</li> <li>• Strategic direction and growth plans—sense of direction in the PSE’s plans for the future including well formulated vision, mission and goals.</li> <li>• Problem statement, understanding and meeting with customer needs—clear match between the customer problem and business solution, understanding of the opportunity with respect to serving women.</li> </ul>
B	Products and sales related	<ul style="list-style-type: none"> <li>• Product offering –clearly defined set of offerings and a core competency, MVP tested against customer feedback.</li> <li>• Product pricing—clear and transparent product pricing, affordability for women.</li> <li>• PSE’s understanding of market—understanding of evolving needs and market trends, competitor assessment.</li> <li>• Marketing &amp; distribution—channels identified and accessible to women, marketing strategies and gaps therein.</li> <li>• Branding—strong brand recognition.</li> </ul>
C	Personnel	<ul style="list-style-type: none"> <li>• Organizational structure—clearly defined roles and responsibilities, focus on increasing women’s participation.</li> <li>• Staff capacity, learning, and development—availability of learning and development resources for all employees.</li> </ul>
D	Enterprise value chain	<ul style="list-style-type: none"> <li>• Customers and target segments—understanding of customer segments (particularly women) and their needs.</li> <li>• Core business processes—how the enterprise markets, sells and distributes to its customers, and if this works for both male and female customers.</li> <li>• Supplier/partner relationships—relationship building and management with suppliers, customers, and other partners throughout their engagement.</li> </ul>
E	Finance	<ul style="list-style-type: none"> <li>• Financial management—regular financial record keeping, including profit and loss.</li> <li>• Financial planning and forecast—financial plan and forecast, and integration of financial results in business operations.</li> </ul>
F	Impact	<ul style="list-style-type: none"> <li>• Social impact objective—clear impact goals.</li> <li>• Climate impact—established solutions with climate impact, and significant potential to scale such impact.</li> <li>• Gender impact—potential for gender impact across the value chains.</li> <li>• Monitoring &amp; reporting—established way of monitoring &amp; evaluating impact, or willingness to institutionalize an M&amp;E process.</li> <li>• Future needs to extend impact.</li> </ul>



#### 4. Gender Action Plan (GAP) development:

Findings from the field identified bottlenecks and opportunities to further the PSEs' gender and climate impact. Intellecap used the findings to create a

customized Gender Action Plan for each PSE, that aligned their business goals, gender impact, and climate change adaptation/mitigation. An overview of the GAP developed for PSEs is provided below.

**Table 7:** Gender Action Plan for supporting PSEs as part of the program

Key Outcomes	GAP Activity	Indicators
1. Increased women's participation in operations	Identify farmer engagement models	# engagement models identified # engagement models relevant for women
	Contract women farmers	# farmers onboarded # women farmers onboarded
2. Enhanced access to inputs for women	Assess supply chain	# customers accessing inputs % women customers buying inputs
	Identify and onboard key suppliers	# input suppliers partnered with # women-led input suppliers
	Input credit for women farmers	# financial institutions partnered with # value chain partners provided credit # women receiving credit
3. Improved adoption of climate-smart products and practices	Increased awareness of products and solutions	# social media posts % engagement on posts
	Training for women farmers/ farmer groups	# farmer training # attendees in each training % women attendees per training
	Partner with key stakeholders	# stakeholders identified # partnerships finalised
	Enhance last mile delivery model for accessibility to women	# customer accessing products through different channels % women representation across channels
4. Gender focused marketing and sales plan	Evaluate engagement of female farmers	# customers engaged through online and offline channels % women engaged through each channel
	Customer mapping exercise	# customer segments identified # segments with high women's representation # segments served
	Identify relevant marketing channels	# channels identified # channels tapped into
5. Enhanced financial and operational efficiencies for the business, along with gender integration	Enhance pitch deck	# revisions to pitch deck # mock pitches
	Access to networking and funding opportunities	# investors reached out to
	Appoint Gender champion	Person selected as gender champion



## 5. Provision of Technical Assistance (TA) support:

Intellectap customized its technical assistance support to PSEs based on their needs and the outcomes identified in the GAP. Technical assistance covered training on subjects such as gender 101, business modelling, financial modelling, pricing strategy, distribution strategy, sales & marketing strategy, consumer financing, operations management, team management, investment readiness, and financial management.

## 6. Midline and endline assessments:

The midline assessment, carried out at the end of 6 months, measured progress against milestones set out in the GAP and identified challenges faced, while the end-line assessment helped evaluate outcomes and impact from the TA support provided.

**This implementation research program focused on answering the following research questions in the course of supporting PSEs:**

- **What are the most successful and impactful climate-smart solution cases that demonstrate the market and impact potential of PSEs on women's economic empowerment, and what factors contributed to their success?**

- **What is the extent of the economic impact (existing or potential) of such PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**
- **What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale such climate-smart PSEs and enhance women's economic participation in the sector?**
- **What support models / approaches (upskilling, childcare, transport, market linkages, access to finance etc.) used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?**
- **What changes in the research countries' policy frameworks are required for women stakeholders to adopt such climate-smart solutions?**
- **Who are key stakeholders working in the climate change mitigation or adaptation and WEE space, and what support are they providing / can they provide to climate-smart PSEs to scale their solutions while increasing women's participation?**



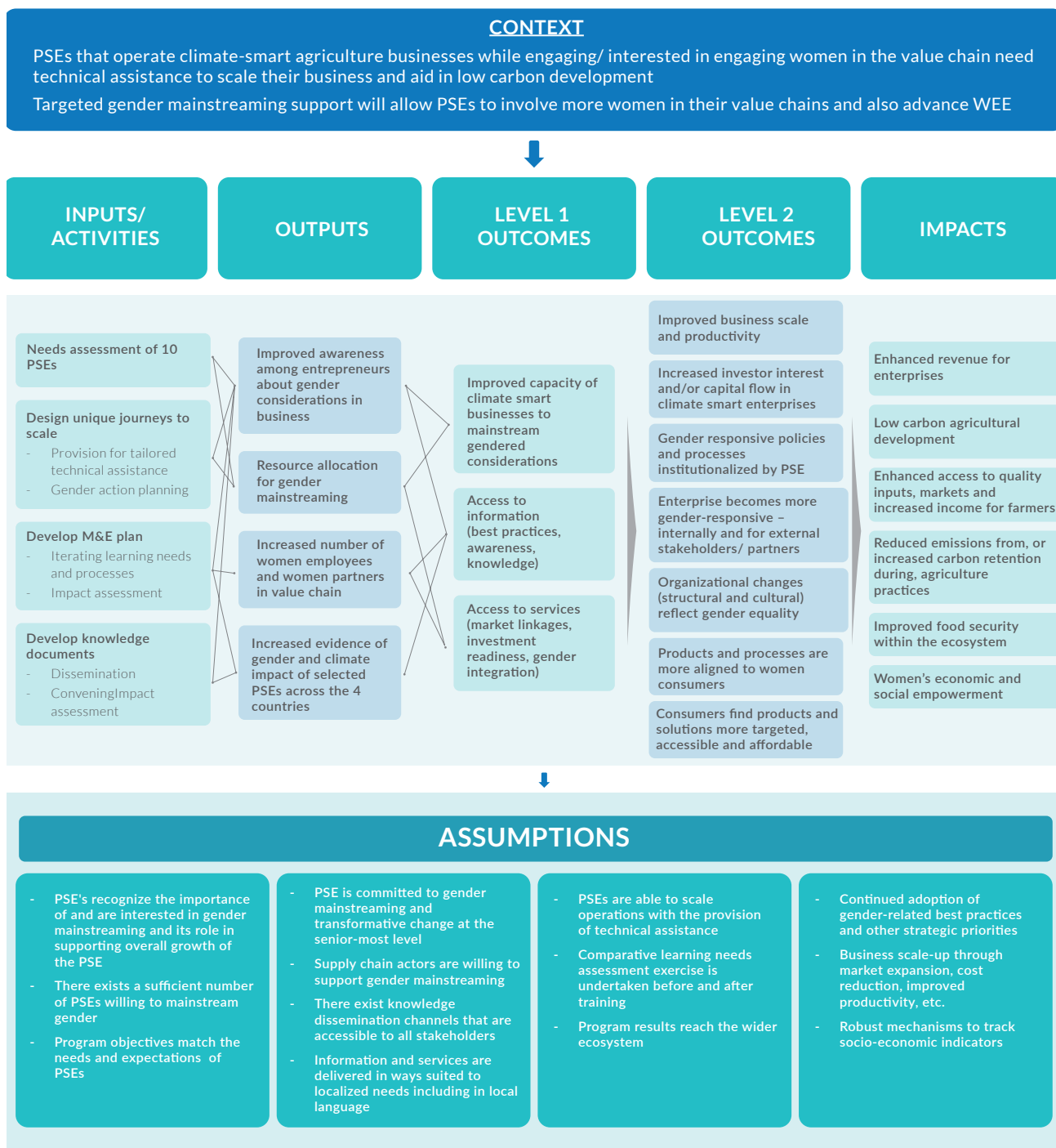
**Photo Courtesy :** Intellectap's team taken at Usomi farmer location in Kenya.

## 2.4 Our Theory of Change

The Theory of Change (ToC) articulates the program's targeted outcomes and impact along with intervention areas. It also highlights the key assumptions surrounding the implementation of the project. It recognizes that women are often marginalized on account of their gender. However, given that women face disproportionate challenges due to climate change, it is important to consider their role and integrate

them by effectively addressing the root causes of gender inequality in the sector—social norms, structural barriers, and economic dependence.

Figure 3: Theory of Change adopted by the implementation research



The ToC articulates key outputs as a) increased participation of women in the sector, b) increased adoption of climate-smart agricultural practices/solutions by customers and the market, and c) documenting evidence of gender and climate impact of PSEs, among others. Driving adoption not only resulted in increased revenues for PSEs, but also contributed to long-term impacts such as a reduction in emissions, increase in farmer incomes, improvement in food security, and advancement of women's social and economic empowerment. Further, the Theory of Change focused on two broad outcomes from the program: 1) institutionalization of gender-responsive

processes by PSEs, and 2) increased gender integration across the business value chain. In the short to medium term, the theory of change forecasts improved awareness and understanding of gender dynamics in climate-smart agriculture. In the long term, it is expected to make gender-transformative business planning a core consideration for PSEs in the sector while enhancing their potential for low-carbon impact. The outputs and outcomes achieved through the support program are highlighted by way of case studies (Refer to Chapter 5 for detailed case studies on all PSEs supported as part of the program).

## 2.5 Types of Technical Assistance support provided by the program

Unique journeys to scale operations and enhance gender-impact were designed for each PSE, based on a detailed business-model analysis. Bespoke support was drafted in the form of targeted Gender Action Plans which identified interventions for various business aspects of the PSEs. During the needs assessment, a major challenge identified across PSEs was the need for technical assistance and capacity building support to achieve higher productivity, efficiency and effectiveness in processes and build competitive advantage while gender mainstreaming. Other areas of focus that were identified included a funding gap and unclear organization structures.

A training plan was developed, based on the mapping of PSE's technical needs, both at the level of individual PSEs as well as at the level of the cohort. Each PSE received a 6-month long training. These trainings were rolled-out in a hybrid format and included facilitated training modules and un-supervised case study assignments, along with one-on-one sessions with PSE teams to help develop/ refine strategies and plans as realistically as possible.

The program provided several types of TA support to address the PSEs' business challenges and goals while improving gender equality in these businesses.



Photo Courtesy : Intellecap's team taken with chicken and grain farmers in Kenya.



**Figure 4:** Technical Assistance support provided to PSEs as part of the program

#		Description	Expected Outcomes
1	Conducting market sizing and customer segmentation	Mapping of potential farmer-customer segments, shortlisting of high-potential women farmer segments, and understanding their needs and challenges to increase accessibility and availability of products/solutions for them.	<ul style="list-style-type: none"> <li>Increased engagement with relevant farmer and customer groups, with a focus on women farmers and customers.</li> <li>Improved adoption of products/solutions by women groups through targeted outreach and campaigns.</li> <li>Increased revenues for the PSE by onboarding more women as customers.</li> <li>Deepen climate and gender impact.</li> </ul>
2	Developing and implementing effective marketing strategies	Attract new customers or inform existing customers of products through targeted social media campaigns, participation in key sector-level conferences and webinars, creation of WhatsApp groups for women farmers/groups, advertising through pamphlets distributed during events, and encouraging word-of-mouth marketing by current customers and partners.	<ul style="list-style-type: none"> <li>Increased awareness about emerging climate-smart solutions/ technologies in the farming community, particularly amongst women smallholder farmers, and the investment ecosystem.</li> <li>Increased sales for the PSE.</li> <li>Improved brand loyalty.</li> <li>Facilitate outreach and engagement with women farmer groups/ value chain partners.</li> </ul>
3	Investment readiness and pitch preparation	Hands-on training on investment readiness, including identification of relevant capital sources, aligning with investor expectations through advisory support, aligning pitch with investor expectations, and direct investor engagement.	<ul style="list-style-type: none"> <li>Showcase the gender impact of climate-smart agriculture enterprises.</li> <li>Increase awareness of emerging models of climate-smart agricultural businesses among gender lens investors.</li> <li>Facilitate networking with impact and gender lens investors.</li> </ul>
4	Engaging with and supporting more women farmers (or farmer groups)	Supporting PSEs in reaching out to relevant women farmers/ farmer groups through successful approaches for farmer engagement, adapting models to the local context to onboard women, and extending training to women (on climate-smart agriculture, and digital literacy, among others).	<ul style="list-style-type: none"> <li>Increased number of women farmers (as suppliers and/or customers) in the business value chain.</li> <li>Increased access to climate-smart products and services for women.</li> <li>Improved quality of life for women/children/family (e.g., improved physical &amp; mental health).</li> </ul>



#		Description	Expected Outcomes
5	Development of targeted products/services for women partners	Support PSEs to partner with input suppliers or procure inputs in bulk to ease access to high-quality inputs at fair prices for women. Using digital platforms or partnering with large wholesalers and exporters can further ease market linkages and offer assured markets for products from women farmers.	<ul style="list-style-type: none"> <li>Enhanced livelihood opportunities for women farmers.</li> <li>Improved agricultural productivity/ yields.</li> <li>Reduced gender-related vulnerabilities</li> </ul>
6	Enhancing access to finance for women partners	Identifying relevant financial institutions for the PSE to partner with and facilitate credit for their women farmer-suppliers and customers, while also providing financial literacy training.	<ul style="list-style-type: none"> <li>Enhanced livelihood opportunities for women farmers.</li> <li>Increased/ dual income for women.</li> <li>Increased access to resources for women farmers.</li> </ul>
7	Collecting and leveraging gender-disaggregated data	Creation of a Gender Action Plan and M&E framework to periodically track and monitor gender-disaggregated outcomes across various and externally. aspects of the business and identify gaps and opportunities to further gender impact throughout the business value chain, both internally.	<ul style="list-style-type: none"> <li>Institutionalize gender-disaggregated data collection within the PSE.</li> <li>Report gender and climate impact through periodic monitoring.</li> <li>Identify gender gaps in business operations.</li> <li>Promote opportunities for women across the value chain and within the organization.</li> </ul>
8	Enhancing HR policies and practices to improve gender inclusivity	Review and provide feedback on the PSE's HR policies and processes to integrate gender considerations into job descriptions, workplace culture and benefits, internal feedback mechanisms, etc. to reduce the gender gap at work and allow women's equal participation in the PSE's operations and equal access to opportunities for growth and development.	<ul style="list-style-type: none"> <li>Gender-inclusive job descriptions.</li> <li>Increased representation of women as employees and leaders.</li> <li>Improved workplace culture.</li> </ul>
9	Designation of a Gender Champion for continuous gender mainstreaming in the organization	Encouraging PSEs to appoint a mid/ senior-level employee as a Gender Champion to generate buy-in for gender integration both internally and externally as well as to ensure implementation of key gender equality interventions.	<ul style="list-style-type: none"> <li>Buy-in for gender integration from PSE leadership.</li> <li>Increase in gender sensitivity training for employees.</li> <li>Greater employee awareness of gendered considerations for business.</li> </ul>





Photo Courtesy : Intellecip's team taken at NjordFrey demo farm in Kayonza, Rwanda with women farmers.

# 3. Details of PSEs Supported



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The implementation research supported PSEs offering climate-smart agricultural products/services to integrate women into their value chains through gender-transformative approaches. This was based on the premise that climate-smart enterprises, while providing significant environmental benefits and increased food security for the region, also have significant potential to impact women engaged in the sector.

PSEs were sourced through two calls for applications. The first call was focused on sourcing PSEs operating in Kenya, Rwanda, Tanzania, and Uganda, and resulted in 151 applications from the 4 target countries. The second call for applications was targeted at PSEs in Rwanda and resulted in 26 applications.

The program considered enterprises across all sub-sectors of agriculture including crop farming, fishery, livestock & animal husbandry, and other allied areas. The program focused on PSEs with business models that have the most potential for enabling low-carbon development and WEE (such as easing access to farm inputs and credit for women, mainstreaming women across key roles in farm employment, simplifying access to markets, reducing structural vulnerability, among others).

### Applicants were required to meet the following minimum requirements to be considered:

- **Be registered and operationally active in at least one of the focus countries (Kenya, Rwanda, Tanzania, or Uganda).**
- **Be operational for at least three years.**
- **Have a clear intent or vision to advance women's participation across the value chain (as partners, employees, leaders, etc.).**
- **Have a proven and piloted business model.**

### PSEs for the program operate across five major innovation areas.

1. **The service-provider model** demonstrates great potential to significantly contribute to farmers' climate resilience and help reduce the agricultural sector's carbon footprint. PSEs like **Aquarech in Kenya**, **Pedon in Uganda** and **Alaska in Tanzania**, work with farmer clusters to provide a combination of services, including inputs, financing, extension services, markets, and others. By combining various services and support mechanisms, this model facilitates the collective adoption of climate-smart agricultural practices, such as efficient irrigation systems, climate-resilient crop varieties, precision agriculture tools, conservation agriculture, agroforestry, integrated pest management, and soil health management. This model presents an opportunity for PSEs to facilitate access to finance and insurance for farmers, helping farmers secure loans or micro-credit for investment in climate-resilient infrastructure, such as water management systems or renewable energy solutions. These offerings will prove beneficial for women farmers since accessing input credit or crop insurance is particularly challenging for

them. Moreover, it provides farmers a reliable source for inputs and/or accessible markets. In the fisheries sector for instance, such a solution is helping women traders break the cycle of 'Fish for Sex'<sup>35</sup> trade by eliminating middlemen and accessing produce from platforms.

2. **Recycling organic waste to produce organic inputs** is an example of an innovative practice that helps mitigate the adverse effect of climate change. Organic inputs derived from recycled organic waste, such as compost, improve soil's organic matter content leading to enhanced soil health and structure. Healthy soils allow for [carbon sequestration](#) while improved soil structure helps to conserve water, minimize irrigation requirements, and reduce the vulnerability of crops to drought. Since organic inputs are derived from natural sources such as plants, microbes, or insects like the black soldier fly, they help farmers reduce their reliance on synthetic pesticides, which are produced through energy-intensive processes that generate significant greenhouse gas emissions. [Black soldier fly \(BSF\) larvae are known for their ability to efficiently consume a wide range of organic waste](#), including food scrapings and agricultural by-products. By utilizing these larvae to convert organic waste into valuable fertilizers, the amount of waste going to landfills or incinerators is reduced, thereby minimizing greenhouse gas emissions associated with waste decomposition and disposal. In addition, with feed prices rising sharply, livestock farmers are forced to look for alternative feed sources for their animals and BSF farming has emerged as a high-quality protein source for animal feed production. **Ugavoil (RAQCCOL) in Uganda** and **Griincom in Kenya** are examples of PSEs in this category. The industry offers immense potential for job creation and gender inclusion, especially given that activities such as waste segregation, recycling, reusing, and repurposing are mostly undertaken by women. Periodic assessments to highlight such impact will help attract more private sector engagement and investor interest, and as a result create more opportunities for gender impact.

3. **Using controlled production systems** is another approach used by PSEs to address the impact of climate change on agricultural production. Companies like **NjordFrey in Rwanda**, **Green Harvest Farmers in Rwanda**, and **Synnefa in Kenya** are leveraging smart greenhouses, aquaponics, and hydroponics farming, respectively, to provide efficient production systems. Greenhouses allow for precise control over environmental factors such as temperature, humidity, light, and water use which helps to reduce resource wastage, minimize the need for mechanical tilling, reduce deforestation and pressure on land resources, and promote crop diversification. Farmers report higher yields, better crop quality (in terms of fruit size and weight), reduced manual work, and efficient water use for land covered by the greenhouse as compared to open fields.<sup>36</sup> Hydroponics, a soilless method of growing plants, minimizes water loss due to evaporation and optimizes water usage, making it suitable for regions facing water scarcity, drought and erratic rain patterns due to climate change. Aquaponics is a closed

loop, water-efficient method of production that combines aquaculture with hydroponics by recirculating water between fish tanks and plant beds. By creating a stable and controlled climate, both hydroponics and aquaponics allow for year-round production and offer a more resilient production system that is less vulnerable to the impacts of climate change. Compared to conventional soil-based farming methods, [aquaponics can reduce water use by up to 90%](#); critical for regions facing water scarcity and drought due to climate change. However, as compared to greenhouses, hydroponics and aquaponics are at very nascent stages of development in the region. Controlled production systems such as these provide tremendous opportunities for gender inclusion in the sector, especially since they can be readily applied to vegetable gardening and cash crop production where women are majority actors. There is, however, a need to establish a business case for the sector, increasing awareness among farmers, and structuring the solution as per the affordability of farmers to ensure widespread adoption.

4. **Businesses providing technology platforms** play a crucial role in helping farmers and other actors mitigate and adapt to the effects of climate change. These platforms provide farmers with real-time climate data, climate-smart farming practices, weather forecasts, and early warning systems that enable farmers to make informed decisions about crop choices, planting schedules, irrigation management, and pest and disease control, helping them adapt to changing climatic conditions. Platforms that provide farmers with access to marketplaces help to streamline supply chains, reduce post-harvest losses, increase farmers' profitability, and build their resilience to climate-related market fluctuations. These tech platforms also facilitate access to climate-resilient seeds, sustainable agricultural inputs, and innovative farming technologies, which allow farmers to grow crops that are better adapted to changing climatic conditions. **Usomi in Kenya** offers an online marketplace for farmers to access high-quality, high-yielding, drought-tolerant seeds, and other inputs. Fintech platforms like **DMA Tanzania** provide digital payment systems, insurance, and access to credit, enabling farmers to manage risks associated with climate change. These tech-enabled platforms are critical not only for addressing the digital divide in the sector, but also for ensuring that women farmers have equal and timely access to useful data, knowledge and market resources to develop climate resilience. However, to improve farmer uptake and adoption, there is a need to deliver in-person support and increase digital literacy while also providing access to information through mobile phones, particularly when working with women farmers. It is also important for businesses to demonstrate quick wins to provide momentum to and establish a case for scaling up such digital efforts.

5. **Agricultural biotechnology** presents another pathway for our food systems to build resilience against climatic and environmental shocks. PSEs like **GenePlus in Kenya** provide high quality genetic material and vaccines to rural smallholder and semi-commercial farmers by

leveraging cold chain facilities. Genetic materials that are drought tolerant and disease resistant and have enhanced nutrient-use efficiency help farmers reduce crop losses, improve yields, lessen the need for land expansion, and minimize deforestation associated with agriculture. By also providing access to effective vaccines and treatments, these PSEs are able to help farmers protect their livestock from diseases, improve animal health and productivity, reduce economic losses, and improve resilience to climate-related stresses. For women dairy farmers, who typically have small cattle herds and limited access to land, high quality genetic materials can help increase productivity and income while using fewer resources.



**Photo Courtesy :** Intellecap's team taken with women farmers using greenhouses in Rwanda.





Photo Courtesy : Intellecap's team taken in Rwanda.

# 4. Learnings/Findings from the Program



The implementation research focused on selecting enterprises operating at the intersection of climate and agriculture; existing gender-focused interventions were not key criteria for selection. However, the program ensured that the selected PSEs were interested/committed to increasing women's representation in their business and deepening their gender impact.

Although, during the initial stages of the program, PSEs expressed an interest in promoting women's representation in the sector, most did not have a clear understanding of how to translate their gender intentions into action or did not fully understand the value of gender integration for their businesses. With this in mind, this implementation research created customized Gender Action Plans for each enterprise and the team worked with the selected PSEs to enhance their understanding of the business case for increased engagement of women in the sector, offered support in creating action plans that could guide the design and implementation of gender-focused interventions, and helped showcase their gender and climate impact to increase ecosystem awareness on emerging solutions.

As part of the program, 11 PSEs were selected; however, only 8 PSEs completed the program and received support across various aspects of their business. At the program's outset, a needs assessment was conducted to identify gaps in, and opportunities for gender mainstreaming along with a baseline assessment to establish the status of gender integration within the PSEs and their value chains. At the end of the program, an endline assessment was conducted to evaluate the progress /changes in gender integration over time as well as the impact of the PSE's business operations on women and climate.

## Extent of gender mainstreaming in the PSEs' business models

### 1. Adoption of new Gender-inclusive HR policies

**86%** of PSEs reported implementing new gender-inclusive policies after receiving support from the program. The remaining 14% did not implement any new gender-inclusive policies because they already had an existing gender-focused policy framework. A detailed analysis indicated that for PSEs without pre-existing HR manuals and policies, the program predominantly helped in formulating HR manuals and inclusive policies. For PSEs with established HR manuals and policies, the program was instrumental in effectively implementing and integrating gender-inclusive policies which significantly impacted the PSE's recruitment, onboarding, and operational procedures. For instance, one PSE introduced a flexible working policy to support young mothers. Another PSE revised its recruitment policy to actively encourage female applicants for senior positions, resulting in the successful hiring of a woman for a recently advertised senior position. These changes fostered a more inclusive workplace culture within the PSEs, characterized by improved time management and

increased productivity among employees, a noticeable boost in confidence levels, particularly among female employees, and an uptick in female customers.

### 2. More inclusive workforce with an increased number of women engaged at the management level

By the end of the program, women comprised **51%** of PSEs' total workforce indicating equal gender representation.

Our analysis revealed that a larger proportion of female employees (70%) held full-time positions, while male employees were more likely to occupy more part-time roles (78%). The percentage of female part-time female employees increased from 17% at the beginning of the program to 22% at the end of the program. The higher proportion of women in full-time roles compared to part-time roles was attributed to the nature of work, with full-time roles primarily involving administrative and accounting responsibilities, while part-time roles were associated with extension services and production activities.

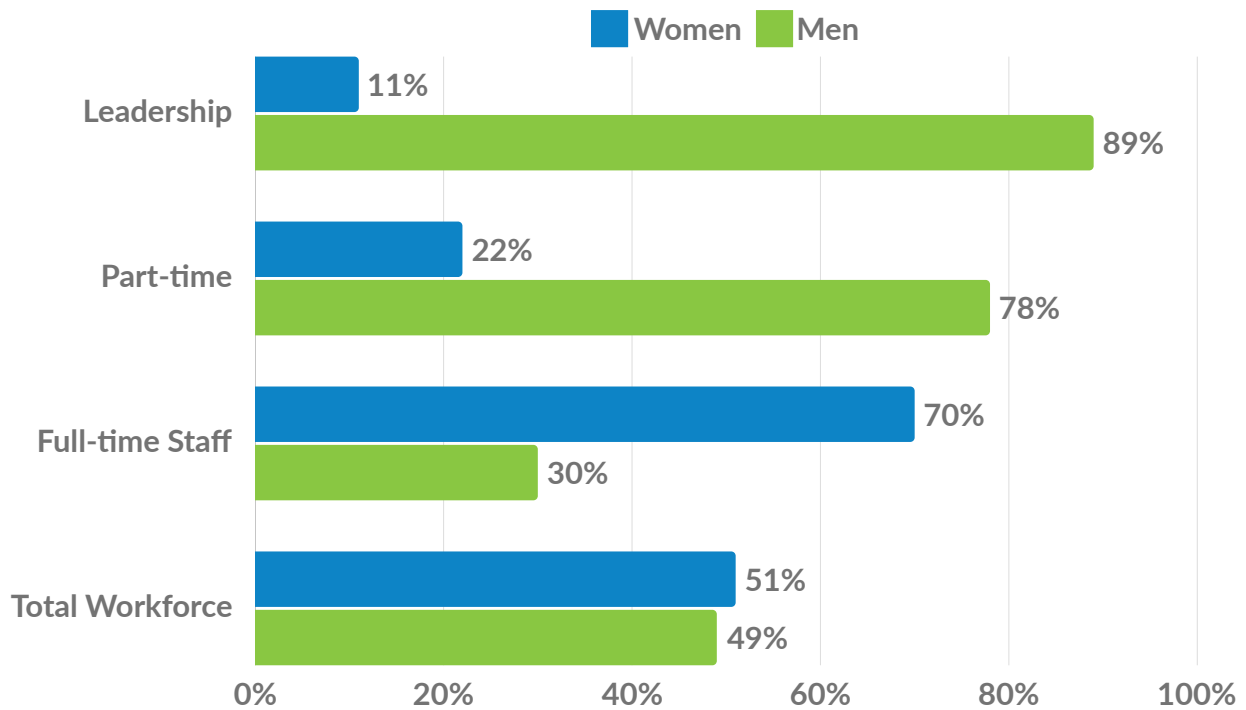
By the end of the program, the representation of women in leadership positions across PSEs improved from 8% at the baseline to 11% at the endline. Discussions with the PSEs' founders indicated that while achieving a more balanced gender representation in managerial roles is crucial, it would require more time, as hiring decisions were largely based on immediate operational needs. Furthermore, PSEs noted a higher number of male applicants compared to female applicants for the senior positions advertised during the program. Alt: Furthermore, PSEs observed that a higher number of men applied for senior positions advertised during the program compared to women.



Photo Courtesy : Intellecap's team taken during interactions with women farmers in Rwanda.

**100%** of PSEs reported an improvement in workplace culture, such as better gender perceptions and attitudes towards women employees, as compared to the beginning of the program.

**Figure 5:** Women vs men workforce indicators (n=7)<sup>37</sup>



### 3. Regular gender-focused training and capacity building of employees

65% of PSEs reported conducting regular training and capacity-building initiatives for their employees while 35% reported conducting at least one training for their employees during the program.

These trainings focused on gender and business-related topics as outlined in the PSE’s respective Gender Action Plans. In total 193 employees (120 female employees and 73 male employees) participated in these sessions.

An analysis of employee participation in training activity across all PSEs revealed that 62% of those attending the training programs were women, indicating a higher level of interest in training and capacity-building endeavors from female employees as compared to their male counterparts. Conversely, training activities involving fieldwork and practical experimentation saw greater participation from male employees.

**Table 8:** Gender-focused trainings by PSEs<sup>38</sup>

Indicator	Description	%
Frequency of training	Regular	65%
	Ad hoc	35%
Training manual	Developed	25%
	Work in progress	55%
	Not developed	20%
Participation of employees (Total Employees=193; M=73; W=120)	Women	62%
	Men	38%

<b>Employees (Total Employees= 193; M=73; W=120)</b>	<b>Men</b>	<b>38%</b>
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Areas on which training was conducted by the PSEs:

- i. Gender, inclusivity, and diversity
- ii. Production and operational-related
- iii. Marketing and sales
- iv. Climate-smart adoption practices
- v. Extension services

#### 4. Improved investment attractiveness due to gender mainstreaming

**71%** of PSEs reported attracting impact investors i.e. investors interested in funding businesses that address social and economic challenges in their communities. The gender-focused investment readiness, pitch preparation, and investor networking support provided by the program helped these PSEs attract such investors. PSEs raised a total of USD 1.8 million during the program period. PSEs who secured funding as a result of the support provided by the program, did so in the form of grants, debt, and equity, with amounts ranging from USD 12,000 to USD 1.7 million.

Among the PSEs that secured funding during the program, 40% allocated the funds to capital expenditure (CAPEX) activities, such as procuring new machinery and fleet, while the remaining 60% directed most of their funds towards operational activities, including recruiting key personnel, restructuring distribution channels, and expanding into new regions. PSEs that did not secure funding during the program reported a significant increase in their investor engagements and expressed a positive outlook for future fundraising endeavors.

#### 5. Improved business processes such as last-mile delivery models for women farmers

**28%** of PSEs implemented last mile-delivery models that would enable them to increase the participation of women farmers in their value chain, while 57% developed new products and services specifically for their women value chain partners (customers, distributors, and suppliers). For instance, two PSEs introduced an agri-input credit facility to serve their female customers, while another PSE introduced an urban farming initiative, using raw materials provided by women farmers to install vertical gardens.

100% of the PSEs revamped their marketing strategies and customer delivery processes to incorporate gender considerations. For instance, some PSEs curated their messaging to appeal to women farmers through the use of illustrations and images featuring women farmers and developed gender-sensitive content, across both online and offline channels.

#### 6. Revenue growth from diversification and adoption of gender transformative approaches

**71%** of PSEs reported revenue growth during the program, with an average growth of 27% across all participating enterprises. Notably, one PSE reported a 60% revenue growth during the program, attributing this success to diversifying into establishing vertical farms and training women farmers to manage these farms. Another PSE reported a 70% revenue growth as a result of implementing gender transformative approaches such as improved customer segmentation and targeted gender marketing.

PSEs that did not report revenue growth pivoted their business models to focus on core aspects of their business while outsourcing/discontinuing secondary and least-income-generating activities. For instance, one PSE discontinued the direct sale of degutted fish to women traders, and instead adopted a digital sales platform and a franchise model in both rural and urban areas. Even though such business model pivots were not beneficial in the short-term, they were necessary to address gender bias in the sector and ensured long-term business growth.

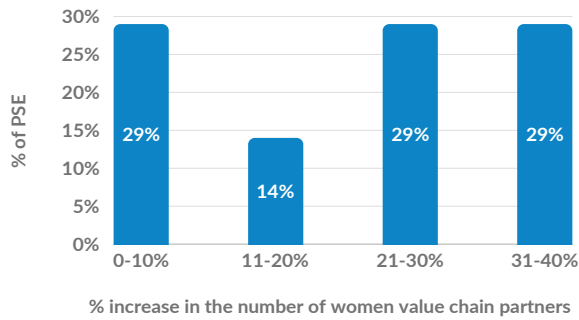
#### Extent of positive impact on women value chain actors

##### 7. Increase in number of women value-chain actors

**71%** of the PSEs reported successfully increasing the number of female value chain partners (customers, farmers, distributors etc.) and enhancing the involvement of female partners within their value chain since the program's inception. The program aimed not only at increasing the number of women employed by PSEs but also increasing the number and participation of women across value chain activities.

Within this group, 58% of PSEs reported a 21%-40% increase in engagement with value chain partners and 14% saw a 11%-20% increase. Most PSEs adopted new farmer engagement models to onboard more women, such as offering bundled value-added services (inputs, access to markets, etc.), employing a community-based approach to create awareness, providing training and capacity building support, and setting up a credit facility. Other PSEs refined their last-mile distribution models or offered targeted products for women. For instance, Griincom's installation of vertical gardens was aimed at employing female farmers and resulted in a 50% increase in garden installation. Businesses engaged in organic input production showed the most significant increase in engagement with female partners across their entire value chain. PSEs with the lowest engagement with female stakeholders typically operated as produce/inputs aggregators.

**Figure 6:** Engagement of women value chain actors (n=7)<sup>39</sup>



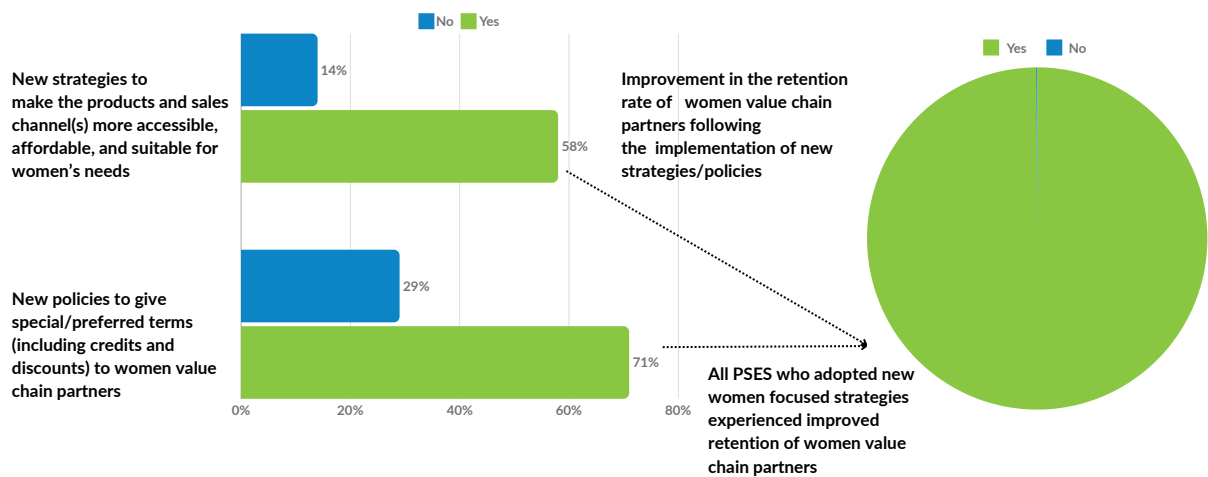
### 8. Adoption of new women-focused strategies for increased involvement of women value chain partners

Most PSEs reported adopting new strategies to support their women value chain partners (customers, distributors, and suppliers). Two main categories of strategies categories emerged from the endline survey: one focused on new company policies offering preferred transaction terms, such as credits and discounts to the women, while the other focused on making products and sales channel(s) more accessible, affordable, and suitable for women’s needs.

**71%** of PSEs adopted policies in the first category with examples including extending a 30% credit on total input purchases to women groups, applying direct discounts exclusively for women customers, and offering credits for bulk purchases by women’s groups. The remaining 29% either had pre-existing women-focused strategies in place or required additional investments to implement such new strategies. In the same vein, 86% of PSEs adopted new strategies/policies in the second category, such as implementing last-mile service delivery service for women’s farmer groups, delivering extension services through a cooperative-based model, and introducing smaller, affordable and portable product packages.

Adopting new policies that focus on women has had a direct impact on the retention of women value chain partners. All PSEs that adopted such strategies also reported improved customer retention, attributing this improvement to a more value-based engagement with the women stakeholders.

**Figure 7:** New strategies implemented by PSEs (n=7)<sup>40</sup>



### 9. Increased number of trainings for women value chain partners

**71%** of PSEs conducted training for their women value chain partners during the program, an improvement from the 57% that conducted such training before the program.

These training sessions were typically conducted in mixed farmer groups or cooperative societies and

focused on topics such as good agriculture practices to help the farmers improve their yields. A total of 16,997 value chain partners participated in these sessions. Further analysis showed that 78% of the training participants were female and 28% were male. Of the PSEs that conducted training, over half (57%) took special measures to increase women’s participation. For instance, one PSEs introduced flexible training schedules while another delivered the training at women’s residences/businesses.

**Table 9:** Value chain partners trained by PSEs in the program duration (n=7)<sup>41</sup>

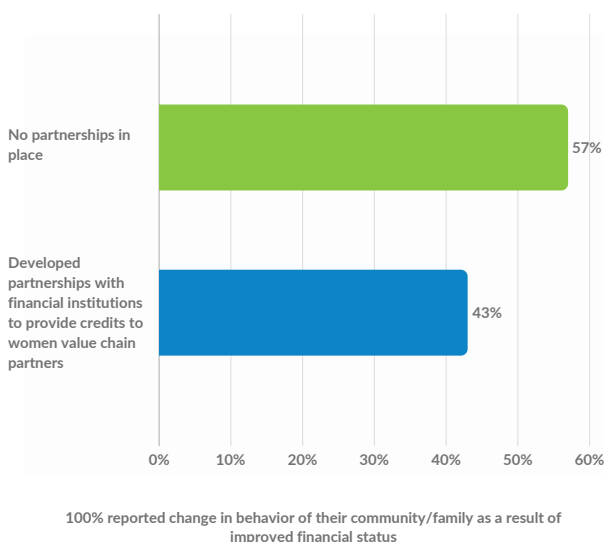
Indicator	Description	%
Training of women value chain partners	Conducted training	71%
	Did not conduct training	29%
If conducted training, took special measures to increase women's participation in training	Yes	57%
	No	43%
Participation of women and men in the training	Women	78%
	Men	22%

### 10. Enhanced financial support to women value chain actors

**43%** of PSEs reported forming financial partnerships during the program's lifetime to provide improved credit facilities to women value chain actors. As a result, over 15,000 women smallholder farmers were able to access these credit facilities during the program's duration.

The remaining 57% of PSEs did not form financial partnerships but implemented measures such as flexible payment terms to ease the financial burden on women customers and distributors. Additionally, a positive correlation was observed between access to finance and positive changes in the behavior of family/community towards women. Women value chain actors across all PSEs that provided financial support reported a positive change in community/family attitudes as a result of their improved financial status.

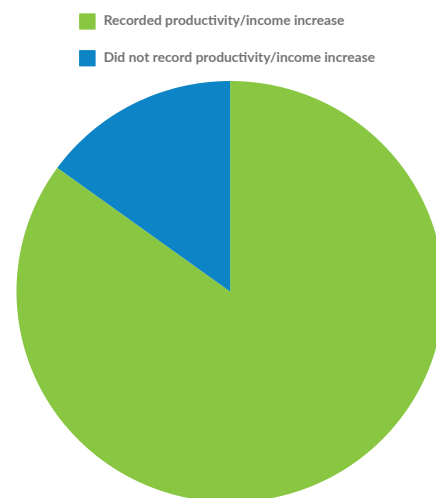
**Figure 8:** Partnerships established by PSEs to offer financial support (n=7)<sup>42</sup>



### 11. Enhanced productivity/ increase in income for women value chain actors

**86%** of PSEs reported significant increases in productivity and income for their value chain partners since the beginning of the program.

**Figure 9:** Productivity/increase in income for women value chain partners (n=7)<sup>43</sup>



Using the support received from the program, each PSEs established an M&E framework to actively track changes in yield and income among their women value chain partners. For instance, one PSE recorded a 50% increase in the yield of vegetable farmers that adopted vertical gardens while another noted an up to 25% increase in income for maize farmers who used the enterprise's organic inputs. Interestingly, a positive correlation was found between providing training and increased productivity for women value chain actors. The endline survey revealed that all PSEs who provided training also reported productivity and income increases for their women value chain partners.





**Photo Courtesy :** Intellecap's team taken with Green Harvest greenhouses in the background in rural Rwanda.

# 5. Case Studies of Enterprises Supported by the Program

# 5.1 AQUARECH

## Fish Farming Platform in Kenya

### 5.1.1 Sectoral overview – Aquaculture in Kenya

Kenya's aquaculture industry has recorded significant progress over the past two decades. Aquaculture production has steadily increased, contributing significantly to the country's total fish production. In 2003, Kenya produced around 1,012 metric tons (MT) of fish through aquaculture, which increased to 19,945 MT in 2020.<sup>44</sup> Production needs to further increase to 150,000 MT by 2030 to fulfil the existing demand.<sup>45</sup> Among the various varieties of fish, Tilapia has gained popularity with farmers in Kenya, due to its low cost of production and high nutritional value. The Government has aided the increase in Tilapia's production through various types of technical support, funding, and market linkage initiatives, such as the Economic Stimulus Program, which aims to provide tilapia fingerlings and support small-scale fish farmers in increasing their income.

Farmers have increasingly adopted improved fish farming techniques, such as using modern ponds and recirculating aquaculture systems (RAS) to optimize fish production. These systems help control water quality, reduce disease risks, and improve the growth rate of fish. Integrating aquaculture with other agricultural activities, such as poultry and crop farming, has become more common. This integrated approach allows farmers to maximize resource use, decrease production risk, diversify income sources to better withstand shocks, and enhance food security.

Research institutions, such as the Kenya Marine and Fisheries Research Institute (KMFRI),<sup>46</sup> have also conducted studies and introduced various innovative technologies for the aquaculture sector. KMFRI has worked extensively on innovative practices such as climate-smart aquaculture technology and multitrophic aquaculture, introducing them to the sector by training farmers and County fisheries officers. These innovative practices have helped realize intensification to overcome the decreasing size of land holdings, changing water temperatures, and increased frequency of flash floods, among others.<sup>47</sup> This type of research and the adoption of resulting innovative practices has led to improvements in fish breeds, and better disease management and feed formulation. Finally, the Government has supported the sector by strengthening regulatory frameworks. For instance, it has established the Aquaculture Act, which provides guidelines and regulations for the sector, ensuring responsible and sustainable practices.

Figure 10: Fish being sorted by farmers at Ogal Beach, Lake Victoria, Kisumu County



Photo Courtesy : Intellecap's team.

Aquaculture contributes significantly to the well-being of farmers, their communities and the environment. It does this in several ways: 1) By providing a source of sustainable livelihoods for farmers: Aquaculture had aided poverty reduction by 23% -37% and increased incomes by 19%-23% for small scale producers; 2) By improving food security: Aquaculture provides an affordable source of animal protein for low-income populations leading to the eradication of hunger and improved nutrition<sup>48</sup> (aquaculture contributes to a steady increase of 7.5% in fish production annually);<sup>49</sup> 3) By increasing women's empowerment: Aquaculture requires lower inputs and labor, and yields higher net returns as compared to traditional fisheries, enabling more women to take up the practice, thereby creating income generation opportunities for women;<sup>50</sup> 4) By creating a positive impact on the environment: Aquaculture reduces pressure on wild fish stocks and promotes sustainable practices<sup>51</sup> that reduce fish production cycles by 35%.<sup>52</sup>



## 5.1.2 Challenges faced by the aquaculture sector in Kenya

### Sector-level challenges

At a macro level, Kenya's aquaculture sector faces several challenges that threaten its sustainability. Small-scale farmers find it difficult to take up aquaculture at a commercial scale, given the high cost of production for large ponds (due to the high input cost). Access to credit could ease the upfront burden of input costs; however, financing is not widely available. Lack of or difficulty in accessing credit results in farmers acquiring cheap and locally available inputs to continue production.<sup>53</sup> Unavailability and inadequate supply of quality feed and fingerlings impact produce quality and lead to high fish mortality rates.

The cost of building and maintaining ponds further adds to the woes of fish farmers. Farmer's face several challenges in pond maintenance, such as ponds drying up during droughts, siltation of ponds from excessive feed accumulation, and poor security.<sup>54</sup> Moreover, farmers often lack the agronomic expertise required for fish farming, and there are few avenues

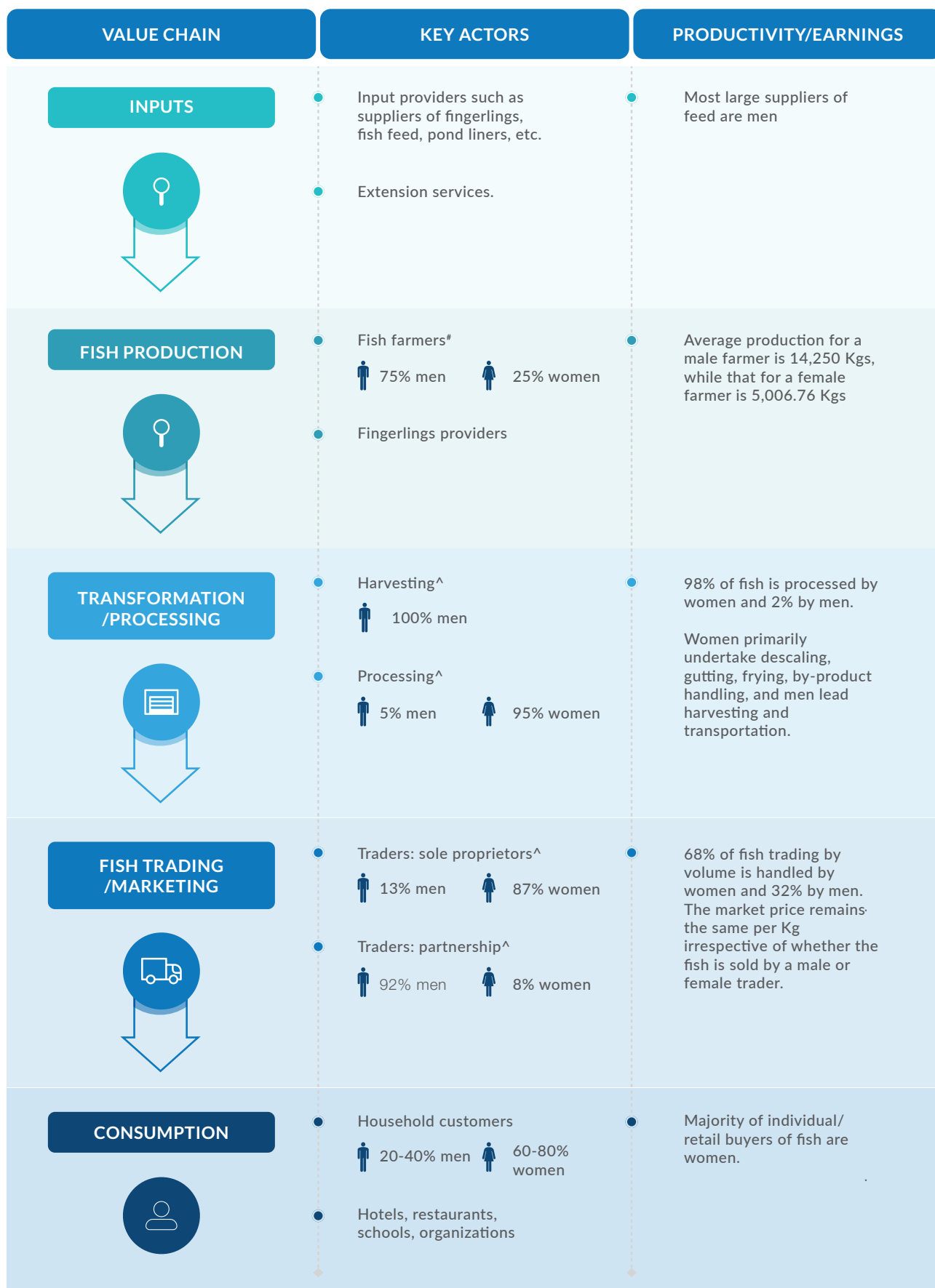
to build their capacity. Farmers rely on extension officers as their primary source of information. However, uncoordinated promotion efforts from the government, research institutions, NGOs, and other authorities lead to farmers receiving varying and often incomplete information.<sup>55</sup> This lack of information, coupled with limited access to markets, affects farmers' profitability and has acted as a hurdle to the aquaculture's growth in Kenya.

At a micro-level, there is a severe influx of Tilapia imported from China in the market. Tilapia is the major fish species produced and consumed in Kenya, accounting for over three-fourths of the production.<sup>56</sup> Chinese Tilapia not only undercuts local fish farmers on price, it is also surrounded by quality issues—such as alleged high contamination levels, which include traces of lead, mercury, and some pesticides.<sup>57</sup>



Photo Courtesy : Intellecap's team taken during interactions with farmers in Kenya.

Figure 11: Value chain of the aquaculture industry in Kenya



## Gender-related challenges

**Women play a significant role in Kenya's aquaculture industry; however, the industry is characterized by a highly gendered division of roles.**

Around 75% of the fish farmers in the region are men<sup>58</sup> (who control production), while a majority of fish traders are women (however, extensive fish aggregation facilities and market centers are still managed by men). This practice eliminates women from the production side of the fish value chain. Moreover, while most of the fish traders on Kenyan coasts (who buy and process fish for local markets from small-scale fishermen) are women, they must buy fish from fishermen. A rising demand in fish from traders, particularly women, alongside a dwindling supply of fish has given rise to the practice of quid pro quo transactions—commonly termed 'Fish for Sex (FFS)' trade<sup>59</sup> or Jaboya, an extra monetary strategy to sell fish to traders. In the Jaboya system, women fish traders engage in sex with fishermen to gain preferential access to fish, given that fish produce is limited, and availability of funds does not always translate to access for traders. This practice not only makes women traders vulnerable to gender-based violence but also exposes them to health risks such as HIV. Estimates suggest that 30%-40% of fishing communities across Kenya are affected by HIV.<sup>60</sup> Nonetheless, the declining availability of fish has strengthened the ties between social and ecological systems around the lake to secure fish supply, which is often the only source of income for women traders to support their families.

Even in the evolving aquaculture ecosystem, where both men and women participate in fish production, men tend to produce and trade higher volumes of fish than women. This gender disparity is a result of the challenges faced by women, including lack of access to capital, limited knowledge and expertise in fish farming, and traditional and cultural biases against women in the sector.

## Climate change-related challenges

**Climate change is increasingly threatening the sustainability of aquaculture and fish production systems.**<sup>61</sup> A study by the University of British Columbia Institute for the Oceans and Fisheries indicates that global warming could reduce global aquaculture production by as much as 16% by 2090.<sup>62</sup> In Kenya, the direct and indirect impact of climate change will affect an estimated 40% of the current production potential of aquaculture.<sup>63</sup> Rising temperatures, changing precipitation patterns in freshwater ecosystems, and more frequent storms, endanger fish habitats, fish stocks in production systems, production infrastructure (such as fish farms), and, consequently, the livelihoods of fish farmers.<sup>64</sup> For instance, frequent floods reportedly destroy fish farms in Kenya, and farmers in the Lake Victoria region often have to deal with fish kills<sup>65</sup> due to upwelling.<sup>66</sup>

Changes in sea surface temperature may change local underwater ecosystems, leading to increases in infestations, thereby increasing operating costs for aquaculture and altering the abundance/composition of fish stocks in

capture fisheries. Altered precipitation patterns may result in migration patterns changing, lower water quality, and a greater risk of drought. For the aquaculture industry, these biophysical effects impact fingerling availability, increase pond maintenance and production costs, and reduce productivity. Finally, increased frequency and intensity of storms increase the risk of diseases and alter water salinity, leading to the loss of fish stock, impact wild fish recruitment, and increase the amount of capital required to design and build infrastructure that can withstand storms.

## 5.1.3 Business/Operating model of Aquarech

Started in 2019 in Kenya's Lake Victoria region, Aquarech is a social enterprise that works with rural, small-scale fish farmers, assisting them in improving productivity, increasing incomes, and developing an inclusive community-based aquaculture value chain. Aquarech's business model involves selling inputs (high-quality fish feeds) to fish farmers, buying fish from the farmers through established aggregation facilities (fish bulking centers), and trading fish through Aquarech-owned depots based in local market centers where traders (women and youth) and retail and B2B customers can buy the fish produce. Aquarech establishes fish distribution outlets in low-income areas to sell fish directly to low-income communities and increase their access to fish as an affordable source of protein. Aquarech works with two categories of farmers: i) individual small-scale / subsistence fish farmers and ii) commercial farmer groups. Aquarech engages both these farmer categories through contract farming agreements.

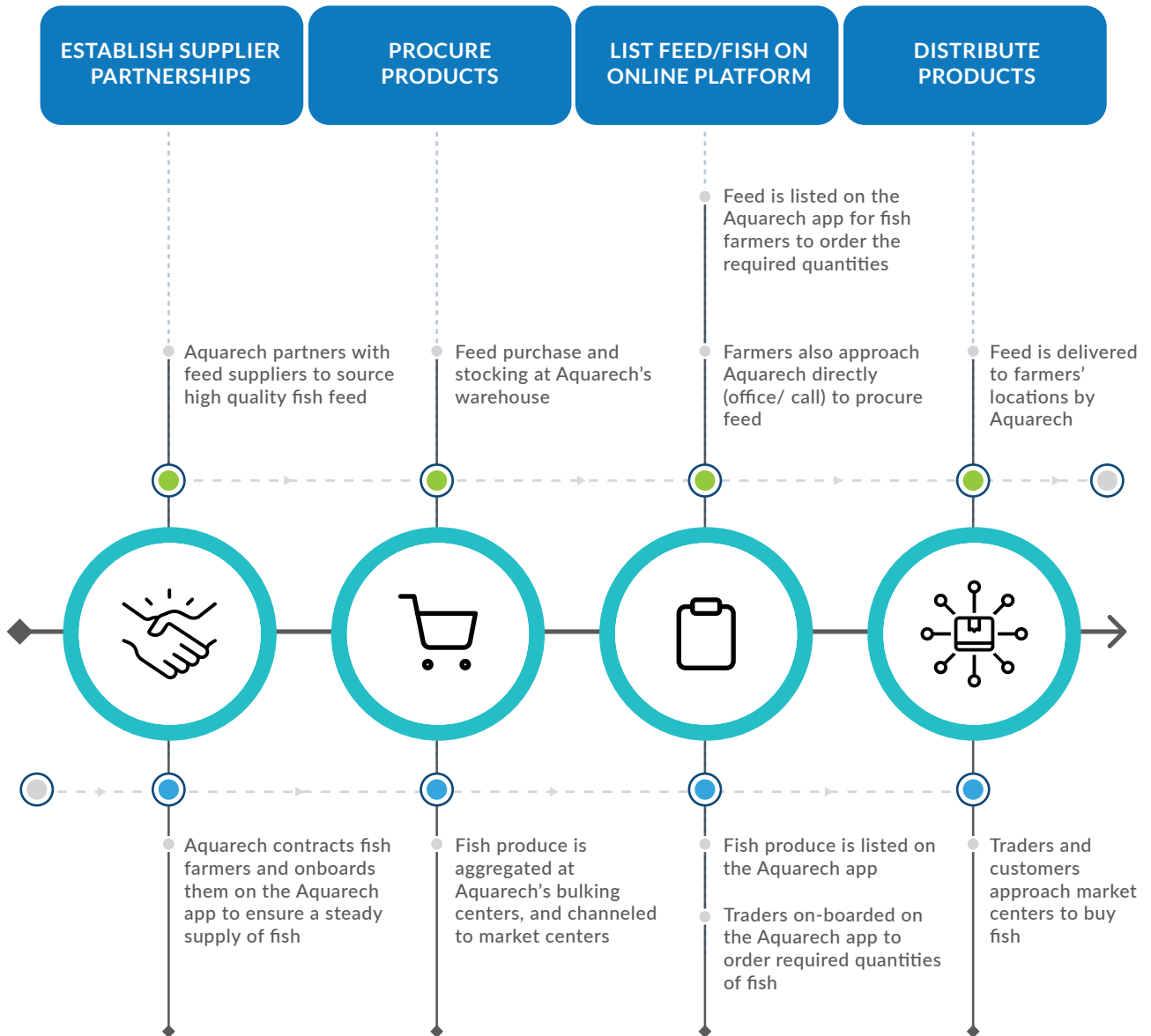
The business uses remote sensing technology to collect and consolidate data. It then uses this to assist fish farmers in deciding when to place feed orders, monitor their fish's growth and development, and recommend mitigation measures where growth is not in tandem with expectations. Aquarech also uses this data to manage its supply chain and coordinate marketing activity for expected fresh fish harvests.



Photo Courtesy : Stock photo.



Figure 12: Aquarech's business model



**Aquarech makes its products and services accessible to its target market through a mobile-based digital platform.** Aquarech has a digital platform that allows small and medium-sized fish farmers to access quality inputs and traders to access fish for trade. It procures bulk feed from feed millers and sells this to farmers on its platform (Aquarech Farmer App). Farmers can also use the USSD App to buy feed. Farmers can also access their production data via a smartphone or USSD code application, which is easy to use and maintains information integrity, allowing farmers to make production- and sales-related decisions with security and ease.

**Aquarech is working towards adapting to the effects of climate change on Kenya's aquaculture industry while also empowering the communities involved in the sector.** To overcome quality issues in local fish production, Aquarech offers farmers remote sensors which are integrated into its App to monitor fish growth from stocking to sale. The remote

sensor can monitor vital production data such as the quantity of feed given, average daily growth, Feed Conversion Ratio (FCR), and feed cost, among others. It has an in-built feeding regime that automatically calculates and informs the farmer about the exact amount of feed to be provided based on water temperature, size of fish, and quantity of fish. This process ensures fish quality and checks pond siltation due to excessive feed in the water. While the sensor-based monitoring system has enormous potential for managing productivity and ensuring the quality of fish produced (in terms of the nutritional content of the fish), its adoption is limited to only a handful of Aquarech farmers as it requires capital investment (costing each farmer approximately USD 40 for the sensors).

**The Aquarech app aims to empower women and youth fish traders** by providing an open and easily accessible USSD platform for accessing fish for trade from the company depots, where produce from member fish farmers is aggregated.



Aquarech's vision of shifting fish procurement entirely onto its app, thus eliminating direct interactions with fishermen on the coasts, has the potential to eliminate FFS in the region; however, implementation is limited, with most traders still buying fish from the open market at the beginning of the GLOW program.

**At the start of the program, Aquarech planned to introduce contractual cage farming with the aim of empowering fish farmers, especially women and youth.** Cage farming, also called net pen aquaculture, is a farming technique that involves raising fish in submerged cages built in water bodies such as lakes and seas. The cages are constructed to confine the aquatic organisms (fish) while allowing water to flow through, providing a controlled environment for their growth and maintenance.

In line with the overall objectives of the GLOW program, Aquarech was selected for the implementation research because of its potential to enable a low-carbon transition of the aquaculture ecosystem and integrate women across the sector's value chain. Aquarech's business model demonstrates the potential to create the following benefits that align with the program's objectives:

- **Training farmers on good aquaculture practices, the effects of climate change, and coping mechanisms.**
- **Providing access to improved and more efficient feeds that reduce siltation in ponds, thereby helping maintain an ecological balance (particularly oxygen levels) in the ponds.**
- **Offering remote sensors to fish farmers to monitor production cycles and suggest a precise feeding regime as well as enable farmers to monitor and control water temperatures to adapt to climate change.**
- **Providing precision farming techniques that eliminate overfeeding or underfeeding and help lessen the impact of feed on ecological systems within the water bodies.**
- **Creating entrepreneurship and employment opportunities for women in fish production by proactively targeting women groups for training and onboarding them as cage fish farmers.**
- **Reducing the vulnerabilities of women fish traders to FFS by linking them with fish produce through the Aquarech app.**
- **Running fish distribution outlets that directly serve low-income communities, increasing their access to fish as a source of protein, with 60-80% of individual buyers being women.<sup>67</sup>**

Women play an important role in the fisheries sector, making up nearly half of the overall workforce in the fisheries value chain.<sup>68</sup> Despite women's participation in the value chain, gender inequalities persist due to inadequate education and

training, cultural and societal norms, and lack of financing, which prevent women from fully participating in economic opportunities and decision-making in the sector. This is where Aquarech is playing a part in helping small-scale women fish farmers adapt to climate change while actively championing gender mainstreaming in the sector.

**Figure 13:** Intellecap and Aquarech teams at the Aquarech headquarters during the baseline assessment



### 5.1.4 Support provided by the program to Aquarech

Through a tailored Gender Action Plan and a comprehensive training program designed on the basis of an in-depth, on-ground needs assessment, the implementation research supported Aquarech in improving women's representation and deepening gender impact across their entire value chain—from production to fish trading, as well as in promoting low-carbon development in the sector. The GAP targeted four broad outcomes critical in ensuring that Aquarech accelerates its low carbon transition and improves positive outcomes for women's economic empowerment:

- **Increased access to fish feed for women fish farmers.**
- **Formalized access to fish for women fish traders through the online platform, reducing exposure to FFS.**
- **Increased use of the digital platform to link farmers with inputs, markets, and advisory services**
- **Improved financial and operational efficiencies for the business, along with gender integration.**

Figure 14: A snapshot of Aquarech's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to organic inputs for women farmers in the North-Rift region of Kenya</b>	<ol style="list-style-type: none"> <li>1. Agreements to contract women fish farmers</li> <li>2. Increased engagement with women farmers</li> <li>3. Increased number of women farmers buying feed from Aquarech</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Preparation of Gendered Business Model Canvas</li> <li>3. Designation of gender champion</li> </ol>	<ol style="list-style-type: none"> <li>1. 5 women groups contracted at endline in Sep 2023 (out of 18 farmer groups)</li> <li>2. 3,058 farmers engaged (Female 663, Male 2,395)</li> <li>3. 60% of Aquarech's women farmers buying feed from Aquarech at endline as compared to 5% of women farmers at baseline</li> </ol>
<b>Formalised access to fish for women fish traders through the platform, reducing exposure to FFS</b>	<ol style="list-style-type: none"> <li>1. Increase engagement with women traders</li> <li>2. Onboard women traders on the Aquarech platform for fish sourcing</li> <li>3. Partner with BMUs and fishery officers to identify women farmers/ traders</li> </ol>	<ol style="list-style-type: none"> <li>1. Development of M&amp;E framework</li> <li>2. Tracking gender-disaggregated data through app</li> <li>3. One-on-one marketing and operational planning sessions with experts</li> </ol>	<ol style="list-style-type: none"> <li>1. 997 traders engaged at endline (Female 764, Male 233), as compared to 40 at baseline</li> <li>2. 99% of women traders onboarded on the App</li> <li>3. Partnered with 30 BMUs</li> </ol>
<b>Enhanced financial and operational efficiencies for the business, along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Create awareness of gender considerations in the workplace</li> <li>2. Enhance pitch deck to highlight gender impact for fundraising</li> </ol>	<ol style="list-style-type: none"> <li>1. Elect Gender Champion</li> <li>2. Investment readiness training</li> <li>3. Pitch preparation</li> <li>4. Pitch day</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender Champion elected leading to sensitization of staff</li> <li>2. Raised equity funding from AquaSpark by showcasing climate and gender impact</li> </ol>

### Gender mainstreaming TA support interventions

#### 1. Increase participation of women in fish production through improved feed and input access

The Gender Action Plan developed for Aquarech identified the importance of including more farmers in the supply chain. Thus, while Aquarech was looking at contracting cage fish farmers to ensure a steady supply of quality fish to their depots, it worked on identifying women fish farmers in a targeted manner, offering them training on best practices for operating in the industry.

Targeted onboarding of women is not only helping increase women's representation on the production side but also arming them with the proper knowledge, skills, and technology to do so more efficiently.

Moreover, women fish farmers present in the sector are unable to procure quality feed, which results in inferior quality fish produce and leads to women realizing lower incomes than their male counterparts. The GAP focused on increasing gender integration by making the app more accessible for women and training them to procure high-quality feeds, resulting in an improvement in product quality. Reportedly, more women

farmers than men farmers attend these trainings. Moreover, the training content is also available on the Aquarech app for future reference. **Aquarech has recorded a 20% increase in women farmers purchasing feed from the platform. Currently, over 60% of the farmers buying feed from the platform are women.**<sup>69</sup>



Photo Courtesy : Stock photo.

**Figure 15:** Fish farming at Ogal Beach, Lake Victoria, Kisumu County



**Photo Courtesy :** Intellecap's team.

The GAP also highlighted the importance of contractual fish farming for Aquarech's supply chain; the enterprise now focuses on achieving gender mainstreaming through contractual fish farming with women and youth. In addition, Aquarech has received funding from DEG Impulse to support contractual fish farming and develop an inclusive aquaculture system by bringing in more women and youth.

As of June 2023, Aquarech had already contracted five women groups (with 15-20 women farmers in each group) and sensitized them to the sector's challenges as well as trained them on best practices. Aquarech also raised capital to increase the number of contractual women farmer groups to 30 in 2023 by offering cages for women farmers to undertake cage fish farming. It has received commitments of Euro 100,000 to support contractual fish farming, including providing cages to women farmers, and an additional grant of Euro 250,000-300,000 focused on delivering specific support for women farmers.

Aquarech is now working with the Beach Management Unions (BMU) to ensure that the women's self-help groups are certified by NEMA/KEMFRI,<sup>70</sup> and registered as cooperatives. Such certifications help women's groups adopt a more formal structure, create organized leadership, and increase transparency. Additionally, a more formal and transparent structure allows Aquarech to track payments more effectively for cages provided to women farmer groups. Aquarech plans to register these groups with social services and open bank accounts for them in the future.<sup>71</sup> Access to financial support and assistance will strengthen women farmers' social standing and economic agency while enhancing financial inclusion for an otherwise unbanked population.

### **Box 3. Aquarech's Public Private Partnership (PPP) with the Lake Basin Development Authority (LBDA)**

Aquarech has partnered with the Lake Basin Development Authority (LBDA), which has provided them with a training center and a hatchery unit. The training center can accommodate up to 80 people. The facility is being renovated to incorporate gender-friendly facilities such as comfortable classrooms and a nursery for women with children and is expected to become operational in November 2023.

Aquarech has taken over the LBDA Hatchery facility in Kibos, Kisumu, renovated the buildings and the ponds, and currently have brood stock in the ponds ready for production in September 2024. The enterprise expects to be selling fingerlings to farmers from September/October 2024.

Additionally, Aquarech was showcased at the Blue Food Innovation Summit as one of the top six promising start-ups offering solutions that are changing food systems in the blue economy sector.

In addition, Aquarech has onboarded individual farmers (both men and women) to support the production of fingerlings and juvenile fish, which will be sold to contracted fish farmers, most of whom are women. This arrangement will ensure the supply of good-quality fingerlings to contracted women farmer groups and aid their overall productivity, further boosting their revenue.



#### Box 4. Piloted remote sensing technology to monitor production data in partnership with a technology provider

Aquarech had also been piloting remote sensing technology to ensure precision feeding in fish farming. The remote sensor is designed to read the water temperature and feed this information to the Aquarech app. As a result, the app indicates the quantity of feed to be provided each day based on 3 key factors—water temperature, number of fish, and size of fish. The data on number and size of fish are collected in the app during farmer registration. Thus, for the sensor to be effective, farmers need to key in fish stock data regularly.

Pilot testing revealed that farmers can reduce costs by 30% using this technology. Therefore, scaling up the use of these sensors by fish farmers for precision feeding will eliminate underfeeding or wastage.

As of June 2024, Aquarech has deployed 52 sensors and plans to deploy an additional 48 sensors during the rest of the year.

## 2. Formalize access to fish for women fish traders through the platform, reducing exposure to FFS

While Aquarech built its app with a vision to digitize fish production and trade, it focused on leveraging the app on the production side—to improve access to feed and monitor fish growth. However, the baseline assessment identified the potential impact of expanding the app's use for fish trade, and consequently, this became an essential action item under the Gender Action Plan.

Using the app for fish trade entailed many more women traders being onboarded to the app and sensitized to the benefits that such a platform could bring to their business. Direct procurement of fish from the Aquarech app means women traders can break free from the cycle of FFS trade, get regular access to fish through a formalized channel, and contribute to increasing their household income in a dignified manner.

In line with recommendations in the GAP, Aquarech launched version 2.0 of its app in May 2023, which captures the gender of registered farmers and traders and assesses the engagement levels of women and men within Aquarech's value chain. Through enhanced support on the fish trading side from the program and GSMA, Aquarech has onboarded 99% of its fish traders onto the app. To make the platform more inclusive, Aquarech has also been undertaking periodic reviews to identify any bottlenecks in women's access to fish and feed from the platform. During the baseline assessment in August 2022, Aquarech was working with 40 fish traders (no sex disaggregation was provided), most of whom were sourcing fish offline. As of September 2023, a total of 997 traders have

been onboarded on the app for direct fish sourcing, of which 764 are women.

## 3. Ease access to finance for value chain actors

While providing fish feed for farmers in the region, Aquarech realized the importance of access to credit. Women farmers, in particular, tend to have significantly less access to formal credit and savings as compared to their male counterparts, which limits their ability to procure quality inputs in a timely manner, acquire productive assets such as land (which most women farmers do not own), and manage shocks (including financial shocks such as seasonal income decline, climatic shocks such as droughts/ floods leading to reduced productivity, and other shocks such as COVID-19). The baseline assessment found that Aquarech offered input credit to farmers on its books to enable fish farmers to purchase quality feed in a timely manner. However, Intellectap also found that Aquarech was extending this credit only to a handful of its farmers. This was due to two reasons: 1) credit was offered only to trusted fish farmers in the founders' and staff's networks, in order to manage credit risk, and 2) internal capital constraints allowed for only a limited amount to be allocated for providing such credit. Moreover, since the founders' farmer networks comprise of mostly male farmers, who availed most of the available credit, women were left out of this provision.



Photo Courtesy : Stock photo.



**Figure 16:** Farmers from the FishMongers Working Group during the baseline assessment



**Photo Courtesy :** Intellecap's team.

The GAP recommended that the Aquarech team integrate a module to make farmers aware about the availability of input credit. During the TA support, Aquarech sensitized its contracted farmer groups, primarily women, and helped them understand the importance and benefits of availing its credit facility. The training resulted in an increased number of women accessing credit to buy fish feed. **Following the training, women farmer's uptake of credit has increased by over 200% (from 15 women accessing credit in August 2022 to 46 women in September 2023 at the endline assessment), and a 100% order fulfilment rate has been recorded for women who now access credit from Aquarech.**

However, since credit is being offered from Aquarech's internal capital resources, the enterprise can only serve a limited number of farmers. To overcome this challenge, the GAP recommended that Aquarech engage and partner with microfinance institutions willing to offer credit to fish farmers along with bookkeeping and financial management training. At the time of the midline assessment in February 2023, Aquarech was in discussions with several microfinance institutions to extend input credit to fish farmers contacted by the enterprise. In September 2023, Aquarech signed a MoU with a local bank to integrate financial offerings into the Aquarech app so that farmers can access credit directly from the app.

#### **4. Leverage gender data from the Aquarech app for customer outreach and onboarding**

During the baseline assessment (August 2022), it was established that several Aquarech farmers and traders have been using the app for feed and fish procurement, respectively. The company also has a significant footprint across social

media platforms such as Facebook, LinkedIn, and Instagram. However, there was no gender-disaggregated data to validate the engagement levels for men and women separately on the app or the social media platforms.

The GAP recommended the integration of a feature on the App that not only captures the user's gender to understand usage by women vs. men but also captures their location to ascertain the geographic concentration of Aquarech farmers and traders. In May 2023, Aquarech launched an updated version of the Aquarech app to capture women's engagement levels across various platforms. The updated app led them to witness a 2.9% increase in their social media followers by September 2023, with engagement on LinkedIn at 39%, Facebook at 29%, and Aquarech website at 40%. According to the enterprise LinkedIn is the leading platform for Aquarech for investment-related and partner engagement, while Facebook witnesses higher customer engagement. The overall increase in engagement of women across various digital platforms will increase awareness about the value of Aquarech's app among women farmers and traders. As a result, more farmers and traders are expected to register as app users.

#### **5. Appoint a Gender Champion to drive gender outcomes for the business**

While Aquarech has been undertaking various initiatives to improve women's representation within the business, the enterprise needed a roadmap on how to translate this objective into action. The GAP recommended that Aquarech appoint a Gender Champion who would work towards achieving gender outcomes for Aquarech. The Gender Champion would ideally be a middle or senior manager with the ability to influence staff members.

The appointment of the Gender Champion helped Aquarech sensitize its staff about gender roles and aimed to eliminate unconscious biases within the team. This sensitization improved working conditions in the enterprise and helped create a buy-in for the roadmap toward engaging more women as farmers and traders.

### Business efficiency interventions

1. Enhance financial and operational efficiencies for the business, along with gender integration

### Training for investment readiness and provision of opportunities for investor networking

As part of the implementation research, Aquarech received hands-on training on investment readiness, which covered identifying relevant capital sources, understanding investor expectations, and increasing investor engagement. In addition, Intellecap supported Aquarech in updating its pitch deck and refining the elevator pitch. Intellecap also offered Aquarech an opportunity to participate in the Sankalp Africa Summit<sup>72</sup> 2023 and 2024, during which the enterprise could network with multiple investors and other ecosystem stakeholders.

Figure 17: Fish sorting on the banks of Lake Victoria



Photo Courtesy : Stock photo.

### Development of an impact monitoring and measurement framework with a focus on gender and climate indicators

Finally, Intellecap worked with Aquarech to highlight its gender and climate impact. The enterprise's pitch deck also included these impact parameters to help it network with gender-focused and climate-focused investors to raise capital.

In November 2023, Aquarech secured USD 1.7 million in equity funding led by AquaSpark, Acumen, Katapult, and Mercy Corps Ventures.<sup>73</sup> Aquarech will utilize the funds to develop cold chain infrastructure, strengthen logistics, increase access

to fish feed, improve the Aquarech mobile app, and increase team capacity to reach more farmers and traders. **Aquarech's fundraising effort and success establishes a strong case for investments into businesses that can scale climate-smart solutions while creating a social and economic impact on women.**

In the future, Aquarech aims to focus on some critical pathways for growth, as outlined in the table below.

**Table 10:** Pathways for growth for Aquarech

<p><b>Contractual fish farming</b></p>	<p>According to Aquarech, contractual fish farming focusing on women and youth groups will be critical to its supply chain. Given its business expansion plans, Aquarech has been entering into contractual agreements with fish farmers to ensure a continuous supply of fish for its traders. It also sets the pace for the aquaculture industry with this model. As a result, the PSE looks to</p> <ol style="list-style-type: none"> <li>1. Achieve gender mainstreaming through contractual farming and</li> <li>2. Ensure a consistent, reliable supply of fish on the Aquarech platform.</li> </ol> <p>This model will ensure supply of quality fish for Aquarech’s customers while paving the way for a blue ocean strategy for the aquaculture sector.</p>
<p><b>Partnerships</b></p>	<p>Due to its keen focus on the contractual farming model, Aquarech needs to organize fish farmers into formal groups / cooperatives. This calls for Aquarech to identify on-ground partners that can help organize women and men farmers into groups or cooperatives; thus easing Aquarech’s onboarding and training process. Aquarech has partnered with BMUs to structure women’s self-help groups into cooperatives and help them become certified as fish farmers.</p>
<p><b>Expansion of feed supply</b></p>	<p>Despite procuring feed from 4 fish feed suppliers, farmers’ demand for feed far surpasses Aquarech’s supply to the market. This gap is largely due to Aquarech’s limited financial capacity for procuring fish feed.</p> <p>Aquarech plans to utilize part of its recent fundraising round to enhance its financial capacity, thereby increasing the amount of feed procured, while also supporting the onboarding of additional feed suppliers to fulfil current demand.</p>
<p><b>Franchise model</b></p>	<p>Currently, Aquarech sends the fish procured from farmers to its market depots, from where fish traders, retailers, and B2B customers can buy fish. Aquarech is looking to expand its reach by creating a custom franchise model to target rural setups where the demand for fish is less saturated than urban centers. The enterprise may open franchisees in cities such as Kisumu, Nakuru, etc., with a high concentration of middle-income earners.</p> <p>This model will create new jobs and increase market access for fish farmers, especially women, who will also be engaged as franchisees.</p>
<p><b>Lease-to-own model</b></p>	<p>Aquarech has introduced a lease-to-own model following its contractual fish farming model. This model enables women to access cages for cage fish farming through a loan from Aquarech, which is repaid in installments after every harvest until fully paid. The typical repayment period is three years, which cover 3 to 4 production cycles, since the repayment plan enables the groups to make profits while paying back the loan.</p> <p>Once fully repaid, the ownership of the cage is transferred to the women’s group.</p>



### **Box 5. The Aquarech business model has now ventured into the B2C model (as of March 2024).**

Aquarech has opened company-owned Fish deli shops that sell fresh and air fried fish directly to end consumers. The fish is locally farmed, prepared, and delivered right to the customers' doorstep.

Customers can order the fish over the phone. The company has also launched the Aquarech Fish Deli app that consumers can use to buy fish.

## **5.1.5 Learnings across the key research questions**

**Research Question 1: What is the role of PSEs in accelerating the transition to a low-carbon economy while keeping women's economic empowerment at the core of this transition?**

### **Amplifying women's leadership has the potential to transform aquaculture systems**

Women's engagement in the aquaculture value chain has been largely unrecognized and unreported, leading to gender-blind policies and processes. However, women are crucial to mitigating climate risks, which are even more pronounced in fisheries and aquaculture. Therefore, the sector needs to become more inclusive and strive towards gender equality, not only at the organizational level but across value chains.

A stepping stone in this direction is the appointment of a Gender Champion by enterprises to lead the gender inclusion agenda within the organization. The roles of a gender champion include sensitizing employees on gender roles within the business, helping to create better working conditions, and creating awareness of gender issues, among others. These activities will allow aquaculture businesses to develop a clear roadmap for engaging women actors across the value chain. Furthermore, these gender champions will encourage women farmers/ traders to take leadership positions within their communities and drive the adoption of digital and innovative solutions to foster gender equity.

**Research Question 2: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

### **Simplifying access to fish could reduce existing vulnerabilities for women traders**

Even though more than 80% of fish traders in Kenya are women,<sup>74</sup> data/research show that many of them are vulnerable to the existing FFS practice prevalent in the fisheries and aquaculture industry. Given that a majority of the

fish production is undertaken and controlled by men, women traders have to engage with male fish farmers to be able to procure enough produce to sell in the markets.

Linking produce to a digital platform easily accessible to women can eliminate the cycle of FFS trade, thus reducing women traders' vulnerability to this malpractice. Such linkage also ensures women's access to produce at fair prices, potentially resulting in increased incomes and economic independence.

**Research Question 3: What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale such climate-smart PSEs to enhance their impact on women?**

### **Promoting gender equity and showcasing gender impact is critical to scaling businesses in sectors with significant female participation but limited to low-paying / informal jobs.**

Targeted business-level interventions such as gender sensitization training and regular check-in and feedback sessions with internal staff can help them better understand gender roles in the sector, improve working conditions, and create awareness of gender issues, among others. Even beyond the enterprise's staff, such understanding has led to the development of a clear action map for engaging women value chain actors across all business levels, including farmers/suppliers, distributors, traders, and customers. Such interventions offer equal economic opportunities for women and result in their improved decision-making ability and personal agency.

Furthermore, financial interventions, such as investment readiness training, and understanding capital needs and matching them with relevant sources of capital, helps entrepreneurs move the business in the right direction and meet investor expectations.

**Research Question 4: What is the business case for investments in climate-smart businesses to increase scale and deepen gender and climate impact?**

### **Channeling capital to aquaculture enterprises can enhance social and economic outcomes for women, as well as create positive environmental impact**

Gender mainstreaming in aquaculture has the potential to increase revenues for businesses in the sector by improving the reliability of supply from contracted farmers, who are primarily women, and offering better repayment rates for credit provided.

Supporting such enterprises to showcase their gender and climate impact as part of their pitch further attracts gender lens and climate investors to invest in such businesses. For instance, showcasing sustainable business growth and impact helped Aquarech raise targeted funding from AquaSparks. This will enable the enterprise to further economic outcomes for small-scale women fish farmers in Kenya by increasing accessibility to feed and fish produce through its innovative





mobile App while also enhancing environmental outcomes by developing cold chain infrastructure.

**Research Question 5: What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?**

**Providing innovative solutions is vital for transforming gender norms in the industry.**

Innovations such as the development of an online platform/app to address gender-specific needs, onboarding women farmers through contract fish farming and lease-to-own model, evolving from company-funded input credit to an FI-partnership, focusing on training and capacity development, and even support on the use of the app, etc. may go a long way in onboarding more women users. A feedback mechanism instituted as part of core business processes has the potential to channel customer (particularly women) feedback to the enterprise, resulting in iterations and innovations around the business model and delivery.

Such solutions can transform women's existing roles and pave the way for more women to produce fish by providing easier access to inputs, capacity building on emerging production technology, and creating avenues for dignified sourcing of fish for trading.



Photo Courtesy : Stock photo.



Photo Courtesy : Stock photo.

# 5.2 RAQCCOL (formerly UGAVOIL)

## Waste To Agricultural Inputs In Uganda

### 5.2.1 Sectoral overview – Waste to agriculture in Uganda

Rapid urbanization and population increase have contributed to the growth of slums across Ugandan cities, resulting in waste management problems. Kampala, Uganda's capital city, generates between 2,000 and 2,500 MT of mostly organic waste, every day. However, the city government is only able to collect and dispose of an average of 1,300 to 1,500 MT of waste per day (about 60% of the total waste generated), and the rest is indiscriminately disposed by the public.<sup>75</sup> There is limited public awareness of waste management and harmful practices like burning and dumping waste are commonly observed. These practices have led to the triple burden of environmental, health, and agricultural problems in the country. If efficiently managed and harnessed, organic waste produced across Sub-Saharan Africa can generate about 133 million GWh of energy as well as produce 11.08 million MT to 306.26 million MT of bio-fertilizer, annually.<sup>76</sup> Further, according to UNEP estimates, **the opportunity for reusing, recycling, and recovering waste for the African continent could inject USD 8 billion annually into the economy.**<sup>77</sup>

In Uganda, effective waste utilization offers substantial benefits for mitigating the effects of climate change. Diverting organic waste from landfills, through recycling and composting, reduces methane released from decomposition. Moreover, recycling waste consumes less energy than other processes involved in creating similar products (e.g., synthetic fertilizers) thereby reducing greenhouse gas emissions. Similarly, investing in waste diversion in Uganda eliminates environmental and health impacts associated with poor solid waste management, creates jobs, and contributes to the country's GDP.

**U**ganda's Vision 2040 prioritizes a green economy as a key to achieving sustainable growth. The vision emphasizes strict control of pollution, wetland management, and waste management across the country with relevant agencies guided by policies such as the National Environment Management Act and 2025 Ugandan Nationally Determined Contribution (NDC) Update. As part of its strategy, the Ugandan government is promoting the development, adoption, and equitable transfer of environmentally sound technologies that can combat the challenge of waste management. In addition, the National Industry Policy, overseen by Uganda's Ministry of Trade and Industry outlines specific guiding principles to promote cleaner production practices, waste recycling, and effective waste management.<sup>78</sup>

In response to the government's efforts, there is a growing interest in composting methods such as vermicomposting and the black soldier fly (BSF) larvae system across the country, which has spurred the development of an emerging waste-to-agriculture input sector. This sector is a crucial part of the circular economy, whereby agricultural waste is converted into valuable inputs for agricultural activities. This process involves repurposing agricultural waste, such as crop residues, livestock waste, and food processing wastes, as raw materials for energy, fertilizer, and livestock feed production.

The BSF model in Uganda is an innovative approach to waste management and sustainable farming. It involves farming black soldier flies, whose larvae are known for their ability to convert waste to valuable resources. The larvae feed on a wide range of organic material, including food scraps, animal manure, agricultural residues, and even sewage sludge. As they feed, the larvae convert such waste materials into **protein-rich larvae biomass and nutrient-rich natural fertilizer**. These materials are harvested and used as livestock or fish feed or converted into biofuels. The BSF production system is a rapidly emerging sector in Uganda, with institutions such as the Center for Insect Research and Development (CIRD) piloting small-scale commercial BSF farming and supporting the establishment of BSF farming businesses since 2019.<sup>79</sup> The BSF model offers an affordable alternative to expensive livestock feed and can be locally produced by smallholder and medium-scale farmers. It also fosters local community development through a local value-chain approach and promotes environmental sustainability and livelihood security.

### 5.2.2 Challenges faced by the waste-to-agriculture input sector, particularly the BSF sector, in Uganda

Uganda's waste-to-agriculture input sector faces several significant challenges, including adverse effects on the environment and gender-related limitations at the sector level.

#### Sector-level challenges

- a. **Low fertilizer usage across the country:** Uganda has one of the lowest rates of agricultural input use in Sub-Saharan Africa, with fertilizer application at 1.8 kg/ha<sup>80</sup> compared to the continental average of 17kg/ha and the global average of 135kg/ha.<sup>81</sup> Nearly half of Ugandan

farmers do not use any type of fertilizer, and only about a quarter use organic fertilizers.<sup>82</sup> This poses a significant marketing challenge for businesses innovating around waste conversion to fertilizer, a key product of waste composting. The BSF sector is focused on producing fertilizer as one of several end products. Given Uganda's low rate of fertilizer use, huge marketing and behavioral change campaigns are necessary to drive the uptake of these organic fertilizer products.

- b. **High capex requirements:** Waste processing requires large expanses of land for waste aggregation and sorting in open, well-ventilated environments. Insect-based solutions like those involving BSF, require large areas for breeding cages/nets, feed extrusion, packaging, and storage. Many small businesses in Uganda often lack the financial capacity to purchase or lease land for such operations. Legal and regulatory barriers such as complex land laws and regulations, bureaucratic procedures, and inefficient land administration systems also hinder access to land.<sup>83</sup>
- c. **Financing:** The growth of waste-to-agricultural inputs enterprises in Uganda is hampered by limited access to funds needed to scale operations and meet increasing demand. Funding is necessary for acquiring land, obtaining feed processing equipment, hiring workers, executing a range of traditional and digital marketing campaigns, and achieving competitive product branding and packaging. Access to finance for these businesses is constrained by limited collateral, low market penetration of their products, and unstable market conditions.
- d. **Poor technical skills and inefficient management:** The BSF model's bioconversion process is complex and requires careful management. Enterprises using the BSF model must have technical expertise in waste handling, and health and safety procedures to protect workers and the community. A lack of technical skills could lead to suboptimal conditions reducing the efficiency of the process and potentially leading to incomplete waste conversion and environmental pollution.<sup>84</sup> Given the nascent stage of Uganda's waste-to-agriculture and BSF ecosystem, there is limited availability of information and capacity-building programs to help entrepreneurs acquire the required skills.

## Gender-related challenges

### Women as entrepreneurs and employees in Uganda's waste-to-agriculture sector

- a. **Segregation into lower-tier value chain activities:** Traditionally responsible for managing household and market waste, women are typically engaged as waste pickers and sorters in the BSF value chain, roles that are poorly compensated. In contrast, men dominate the formal, higher-income, and decision-making roles, including those of truck drivers, recyclers, and owners of circular BSF-based businesses.<sup>85</sup>

- b. **Limited access to land:** Only 27% of registered land is owned by women in Uganda.<sup>86</sup> In addition, only 55% of women have ownership and control over enterprises or farm proceeds while the rest lack a say on how the land is used.<sup>87</sup> This inhibits women from participating in BSF production systems which require large parcels of land to sort and process waste in commercial quantities. Access to capital is also a greater challenge for women than for men, further restricting their ability to purchase land and equipment, such as extruders, needed for feed formulation in the BSF production process.

### Women (farmers) as end users in Uganda's waste-to-agriculture sector

- a. **Inequitable access to agricultural inputs:** Despite 72% of women being engaged in agricultural work in Uganda,<sup>88</sup> compared to 61% men,<sup>89</sup> studies consistently show that Ugandan female farmers have lesser access to inputs due to factors such as prohibitive input costs, limited proximity to agro-dealers, and domestic responsibilities such as childcare. In 2019, out of 26,925 farmers receiving inputs in twenty districts in Uganda through the National Agricultural Advisory Services / Operation Wealth Creation (NAADS/OWC), only 9,781 (36.3%) were female. Similarly, out of the 73 farmers who benefitted from fertilizer demonstration inputs under this initiative, only 10 (13.7%) were female.<sup>90</sup> These significant gender gaps in input access and use result in a lower demand for agricultural inputs from women, ultimately leading to lower yield/production. However, this also presents an opportunity for businesses in the BSF industry to specifically target and provide last-mile delivery of BSF-based organic farm inputs to women farmers.
- b. **Lower levels of awareness on innovation and sustainable agricultural practices:** Cultural norms and societal expectations place the burden of care responsibilities on women, limiting their active participation in educational gatherings, extension training, and farmer field days, etc. According to a [UN Women publication](#), the "time poverty" experienced by women farmers limits their exposure to information, restricting their ability to learn and adopt new agricultural practices. Consequently, women are late or never adopters of sustainable practices like the BSF production system. This presents a unique opportunity to leverage education, training, demonstration plots, and other tools to reach women with information and products to drive the adoption of organic inputs produced by Uganda's emerging BSF industry.

## Climate change-related challenges

- a. **Inefficient waste recycling:** Despite the potential value of organic waste, most residues and waste are not efficiently recycled or reused due to poor technical know-how and/or lack of resources. This inefficiency can lead to missed opportunities for creating a circular value chain in the BSF model, resulting in the release



of greenhouse gases like methane and carbon dioxide. Agribusinesses in the Ugandan waste-to-input sector must adopt sustainable waste management practices that fully utilize collected organic waste and minimize GHG emissions. This starts with establishing efficient collection methods, training staff on waste handling, and building closed-loop waste processing systems.

- b. Non-organic waste components:** In Uganda, all types of waste including organic and non-organic wastes (such as plastics, ceramics) are collected together. As a result, waste-to-input agribusinesses collect both useful and non-useful waste types and then sort them to extract organic components. Often, only a quarter of the waste collected is useful organic material that can be processed into feed and fertilizer, with the rest still ending up in landfills. Partnering with non-organic waste recyclers to repurpose these materials will benefit agribusinesses in ensuring a complete diversion from landfills.

### 5.2.3 Business/Operating Model of Rwenzori Agricultural Quality Control Co. Limited (RAQCCOL)

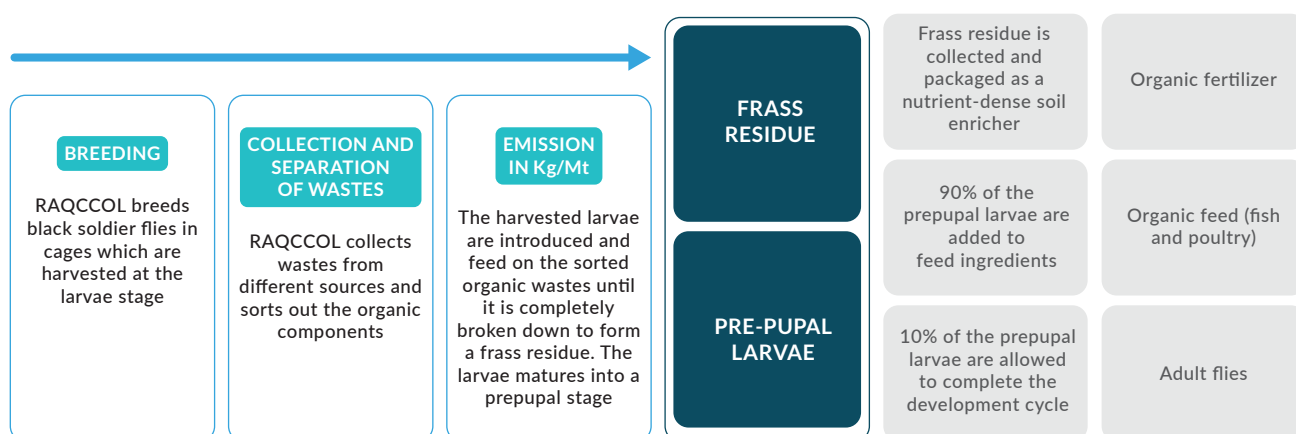
Founded in 2018 by Augustine Babughirana, RAQCCOL (formerly operating under the business name 'Ugavoil') is a circular agribusiness in the Kasese district of Western Uganda that converts household and farm waste to organic inputs for smallholder farmers. RAQCCOL focuses on producing and distributing two primary farm inputs: livestock feed and organic fertilizers. Using the Black Soldier Fly, RAQCCOL has developed a closed-loop system that reduces the build-up of waste, prevents pollution, and preserves vital soil nutrients by recycling organic waste such as crop residue,

animal manure, food scraps, and market waste into organic feed and fertilizers.

**RAQCCOL's production process starts with breeding black soldier flies** in cages and nets, where the eggs are harvested and hatched to produce larvae. This process takes about 15-22 days. Next, wastes are collected through established public and private sector partnerships. Food and other organic wastes are collected from markets and households through the partnership with the municipal authority in the county, while farm waste is collected from a large avocado processing factory in the Kasese district of Uganda. The harvested larvae are then introduced to the organic waste. The larvae break down the organic materials in about 3-5 days, as they feed. Once the breakdown of waste is complete, the larvae are harvested at the pre-pupal stage.<sup>91</sup> This is followed by three distinct processes:

- a. Feed production:** Harvested larvae are passed through a feed formulation process. First, the larvae are mixed with soybean, maize, premixed vitamins, calcium, and coccidiostat<sup>92</sup> to form a nutrition-dense meal for livestock. Larvae can nutritionally replace 70% of a soybean meal, thereby reducing the amount of soybean meal used in the feed formulation. The mix is then fed into an extruder, which cooks the mixture and converts it into pellets, used as organic feed for fish and poultry.
- b. Fertilizer production:** The food casts (frass residue) from the BSF system are collected separately to make organic fertilizer.
- c. Breeding:** 10% of the adult larvae are allowed to complete their development cycle (pupal and adult fly stages) and are transferred into the breeding cages/nets to ensure a readily available source of BSF.

Figure 18: RAQCCOL's production process



Up to 14,000 MT of waste collected per annum by RAQCCOL across:

- 50,000 households
- 13,000 smallholder farmers
- ≈100 MT of poultry feed produced/year and sold to smallholder farmers
- ≈64 MT of organic fertilizers produced/year and sold to smallholder farmers

**ADULT FLIES ARE INTRODUCED INTO THE BSF PRODUCTION UNIT TO RESTART THE BREEDING PROCESS**

Source: Intellectap analysis on data and insights gathered from RAQCCOL



Unlike conventional composting processes, which take up to 24 weeks, the BSF composting system only takes 4 to 5 weeks,<sup>93</sup> offering a more environmentally friendly alternative waste management method with a significantly lower carbon footprint. A 2018 study of the global warming potential of a

BSF waste treatment facility as compared to an open window composting facility demonstrated that direct GHG emissions from BSF waste treatment facilities are 47 times lower than from windrow composting.<sup>94</sup>

**Figure 19:** Left to right: slides showing black soldier flies in the breeding unit, freshly harvested larvae, and larvae feeding on organic waste



RAQCCOL collects and works with up to 14,000 MT of waste per year. Landfills in Uganda generate varying quantities of CH<sub>4</sub>, N<sub>2</sub>O and NO<sub>x</sub> from household waste as shown in Table 10.

By diverting 14,000MT of away from landfills, the enterprise stops approximately 526,914 MT of CO<sub>2</sub> equivalent from being released into the environment.

**Table 11:** GHG emission savings from diverting 14,000MT of waste towards the production of organic inputs per year

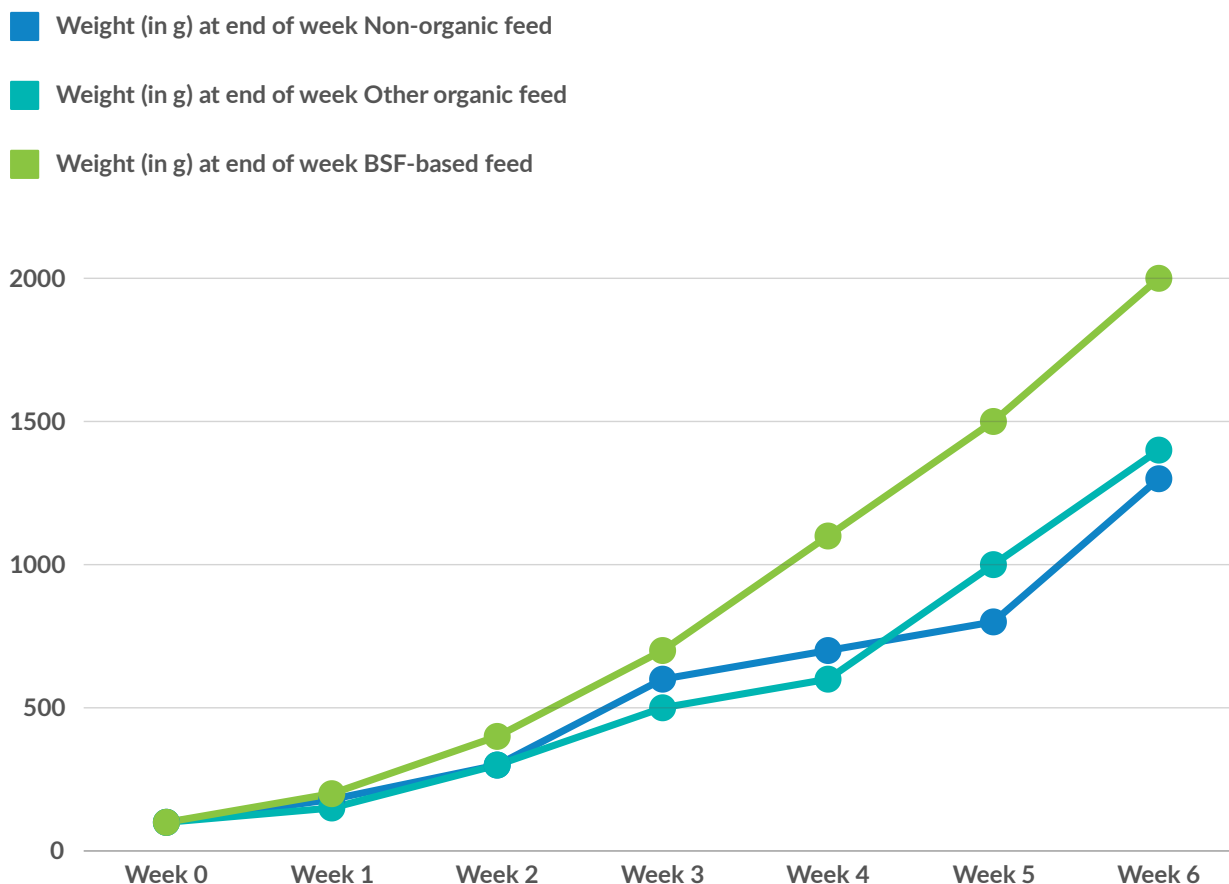
GHG type	Emission in kg/MT	Amount (in kg) of CO <sub>2</sub> in 1kg of GHG <sup>95,96</sup>	CO <sub>2</sub> Equivalent of GHG emission
CH <sub>4</sub>	204.00	28.00	5,712.00
N <sub>2</sub> O	0.13	298.00	38.74
NO <sub>x</sub>	107.00	298.00	31,886.00
Total Kg CO <sub>2</sub> eqv (per MT household waste)			37,636.74
Total MT CO <sub>2</sub> eqv (per MT household waste)			37.64
Total MT CO <sub>2</sub> eqv for 14000 MT household waste			<b>526,914.36</b>

Source: Intellecap Analysis

BSF-based feeds and fertilizers are relatively new products, particularly in the Ugandan agricultural landscape. Information on how BSF-based organic feeds and fertilizers influence livestock and soil growth, yield, and productivity

is largely unresearched. To address this, RAQCCOL actively conducts research and development to create and disseminate knowledge on using BSF feed and fertilizers.

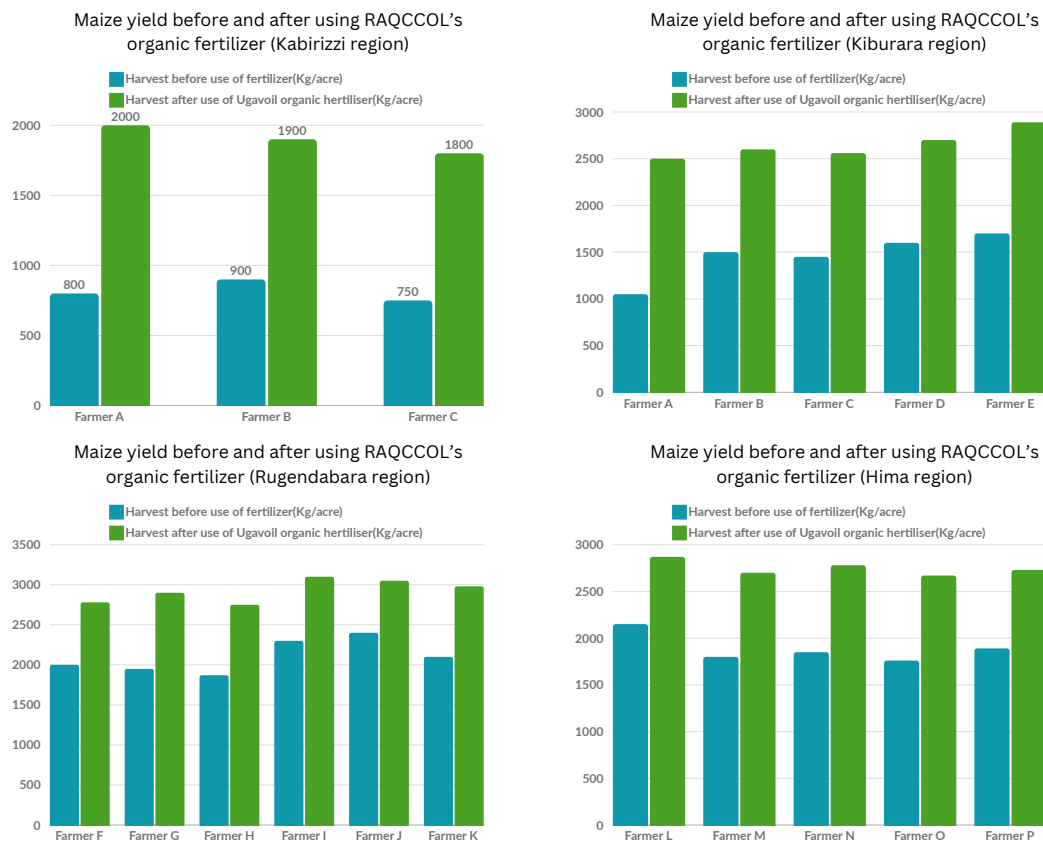
**Figure 20:** Weight gained by day-old chicks fed with BSF-based feed versus those fed with other type of feed. (Data source: RAQCCOL prototype experiment)



**For poultry and fish feed produced through the BSF system,** RAQCCOL compared the performance of BSF-based feed against other organic and non-organic feeds. The experiment used day-old chicks sourced from the same parents on the same date and raised under the same conditions, including immunization, temperature, water intake, humidity, and housing materials, with the only variable being the feed. As shown in Figure 20, the chicks fed on BSF-based feed gained more weight each week than those fed on other types of feed. Moreover, the chickens fed on BSF-based feed reached the desirable market weight of 2kg in six weeks, while those fed on other feeds only weighed 1.4kg and 1.3 kg at the same time. This indicates that chickens fed on BSF-based feed reach maturity faster. RAQCCOL's feed sells at UGX 2,300 (≈USD 0.6) while other feeds sell at 2,700 (≈USD 0.7). Thus, given the shorter period required to reach maturity, farmers save over 15% by using BSF-based feed.

Based on the prototype experiment, RAQCCOL introduced a chick brooding service in 2023, allowing the enterprise to directly sell brooded chicks (at 2–3 weeks) to farmers. This service is particularly beneficial for women farmers who lack the technical and financial capacity to brood chicks and therefore face challenges in starting a small poultry. RAQCCOL now serves as a one-stop shop for high-quality, affordable organic feed and healthy brooded chicks for women farmers desirous of starting or expanding their poultry farms. This new business line accounts for 30% of RAQCCOL's total revenue.

**Figure 21:** Maize yield before and after using RAQCCOL's organic fertilizer in 16 farms



RAQCCOL also compared the crop yield across 16 maize farms in four locations in Uganda. Figure 21 shows a significant increase in yield as a result of using RAQCCOL's BSF-based organic fertilizer across all locations. RAQCCOL's fertilizer provides clear benefits, especially for women farmers who typically farm on small pieces of land. These women can now produce more crops on the same piece of land, thereby increasing their incomes, exploring new farming ventures, and further diversifying their incomes. RAQCCOL's organic fertilizer costs 250,000 UGX (≈ USD 66) for a cropping cycle compared to locally available synthetic mineral-based fertilizers which cost about 600,000 UGX (≈ USD 160). Thus, using RAQCCOL's fertilizer allows farmers to save up to 60% in production costs.

Overall, not only are RAQCCOL's organic products increasing farmers' productivity and revenue as well as improving economic outcomes for women, they are also contributing to reducing the carbon footprint associated with the use of synthetic fertilizers and livestock feed production. Urea, DAP, and NPK are the most common types of inorganic fertilizers used in Uganda,<sup>97</sup> each having an emission per MT of 0.71-, 0.86-, and 1.29-MT CO<sub>2</sub> equivalent per MT, respectively.<sup>98</sup> Thus using 1MT of synthetic (N<sub>2</sub>-based) fertilizers releases 0.9533 MT CO<sub>2</sub> equivalent. As shown in Table 11 below, using BSF-based fertilizers reduces GHG emissions by up to 94% compared to using Urea, DAP, and NPK.

**Table 12:** GHG emissions savings from BSF-based fertilizers

	Urea	DAP	NPK
Emissions from synthetic fertilizers (CO <sub>2</sub> eqv per MT)	0.71	0.86	1.29
Average emission from applying synthetic fertilizers (eqv per MT)	0.9533		
Direct GHG emissions per MT of dry larval biomass gain <sup>99</sup>	0.0168		
<b>Reduction in CO<sub>2</sub> eqv per MT</b>	<b>0.9365</b>		

Source: Intellecap Analysis, adapted from Parodi et al. and Hamieh et al.



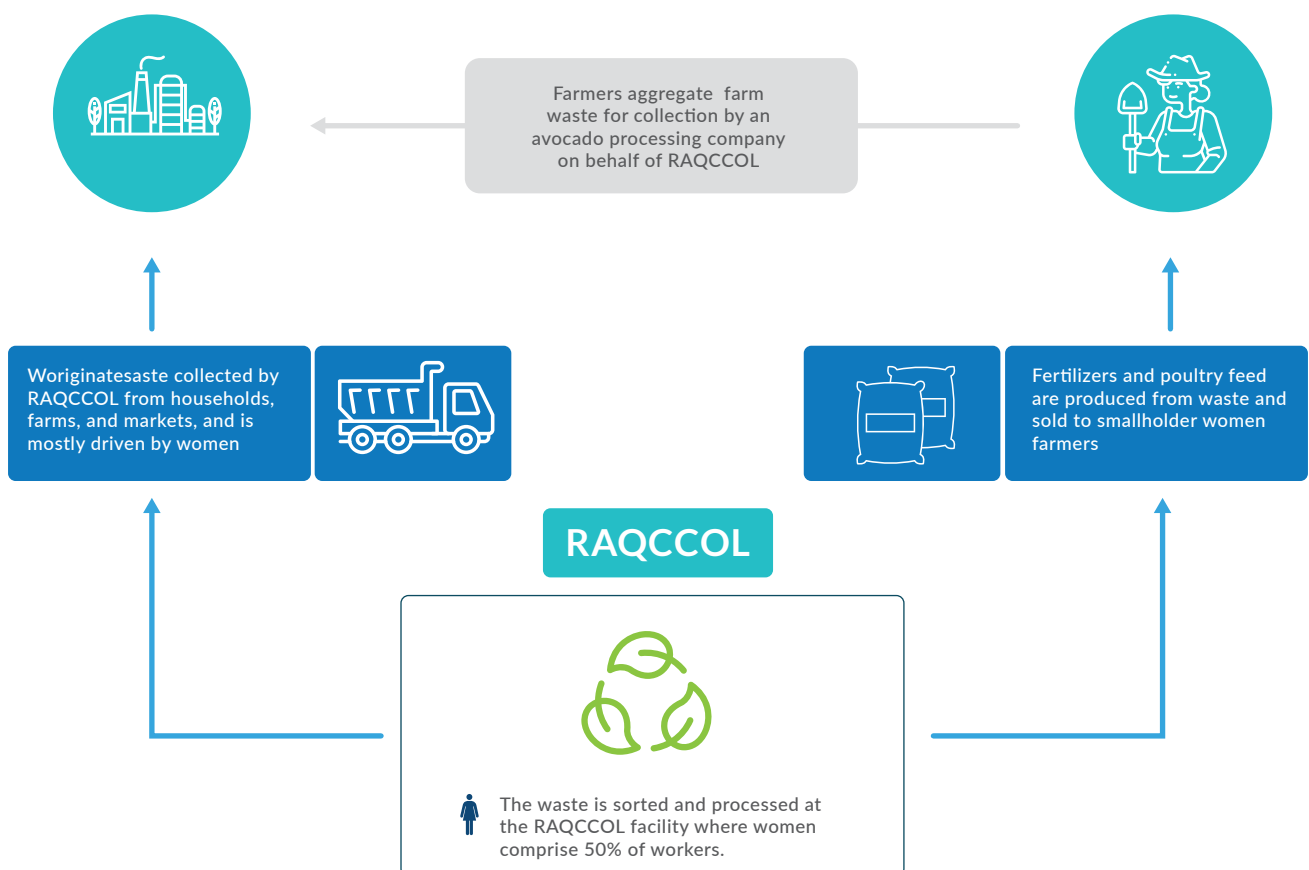
**RAQCCOL's primary customers are smallholder farmers and farming cooperatives in the Kasese district of Uganda.** These farmers are mainly women and typically own 0.5 to 2 ha of farmland. Farmers using RAQCCOL's BSF feed mostly rear poultry and fish, while those using RAQCCOL's fertilizers typically cultivate maize, soybean, beans, and coffee. Moreover, women are largely involved in handling waste in markets, households, and farms, which are the primary sources of waste used by RAQCCOL.

**RAQCCOL employs a community-based approach to make its products available to its target market.** The RAQCCOL team engages local farmers through training and farm visits, encouraging them to embrace sustainable agricultural practices and BSF-based inputs. Uptake is typically slow as farmers are unfamiliar with using 'insects' or 'maggots' to produce farm inputs such as livestock feed and fertilizer. Hence, demonstrating success, as shown in the experiments above, is critical for creating awareness. RAQCCOL engages 'early adopter' farmers as 'ambassadors' and organizes training

sessions to educate and onboard other farmers through this 'ambassador' network. Ultimately, the adoption and use of its products rely on RAQCCOL's ability to demonstrate improved yields (of crops and livestock) and lower production costs compared to traditional alternatives. RAQCCOL also provides after-sales services such as extension services and training on waste sorting, management, and composting for women farmers.

The RAQCCOL BSF model interacts with women across the entire value chain, as depicted in Figure 22 and Box 6. At its pre-production stage, women are engaged as suppliers of farm and market wastes through relevant partnerships. Women are employed by RAQCCOL; they are formally recruited and trained in waste management and conversion using the BSF production system. Post-production, RAQCCOL's primary customers and distributors are women. They receive training to build their skills in various areas such as branding and marketing and to increase their knowledge of the BSF value chain.

**Figure 22:** RAQCCOL engages women at every stage of its value chain, including as suppliers of raw materials (wastes), employees (during production), and customers and distributors (post-production)





In line with the overall objectives of the GLOW program, RAQCCOL was selected for the program because of its potential for low-carbon transition through input production as well as its evident integration of women across the value chain. RAQCCOL's business model demonstrated the following potential benefits and impacts that aligned well with the program objectives:

- a. **Climate change mitigation and environmental protection:** By diverting waste from households, markets, and farms, where it would either be burnt or left to decay and release methane – a greenhouse gas over 80 times more harmful than carbon dioxide – RAQCCOL leverages the black soldier fly larvae to combat climate change significantly. Furthermore, RAQCCOL's activities help reduce floods, decrease the pollution of water bodies, and control vectors like rats, mosquitoes, and flies that transmit diseases such as malaria, cholera, and typhoid. By diverting 14,000 MT of waste for processing, RAQCCOL prevents **526,914 MT** of CO<sub>2</sub> equivalent from being released to the environment and reduces GHG emissions from synthetic fertilizers by up to 94%.
- b. **Gender inclusion and employment creation:** RAQCCOL's model presents an opportunity to empower women beyond their traditional role in waste management. RAQCCOL has trained over 150 women on end-to-end composting processes such as sorting organic waste, breeding black soldier flies, harvesting larvae, etc., using easily available farm resources. RAQCCOL has also directly employed three women in the Kasese community, with the opportunity to engage more women to expand the business. RAQCCOL's model empowers the local community, helps create additional income streams for women, fosters economic growth, and contributes to achieving several Sustainable Development Goals (SDG 5 - Gender Equality; SDG 8 - Decent Work and Economic Growth; (SDG) 12 - Sustainable Consumption and Production; and SDG 13 - Climate Action).
- c. **Available, accessible, and affordable inputs for farmers:** RAQCCOL's organic feed and fertilizer are sold to farmers in Kasese District, which is where RAQCCOL's production facility is located. This local availability helps reduce farmers' reliance on traditional, resource-intensive proteins like soy and fishmeal, which typically cost more since they are delivered from urban areas. As a result, local farmers can access affordable and sustainable feed options and transition to low-carbon, sustainable practices, thereby enhancing the productivity of their livestock and boosting rural economies. Overall, RAQCCOL sells organic inputs to over 300 women farmers in the Kasese community.

### Box 6. RAQCCOL's strategic public-private partnership approach to waste management

RAQCCOL has established strategic partnerships with the Kasese County and an Agro-processing firm in Kasese to collect the waste used in its production process.

Prior to these partnerships, RAQCCOL directly collected wastes from farmers, mostly women, in the Kasese region. This model provided incentives for proper waste management and opportunities for income diversification for women which was previously absent in the community. However, due to the logistics and time involved, RAQCCOL was unable to sustain this model as it expanded. Thus, RAQCCOL partnered with a large-scale agro processing company that has the capacity to collect waste from up to 1,000 women farmers, thereby ensuring continued engagement with women farmers and a sustained impact on their livelihoods.

RAQCCOL also initiated a partnership with the Kasese Municipal Council, the body responsible for collecting and disposing waste from households, markets, and firms in the county. This partnership allowed RAQCCOL to collect up to 40 MT of waste per day, thereby providing an alternative use for waste that would have otherwise gone to landfills. In recognition of and to boost RAQCCOL's efforts, the Kasese Municipal Council provided 2 ha of land to RAQCCOL for collecting and sorting waste. The county office also organizes periodic sessions with women and farmers where the RAQCCOL team provides sensitization on waste handling.

RAQCCOL's partnerships serve as a model for engaging both the private and public sectors in promoting sustainable solutions in agriculture. Such partnerships can generate support for the sector, foster the development of an enabling environment and supportive policies, contribute to awareness creation, and deepen the engagement of women in this sector.



Photo Courtesy : Stock photo.

## 5.2.4 Support provided by the program to RAQCCOL

Intellectap engaged RAQCCOL in a range of activities tailored to the specific needs of the business. Intellectap worked directly with RAQCCOL's CEO, Augustine Babughirana, to develop a comprehensive Gender Action Plan designed to address specific gender gaps and business challenges identified during the baseline assessment. The GAP targeted three broad outcomes that are critical to ensuring that RAQCCOL accelerates its transition to low-carbon development and deepens positive outcomes for women's economic empowerment:

- **Increased access to organic fertilizers and animal feed for women farmers through tailored gender-transformative practices across RAQCCOL's production, sales, and marketing activities.**
- **Increased revenue earnings for RAQCCOL's women value-chain partners, including farmers and employees.**
- **Enhanced financial and operational efficiencies for the business alongside gender integration.**

**Figure 23:** A snapshot of RAQCCOL's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to organic fertilizers and animal feed for women farmers through increased production, sales and marketing</b>	<ol style="list-style-type: none"> <li>1. Identify strategies to increase engagement with individual farmers and women-only/mixed farmer groups</li> <li>2. Engage and onboard women farmers</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Technical business training</li> <li>3. One-on-one training sessions with marketing experts</li> <li>4. Development of guides and SOPs</li> </ol>	<ol style="list-style-type: none"> <li>1. 50% gender employee ratio</li> <li>2. Over 100 additional women farmers engaged</li> <li>3. Increase in the value chain representation of women from 70% to 80%</li> </ol>
<b>Increased revenue earnings for women actors in RAQCCOL's value chain, including farmers and employees</b>	<ol style="list-style-type: none"> <li>1. Increase awareness for RAQCCOL's products</li> <li>2. Train women farmers on sustainable agricultural practices</li> <li>3. Monitor productivity and income increases</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Technical business training</li> <li>3. Designation of gender champion</li> <li>4. Development of 'Training of Trainer' manuals for women farmers</li> </ol>	<ol style="list-style-type: none"> <li>1. 20% increase in revenue for women distributors and marketers</li> <li>2. 30% cost savings for women farmers</li> <li>3. 30% increase in revenues of women farmers</li> </ol>
<b>Enhanced financial and operational efficiencies of for the business along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Connect with relevant funding opportunities in the sector</li> <li>2. Increase production and optimize operations</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender lens investment readiness training</li> <li>2. Connect with potential investors</li> <li>3. Ongoing business advisory</li> <li>4. Development of specific M&amp;E framework</li> </ol>	<ol style="list-style-type: none"> <li>1. 50% increase in production capacity</li> <li>2. Over USD 100,000 secured in funding</li> </ol>

### Gender mainstreaming TA support interventions

1. **Increased access to organic fertilizers and animal feed for women farmers through increased production, sales, and marketing**

### Strengthening RAQCCOL's production capacity to identify and address gender gaps

RAQCCOL's Gender Action Plan highlighted the need to

increase opportunities for women in RAQCCOL's production chain. This is even more significant in light of the fact that RAQCCOL's primary customers are mostly women. In 2023, RAQCCOL employed two female workers (one in charge of marketing and the other in the production team), attaining a 50:50 men-to-women employee ratio. The CEO trained RAQCCOL's employees (both old and new) based on the Gender 101 training received during the cohort-level training program. These efforts have resulted in RAQCCOL's operations becoming more inclusive, production capacity

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increasing from 400 kg to 550kg per day and have also contributed to onboarding three women distributors buying and reselling RAQCCOL products.

### **Strengthening RAQCCOL's sales capacity to identify and address gender gaps**

Even though RAQCCOL had already initiated a community-based approach for engaging and selling organic inputs to farmers, the GAP designed for RAQCCOL identified an urgent need to address existing gender gaps, such as women's limited access to innovation and information. The Intellecap team worked with RAQCCOL to develop a step-by-step guide for mapping, engaging, training, and onboarding rural women farmers (individuals and farmer groups) in order to enable them to adopt organic farm inputs produced by RAQCCOL. The guide was tailored to RAQCCOL's business, farmer demographics, and unique gender challenges encountered in the field. This guide has been adopted by RAQCCOL's sales team on the field as a 'training of trainers' manual to ensure efficient communication, targeted marketing, and seamless onboarding of women farmers, especially in rural areas. During the program, RAQCCOL recorded a 20% increase in the number of women farmers engaged in Kasese, including two women farmer groups. Over 300 women farmers now have access to RAQCCOL's organic inputs and are being supported by RAQCCOL's team to transition from synthetic fertilizers and inorganic poultry feed to RAQCCOL's BSF-based fertilizer and feed. In addition, RAQCCOL has also introduced smaller portable and affordable packs for women, since they typically do not own vehicles and find it difficult to transport purchased inputs from the point of sale to their farms.

### **Strengthening RAQCCOL's marketing capacity to identify and address gender gaps**

Beyond community engagement, capacity development efforts, farm visits, and door-to-door extension services, RAQCCOL's Gender Action Plan highlighted avenues to introduce marketing strategies that address gender gaps in the sector. The program provided gender-focused training and one-on-one sessions with experts on marketing, which helped RAQCCOL adopt a range of gender-transformative marketing strategies. This included: a) using marketing messages that highlight the role of women in waste management and agriculture, b) using images and visuals that depict men and women participating in all aspects of the BSF value chain in their training sessions, c) showcasing stories of successful women farmers, and d) partnering with women's groups and organizations to reach more women from the ecosystem. These efforts have helped break down stereotypes, demonstrated that roles are not gender-specific, and doubled RAQCCOL's reach and engagement with women farmers. In addition, the GAP also highlighted potential gains from deliberately targeting women and mixed farmer groups. As a result, RAQCCOL engaged several women-only as well as mixed groups within and outside Kasese, such as the Anasi Farmers Association, offering to train them on converting waste to farm inputs using the BSF production system. RAQCCOL has trained over 150 individual women

farmers and three farmer groups, increasing the exposure and participation of women in the BSF and waste-to-agriculture landscape in the country.

### **2. Increased earnings for RAQCCOL's women value chain partners, including farmers and employees**

RAQCCOL's initial strategy focused on selling directly to farmers. However, based on the GAP's recommendations RAQCCOL integrated a distributor model encouraging local enterprises owned by women farmers to purchase feed and brood chicks from RAQCCOL, and promote them within their farmer networks. This approach involved building the capacity of women enterprises to clearly communicate the value of adopting BSF-based inputs as well as improving their knowledge of sustainable agricultural practices. Women farmers who use RAQCCOL's feed and fertilizers save on inputs and benefit from enhanced productivity while commanding the same market price as those who do not use RAQCCOL's products. This significantly increases their profit margins and overall income. According to the enterprise, women enterprises and farmers using and selling organic inputs have respectively reported an up to 20% and 30% increase in their revenues.

### **Business Efficiency Interventions**

#### **1. Enhanced financial and operational efficiencies for the business alongside gender integration**

##### **Measuring gender impact**

Prior to the program, RAQCCOL had instituted a robust M&E framework that captures the business's environmental and economic impact. In line with RAQCCOL's customized TA & GAP, Intellecap integrated key gender metrics into the existing framework, which is critical for helping RAQCCOL effectively measure its gender and socioeconomic impact. Key metrics that were integrated include increased income and productivity, adoption of sustainable practices, increased participation in formal sectors, access to markets, income diversification, and financial agency of the women farmers.

##### **Building investment readiness**

Critical to attracting gender-lens and other types of investment, the program provided dedicated support to build RAQCCOL's investment readiness through training and mock pitch sessions. The training and mock pitches covered topics such as identifying relevant capital sources, communicating gender, environmental, and social impact, and understanding the investment cycle. According to RAQCCOL's CEO, Augustine Babughirana, this support has helped to improve their pitching and deal negotiation skills with potential investors from within and outside the program. RAQCCOL secured a USD 100,000 loan from a commercial bank in Uganda, with the European Union discounting the loan by 33%. Moreover, using skills developed during the program, Augustine was able to negotiate the interest rate on the remaining loan amount from 24% to 18%, spread over three years.

## Accessing gender-lens investments

Intelcap sponsored RAQCCOL's participation in the Sankalp Africa Summit, enabling it to connect with gender-lens investors such as SHONA. As a result, RAQCCOL participated in the SHONA Accelerator Program, which provides debt funding of up to USD 50,000 to participating enterprises. RAQCCOL was also selected as part of the 2023 cohort for the Land Accelerator program, securing a grant of USD 5,000. These successful investor engagements attest to RAQCCOL's impact on women's economic empowerment and low-carbon development, through which it creates and optimizes value for all its stakeholders.

## Ongoing business development support

The program included ongoing business development support delivered through virtual biweekly meetings. The sessions acted as a platform for discussing emerging challenges and opportunities arising from implementing gender mainstreaming strategies at RAQCCOL and brainstorming potential solutions and recommendations. These sessions led to the development of an employee manual containing relevant gender policies and the integration of gender-sensitive surveys in RAQCCOL's R&D activities, initiatives aimed at strengthening RAQCCOL's capacity to address inequities and move towards attaining gender equality.

**Figure 24:** Visit to RAQCCOL's warehouse in Kampala for the midline assessment in September 2023



**Photo Courtesy :** Intelcap's team taken at RAQCCOL Uganda.

## 5.2.5 Learnings across the key research questions

**Research Question 1:** What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?

**Black soldier fly-based solutions could increase productivity, income, and financial agency for women farmers**

BSF farming can be done on a small scale as it requires minimal resources, making it accessible for both smallholder rural and urban women farmers. Women can convert waste from their households and farms into valuable resources, addressing waste management challenges while generating income through the sale of biomass. Additionally, processing the larvae into livestock feed also helps reduce feed costs and increase livestock productivity. RAQCCOL's efforts to directly train women in BSF farming is a step in the right direction. Through training and capacity building on BSF-based solutions, women farmers can not only increase their productivity and income but also contribute to environmental sustainability and better waste management in their communities.

**Research Question 2:** What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?

**Capacity building and awareness creation are critical tools for increasing women's participation**

Generally, input usage by women farmers is lower than men in Uganda. Tools like training sessions and demonstrations backed by community engagement and strategic partnerships are crucial for increasing awareness and driving the adoption of organic inputs. RAQCCOL's success in promoting BSF-based inputs to women farmers in the Kasese district largely hinged on this formula, ultimately leading to 50 women farmers moving from synthetic inputs to organic fertilizers and feed over the course of the program. Through the sales of brooded chicken, RAQCCOL also increased the participation of women in poultry farming, consequently contributing to income diversification for women.

**Research Question 3:** Who are the key stakeholders working in the climate change adaptation and WEE space, and what support are they providing to climate-smart PSEs to scale their solutions while increasing women's participation?

**Support from the public and private sectors is critical for success**

RAQCCOL's multi-stakeholder partnerships have played a key role in its growth. Through its partnership with the municipal council, RAQCCOL accessed land and aggregated waste and coordinated with county officers to sensitize households, farmers, and market vendors about waste management, thereby contributing to knowledge dissemination and capacity building for women in the sector. Investors like SHONA and microfinance banks play an important role in providing the funding required to scale operations. Finally, women farmer groups and other private sector players are important allies to reach and engage women farmers across various geographical locations.

**Research Question 4:** What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale climate-smart PSEs to enhance their impact on women?



**A combination of training, technical assistance, and access to funding are critical for scaling climate-smart PSEs**

**Short term interventions:** Deploying customized gender-based training for PSEs has proven instrumental in building their capacity to break gender biases, create awareness about gender roles and needs, and implement required changes. For RAQCCOL, the Gender 101 training helped the enterprise create awareness of gender issues, improve its understanding of gender roles in the sector, implement better working conditions within the enterprise, and develop a clear action map for engaging women across the value chain, including suppliers, employees, partners, and customers.

**Medium-term interventions:** The program’s approach of combining technical assistance, a detailed gender action plan, follow-up advisory support, and an effective M&E framework, ensured that the PSE was able to gradually

implement required changes while also identifying new opportunities for growth, over time. Such interventions also offer equal economic opportunities for women, improve their participation, and boost personal agency for women actors across RAQCCOL’s value chain. Consequently, RAQCCOL’s ability to integrate more women into their value chain, track their gender impact, and tell their stories, has helped them attract multiple investments to increase their production capacity and expand their reach.

**Long-term interventions:** Financial support is critical for PSEs to maintain a sustainable growth trajectory. With new funding, PSEs can widen their geographical reach, increase their research budget, and improve their marketing efforts, thereby engaging and impacting more women actors in the ecosystem. The figure below shows RAQCCOL’s potential expansion over a three-year period following an investment of USD 150,000.

**Figure 25:** Potential business expansion over a three-year period



# 5.3 GRIINCOM

## Waste To Value In Kenya

### 5.3.1 Sectoral overview – Waste to agriculture in Kenya

**Africa's foremost challenge is persisting food insecurity amidst a polluted and rapidly deteriorating biodiversity.**

A burgeoning population and the adverse effects of climate change, globalization, and soaring food prices have only worsened the situation. A quick fix has been to open more land for cultivation. However, such land is still susceptible to degradation due to continuous cropping, especially when coupled with little or no use of external soil inputs, leading to low agricultural productivity and poverty.<sup>100</sup> To remedy the issue, African nations must create farming systems that are sustainable, resilient, and productive.

**Studies have shown that using organic inputs over conventional synthetic inputs has numerous benefits.**

Some advantages include improved human health due to the production of healthy and safe foods with minimal pesticide residues.<sup>101</sup> Additionally, using organic inputs leads to improved soil fertility, as organic inputs nourish the biotic component of the soil and the microbes that release, transform, and transfer nutrients.<sup>102</sup> From an economic perspective, organic farming is more profitable than conventional farming due to the lower costs of inputs and the higher price commanded by organic products.<sup>103</sup>

#### Overview of organic farming in Kenya

**Kenya's organic farming sector is relatively small but growing rapidly, especially the cultivation of fruits and vegetables.**

Approximately 12,647 farmers produce various organic products such as vegetables, fruits, chilies, coffee, tea, nuts, herbs, and spices, cultivating a total of 154,488 ha. Key partners in Kenya's organic agriculture sector include organizations such as the Kenya Organic Agriculture Network (KOAN), Kenya Institute of Organic Farming (KIOF), Nyumbani, Woodlands Trust 2000, Kenya Organic Farmers (KOF), Bridge Organic Health Restaurant, and Green Dream Organic Shop (GEM, 2007).<sup>104</sup> Various institutions and organizations, including the Kenya Institute of Organic Farming, have promoted organic and sustainable farming systems since the 1980s. Non-governmental, faith-based, and community-based organizations have also significantly promoted the spread of organic farming in Kenya. Initially, organic farming was promoted through the diversification of food production at the household level and the use of intensive ecological methods. However, over time, there has been a shift towards more commercial approaches and adoption by large-scale farmers.

Despite the absence of explicit official policy support from the government, various institutions and organizations, such as KIOF and KOAN, have been promoting organic and sustainable farming since the 1980s. This has been achieved through the diversification of food production at the household level and the use of intensive ecological methods. Over time, the sector has attracted increasing public interest and recognition, as well as become the subject of policy advocacy. For instance, to aid the continued development of this sector, KOAN, in partnership with the Ministry of Agriculture and other stakeholders in the ecological organic agriculture space, has initiated the development of the Kenya Organic Sub-Sector Strategy, a strategic framework that will serve as the foundation of the country's organic agricultural plans, projects, and programs.<sup>105</sup>

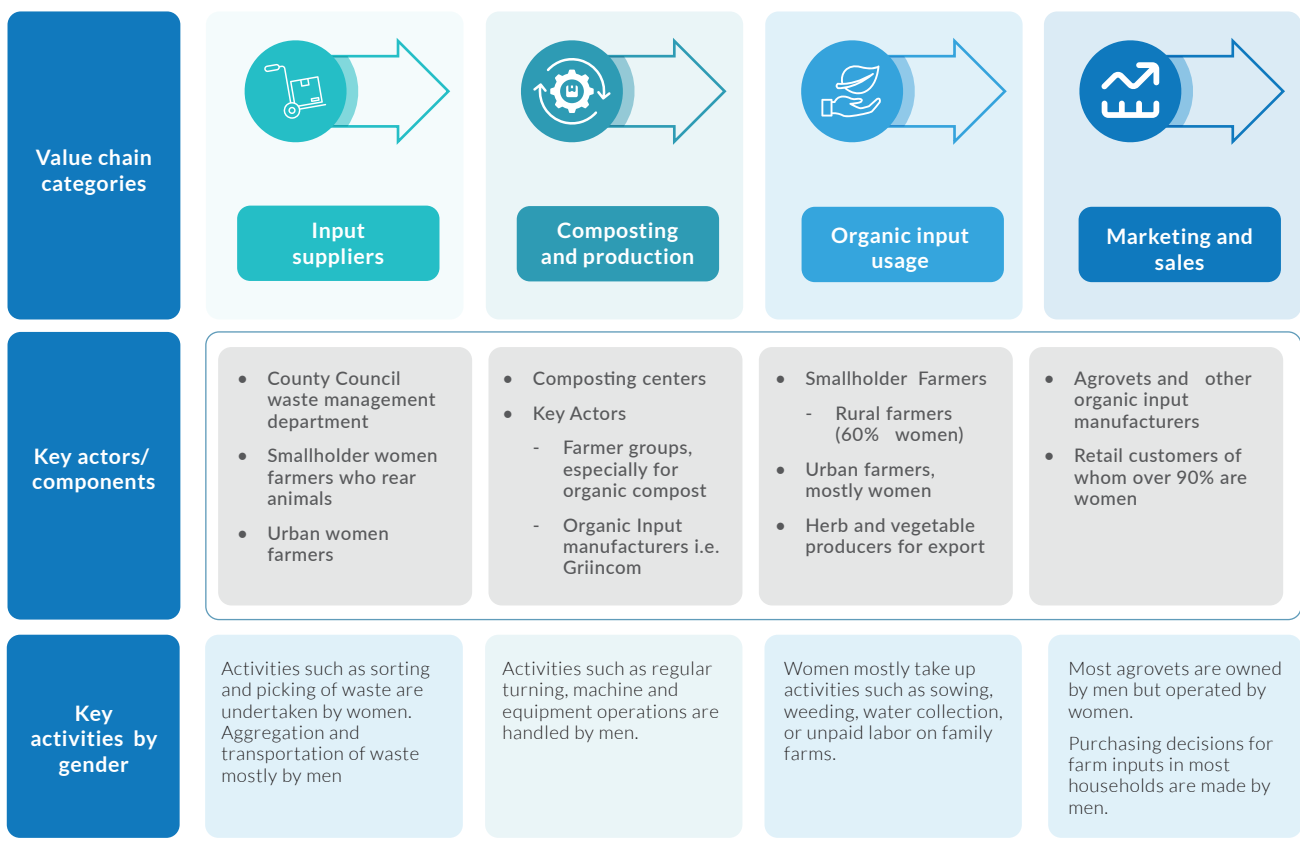
#### Adoption of organic inputs by smallholder farmers in Kenya

Smallholder farmers in Kenya and other regions of Sub-Saharan Africa are turning to organic farming as a viable alternative. Despite its widespread use, conventional agriculture has failed to provide affordable and healthy food to approximately 700 million people. Furthermore, in Kenya, the use of inorganic fertilizers has been low due to their high cost, limited accessibility and concerns over their contribution to rapid soil degradation.<sup>106</sup> Hence, smallholder farmers are turning to locally available and more affordable soil organic inputs as a solution to declining soil fertility. By applying organic inputs, smallholder farmers can benefit from lower farm input use, environmental conservation, and access to premium prices and stable markets, driven by the predictable demand for organic products.<sup>107</sup>

The adoption of climate-smart agriculture by smallholder farmer households in Kenya is influenced by factors such as the gender and age of the household head, average education level, household size, access to external labor, training, tropical livestock unit, agriculture group membership, access to credit, land cultivated, and farming experience.<sup>108</sup> Women farmers are more likely to adopt organic farming since it can be easily undertaken even on small plots of land. Moreover, organic farming inputs are affordable, easy to apply, and lead to higher yields.<sup>109</sup>



Figure 26: Organic input manufacturing value chain in Kenya



## 5.3.2 Challenges faced by the organic inputs sector in Kenya

### Sector-level challenges

For smallholder organic farmers

- Higher cost of production:** Research shows that production costs for organic foods are typically higher because they require more labor per unit of output compared to conventional products. Additionally, handling small quantities of organic foods after harvest adds to costs, since organic and conventional produce must be kept separate, especially during processing and transportation. These high production costs can limit smallholder farmers from expanding their organic production.<sup>110</sup>
- Limited access to organic inputs:** Limited availability of organic inputs, including organic fertilizers, biopesticides, and organic seeds, poses a major challenge to organic farming in Kenya. Furthermore, these inputs are typically more expensive and less accessible than conventional agricultural inputs, making it difficult for farmers to fully adopt organic practices.<sup>111</sup>
- Pest and disease management:** Organic farming relies on natural methods to manage pests and diseases, which can be more labor-intensive and less effective compared to synthetic chemical interventions.
- Climate change and weather variability:** Kenya's agricultural sector is highly vulnerable to climate change and weather variability, which can pose significant challenges for farmers. Erratic rainfall patterns, prolonged droughts, and increased incidences of pests and diseases can directly impact crop production and yield predictability in organic farming systems. Adaptation strategies and resilient organic farming practices need to be developed to mitigate the adverse effects of climate change on organic agriculture.
- Knowledge and training gaps:** Adequate knowledge and training are crucial for successful organic farming practices. However, there are gaps in knowledge and awareness among farmers, extension service providers, and other key stakeholders regarding organic farming techniques, principles, and best practices. Lack of training opportunities, limited access to relevant information, and a shortage of skilled extension personnel can hinder the effective adoption and implementation of organic farming methods.<sup>113</sup>

Moreover, effectively controlling pests and diseases without using conventional pesticides requires a thorough understanding of integrated pest management strategies, crop rotation, companion planting, and other organic techniques. Insufficient knowledge and training in these methods have hindered effective pest and disease control in organic farming systems.<sup>112</sup>

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#### For organic input manufacturers

- a. **Access to finance:** Despite the growth of organic farming in the region, limited access to funding acts as a barrier to achieving scale. Organic manufacturing requires resources such as land on which waste can be aggregated and sorted and equipment for converting waste into organic products. Many small-scale organic manufacturers lack the financial capacity to purchase or lease land and equipment for their operations.<sup>114</sup>
- b. **Certification and compliance:** Organic farming certification is essential to verify the authenticity and integrity of organic products. However, the certification process can be complex, time-consuming, and costly for small-scale manufacturers. Meeting the strict requirements and standards set by organic certification bodies can pose a challenge for small-scale organic manufacturers who often lack the resources or technical knowledge to navigate the certification process.<sup>115</sup> Additionally, complying with organic standards over time can be demanding, requiring continuous monitoring and record-keeping.<sup>116</sup>

#### Gender-related challenges

##### For women entrepreneurs and employees in Kenya's organic input manufacturing

- a. **Entrepreneurs' technical know-how:** Entrepreneurs in the field should have technical know-how in waste management, proficiency in organic farming methods such as soil health management and composting, and an understanding of the legal standards for organic labeling and compliance. However, many female entrepreneurs lack the technical and business skills needed to effectively run their organic manufacturing businesses. Without adequate technical skills and knowledge, women-owned organic input manufacturing enterprises struggle to efficiently oversee the production of organic inputs.<sup>117</sup>
- b. **Segregation into lower-tier and value-chain activities:** Women provide much of the labor and undertake essential but low-paying tasks in organic input manufacturing, such as picking and sorting waste. Conversely, men dominate formal, high-income, decision-making roles, such as those in logistics and distribution, recycling, and business management.<sup>118</sup>

##### For women end users of organic inputs in Kenya

- a. **Time constraints:** In Kenya, female farmers experience lower rates of agricultural productivity as compared to their male counterparts.<sup>119</sup> This is primarily due to women's triple roles, in reproduction, agricultural production, and domestic/care work. Engaging in these roles limits women's involvement in agriculture, hindering their ability to take advantage of modern agricultural methods and enhance their skills through various agricultural and livestock extension networks.

- b. **Unequal access to organic inputs and resources:** Research indicates that gender gaps in agricultural productivity are not a result of women's inefficiency but stem from their limited access to agricultural inputs such as high-yielding seeds, pesticides, and fertilizers. Moreover, since men own most land, they can use it as collateral to acquire credit for investment in farming. In comparison, women have limited access to credit. Men also exercise de facto decision-making authority regarding the choice of crop and livestock, the allocation of acreage, farming methods used, and access to other productive assets like water for irrigation and agricultural use.
- c. **Low levels of awareness:** Women's low literacy levels and limited access to extension services due to reproductive and care work contribute to their low utilization of modern farming methods and technologies.

#### Climate change-related challenges

- a. **Inefficient waste recycling:** Despite its potential value, organic waste is not efficiently recycled or reused in Kenya due to poor technical know-how and/or lack of resources. This inefficiency can lead to missed opportunities for creating a circular value chain in the waste-to-value sector in Kenya. It is crucial that organic input manufacturers like Griincom adopt sustainable waste management strategies that not only effectively utilize collected organic waste but also play a significant role in minimizing GHG emissions. Enterprises can achieve this by establishing efficient collection methods, conducting training on waste handling for staff, and building closed-loop waste processing systems.
- b. **Challenge in sorting organic waste components:** In Kenya, all types of waste, organic and non-organic wastes (such as plastics, ceramics, etc.) are collected for disposal. As such, waste-to-value agribusinesses collect both useful and non-useful waste, which are then sorted into organic and non-organic components. In most cases, only a quarter of the collected waste is valuable organic waste that can be processed into feed and fertilizer, with the rest ending up in landfills. It will benefit agribusinesses to partner with non-organic waste recyclers to repurpose this waste to ensure complete diversion from landfills.

### 5.3.3 Business/Operating model of Griincom

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Griincom Innovate Limited is a social enterprise based out of Nakuru County, Kenya. The enterprise was founded in 2020 by a woman, Mildred Day Gachoka, a visionary with a passion for sustainable farming. Griincom Innovate Limited's primary objective is to promote and encourage sustainable agricultural practices, particularly through organic farming, among women and youth in the region. Griincom employs a sustainable approach to farming by recycling organic waste into environmentally friendly and healthy organic farm products. Furthermore, the enterprise provides extensive





training on organic agriculture practices to equip farmers with the skills, knowledge, and techniques required to cultivate their crops sustainably.

Additionally, Griincom facilitates the installation of urban farming structures empowering urban and peri-urban farmers to cultivate crops in limited spaces such as their kitchen gardens, backyards, or rooftops. The organization is steadfast in its commitment to revolutionizing the agricultural terrain in Nakuru County and beyond, one farm at a time.

## Griincom's founder

### Mildred Gachoka

Mildred, the founder of Griincom Innovate Limited, leads a social enterprise that is transforming agriculture through waste management in Nakuru, Kenya. Her dedication to environmental conservation and commitment to promoting women's economic empowerment inspired her to establish a waste management social enterprise in partnership with women-led community groups in Nakuru. The company collects organic waste from the county market, where most of the traders are women, as well as kitchen waste from various women in the county, and converts it into organic agricultural inputs such as fertilizers, foliar, and pesticides.

Currently, Mildred operates three waste management centers that process 30-40 MT of waste monthly. Utilizing recent investments, Mildred has purchased equipment to mechanize the production process at one of the centers fully. This upgrade is expected to enable the center to process over 400 MT of waste monthly, thereby increasing the supply of organic inputs in the country.

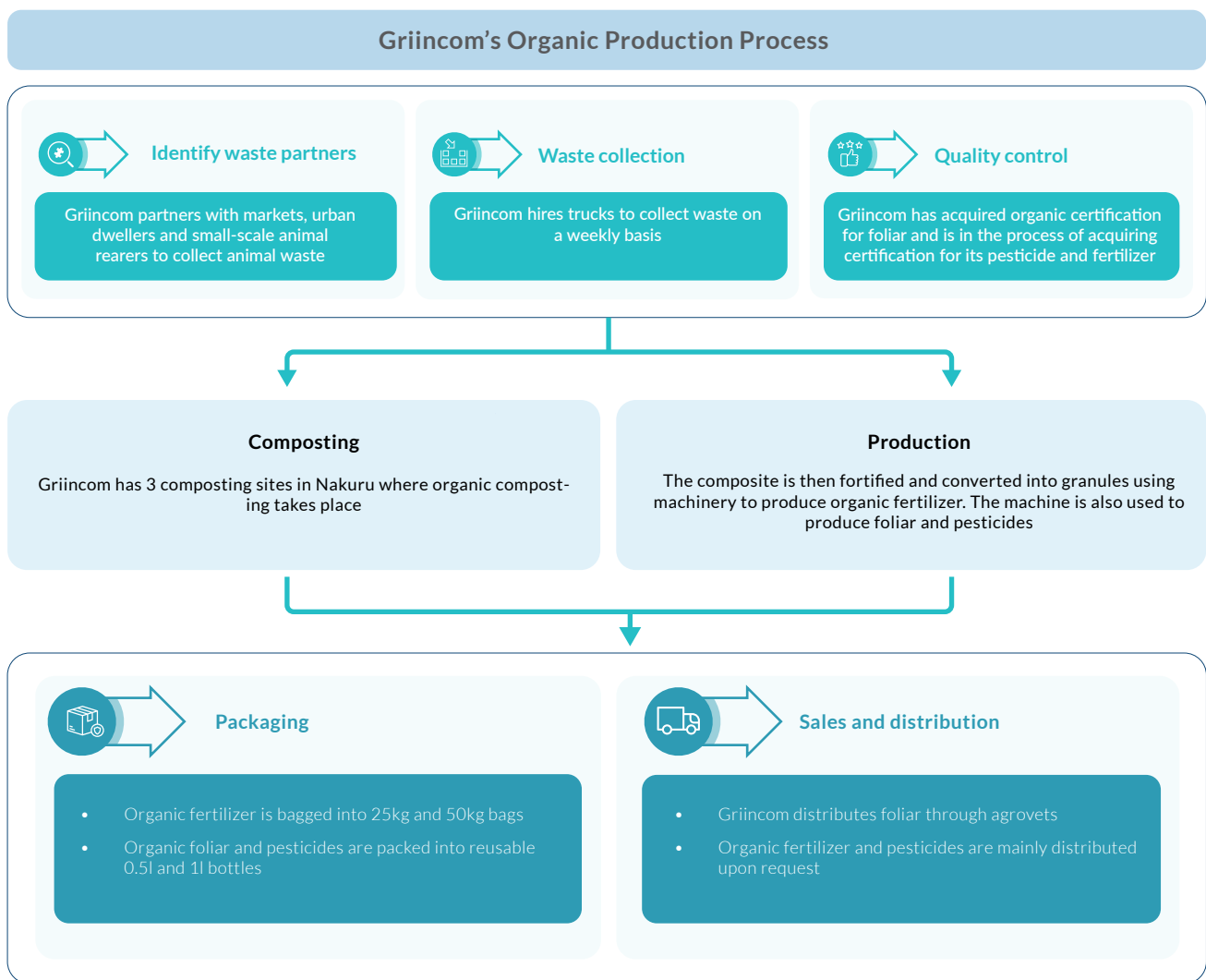
Mildred has also played a pivotal role in promoting climate smart agriculture among smallholder women farmers through knowledge sharing, training, and demonstrations. She educates farmers on urban farming techniques, organic composting, and using organic inputs in their farms. Additionally, she has facilitated the adoption of urban farming among 47 women farmers by installing urban farming structures and encouraging farmers to use Griincom's organic inputs in their urban farms.

Furthermore, Mildred advocates for the adoption of circular agriculture through various platforms. For example, she participated in the 2023 Nakuru National Agricultural Show, themed "Promoting Climate Smart Agriculture and Trade Initiatives for Sustainable Economic Growth." At the event, she set up small demonstration plots using urban farming techniques and organic inputs to showcase how even small farms can be maximized for food production. Moreover, she is a founding member of OFIMAK, which aims to advance the organic farming agenda in Kenya through collaboration, quality, and advocacy.



Photo Courtesy : Intelliecap's Team.

Figure 27: Griincom's Production Process



Note: Griincom acquires 90% of its customers through referrals

## Organic fertilizer

- Composting:** The agricultural waste generated from plants is mixed effectively with livestock waste such as cattle, chicken, rabbit, and sheep droppings. Griincom uses the windrow method for composting as it allows the composted material to attain high temperatures (above 70 degrees Celsius), thus destroying weed seeds and pathogens and resulting in high-quality compost piles. Griincom also uses the Effective Microorganisms (EM) technology, which uses organisms such as Mycorrhizal fungi and Rhizobium bacteria in the decomposition process producing high-quality compost quality which provides various benefits to soil and plant health.
- Fortification:** The compost is then fortified to produce Griincom's fertilizer. Fortification is conducted using plant extracts with a high nitrogen content as well as urine and manure from selected livestock, which is rich in Nitrogen, Phosphate, and Potassium. Griincom initiates the fermentation process using organic concentrates, including effective micro-organisms to produce a high-

nutrient liquid extract. This extract is then added to the compost to produce a high-nutrient fertilizer, which improves pest resistance and spurs plant growth.

- Granulation and Packaging:** Griincom produces its organic fertilizer in the form of dust. Recently, facilitated by the purchase of new equipment, the enterprise has begun producing granulated fertilizer on customers' requests. Once the fertilizer is granulated, it is packed into 25kg and 50kg bags.

Griincom also produces organic foliar and organic pesticides, which are used by its customers along with its organic fertilizer to boost plant health.

By adopting Griincom's organic inputs consistently over three seasons, Griincom customers have reported increased yields and income as compared to using synthetic inputs. Over a 10-season period, Griincom customers reported that they had saved an average of over KES 75,000 on purchasing inputs for 0.5 ha of farmland. Moreover, their income per season increased by KES 18,000 for each 0.5 ha of land due

to an increase in the yield and quality of produce. Below is a snapshot of yield increment in maize production over three seasons as reported by one of Griincom’s customers:

**Table 13:** Yield increase in maize production

Maize production yield on 0.5 ha			
Type of input	Season one	Season two	Season three
Synthetic Inputs (In Kgs)	540	540	540
Griincom’s organic input (In Kgs)	810	1,080	1,350

**Griincom’s value chain incorporates gender mainstreaming and considerations related to climate-smart agriculture in the following manner:**

**A majority of Griincom’s waste suppliers and waste management workers are women.** Griincom collaborates with urban households (mostly women) to collect kitchen organic waste and with the county government to market organic waste. Griincom trains urban households on how to sort their household waste into organic and non-organic waste. Furthermore, as a result of Griincom’s efforts, the number of women livestock waste suppliers is on the rise in Nakuru County. According to one female supplier of rabbit waste interviewed by Intellecip, in the past, she did not understand the value of livestock waste, disposing it off as trash. However, since Griincom approached her, she has increased rabbit production to increase waste production. She has also renovated her livestock shed to ensure maximum urine collection.

**Griincom’s urban farming installation and training program has impacted numerous women in the urban areas of Nakuru County:** Griincom trains urban dwellers on how to set up kitchen gardens and vertical gardens. Through these trainings, they have educated women on how to use various materials such as tires, flower vases, jerry cans, and shed nets to design urban farms in their kitchens, verandas, and backyards. Moreover, Griincom also trains them on how to convert their kitchen waste into organic input through composting, thus reducing input cost while increasing yields.

**Griincom’s primary customers are smallholder women farmers in Nakuru County, who live in urban, peri-urban, and rural areas.** During 2023, Griincom has trained more than 200 women farmers in Nakuru County on household and livestock waste management. These trainings have equipped participating women farmers with the skills and knowledge required to adopt CSA practices. As a result, Griincom has experienced an increase in the uptake of its organic inputs by smallholder women farmers.

**Figure 28:** Mildred (on the right) illustrating the vertical garden project for a farmer in Nakuru County



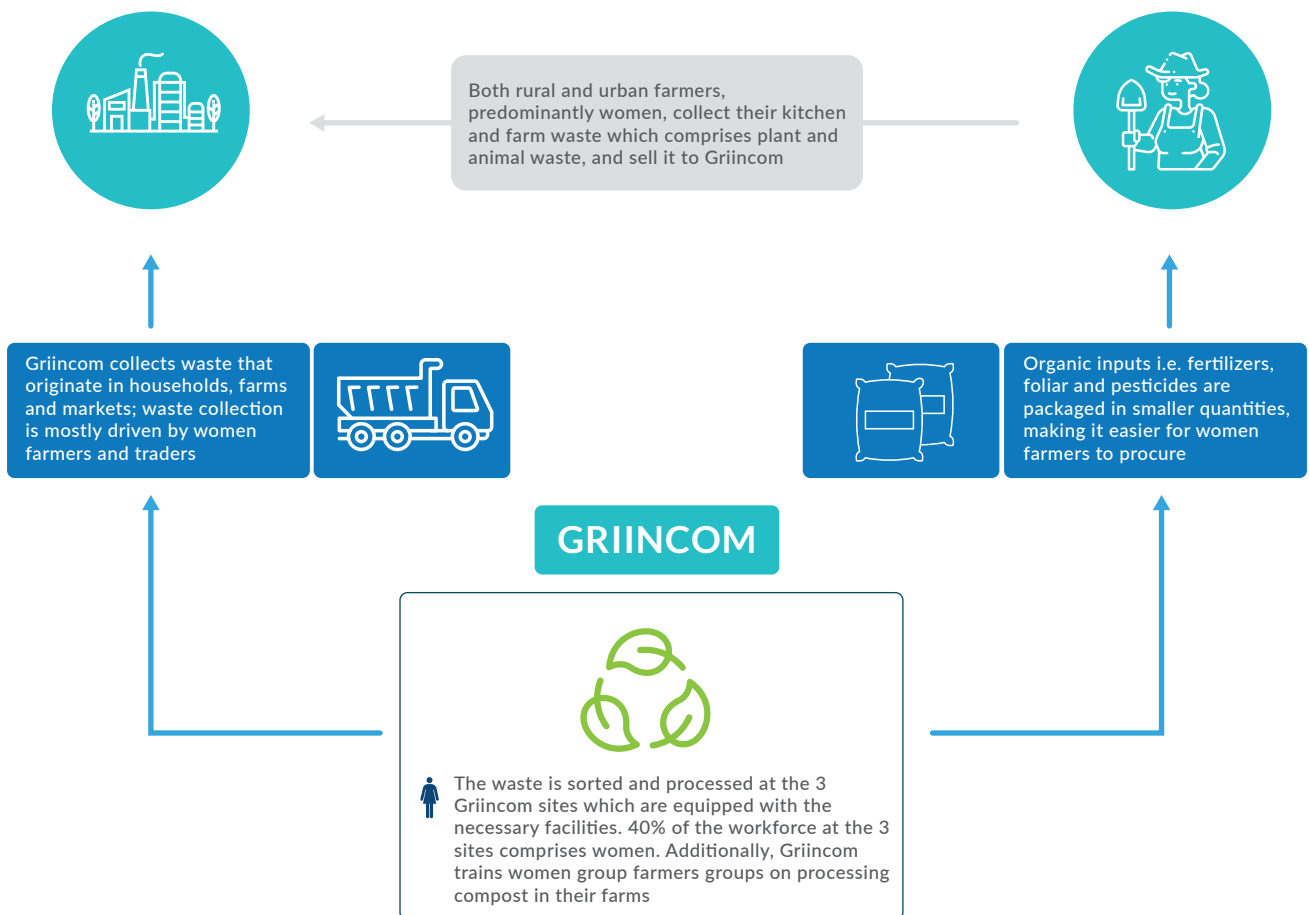
**Photo Courtesy :** Intellecip’s team taken with founder of Griincom.



**Photo Courtesy :** Intellecip’s team taken with women farmer in Kenya.



Figure 29: A snapshot of gender mainstreaming in Griincom's production



In line with the overall objectives of the GLOW program, Griincom was selected for the program, given its potential for enabling low-carbon transition through the production of organic inputs and its evident integration of women across the value chain. Griincom's business model demonstrates the following potential benefits and impacts that align with the program's objectives:

- a. **Climate change mitigation and environmental protection:** By providing access to organic inputs, Griincom contributes to reducing greenhouse gas emissions by enhancing soil health, reducing the need for synthetic inputs, and reducing nitrous oxide and methane emissions. Griincom estimates that using compost as a soil amendment offsets approximately 0.1 to 0.2 MT of CO<sub>2</sub> equivalent per MT of organic waste by reducing the need for synthetic fertilizers.
- b. **Accessible and affordable high-quality inputs:** Griincom offers high-quality organic inputs that are affordable and easily accessible. Their 50kg organic fertilizer is priced at KES 2,000, making it a more cost-effective option compared to conventional fertilizers provided by Kenya's Ministry of Agriculture under its subsidy program (see table below). This affordability has led to an increased adoption of low-carbon inputs, particularly among women farmers. Griincom's products are readily available to farmers in Nakuru County and the company

currently serves over 500 customers, most of whom are female.



Photo Courtesy : Intellecip's team taken at a greenhouse location in Kenya.



**Table 14:** A comparison of Griincom’s organic fertilizer with the subsidized fertilizers provided by the Kenyan government

Prices	Griincoms organic fertilizer	DAP	CAN	NPK
Subsidised Prices	2,000	3,500	2,875	3,275
Original Retail Price	2,000	6,000	6,000	6,000

Note: The Prices are for a 50kg bag

c. **Employment creation and women’s economic empowerment:** Griincom empowers women farmers through waste management initiatives and the promotion of urban farming. The organization has trained over 200 women farmers on end-to-end composting processes, including urban farming techniques such as vertical farming, which can be adopted by smallholder women farmers in both urban and rural areas. Also, whereas previously Griincom employed only male part-time employees in its production process, it has recently employed 4 female part-time employees in its production process. Griincom’s model empowers the local community, helps diversify women’s incomes, fosters economic growth, and contributes to achieving several Sustainable Development Goals: SDG 5 - Gender Equality; SDG 8 - Decent Work and Economic Growth; SDG 12 - Sustainable Consumption and Production; and SDG 13 - Climate Action.

### 5.3.4 Support provided by the program to Griincom

Intelcap engaged Griincom in a range of activities tailored to the business’s specific needs. Intelcap worked directly with Griincom’s Founder and CEO, Mildred Gachoka, to develop a comprehensive Gender Action Plan designed to address specific gender gaps and business challenges identified during the baseline assessment. The GAP targeted three broad outcomes that are critical to ensuring Griincom accelerates its transition to low-carbon development and deepens positive outcomes for women’s economic empowerment.

- **Increased access to organic input by women farmers in Kenya’s North-Rift region of Kenya.**
- **Increased adoption of climate-smart agricultural practices through business development initiatives and strategic partnerships with key players in the ecosystem.**
- **Enhanced financial and operational efficiencies for the business alongside gender integration.**



Photo Courtesy : Intelcap’s team taken in Kenya.

Figure 30: A snapshot of Griincom's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to organic inputs for women farmers in the North-Rift region of Kenya</b>	<ol style="list-style-type: none"> <li>1. Increase the production capacity of organic inputs</li> <li>2. Assess the supply chain and define key suppliers</li> <li>3. Identify opportunities for last mile delivery channels</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Training on production workflow and efficiencies and production planning</li> <li>3. Track gender disaggregated data for key suppliers</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased production of organic capacity by 200%</li> <li>2. Increased uptake of organic inputs by 30%</li> <li>3. Increased women suppliers of animal waste by 80%</li> </ol>
<b>Increased adoption of climate smart agriculture through sensitization and strategic partnerships</b>	<ol style="list-style-type: none"> <li>1. Roll-out farming training and installation and sensitization programs for female farmers</li> <li>2. Evaluation of potential areas of for partnerships with key stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>1. One-on-one go-to-market strategy sessions</li> <li>2. Map key stakeholders and partners and provide advisory on engagement</li> <li>3. Marketing and sales training</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased adoption of urban farming among female farmers by 30%</li> <li>2. Member of OFIMAK</li> <li>3. Ongoing conversation with NCC on a potential partnership</li> </ol>
<b>Enhanced financial and operational efficiencies of for the business along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Revamp pitch deck and financial model</li> <li>2. Evaluate Griincom's business model and processes</li> <li>3. Create awareness of gender mainstreaming</li> </ol>	<ol style="list-style-type: none"> <li>1. Elect gender champion</li> <li>2. Investment readiness training and matchmaking support</li> <li>3. Investor showcase through pitch day and Sankalp forum</li> </ol>	<ol style="list-style-type: none"> <li>1. Received funding from 2 grants funding: One with a focus on gender</li> <li>2. Finalizing debt funding from an investor for its last-mile delivery project</li> <li>3. Revamp business model and production manual</li> </ol>

### Gender mainstreaming TA support interventions

1. Increased access to organic inputs for women farmers in the North-Rift region

#### Increase the production capacity of organic inputs whilst gender mainstreaming

Griincom's GAP highlighted the need to increase its production capacity of organic inputs to cater to growing demand, especially among smallholder farmers. Leveraging customized training on Gender 101, production workflow and efficiencies, and production planning, as well as the advisory support and investor showcase provided by the program, Griincom achieved the following:

- I. With the help of GLI grants, Griincom upgraded its facilities in Mang'u and Greensted by purchasing equipment to fully mechanize the production process.
- II. Increased the capacity of its production team through capacity building programs. Previously, there was no female representation in Griincom's production process. However, after the Gender 101 training, the enterprise was able to hire a part-time female agronomist and three part-time female laborers in their production department.

III. As of March 2024, Griincom, through increased production, had expanded its customer base to 500 farmers, 80% of whom are women.

IV. Developed a production process manual that streamlined its production processes to improve efficiency.

#### Increased access to Griincom's products through last-mile delivery model

The GAP emphasized the need for Griincom to develop a more efficient last-mile delivery channel to reach more smallholder women customers. Leveraging the training on distribution channels, Griincom created an action plan for last-mile delivery, acquiring a delivery van and hiring female farmers as part-time sales agents. The action plan also envisages recruiting female partners as part-time sales agents. Recently, Griincom secured grant funding from an impact investor to improve their last-mile delivery model. Griincom plans to utilize these funds to purchase a van and hire a business development leader who will oversee the implementation of its last-mile model. Griincom expects that this initiative will lead to a 30% increase in product uptake by July 2024.

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## 2. Increased adoption of climate-smart agriculture through sensitization and strategic partnerships

### Increasing the roll-out of urban farming installations and sensitization programs for female farmers

Griincom is helping smallholder women farmers adopt urban farming practices by setting up structures like vertical gardens and providing training on urban farming techniques. The GAP recommended that Griincom integrate urban farming installation services and organic farming practices to increase the adoption of climate-smart agriculture. Research indicates that farmers are more likely to adopt multiple climate-smart agriculture practices to complement or substitute existing processes.<sup>120</sup> In response to this recommendation, Griincom created a training manual that covers both organic farming practices, such as composting and using organic inputs, with urban farming techniques, such as planting vertical and kitchen gardens. Griincom also updated its marketing materials to include both urban and organic farming practices. These efforts have led to a 30% increase in the adoption of urban farming by female farmers and have enabled Griincom to participate in various climate-smart agriculture awareness events such as the Agricultural Show of Kenya (ASK). Moreover, Griincom has installed urban gardens for 14% of its rural customer base.

## 3. Enhanced financial and operational efficiencies for the business alongside gender integration

### Measuring gender impact

Prior to participating in the program, Griincom did not have a M&E framework to measure its impact. Following the GAP's recommendations and receiving customized training on Gender 101, Griincom appointed its founder & CEO, Mildred Gachoka, as its Gender Champion. Additionally, leveraging the program, they revamped their customer database to track gender-disaggregated data. Moreover, Griincom plans to utilize the Theory of Change developed in collaboration with the program as the basis for its M&E framework in the short run. The M&E framework is expected to measure the following key impacts: the adoption of CSA practices by female farmers, increased yield among its customers, especially rural female farmers and an increased uptake of organic and urban farming by female farmers.

### Improving the quality and quantity of livestock waste procured from women suppliers

Griincom's business model involves collecting plant and livestock waste from various small-scale suppliers in Nakuru and using it to produce organic materials. The GAP emphasized the need for Griincom to create a testing and quality control framework for its suppliers to ensure consistent raw material quality. With the program's support, Griincom developed a quality control framework that they shared with their suppliers. They also provided training to help their suppliers improve the quality of their organic waste. This training included guidance on feed management for farmers who raise rabbits and chickens to improve feed

quality. Additionally, Griincom identified and tracked gender-specific data for its key suppliers. Their analysis revealed that women suppliers largely provided plant waste, while male suppliers largely provided livestock waste. Griincom found this information useful for its strategy, as it highlighted the need to engage more women farmers in supplying livestock waste. Griincom believes that livestock waste has greater value compared to plant waste.

### Fundraising and access to gender lens investing opportunities

The program supported Griincom to become investment-ready by updating their pitch deck and business model, and aided investment matchmaking by introducing the enterprise to potential investors within the Intellectap network. These opportunities allowed Griincom to receive feedback on their product offering, business model, gender integration and stakeholder engagement. Using skills gained during the program, Griincom's CEO & Founder successfully pitched to various investors at the 2023 and 2024 Sankalp Forums. As a result, Griincom received 2 grants worth USD 20,000 to purchase equipment as well as integrate gender considerations into its value chain. Further, a Sankalp Africa Summit partner sponsored the participation of Griincom's founder in an exchange program to India. This enabled her to network with and learn from successful organic input manufacturers in India.

### Business efficiency interventions

## 1. Increased adoption of climate-smart agriculture through sensitization and strategic partnerships

### Strengthening existing partnerships with key stakeholders and developing strategies to forge new partnerships

Griincom has been working with various partners in the waste management space such as the Nakuru County government (NCC), which provides sorted organic waste to Griincom at no cost and Nakuru Living Lab (NLL), which supports Griincom in the research and development of its organic products. The GAP provided recommendations for Griincom to strengthen its existing partnerships by submitting proposals to formalize its Memorandum of Understanding (MOUs) and secure long-term contracts. Moreover, the GAP highlighted the need to forge new partnerships with other key players in the ecosystem ranging from organic manufacturers to gender-impact partners. By leveraging support from the program, Griincom has been able to join OFIMAK as one of its founding members. OFIMAK's main objective is to drive the organic farming agenda in Kenya through collaboration, quality assurance, and advocacy. Furthermore, Griincom is in talks with NCC and NLL on how to deepen their partnerships for managing organic waste in the county and for spurring research and innovation in organic agriculture, respectively.

## 2. Enhanced financial and operational efficiencies for the business along with gender integration

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## Enhancement of Griincom's business operations and processes

The GAP revealed the need for Griincom to improve its internal operations by creating Standard Operating Procedures (SOPs) for various tasks and by hiring key personnel. The support offered by the program provided training on operations management (including human resources and team management) and marketing and sales. The program also provided a review of Griincom's internal policies such as the HR Manual and employee contracts and aided the development of key business documents such as a formal business model. Griincom has developed key SOPs as well as key business documents such as a production manual and a sales strategy manual. Moreover, Griincom has mapped out the need to hire key personnel such as a business development manager and a full-time agronomist.

### 5.3.5 Learnings across the key research questions

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**Research Question 1: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

#### Organic Inputs can increase productivity and financial agency for women farmers

Organic farming is an accessible option for smallholder women farmers, as it requires minimal resources to start, making it suitable for both smallholder rural and urban farmers. Women can utilize waste from their households and farms, selling it to organic input manufacturers to generate income while also addressing waste management challenges. Furthermore, using organic inputs instead of synthetic inputs is more cost-effective and has been proven to increase crop yield while enhancing soil fertility. Through urban farming installations and training on organic farming, Griincom is helping to increase the adoption of CSA, especially among smallholder female farmers.

#### Access to markets for smallholder women organic farmers

Organic input PSEs like Griincom contribute significantly to the adoption of organic farming by women farmers. By providing inputs like organic fertilizers, seeds and pesticides, such businesses enable women farmers to produce high-quality crops that are free of chemicals and demand premium prices in both local and international markets. This type of access to inputs and markets fosters an increase in women's income and contributes to their economic independence.

#### Promotes women's agency in the agricultural sector

Organic input businesses have the potential to promote gender equity in the agricultural sector. They provide smallholder women farmers with technical know-how on how to productively engage in farming activities on a small-scale level. Moreover, organic input businesses engage women farmers through groups which encourages more women

to form farming groups. Typically, such groups promote participatory decision-making, including women as active decision-makers. For instance, Griincom engages women farmers through women groups, where decisions are made collectively, thus encouraging the increased participation of women in decision-making.

**Research Question 2: What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?**

#### Capacity building and awareness creation are critical tools to increase the participation of women

In Kenya, women farmers typically use fewer agricultural inputs than their male counterparts. The training and capacity building support offered by input businesses on organic farming techniques, soil conservation and urban farming techniques, contribute to increased adoption. For instance, Griincom trains women on composting kitchen waste into organic fertilizer that can then be used in their backyard gardens as manure. By engaging women in the process of converting household waste to organic fertilizer, organic input PSEs empower them to contribute to their households financially, as well as to the environment through effective waste management.

#### Trainings, demonstrations and community engagement as effective tools for marketing

Griincom has observed that the uptake of organic inputs and adoption of organic farming by women farmers is accelerated through referrals obtained during training engagements. Moreover, Griincom has observed that engaging farmers through groups is effective in catalyzing their transition to organic farming.

#### Research and development are critical for advancing the organic inputs sector and thus contribute to participation

Businesses in the waste-to-agriculture space should continuously undertake research and innovate their products to suit their end users. Griincom has been working closely with NLL which provides the enterprise with useful research findings and assists it in testing organic inputs. Furthermore, NLL facilitates the certification of Griincom's organic products. Currently, Griincom's organic pesticide and foliar are certified. Moreover, by engaging with farmers through surveys, and understanding their needs, Griincom has been able to package its organic fertilizers into smaller bags to enable more smallholder women farmers to adopt organic farming.

**Research Question 3: Who are key stakeholders working in the climate change adaptation and WEE space, and what support are they providing / can they provide to climate-smart PSEs to scale their solutions while increasing women's participation?**

#### Support from various players in the public and private sector is critical for success



Griincom's partnership with multiple stakeholders has been a key contributor to the growth of the company. Through partnership with the county government, Griincom was able to access aggregated organic waste and platforms to showcase their organic products, leading to greater awareness. On the other hand, its partnership with research bodies such as NLL, provided Griincom with a platform to innovate and test its organic products and receive accreditation, enabling their business to grow. Furthermore, investors like SHONA and gender-focused programs are important players that provide the required funding while allies like women farmer groups and other private sector players play a significant role in reaching and engaging women farmers across various geographical locations.

**Research Question 4: What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale such climate-smart PSEs to enhance their impact on women?**

**A combination of training, technical assistance, and access to funding are critical to scale climate-smart PSEs**

**Short term interventions:** Deploying customized gender-based training for PSEs has proven instrumental in building their capacity to break gender biases, create awareness about gender roles and needs, and implement required changes. The Gender 101 training helped Griincom become aware of gender issues, improve its understanding of gender roles in the sector, implement better working conditions within the enterprise, and develop a clear action map for engaging women across all value chain activities, including as suppliers, employees, partners, and customers.



Photo Courtesy : Stock photo.



Photo Courtesy : Stock photo.

**Medium term interventions:** The program's approach of combining technical assistance, a gender action plan, follow-up advisory support and effective M&E practices ensured that the PSE was able to gradually implement required changes while also identifying new opportunities for growth, over time. Such interventions also offer equal economic opportunities for women, improve their participation, and boost personal agency for women actors in the organic sector value chain. Consequently, Griincom's ability to integrate more women into their value chain, track their gender impact, and tell their stories, has helped them to attract multiple investments which will increase their production capacity and expand their reach.

**Long-term interventions:** Financial support is critical for PSEs to maintain a sustainable growth trajectory. With new funding, PSEs can increase their geographical coverage, increase their research budget, improve their marketing efforts, thereby reaching and impacting more women actors in the ecosystem. Griincom seeks to secure investments to pilot its last-mile delivery model, expand its organic product range, improve its operational efficiencies, and hire key resources. Through this intervention, Griincom hopes to not only improve the livelihoods of women smallholder farmers but also contribute to climate change action.

# 5.4 DMA (DIGITAL MOBILE AFRICA)

## Digital Marketplace For Smallholder Farmers In Tanzania

### 5.4.1 Sectoral overview – Agriculture in Tanzania

The agricultural sector is a significant contributor to Tanzania's economy, accounting for 29% of GDP, 65% of employment, 30% of export earnings and providing 65% of the raw materials for the industrial sector.<sup>121</sup> The agricultural sector is a direct source of livelihood for about 55% of Tanzania's population of 63 million and an indirect source for 15%, through various functions in its value chain. The rural population dominates the agricultural sector, primarily engaging in food crop farming on average land holdings of 2 to 3 acres,<sup>122</sup> supplemented by livestock rearing and poultry production. Despite some progress, agriculture in Tanzania remains a traditional smallholder production system, responsible for 75% of the country's total rainfed agricultural output.<sup>123</sup> Consequently, poverty remains widespread, with the majority of the country's farmers living below the national poverty line of USD 1.90 a day.<sup>124</sup>

**Tanzania's vulnerability to the adverse effects of climate change is an urgent concern. The country's economy is heavily dependent on climate-sensitive natural resources, rain-fed agriculture, and biomass energy.** With rising temperatures and changing precipitation patterns, Tanzania is experiencing extended rainy seasons, regional flooding, and more frequent and severe droughts. These changes are significantly impacting the livelihoods of its citizens. Projections indicate that a 2-degree Celsius increase in temperature by 2050 could lead to a 13% reduction in the yield of staple food such as maize, an 8.8% reduction in the yield of sorghum, and a 7.6% reduction in the yield of rice,<sup>125</sup> ultimately leading to food insecurity within the country.

**The promotion of climate-smart agriculture in Tanzania has gained momentum in recent years, as the country has ratified the United Nations Framework Convention on Climate Change.**<sup>126</sup> Climate-smart agriculture's integrated approach is designed to increase agricultural productivity, bolster climate change resilience, and mitigate greenhouse gas emissions. However, despite these benefits, empirical data indicates that the adoption of climate-smart practices among smallholder farmers in Tanzania and other sub-Saharan African nations remain quite low.<sup>127</sup> Tanzania's limited uptake of climate-smart agricultural practices can be attributed to various socio-economic barriers. These include restricted access to resources such as land, credit, and inputs and a lack of knowledge and technical support.<sup>128</sup> Establishing appropriate incentives and business connections between smallholder farmers and small-to-medium enterprises is

essential for facilitating the widespread adoption of climate-smart innovations.

#### Agri-inputs analysis

##### Fertilizers

Tanzania relies heavily on imported fertilizers, which account for an estimated 70% of all fertilizers used. Fertilizers are largely imported from India, Turkey, and Colombia. The primary fertilizers used in Tanzania include urea, and the blends DAP, CAN, and NPK. Fertilizer consumption has increased from 16 kg per ha in 2018 to 19 kg per ha in 2023. The demand for fertilizer for the fiscal year 2022-2023 was estimated at 698,262 MT, of which 418,883 MT need to be imported. To support this goal, the government has promised to mobilize funds to provide fertilizers at a subsidized rate to benefit more smallholder farmers as high prices have been a barrier to access.<sup>129</sup>

The Tanzanian Government has established the Agricultural Inputs Trust Fund and the Agricultural Development Bank to finance agriculture. This is because with only 3% of Commercial Banks in Tanzania lending to the agricultural sector there remains a large unmet need for structured financial products and services for farmers.<sup>130</sup>

##### Seed market analysis

**Seed availability and quality are major challenges for Tanzanian farmers. In Tanzania, high-quality seeds are mainly provided by public seed enterprises and large private seed producers.** It is estimated that the country needs 212,274 MT of seed annually; however, only 52,700 MT are available.<sup>131</sup> There are over 100 private seed companies operating in Tanzania, engaged in variety development, seed production, processing, marketing, exporting, and importing. Tanzania has 46 active breeders focusing on maize, beans, soya beans, and pigeon peas. Maize is the most important crop in Tanzania, with 124 varieties released since 2000, compared to 15 varieties of beans, 4 varieties of soya beans, and 7 varieties of pigeon peas.<sup>132</sup> Despite seeds accounting for only 2% of total production costs, smallholder farmers in Tanzania struggle to access affordable, climate-smart high-quality seeds. Over 90% of the seeds that are sown are from previous harvests and are often of low quality. Limited financial resources further hinder access to quality seeds for the next farming season, leading to consistently low yields and eventual food insecurity.<sup>133</sup>



## Access to farm inputs in Tanzania

Despite the Tanzanian government providing free extension services, access to such services as well as to information on good agricultural practices is a challenge for farmers.<sup>134</sup> This is primarily due to the inadequate coverage and quality of these services, leaving many farmers without the necessary support to make informed decisions about input use and farm management. As a result, Tanzanian farmers have struggled to access farm inputs (see Table below), leading to a slowdown in the adoption of climate-smart agricultural practices and technologies. Ultimately, this has negatively impacted farm yields and farmer's incomes.<sup>135</sup>

**Table 15:** Number and percentage of agricultural households reporting the use of farm inputs during 2019/20 agricultural year, Tanzania

Type of input	Number of households	Percent (%)
Inorganic fertilizer	1,727,796	22.5
Farmyard manure	1,497,283	19.5
Compost manure	348,740	4.5
Insecticide/ fungicide	2,131,808	27.8
Herbicide	876,880	11.4
Improved seeds	2,863,470	37.3



**Photo Courtesy :** Photo from DMA's newsletters, courtesy of DMA

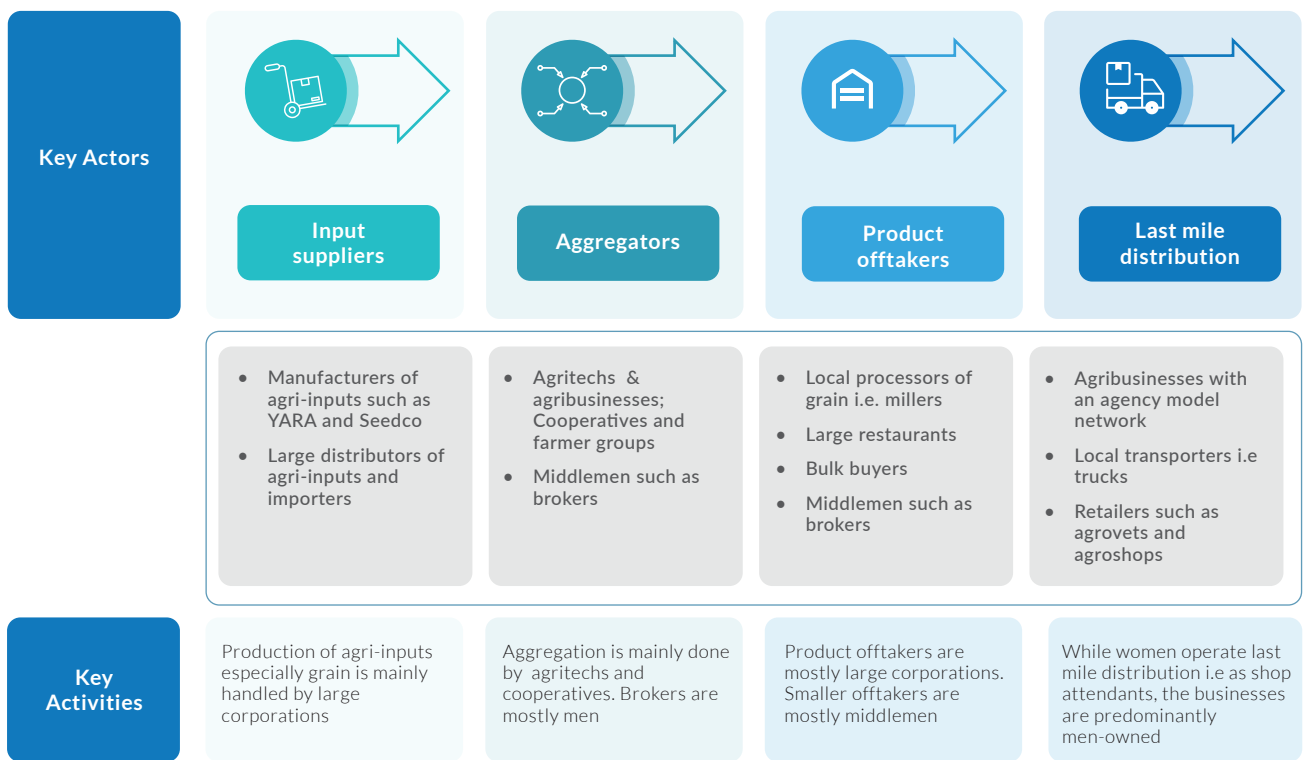
## Agri-fintech industry analysis

The intersection of the agricultural economy with mobile phone usage has significantly increased financial inclusion for rural farmers. A 2020 survey revealed that 83% of rural Tanzanians can access financial services, primarily through mobile money and digital financial services provided by agritech platforms.<sup>136</sup> Not only do these platforms offer financial services and credit access, they also connect farmers with agricultural input suppliers, provide market access, and facilitate the exchange of agricultural information in both formal and informal ways. Major players in the agritech sector, such as DMA, offer a wide range of digital solutions such as input access, extension services, weather information, market linkages, and last-mile distribution for farmers and agribusinesses (see Figure below). Due to its critical role in the Tanzanian economy, this sector alongside fintech, renewable energy, and Eedtech, has received and continues to receive substantial funding.<sup>137</sup> The government is also leveraging the growing use of agritech to address unemployment and boost agricultural productivity through targeted farming solution programs.



**Photo Courtesy :** Intellecap's team.

Figure 31: The value chain of agritech models in Tanzania



## 5.4.2 Challenges faced by the agricultural sector in Tanzania

Tanzania's agricultural input sector, particularly related to the agricultural landscape, faces several challenges, including gender-related limitations at the sector level.

### Sector-level challenges

- Low fertilizer uptake in Tanzania:** Many Tanzanian farmers hesitate to use fertilizers because of their perceived low quality. Despite tests proving that the fertilizers meet nutrient standards, a survey revealed that farmers suspected that they were adulterated. This suspicion has resulted in a lower uptake of fertilizers in Tanzania.<sup>138</sup> Furthermore, inadequate credit and low household incomes pose additional barriers to fertilizer uptake by smallholder farmers in Tanzania.<sup>139</sup>
- Weak credit markets:** Due to weak credit markets, importers and traders of agricultural inputs (such as seed and fertilizer) find it challenging to efficiently supply inputs at low cost, especially to smallholder farmers.<sup>140</sup>
- Price volatility of agri-produce:** Farmers are often uncertain about crop prices and government policies regarding the sale of their yield.<sup>141</sup> This uncertainty makes it difficult to determine whether they will receive sufficient returns from using additional inputs like high-quality seeds and fertilizers. As a result, farmers may choose to use fewer inputs to reduce costs, in order to ensure that they earn a profit. This uncertainty can significantly impact a farmer's decision-making process

and ultimately affect their harvest.

- Information barrier:** Farmers often lack proper information on using inputs such as fertilizers and pesticides, efficiently and profitably. Moreover, even if knowledge is available on yield response patterns to fertilizer application, it is not communicated in a way that can be easily understood by farmers or agricultural extension staff.<sup>142</sup> Additionally, with the increasing impact of climate change and pest/insect resistance on smallholder farmers, input retailers need further training and updated agricultural information and products. However, accessing the latest market information is a challenge for input retailers.
- Infrastructure:** One of the biggest challenges in reaching farmers is accessibility. Often input retailers must travel long distances to source their goods, particularly on poorly maintained roads that become even more difficult to navigate during rainy seasons. The increased logistics costs affect the price at which retailers can sell inputs or services, making it difficult for them to remain competitive and accessible to smallholder farmers.<sup>143</sup>

### Gender-related challenges

#### Women as entrepreneurs and employees in the agricultural input space in Tanzania

- Male dominated:** Tanzania's agricultural input sector is predominantly controlled by male entrepreneurs,<sup>144</sup> making it difficult for women entrepreneurs to enter the sector due to the patriarchal stereotypes deeply rooted in cultural and systemic structures.



- b. **Inadequate access to capital:** A key barrier to women's access to capital in Tanzania is their lack of collateral due to limited access to land. Only 9% of women (2020) have sole ownership of land in Tanzania, and those that do own land have small parcels compared to their male counterparts. This disparity limits the productivity of female farm managers, limiting their output.<sup>145</sup>
- c. **Limited business acumen to scale their businesses:** Many women entrepreneurs in Tanzania face significant challenge in managing and growing their businesses due to their inadequate business knowledge. Studies reveal that women in Tanzania have lower levels of education and are less likely to pursue majors (such as STEM) that equip them with the skills required to manage their businesses efficiently, even when they attend university. This has resulted in women-owned businesses struggling to expand.<sup>146</sup>
- d. **Time constraints:** Studies show that female entrepreneurs struggle to balance work and home responsibilities given their involvement in care work and household tasks. Consequently, this adversely affects women's ability to grow their business.<sup>147</sup>

#### Women (farmers) as end users of agricultural inputs in Tanzania

- a. **Unequal access to agricultural inputs and resources:** In Tanzania, farms managed by women face an inherent disadvantage accessing critical factors that drive agricultural productivity such as land ownership, farm size and the availability of non-labor inputs. Due to these gender-based inequalities in resources and input access, the productivity of agricultural land managed by women is 27.4% less than land managed by men.<sup>148</sup>
- b. **Market access:** Studies show that many female smallholder farmers lack market access, forcing them to rely on middlemen to sell their produce. As a result, they earn low profits, limiting their ability to move out of subsistence farming.

#### Climate change-related challenges

- a. **Unpredictable planting season due to erratic weather patterns:** Climate change affects temperature and rainfall patterns, thereby contributing to shifts in growing seasons. Consequently, smallholder farmers face difficulties in planning their planting and harvesting cycles, leading to mismatches in supply and demand. This also makes it difficult for aggregator companies to ensure consistent supply to meet demand and creates inconsistency in bulk aggregation of smallholder farmers' produce. Aggregator companies may adjust their procurement schedules and logistics to match the changes in farmers production cycles. Unfortunately, this leads to increased costs for the aggregators which are passed on to the smallholder farmers.
- b. **Soil degradation:** Research shows that climate change adversely affects soil erosion, desertification, and soil

fertility, leading to lower agricultural productivity and higher input costs for farmers. As a result, aggregator companies may struggle to maintain the quality and quantity of produce needed to meet market requirements. To address this, aggregators need to provide farmers with affordable inputs that can improve soil fertility and increase productivity. Furthermore, aggregators need to train farmers on ways to enhance soil fertility to increase their productivity.

### 5.4.3 Business/Operating model of DMA

Established in 2018 in Tanzania, DMA Limited is an agri-fintech company with its headquarters in Dar es Salaam. The company operates across multiple regions in Tanzania and aims to transform rural farmers, particularly women, into commercial farmers. It achieves this by providing a digital marketplace that offers agricultural inputs, aggregation services, financial services, and data-driven insights. DMA's business model centers around the Franchised Village Digital Agent (VIDA), also known as Digi-facilitator, and its Digital Marketplace Network platform, which focuses on consolidating farm produce from Farmer Producer Organizations (FPOs/Cooperatives) and Mobile Village Agents (MVAs). These last-mile delivery actors serve farmers, FPOs, agribusinesses, and other supply chain participants in the sector.

The company's main activities entail providing access to digital extension services, agri-inputs and financial services, aggregating produce, and providing logistics for produce off-takers and last-mile distribution for its farmers as detailed below:

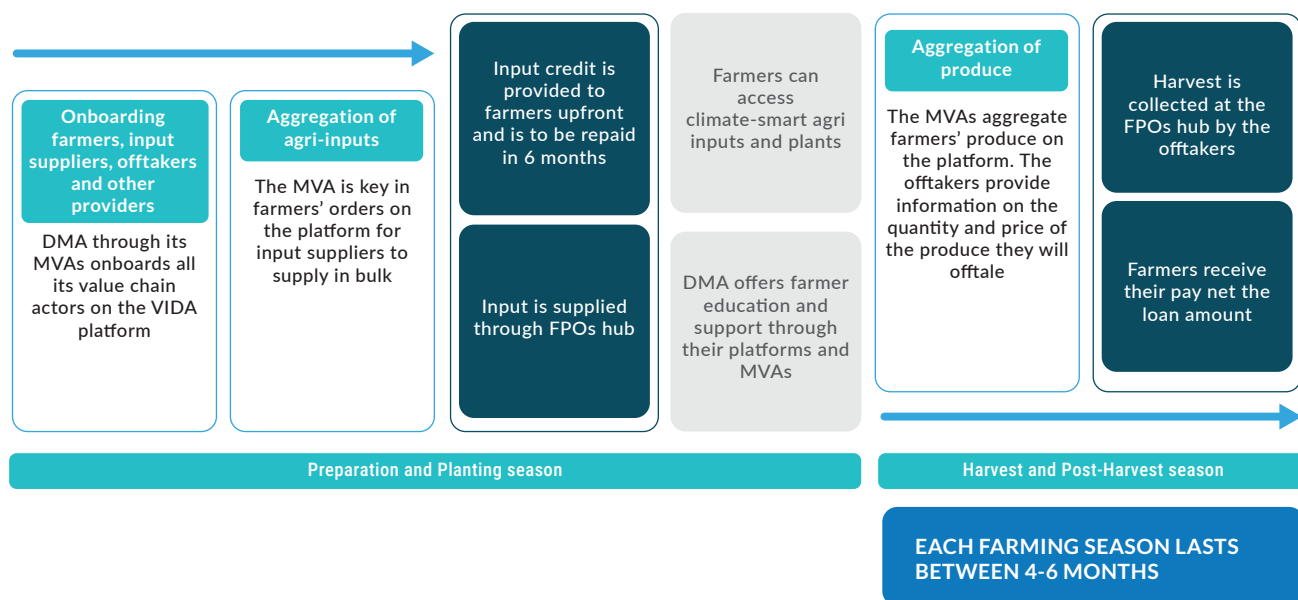
- i. **Facilitating access to agri-inputs that contribute to CSA adoption:** DMA onboards agribusiness and input providers who sell climate-resilient seeds and organic fertilizer on their VIDA platform, enabling them to sell through it. Farmers are onboarded through recruitment drives carried out by its MVAs. The MVAs support farmers with information on inputs through awareness trainings, order placement, and last-mile fulfilment while capturing data at each stage of engagement.
- ii. **Facilitating access to financial products:** DMA facilitates access to loans and credit for VIDA users by integrating Financial Service Providers (FSPs) and Mobile Network Operators (MNOs) on the platform. Data from users' financial transactions through the platform is also used to assess their creditworthiness.
- iii. **Providing market linkages:** DMA facilitates aggregation of produce at the grassroot level and trading of produce on VIDA, by directly linking farmers to off-takers. The platform supports off-takers to make payments to farmers through its digital channels. Through its aggregation services, DMA helps to reduce post-harvest losses among farmers. Post-harvest agricultural waste contributes to the emission of GHG gases. Therefore,

creating market linkages contributes to the transition to low-carbon agriculture.

- iv. **Extension service and information sharing:** Through its platform DMA offers data-driven insights ranging from information on weather, soil, crops and insurance to pricing trends and markets as well as climate-smart farm advisory to aid informed decision-making.

Moreover, through their Farmer Field Schools, DMA enables its smallholder farmers to adapt to climate-smart agricultural practices by offering practical training on seed selection, soil and water management, planting techniques, and post-harvest management.

**Figure 32:** DMA's business model



## Key Actors in the VIDA platform

### Farmers and Farmer Producer Organizations (FPOs)

DMA's primary customers are farmers. Farmers are onboarded on the VIDA platform through the enterprise's MVA-supported farmer groups, commonly known as Farmer Producer Organizations (FPOs). Details collected during onboarding include the farmer's identification number, mobile number, gender, land size, type of crop planted, and farm location. Once farmers are registered on the platform, they receive updates and key information through SMS and MVAs; thus, serving even farmers with basic feature phones.

#### Box 7. DMA's main customer is a rural smallholder female farmer

Some of their distinct characteristics include:

- **Gender:** Over 65% of DMA's customers are women.
- **Land size:** Rural farmers have relatively larger land sizes compared to urban and peri-urban farmers. The farms range between 1 and 5 acres (less than 2 ha). Most small-scale farmers own land as a family.
- **Limited access to resources:** Female farmers often have limited access to resources such as land, water, capital, and technology, which may limit the scale of their operations.

- **Traditional farming practices:** Small-scale women farmers mainly rely on conventional farming methods passed down through generations. While some may adopt modern techniques, their use of technology is often constrained by factors like cost and access.
- **Vulnerability to external factors:** Small-scale farmers are often vulnerable to climate change, market fluctuations, and changes in government policies, which can significantly impact their livelihoods.

### Mobile Village Agents

MVAs or Digital Agriculture Champions (DACs), are part-time employees of DMA, with a minimum qualification of a diploma in agriculture-related studies. They are paid on a commission basis. As of April 2024, DMA was working with over 450 MVAs, 55% of whom were women, across their regions of operations in Tanzania. Their role entails:

- **Onboarding and registering** farmers onto the VIDA platform.
- **Extension services:** They continuously educate

farmers on various products and services available on the DMA platform.

- **Debt collection:** The MVAs ensure that farmers who receive input credit repay on time.
- **Aggregation:** MVAs aggregate farmers' demand for input providers on the platform. They also monitor farmers' production throughout the farming season and aggregate their produce for off-takers. This reduces post-harvest losses for their farmers and side-selling for DMA.

### Financial Service Providers (FSPs)

The VIDA platform enables the integration of FSPs such as mobile money providers, banks, and other financial service providers. Currently, DMA offers input credit to farmers at an interest rate of 6% for 6 months. Such credit is available to farmers in certified FPOs, with produce off-takers acting as guarantors. This facility is critical for DMA farmers who lack sufficient upfront capital to purchase high-quality inputs. Moreover, this facility not only helps farmers plant on time but also helps them adopt CSA practices by providing access to climate-smart seeds and inputs. DMA has just signed a contract with a prominent Tanzanian bank to offer input credit to farmers, especially women farmers, registered under VIDA with the bank bearing the credit risk.

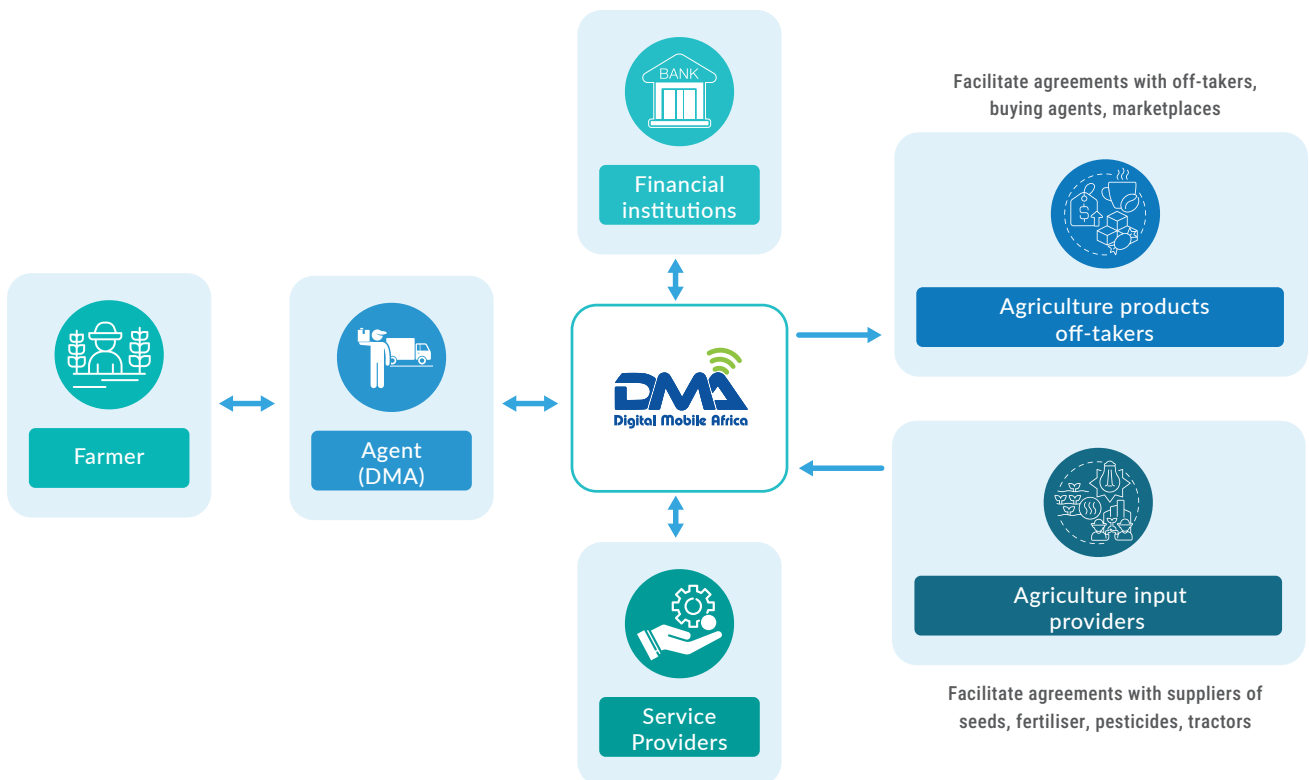
### Input Providers

The VIDA platform's input providers consist largely of seed and fertilizer manufacturers and distributors. These providers have access to aggregated demand for their products, allowing them to supply large quantities of inputs to farmers. DMA has forged partnerships with three major international input manufacturers, including YARA, renowned for its high-quality agricultural inputs. Through these partnerships, the company secures substantial bulk discounts, enabling it to compete effectively with government-subsidized inputs. Additionally, DMA collaborates with local agro-dealers from within its VIDA franchise network to distribute inputs to farmers in various regions. These inputs are collected by farmers from designated shops, primarily located at the FPO hubs, through their MVAs. Farmers leveraging the VIDA platform benefit from competitive pricing and doorstep delivery of inputs.

### Produce off-takers

These buyers purchase produce aggregated from farmers through the VIDA platform. They find the platform immensely valuable as it lists the quantity and location of produce expected to be supplied by farmers at various FPOs. MVAs are responsible for entering the level of produce expected from their farmers on to the platform. Currently, the platform has 12 buyers, most of whom are focused on grain products. Specifically, there are 2 bulk product buyers for maize and 89 local crude oil processors for sunflower.

Figure 33: The VIDA platform



## Program implementation through VIDA

Additional partners for the VIDA platform consist of development organizations, NGOs, and government agencies that need access to farmer data on VIDA in order to implement projects or programs addressing social and climate-related challenges at the local level. These organizations typically carry out their initiatives through DMA by utilizing the VIDA platform to reach farmers. Below is an example of a project that makes use of the VIDA platform.

### The Farmer Visibility Project

This project is funded by Heifer International, with Selcom and Mastercard as the technological and financial partners, and DMA as the project implementer. The project involves registering all value chain actors such as farmers, buyers, agro-input suppliers, and agro-dealers on VIDA to introduce a digital agriculture platform and modernize farmers' traditional practices. Farmers are enrolled through Farmer Producer Organizations, by the MVAs. In addition to enrolment, MVAs also assist farmers access products and services throughout farming activities. Registered farmers also receive a bank card called the Stawi Card, powered by MasterCard, to help them access financial services.

#### Key achievements of the project:

- The project employs over 450 MVAs. These MVAs continue to engage farmers through farmer field days and advocate the adoption of climate-smart agriculture. Through the program, DMA re-evaluated its ongoing MVA recruitment process to ensure that it is gender inclusive. Over 45% of the MVAs are women.
- So far, over 50,000 farmers have been registered through this project, most of whom are women smallholder farmers in rural areas.
- Over 24 agro-dealer outlets are registered on the platform, spread across Dodoma, Singida, and Manyara. With the help of the MVAs, these agro-dealers supply inputs from DMA's registered suppliers to farmers.
- In the last 9 months, farmers have had affordable access to hybrid seeds, high-quality fertilizers, and pesticides through DMA's last-mile delivery model.



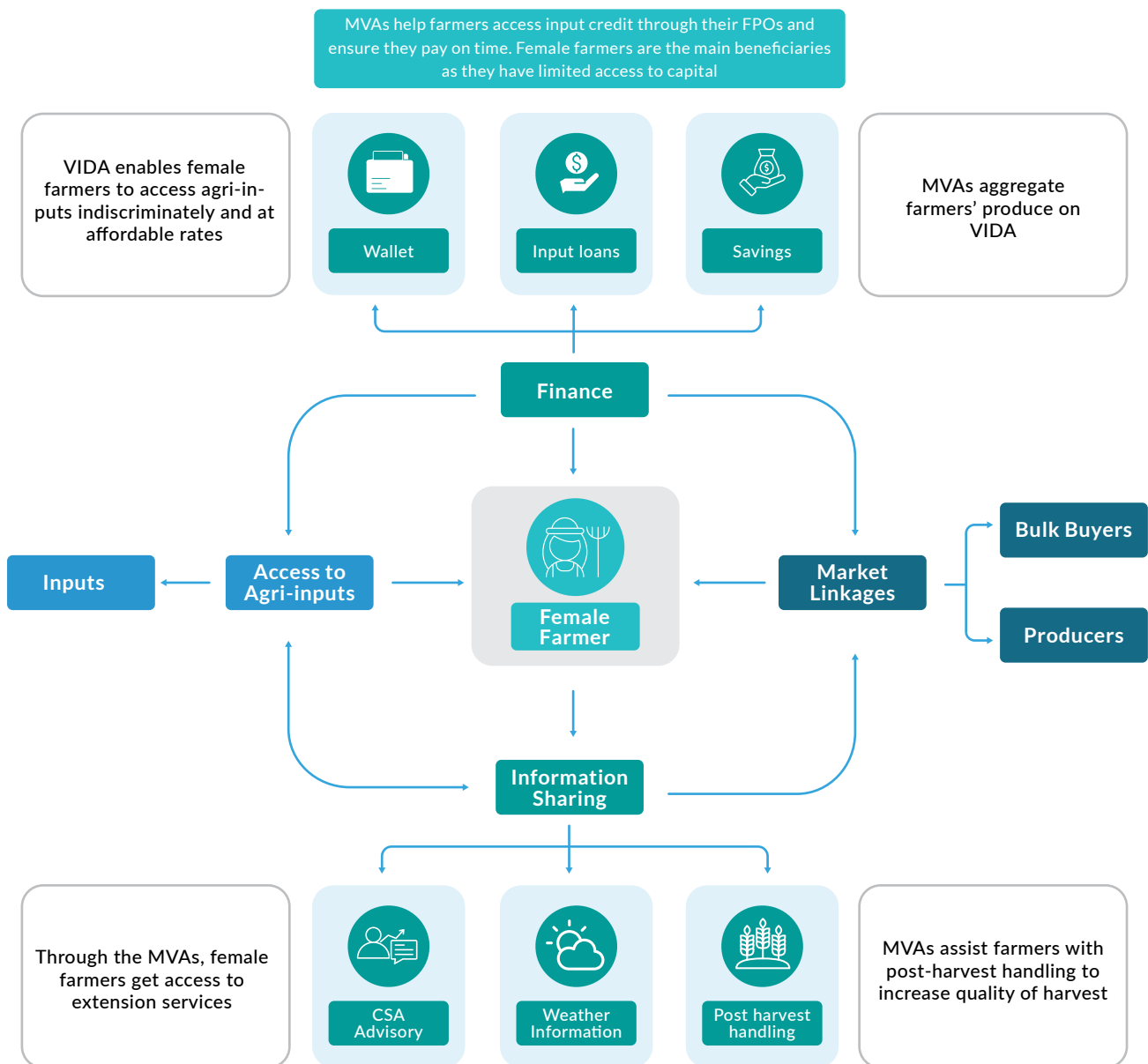
Photo Courtesy : Photo from DMA's newsletters, courtesy of DMA



Photo Courtesy : Photo from DMA's newsletters, courtesy of DMA



Figure 34: Gender mainstreaming in DMA's business model



In line with the overall objectives of the GLOW program, DMA was selected because of its potential for low-carbon transition through input production and the evident integration of women across the value chain. The DMA business model demonstrates the following potential benefits and impacts that align with the program's objectives:

a. **Accessible and affordable high-quality inputs for rural women farmers:** DMA's solution provides an excellent opportunity to empower rural women farmers. VIDA ensures that farmers can access high-quality inputs, financial services, products, and markets. In the past, these women had to rely on various intermediaries to access markets and obtain capital from traditional financial service providers who required collateral to extend financing. This prevented women farmers from accessing high-quality inputs and markets, thereby affecting their livelihoods. By providing access to high-quality inputs, financial services, and extension services,

DMA's model has the potential to increase the adoption of CSA among rural female farmers in Tanzania and promote a low-carbon economy in rural areas across Tanzania.

- b. **Employment creation and women's economic empowerment:** The DMA model involves using mobile village agents to provide extension services and deliver products to farmers through the VIDA platform. These agents are paid on a commission basis, which is sometimes their only source income, and therefore, allows them to earn a living. It's worth noting that over 45% of these agents are women who reside in the same communities as the farmers.
- c. **Improved livelihoods:** DMA has undertaken various projects aimed at promoting gender equality and empowering women farmers in rural areas. One of these initiatives involved collaborating with A carbon credit

project developer Capital to distribute energy-efficient cookstoves, known as “majiko sanifu,” to households of women farmers in Kigoma and Geita regions (see Box 8 for more details). These efforts have contributed to achieving several Sustainable Development Goals, including Gender Equality (SDG 5), Decent Work and Economic Growth (SDG 8), and Climate Action (SDG 13).

main outcomes crucial for advancing DMA's shift to low-carbon development and enhancing its positive impact on women's economic empowerment.

- **Increased access to DMA's products and services for women farmers on the VIDA platform through its last-mile delivery channel.**
- **Increased adoption of climate-smart agricultural solutions and thus improved livelihoods for rural women farmers.**
- **Enhanced financial and operational efficiencies for the business alongside gender integration.**

## 5.4.4 Support Provided by the program to DMA

Intellectap collaborated with DMA on a variety of activities customized to meet the specific needs of the business. It developed a comprehensive Gender Action Plan (GAP) to tackle specific gender gaps and business challenges identified during the baseline assessment. The GAP focused on three

**Figure 35:** A snapshot of DMA's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to DMA's products and services for women farmers on the VIDA platform through its last-mile delivery channel by rural women farmers</b>	<ol style="list-style-type: none"> <li>1. Enhancing DMA's last-mile delivery model through MVAs</li> <li>2. Increasing access to agri-inputs to women farmers through input credit</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Gender-sensitive recruitment plan</li> <li>3. Mapping of credit partners to advance input credit</li> </ol>	<ol style="list-style-type: none"> <li>1. Over 200 MVAs employed; of which 45% are women</li> <li>2. An input credit facility MOU signed with a local bank</li> <li>3. Gender-sensitive recruitment policy</li> </ol>
<b>Increased adoption of climate-smart agriculture solutions by smallholder female rural farmers</b>	<ol style="list-style-type: none"> <li>1. Increase awareness of DMA's products and services to female clientele</li> <li>2. Leverage DMA's gender-impact-led programs</li> <li>3. Enhancing MVAs' skills to deliver CSA advisory</li> </ol>	<ol style="list-style-type: none"> <li>1. Marketing training and advisory</li> <li>2. Mapping and introduction to potential gender-impact partners</li> <li>3. Development of a training strategy for CSAs</li> </ol>	<ol style="list-style-type: none"> <li>1. Two newsletters were issued promoting DMA's impact on women farmers</li> <li>2. Signing of a new gender-impact partnership with an existing partner</li> <li>3. Recruitment of FBAs</li> </ol>
<b>Enhanced financial and operational efficiencies for the business along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Enhancing the VIDA platform by improving its features</li> <li>2. Increasing the visibility of DMA's business and impact</li> <li>3. Fundraising and access to GLI opportunities</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender disaggregated feature and data</li> <li>2. Visibility through Sankalp</li> <li>3. Ongoing business advisory</li> <li>4. Investment readiness and networking activities</li> </ol>	<ol style="list-style-type: none"> <li>1. VIDA has over 441,000 farmers - up from 127,000 farmers. Of whom 43% are women</li> <li>2. DMA was featured in a Sankalp article</li> <li>3. Ongoing negotiations with key investors</li> </ol>

### Gender mainstreaming TA support interventions

1. Increased access to DMA's products and services for women farmers on the VIDA platform through its last-mile delivery channel

#### Enhancing DMA's last-mile delivery model to serve more rural women farmers through Mobile Village Agents

The GAP highlighted the need to strengthen DMA's last-mile delivery model by training its MVAs to better serve their rural female customers. Through the Gender 101 training and advisory support, DMA incorporated gender considerations in recruiting and onboarding its agents. DMA also provided its agents with resources such as mobile phones, airtime, data, and bicycles to help them reach rural farmers, especially women in remote areas, and deliver DMA's products and

services. Moreover, based on the program's recommendations a recruitment plan with inclusivity clauses was developed, to ensure fair hiring of female MVAs. Over the last 6 months, more than 200 MVAs, of which 45% are women, have been recruited and trained using the recruitment plan. The MVAs play a significant role in registering farmers onto the platform as well as in the uptake of DMA's products and services.

### Increasing access to agri-input for women farmers through input credit

Findings from DMA's GAP study revealed that, on average, female farmers spend USD 28 on purchasing agricultural inputs through the VIDA platform, while male farmers spend USD 40. Farmers with access to input credit spend up to USD 100 on agricultural inputs on the platform. This assessment revealed that at its current level, DMA's input credit can only serve up to 26% of farmers registered on the platform. With the support of the program, DMA identified potential credit providers who could use DMA's data to offer input credit to farmers, thus mitigating DMA's credit risk while extending credit to more farmers. By June 2024, DMA had signed a memorandum of understanding with a well-known local bank to extend credit to farmers on the VIDA platform, with their Farmer Producer Organizations (FPOs) acting as guarantors. This partnership is expected to increase access to input credit by 50% in Q4 2024, in turn boosting the uptake of agri-inputs through the VIDA platform. It is also anticipated that this partnership will significantly benefit women farmers, as they

will be able to access collateral-free credit. As a result, their spending on input credit is projected to increase by over 50% to USD 45.

### 2. Increased adoption of climate-smart agricultural solutions by smallholder female rural farmers

#### Advisory on DMA's marketing strategy to boost the adoption of Climate-Smart Agriculture among smallholder female rural farmers

In addition to using MVAs for farm visits and door-to-door extension services, the GAP focused on developing better marketing strategies to address gender gaps in the agricultural sector. The program created gender-focused marketing content and conducted one-on-one market strategy sessions. Through the program, DMA adopted gender-transformative marketing strategies such as creating newsletters and marketing messages that highlight the importance of women in agriculture, incorporate images of women practicing CSA techniques, and sharing success stories of women farmers. DMA also collaborated with women's groups and organizations to reach a broader female audience. As a result, DMA successfully released two quarterly newsletters and saw an 8% increase in the enrolment of women-based FPOs on the VIDA platform. Furthermore, these efforts have helped break down stereotypes and have contributed to attracting more female MVAs. Female MVAs comprise 45% of DMA's total MVA workforce.

Figure 36: Snapshots of DMA's newsletters



## Advisory on leveraging DMA's expertise in implementing gender-impact programs with various partners to increase adoption

DMA has been working with various partners through the VIDA platform to implement programs that positively impact women and promote smallholder farmers' well-being. The GLOW program supported DMA in identifying programs and partners aligned with its mission of transforming rural smallholder farmers into commercial farmers through the adoption of climate-smart agricultural practices. Some of the partners identified included Mercy Corps, ACRE Africa, and UN Women. Thereafter, DMA, with the support of the GLOW program, developed an action plan for engaging short-term and long-term partners. So far DMA has submitted five proposals to new and existing partners on gender transformation through rural e-commerce as a part of the activities highlighted in the GAP. Additionally, the GAP emphasized the importance of gender-disaggregated data and the development of a monitoring and evaluation framework to enable organizations to work with DMA as implementing partners. This has enabled DMA to include gender metrics while reporting to its existing partners.

### Box 8. DMA's Clean Cookstove project

DMA is currently implementing the Clean Cookstoves project (Majiko Sanifu) in Tanzania's Kigoma and Geita regions. The project is being funded by a carbon credit project developer, an organization committed to empowering women, improving the lives of rural communities, and mitigating the effects of climate change. The project aims to reduce carbon emissions by promoting clean energy initiatives, specifically by distributing clean cookstoves to households in rural areas. The project has achieved the following milestones so far:

- Over 150,000 Smart Stoves have been built in the Geita and Kigoma regions, benefiting more than 600,000 people.
- Moreover, this project has provided employment opportunities to more than 250 young people in the region.
- This initiative has greatly benefited women farmers by significantly reducing the time spent in cooking and collecting firewood. Moreover, it has enabled them to spend more time on farming activities, improved their living standards and helped them conserve the environment.
- This project will play a vital role in transforming these regions into a low-carbon economy in the long-run.

Based on the program's advisory on how it can leverage its strength in managing gender-impact projects, DMA has achieved the following:

- DMA recently secured a project, "Sunflower Visibility Project," aimed at promoting local value addition by connecting small-scale sunflower crude oil processors directly to farmers. The project includes a specific mandate to improve the livelihoods of smallholder women farmers. DMA has enrolled over 106,000 sunflower farmers, 43% of whom are women.
- DMA incorporated a gender mainstreaming element into its "maiko snafu" project to ensure that the targeted women farmers benefit from climate-smart advisory services. As part of the project, DMA established 10 demo plots where sunflower and maize were intercropped with Tephrosia to improve soil health and reduce carbon emissions. Through the support of MVAs, over 3,000 farmers, mostly women, were educated on regenerative practices. DMA plans to expand this support to all its sunflower farmers under their new Sunflower Visibility project.

## Advisory on enhancing MVA's skills to deliver knowledge about CSA and best practices to farmers

MVA's knowledge of CSA practices was strengthened in order to better serve rural farmers, particularly women. As part of the program's advisory, DMA hired Field Based Agronomists (FBAs), extension officers experienced in providing services to rural farmers, to work with MVAs. Over the past 6 months, FBAs have collaborated closely with MVAs in selected regions through DMA's Farmer Field Schools and demonstration plots. In these Farmer Field Schools, FBAs conduct training sessions on farmer field days, offering practical instruction to farmers and providing a learning platform for MVAs. In the short term, DMA expects that the skills transferred from FBAs to MVAs will lead to improved extension services and increase the adoption of CSA practices among rural female farmers. In the long term, DMA aims to develop an internal curriculum for MVAs to continually support rural farmers.

### Business efficiency interventions

#### 3. Enhanced financial and operational efficiencies for the business along with gender integration

### Enhancing the VIDA platform by improving its features to efficiently serve the value chain actors

Through the gap analysis conducted on the VIDA platform, the GAP recommended the following:

- **Gender disaggregated feature:** Although the platform has a field for gender, the program recommended the inclusion of an additional data point differentiating women as end users and women as farm owners. This will enable DMA to determine the percentage of its female farmers who are farm managers compared to their male counterparts;



thereby enabling the enterprise to tailor products and services on the platform to meet the needs of its female customers, particularly women farmers, more effectively.

- **Seamless integration of various value chain actors** into the platform to reduce errors and ensure real-time exchange of data between systems, thereby ensuring that all VIDA users have access to information that is up-to-date and consistent across the platform.
- **The program recommended that DMA hire dedicated senior personnel** to link the VIDA platform's operational objectives to DMA's strategic objectives.

In line with the support provided, DMA has been able to achieve the following during the program:

- I. DMA brought on board a CTO, Wellington Mapuku, whose short-term goal was to enhance the platform with the help of the program's recommendations, enabling DMA to become a gender-centric, rural e-commerce platform across the region. Some features that have been enhanced under his leadership include the gendered segregation of farmers, disaggregation of women as users and farm owners, the collection of satellite data to provide accurate weather information to farmers, and the seamless integration of various value chain actors into the platform using APIs. The VIDA platform provides farmers with relevant updates, through SMSs in the local language, Kiswahili.
- II. DMA has been able to track various household and farm characteristics of its farmers, including gender. The key gender-related information that DMA tracks through its platform include the farm manager's gender, the income levels of male and female farmers, the adoption of CSA practices by gender, and the uptake of input credit by gender. Currently, the VIDA platform has over 441,000 registered farmers, 43% of whom are women. Additionally, DMA has developed an ESG framework that considers the business' social, environmental, and economic impact on key stakeholders. In the future, DMA plans to report its measured impact through sustainability reports in its financial statements and other publications.

### **Increased visibility by showcasing DMA's impact on women farmers in Tanzania**

With Intellecap's support, DMA participated in the Sankalp Africa Forum 2024 and Robert Madziva, DMA's CEO was a panelist in the "[Bridging the Gender Gap in the Green Transition](#)" session. In this session, DMA's CEO elaborated on DMA's vision of transforming rural farmers into commercial farmers by prioritizing rural female farmers' adoption of CSA practices to transition to a green economy.

### **Box 9. Callout section**

"DMA prioritizes women's involvement, as they make up over 65% of the customer base. Many of DMA's services are implemented through demo plots, where communities can learn how to grow crops using CSA practices. To encourage the participation of women farmers, our MVAs offer them opportunities to lead the demo sessions at the demonstration plots. As a result of this practice, DMA has observed an increase in the attendance of women farmers at these sessions and an uptick in the onboarding of women FPOs on VIDA."

### **Fundraising and access to gender lens investing opportunities**

The program provided dedicated support to help DMA become investment-ready by updating its pitch deck and business model, as well as offering opportunities to showcase its business to potential investors. These showcase opportunities were offered by way of a dedicated Pitch Day for enterprises within the TA support cohort, and sponsorship to participate in the Sankalp Africa Summit 2024. Through these pitching opportunities DMA received feedback on its product offering, business model, gender integration, and strategies for engaging with other partners. Leveraging skills gained during the program, DMA's CTO, Wellington Mapuku, successfully pitched VIDA's scalability and impact to various investors introduced by the program. DMA has attracted interest from various global impact investors in the region, including GLI investors, and is currently in discussions with potential funders.

## **5.4.3 Learnings across the key research questions**

**Research Question 1: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

**Rural e-commerce solutions utilizing agent models could expedite access to high-quality inputs and promote the adoption of CSA practices among rural female farmers.**

Agri-tech companies that utilize last-mile delivery models and engage village agents, contribute to the adoption of CSA practices among rural farmers, especially women, in the following ways:

- They offer climate-smart advisory, weather forecasts, and market information through smartphones and tablets (often provided by the agri-tech company) to farmers and farmer groups through SMSs and phone calls. This is crucial as most farmers in sub-Saharan Africa only have access to basic feature phones.

- They help farmers obtain climate-resilient seeds, develop efficient irrigation systems, and access other technologies that can improve productivity and resilience to climate change.
- Village agents provide tailored advice on subjects such as soil health and crop choices, since they are familiar with the specific needs of individual farms. They also offer support throughout the farming season, assisting farmers in solving problems and adjusting practices as necessary.
- They help establish and manage formal and informal savings groups, which allow farmers, particularly women, to pool resources and invest in Climate-Smart Agricultural practices.
- Village agents aid women farmers in accessing microfinance loans and crop insurance, reducing financial risks associated with climate variability.

**Agri-tech models that engage village agents contribute significantly to job creation**

Using village agents contributes to job creation, both directly and indirectly, supporting the economy of rural areas in the following ways:

**Table 16:** Contribution of village agents

Directly	Indirectly
<ul style="list-style-type: none"> <li>• Agritech companies hire village agents and pay them on a commission basis. These agents are usually recruited from within the community, providing immediate employment opportunities.</li> <li>• Additionally, jobs are created for trainers and support staff who are responsible for educating and mentoring village agents. For example, DMA hired Field-based Agronomists to build the capacity of its MVAs.</li> </ul>	<ul style="list-style-type: none"> <li>• Village agents often serve as local suppliers of agricultural inputs such as seeds, fertilizers, and equipment. This entrepreneurial role creates additional business opportunities and income streams.</li> <li>• They may also offer services like soil testing, crop advisory, and pest management, effectively becoming micro-entrepreneurs within their communities.</li> <li>• Additionally, village agents often help establish local processing units for tasks such as drying, milling, and packaging, ultimately creating jobs in these new ventures.</li> <li>• In the long run, promoting and maintaining sustainable agricultural practices creates jobs and contributes to long-term economic stability.</li> </ul>

**Research Question 2: What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women’s participation in the sector?**

**Ongoing trainings through demonstration plots and group sessions is critical for increasing women’s participation in CSA.**

The adoption of CSA practices, such as using improved seed varieties, adopting minimum tillage and using fertilizers, by Tanzania’s rural women farmers is lower than their male counterparts. Continuous training through demo plots and Farmer Field Schools supported by community engagement and strategic partnerships, are crucial tools needed to promote the adoption of CSA practices such as the use of climate-smart inputs and regenerative farming practices. DMA has successfully doubled the number of rural women farmers using its platform to purchase climate-smart inputs and access information. Furthermore, farmers registered on the platform have access to DMA’s agents who offer extension services for their farms.

**Research Question 3: Who are key stakeholders working in the climate change adaptation and WEE space, and**

**what support are they providing / can they provide to climate-smart PSEs to scale their solutions while increasing women’s participation?**

**Agri-techs contribute to the growth of agriculture’s supply chain ecosystem through aggregation**

The agritech model benefits several actors in the supply chain ecosystem, such as agro-dealers and bulk buyers, by providing accurate data about the needs of rural farmers. This enables agro-dealers to aggregate inputs and allows farmers to access them at fair prices. Rural farmers can also aggregate their produce for bulk buyers through their MVAs leading to market access and increased incomes. This promotes economic independence for these farmers and the growth of the supply chain actors.

**Collaboration with development agencies and private sector players who are keen on accelerating the adoption of CSA practices**

DMA’s continued partnerships with multiple stakeholders have contributed to the company’s success and growth. By collaborating with various development agencies and private



sector players to implement gender-impact programs that provide technical and financial support to rural platforms, DMA is contributing to the adoption of CSA practices among rural smallholder female farmers.

**Research Question 4: What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale climate-smart PSEs to enhance their impact on women?**

**Short-term interventions:** Providing PSE's with customized gender-based training has been instrumental in building their capacity to eliminate gender biases, create awareness about gender roles and needs, and implement changes. For DMA, the Gender 101 training validated the business's mission of empowering rural female farmers. It helped the enterprise develop a clear action plan for engaging women across all its value chain activities. The training also played a crucial role in revamping DMA's marketing strategy, business plan and pitch deck such that they aligned with the enterprise's mission of serving rural farmers, especially women.

**Medium-term interventions:**

In the medium term, DMA aims to:

- Increase the proportion of women farmers on the platform to over 50% (currently at 43%). This will be achieved through the sensitization and registration of female farmers in rural areas by MVAs. This will be achieved through additional partnerships with local financial service providers to offer credit options.
- Raise Series A funding by attracting multiple investments and participating in gender impact-related programs that can serve rural farmers.
- Increase partnerships with agricultural cooperatives through the VIDA Local Coop Growth Points<sup>149</sup> to cement DMA's social franchise network. With these partnerships, farmer cooperative members can access all digitally aggregated products and services, which will enable the rapid increase of financial inclusion at the last mile.

**Long-term interventions:**

In the long term, DMA plans to:

- Expand its reach and operations, as its model can be replicated in other countries in East Africa.
- Increase its product offering by introducing services such as agri-insurance, digital payments and value-added services.



Photo Courtesy : Photo from DMA's newsletters, courtesy of DMA



Photo Courtesy : Photo from DMA's newsletters, courtesy of DMA

# 5.5 GENEPLUS GLOBAL

## Transforming Livestock Production In Kenya

### 5.5.1 Sectoral overview – Livestock farming in Kenya

Agriculture is one of the most important sectors of economic activity in Kenya, contributing to approximately 22.4% of Kenya's GDP. As of 2020, the sector employs over 40% of the country's total population and approximately 70% of its rural population.<sup>150</sup> Smallholder farming dominates the agricultural landscape contributing to 75% (as of 2022) of total agricultural production, with farmers engaged in both livestock and crop farming.<sup>151</sup>

With a diverse array of climatic zones ranging from arid and semi-arid regions to highland areas, Kenya supports the rearing of a wide range of livestock, including cattle, goats, sheep, poultry, and camels. Livestock production forms 30% (as of 2023) of total marketed agricultural products,<sup>152</sup> and is deeply embedded in the cultural fabric of Kenyan communities, acting as a source of food, income and social status.

The Livestock farming sub-sector is prominent in Kenya with both traditional pastoralist systems and modern commercial enterprises coexisting across the country. In 2021, livestock farming contributed an estimated 12% to Kenya's national GDP and 42% to its agricultural GDP.<sup>153</sup> The sector employs 50% of Kenya's agricultural labor force<sup>154</sup> and generates a significant number of jobs across the value chain. Almost 60% of Kenya's livestock population is found in arid and semi-arid lands (ASALs), where 90% of inhabitants are employed in livestock farming (2020).<sup>155</sup> Traditional pastoralists in arid and semi-arid regions often rely on extensive grazing systems, migrating with their herds in search of water and pasture. In contrast, commercial livestock farming operations are more prevalent in favorable agro-ecological zones and utilize improved breeds and intensive management practices to maximize productivity.<sup>156</sup> Livestock farming in Kenya presents significant opportunities for growth and development driven by increasing market demand,<sup>157</sup> technological advancements, and improved access to finance and inputs.<sup>158</sup> With strategic planning and investment, livestock farmers can contribute to Kenya's food security, economic growth, and rural development while ensuring sustainability and resilience to climate variability.<sup>159</sup>

Despite the immense opportunities for growth and development, livestock farming in Kenya faces several challenges such as climate variability, disease outbreaks, and barriers to accessing quality inputs, veterinary services and markets.<sup>160</sup>

**Improved genetics and nutrition are crucial for improving the efficiency and reducing the environmental footprint of livestock production systems.** Selective breeding programs can improve livestock genetics, leading to increased feed efficiency and reduced methane emissions.<sup>161</sup> By breeding for these desirable traits, farmers can effectively reduce carbon emissions associated with enteric fermentation<sup>162</sup> and contribute to climate change mitigation efforts.<sup>163</sup> Additionally, genetics play a crucial role in enhancing the resilience of livestock to climate variability. Nutritional practices, such as well-balanced diets and appropriate supplementation can enhance the digestive efficiency of livestock, reducing the amount of methane produced per unit of feed consumed.<sup>164</sup> For instance, feed supplements such as nitrates can reduce methane emissions by 16%, while 3-Nitrooxypropanol has the potential to decrease methane yield by up to 36% in dairy cattle.<sup>165</sup> By providing animals with nutritionally balanced diets tailored to their specific needs, farmers can optimize feed use, minimize methane emissions, and improve overall productivity.

**Access to climate-smart solutions such as improved breeds, high-quality feed, and veterinary services is therefore essential for optimizing livestock farming and reducing its environmental impact. Access to and adoption of climate-smart solutions also intersect profoundly with women's economic empowerment within livestock farming for sustainable agricultural development.** Women with access to climate-smart technologies, such as improved breeds, drought-resistant forages, and water harvesting techniques, can cope with climate variability, safeguard their livelihoods, and ensure food security for their families.<sup>166</sup> Moreover, women's economic empowerment within livestock farming, facilitated by access to resources, training, and market opportunities, not only enhances their resilience to climate change but also contributes to broader sustainable agricultural development. This fosters inclusive growth and poverty reduction across rural communities. By embracing gender-inclusive strategies, policymakers and stakeholders can harness the transformative potential of women as catalysts for building resilient and sustainable livestock farming systems in the face of climate challenges.

**Private sector involvement in livestock farming is crucial for smallholder farmers to access and adopt climate-smart solutions.** Private Sector Enterprises can commercially and sustainably provide expertise, innovation, and market access, as well as develop tailored solutions and distribute them through extensive networks reaching rural areas. This will, in turn, contribute to reducing carbon emissions and building farmers' resilience to climate variability.



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## 5.5.2 Challenges faced by the livestock farming sector in Kenya

### Sector-level challenges

**At a micro level,** livestock farmers in Kenya face various challenges that directly impact their livelihoods. These challenges include limited access to high-quality inputs such as superior livestock breeds (genetic material used for insemination), high-quality feed, and veterinary services, which hinder productivity and profitability. Most of Kenya's livestock producers are smallholder farmers who often lack financial resources and infrastructure support, which limits their ability to invest in modern technologies and practices. Additionally, land tenure issues and encroachment on grazing lands, increase competition for resources, leading to overgrazing, soil degradation, and conflicts between farmers and pastoralist communities. Limited access to markets and value chains also make it difficult for farmers to sell their livestock at fair prices, resulting in income instability and economic vulnerability.

**At the macro-level,** inadequate policy frameworks and institutional support hinder the development of the livestock farming sector. For instance, the absence of clear and enforceable policies on livestock movement and trade often leads to the sale of diseased animals and exacerbates the spread of diseases such as foot and mouth disease to previously disease-free areas. Additionally, barriers to market access, including trade restrictions, lack of market information, and inadequate value addition, limit the potential for growth and profitability within the sector, constraining farmers' ability to capitalize on emerging opportunities and address market demand. Additionally, barriers to market access such as trade restrictions, unavailability of market information, and inadequate value addition limit the sector's growth and profitability. This also affects farmers' abilities to take advantage of emerging opportunities and address market demand.

### Gender-related challenges

In many developing nations, women play pivotal roles in the livestock sector, often handling responsibilities such as animal husbandry, milking, and fodder collection.<sup>167</sup> Women account for over one-third of the workforce within pastoralist and mixed farming systems in Africa, and around two-thirds of its 400 million poor livestock keepers are women.<sup>168</sup> However, Kenya's livestock sector faces gender-related challenges that are pervasive and multifaceted, with women disproportionately affected by socio-cultural and economic barriers.

Women farmers face significant challenges in accessing resources and opportunities;<sup>169</sup> they own limited assets, have difficulty accessing credit, and lack decision-making power in the household, among others. For instance, women often own little to no land, which makes it difficult for them to make decisions about managing the herd. Moreover, formal financial institutions usually require assets (typically owned by men) as collateral, making it difficult for women to obtain credit.<sup>170</sup>

Additionally, cultural norms that limit women's decision-making power also hinder their ability to succeed in agriculture.<sup>171</sup> As climate change worsens, so do the challenges faced by the livestock sector, such as unpredictable weather patterns and the declining availability of pasture. Climate-smart agriculture therefore has become increasingly important to maintain farm productivity and resilience. Women's ability to access and implement these solutions is crucial since they often are disproportionately affected by climate change and bear the primary responsibility for managing household livestock resources.

### Climate change-related challenges

Climatic changes such as higher temperatures, shifting rainfall patterns, increased heat stress, reduced availability of water, and more frequent extreme weather, directly and indirectly impact livestock production and productivity. In Kenya, climate variability has a severe impact on livestock farming since it causes fluctuations in the quality and availability of pastures which in turn leads to a shortage of feed and nutritional deficiencies. There has been a 40% increase in Kenyan herders taking up crop farming due to the destruction of pastures as a result of erratic rainfall and frequent droughts, which has reduced the land available for grazing cattle.<sup>172</sup> Erratic rainfall and prolonged droughts reduce water sources, increasing the risk of dehydration and heat stress for livestock, which affects their health and productivity.<sup>173</sup> Severe droughts have caused Kenyan herders to lose 2.5 million cattle between 2020 and 2022, mostly while searching for pasture and water.<sup>174</sup> Moreover, extreme weather events such as floods can damage infrastructure, disrupt grazing areas, and increase the incidence of diseases, further exacerbating the challenges faced by livestock farmers. Limited access to quality inputs, veterinary services, and markets adversely affect farmers' ability to maintain herd health, productivity, and market competitiveness.<sup>175</sup>

Conversely, emissions from livestock rearing also contribute to climate variability. Methane released during enteric fermentation in ruminant digestive systems accounts for a substantial portion of agricultural emissions.<sup>176</sup> Methane is a potent greenhouse gas that contributes to global warming and increased climate variability by trapping heat in the atmosphere.<sup>177</sup> In Kenya, dairy cattle are responsible for about 12.3 MT CO<sub>2</sub> equivalent of emissions.<sup>178</sup> The GHG emissions profile comprises approximately 96% methane, 3% nitrous oxide, and 1% carbon dioxide.<sup>179</sup> Additionally, deforestation and changes in land-use associated with livestock farming contribute to carbon dioxide emissions, which further intensify the greenhouse effect and increase climate variability.<sup>180</sup> Increases in the greenhouse effect, lead to changes in weather patterns, and increases in extreme weather events, disrupting agricultural production systems. Climate change-induced stresses such as heatwaves, droughts, and disease outbreaks pose further challenges to livestock farming.

However, climate-smart strategies, such as improved genetics through breeding (which allow integrating traits such as heat tolerance, disease resistance, and adaptation to local environmental conditions) and optimizing nutrition and feed,

can significantly mitigate GHG emissions from livestock farming and improve farm productivity.

**Figure 37:** GenePlus staff testing the quality of milk



**Photo Courtesy :** Intellecap's team taken at GenePlus dairy cooperative near Eldoret, Kenya.

### 5.5.3 Business/Operating model of GenePlus Global Limited

Based in Nairobi, Kenya, GenePlus Global Limited was established in 2017 as an agricultural biotechnology company. The enterprise operates as a one-stop shop for livestock and dairy farmers, by offering various products to improve breeding practices and animal health. The enterprise also promotes climate-smart farm practices to enhance sustainable milk and beef production and improve farmers' incomes. It aims to address key challenges in livestock farming, such as low yields and high production costs through improved genetics, nutrition, and inputs.

The key products and services that GenePlus provides include:

- I. Dairy genetics/breeds
- II. Vaccinations
- III. Cold store services
- IV. Extension services

GenePlus has partnered with ABS Global Inc<sup>181</sup> (formerly American Breeders Service) and BOC Group Plc (British

Oxygen Company),<sup>182</sup> which supply it with bovine semen (referred to as 'genetic material') and liquid nitrogen, respectively. The enterprise procures genetic material in bulk and sells it to farmers on its platform.

GenePlus distributes its products to farmers through both B2B and B2C business models. In the B2B model, the enterprise sells dairy genetics in bulk to Artificial Insemination (AI) Technicians<sup>183</sup> in various regions, who then sell the product to dairy farmers at a profit. In the B2C model, introduced in 2023, GenePlus sells directly to farmers without intermediaries through a last-mile distribution model. Under this model dairy farmers can order quality inputs, including AI and vaccinations via a USSD code (\*483\*588#).

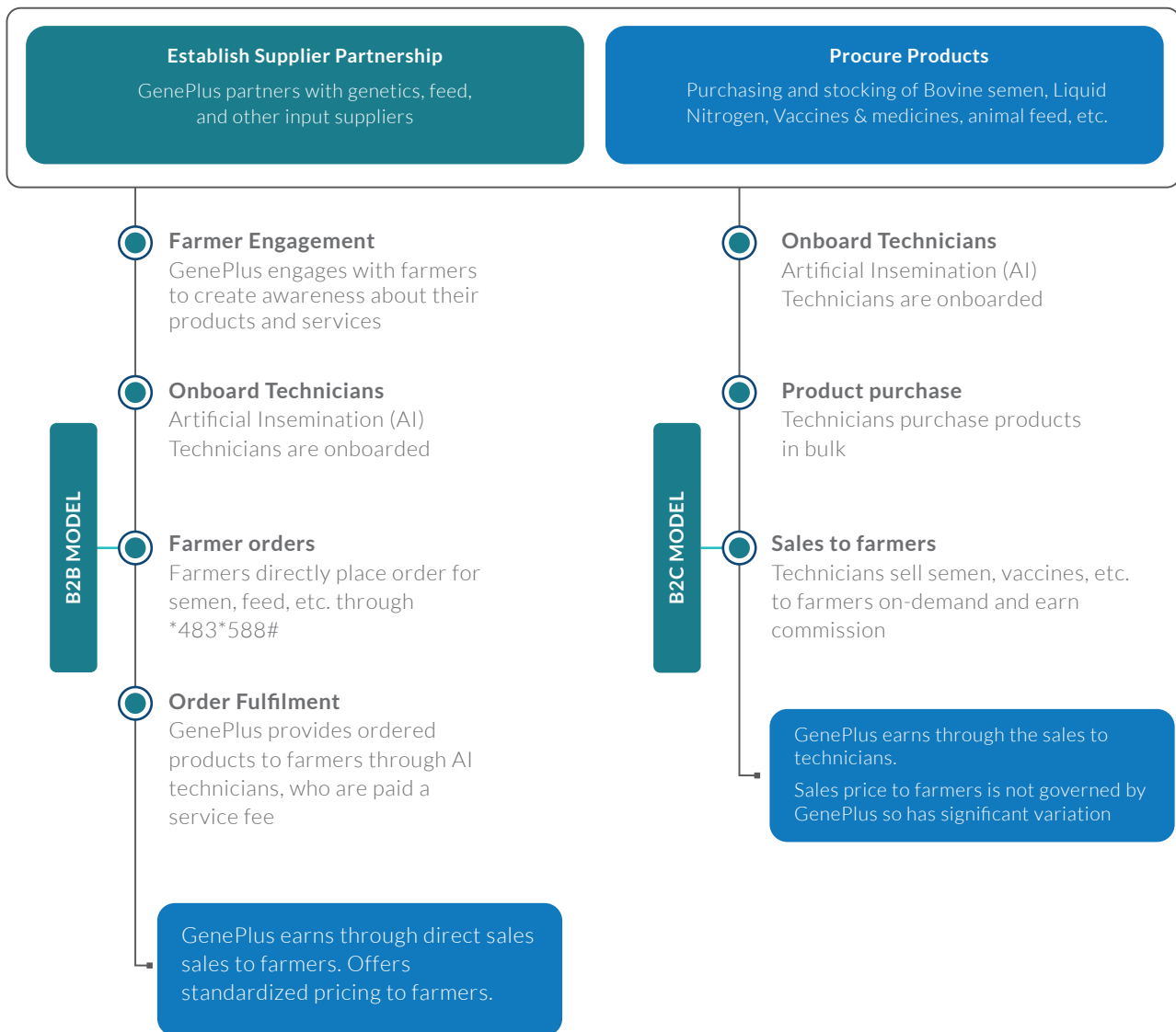
GenePlus also provides high-quality animal feed to meet the specific needs of livestock at different stages of their life cycle. The feed supplements animal grazing with essential nutrients to support high milk production. To maintain optimum animal health, GenePlus also offers disinfectants, and vaccinations and deworming solutions, as well as medicines for respiratory infections, diarrhea, mastitis and parasites like ticks and flies. Further, the enterprise provides farmers with extension services such as veterinary consultations to diagnose illnesses and recommend appropriate treatment plans.

GenePlus believes that by providing farmers with access to superior breeds, improved nutrition, and extension services, it can create social and environmental change. Superior breeds are also more climate resilient as they can produce up to 300% more milk per animal and lower GHG emissions. A study by Hawkins et al. (2022) in Tanzania indicated that breeds with high feed conversion efficiency can produce milk with up to 35% lower GHG emissions per liter compared to traditional livestock. Improved genetics and nutrition have the potential to reduce herd size by up to 20%. In Kenya, a study by FAO (2017) found that using a combination of interventions, like better genetics (through artificial insemination), improved herd health (vaccinations), and increased feed availability, can lower emission intensity by 21%–36%. Additionally, more efficient milk production can boost farmers' income by 300%, assuming all other factors are constant. Dairy farmers in the region often struggle to access good-quality breeds, leading to low milk production, high livestock mortality, and lower incomes. Climate change exacerbates these challenges, leading to reduced feed, malnourished livestock, and the spread of diseases. GenePlus believes that providing farmers with climate-smart solutions can help them cope with the adverse effects of climate change. GenePlus is also keen on increasing access to their products and services for women farmers who play a significant role in livestock rearing.



**Photo Courtesy :** Intellecap's team taken at GenePlus' milk collection centre near Eldoret, Kenya.

Figure 38: GenePlus's Business Model



In line with the overall objectives of the GLOW program, GenePlus was selected because of its potential to enable a low-carbon transition for the livestock farming ecosystem and for integrating women in the value chain. GenePlus' business model demonstrates the following potential benefits and impacts that align with the program's objectives:

- Easy access to climate-smart products through a mobile-based digital platform, which eliminates intermediaries and leads to fair prices and high-quality products.
- Serving and empowering more women dairy farmers by providing convenient access to inputs that do not require an intermediary, such as AI technicians and Agro vets.
- Training farmers on climate-smart practices and equipping them with the knowledge to adapt farming techniques, thereby enhancing food security and increasing their income.
- Mitigating the impact of climate change by providing farmers with access to superior, more climate resilient

livestock breeds, thereby leading to increased milk yield, higher disease tolerance, and reduced calving mortality rate.

- Mitigating the impact of climate change on Kenya's livestock farming and reducing GHG emissions per cow reared.

### 5.5.4 Support provided by the program to GenePlus

As part the program, the team conducted a gap assessment through discussions with GenePlus' customers and employees. Based on the gaps identified, a tailored Gender Action Plan and a comprehensive training/support program were designed for GenePlus Ltd. The GAP targeted three broad outcomes that are critical for GenePlus to accelerate its transition to low-carbon development and deepen positive outcomes toward women's economic empowerment:

1. Increased access to improved breeds for women farmers.

2. Increased access to information on climate-smart solutions for women farmers. A snapshot of GenePlus' GAP is outlined in the figure below.
3. Enhanced financial and operational efficiencies for the business along with gender integration.

**Figure 39:** A snapshot of GenePlus's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to improved breeds for women farmers</b>	<ol style="list-style-type: none"> <li>1. Market segmentation with a focus on women</li> <li>2. Revision of the customer database to capture the gender details of customers</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training.</li> <li>2. Development of a gendered business model</li> <li>3. Gendered Market segmentation</li> <li>4. Farmer database disaggregated by gender</li> </ol>	<ol style="list-style-type: none"> <li>1. 3,286 women farmers (50% of total farmers) mapped out for onboarding, training, and sales</li> <li>2. Identified 8 dairy cooperatives to partner with while linking more of their women members with Geneplus' products</li> </ol>
<b>Increased access to information on climate-smart solutions for women farmers</b>	<ol style="list-style-type: none"> <li>1. Develop marketing campaigns targeting women</li> <li>2. Schedule farmer field visits at favorable times to encourage the participation of women farmers</li> </ol>	<ol style="list-style-type: none"> <li>1. Developed marketing content targeting women customers</li> <li>2. Activated online marketing channels to engage with customers</li> <li>3. Schedule of farmer training</li> </ol>	<ol style="list-style-type: none"> <li>1. Scheduled 50% of the 12 social media posts per month targeting women customers</li> <li>2. 7,424 women trained through farmer field days and exhibitions</li> <li>3. 12,763 women received training on good agricultural practices</li> </ol>
<b>Enhanced financial and operational efficiencies for the business along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Refine business model to enhance aspects needed to scale</li> </ol>	<ol style="list-style-type: none"> <li>1. Elect Gender Champion</li> <li>2. Investment readiness training</li> <li>3. Pitch preparation</li> <li>4. Pitch day</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender champion elected, leading to sensitization of staff</li> <li>2. Pitched to a jury with the prospect of receiving funding</li> <li>3. Refined sales and marketing plan to reach 6,572 farmers</li> </ol>

### Gender mainstreaming TA support interventions

To mainstream gender within the business, the following activities were undertaken to support GenePlus in its journey towards greater gender inclusion.

1. Increased access to improved breeds for women farmers through market segmentation

#### Customer segmentation with a focus on women

Based on recommendations outlined in the GAP, a market sizing and customer segmentation exercise was conducted in Eldoret and Embu, GenePlus' priority counties, to increase access to improved breeds for women farmers. As part of this exercise, GenePlus outlined the Total Addressable Market (TAM) and Share of Market (SOM) for its products in the domestic market. Further, the program supported the enterprise in identifying customer segments—especially male and female—across groups such as dairy cooperatives, and individual farmers.

As a result, 8 dairy farmer cooperatives were identified based

on their interest in linking farmers to products and engaging more women farmers. These cooperatives were New KCC, Tuiyo, Kwanjara, Mburugu, Kongeluk, Springfield, Musemwa, and Chemoset Dairy Farmers Cooperative Society (DFCS). A total of 3,286 farmers were targeted, of which 49% were women.



**Photo Courtesy :** Intellectap's team taken during interactions with GenePlus farmers near Eldoret, Kenya



**Table 17:** Dairy cooperatives identified by GenePlus

Cooperative	Male farmers	Female farmers	Total
New KCC Runyenjes	42	65	107
Tuiyo DFCS	248	262	510
Kwanjara DFCS	385	325	710
Mburugu DFCS	738	764	1502
Kongeluk DFCS	46	130	176
Springfield DFCS	75	58	133
Musemwa Mabusu DFCS	60	60	120
Chemaset DFCS	16	12	28
<b>Total</b>	<b>1676</b>	<b>1610</b>	<b>3286</b>

Source: GenePlus

Based on gender-disaggregated farmer data, GenePlus' in partnership with the 8 cooperatives, is developing a targeted marketing and outreach strategy tailored to the specific needs and preferences of women farmers.

## 2. Increased access to information on climate-smart solutions for women farmers

### Develop marketing campaigns targeting women

To increase access to information on climate-smart solutions for women farmers, the GAP recommended launching targeted marketing campaigns with tailored content, and active online engagement. The GAP recommended that Geneplus' marketing campaigns focus on reaching women farmers in its priority regions Eldoret and Embu. These campaigns utilized targeted messaging and communication through WhatsApp and Facebook to reach women farmers, addressing their unique information and knowledge needs. GenePlus' marketing content was designed to resonate with women. For instance, GenePlus spotlighted stories of successful women farmers benefiting from the enterprise's products. Additionally, GenePlus ensured that 50% of its 12 monthly social media posts targeted women customers, ensuring they receive relevant, relatable, and engaging information.

### Farmer training and field days to enhance access to information

GenePlus used training sessions and farmer field days as key opportunities to provide women farmers with the knowledge and skills needed to adopt climate-smart solutions. The training covered the benefits of genetic improvements and AI such as increasing milk production and reducing mortality and best practices in animal husbandry, including health, feeding, and disease prevention techniques. To ensure the high

participation of women, the GAP recommended scheduling the training sessions and farmer field days, at convenient times based on the availability of women farmers. Since enrolling in the program, GenePlus has trained 7,425 women through weekly sessions in different regions.

By customizing marketing content and being more gender-sensitive in farmer engagements, GenePlus aims empower women with the knowledge and solutions required to cope with climate change-related challenges. GenePlus seeks to establish a supportive and inclusive online community where women farmers can access information, share ideas, and collaborate on sustainable agricultural practices.

## 3. Enhanced financial and operational efficiencies for the business along with gender integration

### Appoint a Gender Champion to drive gender outcomes for the business

To increase women farmers' access to improved dairy breeds, GenePlus, with support from Intellectap, raised internal awareness about gender inclusion and the benefits of gender mainstreaming. Intellectap, brought on board an external gender expert to train GenePlus' employees on the basics of gender inclusion.

In addition, Intellectap provided advisory support through one-on-one brainstorming sessions on how to integrate women into the business strategy. GenePlus also appointed a Gender Champion from among its employees to ensure that the business remains gender inclusive and prioritizes gender integration as part of its growth plans. Throughout the program, Intellectap engaged with the Gender Champion via one-on-one brainstorming sessions to help them integrate gender considerations into the enterprise's business strategy.

## Business efficiency interventions

GenePlus focused on improving financial and operational efficiency and integrating gender considerations based on a needs assessment.

### 4. Enhanced financial and operational efficiencies for the business with gender integration

#### Development of a last-mile distribution model for the B2C business

The GAP prioritized the development of a last-mile distribution model to complement Geneplus' existing B2B model and expand farmer reach. Inefficient logistics and distribution characterized the B2B model, leading to unfulfilled market demand and high prices for consumers. In the improved last-mile distribution model, farmers are able to order inputs directly from GenePlus using a USSD code (\*483\*588#). GenePlus then fulfils the order through AI technicians, who act as the enterprise's on-ground agents. This model allows GenePlus to manage order fulfillment and product pricing, ensuring demand is met at competitive prices. AI technicians, serving as agents, earn a commission for their services, unlike in the previous B2B model, where they purchased stock in bulk from GenePlus and sold them for a profit.

GenePlus also modified its operating model with key partners, such as genetic material and liquid nitrogen suppliers, AI technicians, animal feed suppliers, research institutions, and financial institutions to implement the new last-mile model effectively.

#### Investor readiness and pitch preparation

Finally, as part of business efficiency interventions, GenePlus identified the financial resources needed to support marketing and sales activities and to scale its last-mile distribution model, particularly to engage more women farmers. After identifying these needs, the GAP highlighted the importance of identifying potential investors and refining GenePlus' pitch deck to appeal to Gender Lens investors.

To support fundraising, Intellecip hosted a Pitch Day in February 2024 where GenePlus and other enterprises from the program pitched to potential investors and received feedback. Six capital providers from East Africa, representing both debt and equity, including Root Capital, Equity Bank, Goodwell Investments, Aavishkaar Capital, Founders Factory, and Kua Ventures were present. Through this exercise, and based on the feedback received, GenePlus refined its pitch deck by:

1. **Using less technical language and simplifying the pitch to make it easier to understand GenePlus' business model.**
2. **Highlighting affordability and accessibility as a key value proposition for farmers.**
3. **Communicating GenePlus' potential to scale to justify its financial ask.**

### 4. Showcasing the enterprise's economic, social, and environmental impact to attract investor interest.

This investor readiness boosted GenePlus' confidence in its scalability and long-term viability while also refining its pitch to demonstrate resource allocation and utilization plans and align with investor priorities. Ultimately this helped the enterprise secure the financing required to scale its efforts.

Figure 40: Intellecip team with GenePlus' technicians



Photo Courtesy : Intellecip's team taken at GenePlus branch office

## 5.5.5 Learnings across the key research questions

**Research Question 1: What are the most successful and impactful climate-smart solutions that show the impact potential of PSEs in creating women's economic empowerment and what factors contributed to their success?**

**Targeted and tailored access to information on climate-smart solutions enhances women's productivity and efficiency in farming.**

Private sector businesses such as GenePlus have the potential to significantly contribute to women's economic empowerment in the agricultural sector by linking advanced agricultural technologies and local farming practices. By connecting women farmers with improved breeding techniques, sustainable feed management, and disease control measures, such PSEs help optimize livestock production, leading to increased yields and income generation. Access to tailored resources and training on good agricultural practices further enhances efficiency and productivity. Studies conducted by GenePlus indicate that cows inseminated with their genetic material produce 24 litres of milk per day on average, as compared to 8 litres per day without GenePlus breeds.<sup>184</sup> This 300% increase in milk production is achieved over 33 months and results in

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a proportionate increase in income for dairy farmers. The higher yields and income improve the economic status and livelihoods of women dairy farmers, empowering them to save more, invest in livestock farming, and participate more actively in value chain activities such as marketing milk and managing dairy co-operatives.

Additionally, climate-smart solutions empower women to diversify their income sources and actively participate in value-added activities along the agricultural value chain. For instance, GenePlus enables its women farmers to expand their livestock business and explore new market opportunities by offering better quality meat from its improved breeds.

**Research Question 2: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

### **Enhancing agricultural productivity leads to reduced gender disparities**

The impact of businesses like GenePlus extends beyond individual women farmers to their households and communities. GenePlus has reported a 21%-30% increase in the number of women farmers and AI technicians because of targeted training and engagement strategies recommended by the Gender Action Plan. By the end of the TA support, GenePlus was working with 12,000 women farmers, up from 1,610 women farmers at the start of the program. The increased participation and economic empowerment of women in agriculture have ripple effects throughout households and communities. With better access to resources and opportunities, women can contribute more significantly to household incomes, improving living standards and enhancing family well-being. Increased incomes for women also leads to greater investments in children's education, and the household's health and nutrition, enhancing long-term social outcomes for future generations. Additionally, as women become more economically empowered, communities experience stronger social cohesion, reduced gender disparities, and greater resilience to economic shocks. Women working with GenePlus reported better treatment from last-mile partners due to their improved financial status. By promoting gender-inclusive policies and practices, such as flexible payment options for women through cooperative check-off<sup>185</sup>, GenePlus plays a crucial role in advancing broader social and economic development objectives, fostering sustainable growth and driving prosperity in rural areas.

The active involvement of women farmers in community-based initiatives and farmer field days by GenePlus is creating opportunities for women to voice their opinions and share their knowledge within their communities. Through participation in farmer cooperatives, self-help groups, and community-based organizations, women farmers are empowered to collectively advocate for their rights, demand access to resources, and be recognized as equal partners in agricultural development, ultimately driving positive social and economic change in their communities.

**Research Question 3: What is the business case for investments in climate-smart businesses to increase scale and deepen gender and climate impact?**

### **Channeling capital to enterprises such as GenePlus can enhance economic outcomes for women, while positively impacting the environment**

Investing in climate-smart businesses, such as GenePlus, promotes innovative solutions to pressing environmental challenges while generating economic returns. GenePlus has witnessed a 40% increase in revenues since 2021, establishing its potential for growth and demonstrating its investment readiness.

Investing in climate-smart businesses that integrate gender-sensitive approaches can empower women in the development of sustainable agriculture. GenePlus provides training and support to women farmers, helping them access knowledge, and improved breeds, as well as adopt climate-resilient practices. This leads to increased dairy productivity while also reducing the GHG emissions. By the end of the program, GenePlus was working with dairy cooperatives comprising over 12000 women farmers, and offering them the potential to increase their income by up to 300%.<sup>186</sup> The resultant income growth is expected to boost women's confidence and visibility, encouraging them to take up leadership roles in their communities, as well as gain a stronger voice in agricultural and household decision-making.

**Research Question 4: What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale such climate-smart PSEs to enhance their impact on women?**

### **Implementing effective last-mile distribution and leveraging digital platforms are essential for promoting access for women and sustainability for the business**

Scaling a business model like GenePlus requires a combination of strategic interventions focused on market expansion, last-mile distribution, operational efficiency, and fostering innovation and collaboration. First, to achieve scale, it is critical to finetune last-mile distribution models to ensure availability, affordability, and accessibility of products for end customers. These models may include partnering with agro-dealers, utilizing mobile-based platforms such as iShamba, DigiFarm, and working with rural agri-entrepreneurs such as VBAs (by AGRA), Farmers Hub (by Syngenta Foundation) and Farmer Service Centers (by Farm to Market Alliance). Second, it is imperative to engage with strategic partners, such as cooperatives, AI service providers, and financial institutions, and leverage their networks and resources to reach more farmers. Finally, digital platforms are crucial for expanding access to climate-smart solutions and reaching a wide customer base. By leveraging digital technologies, businesses can increase their market penetration and effectively promote sustainable products and services to a global audience.

# 5.6 USOMI

## Transforming Agriculture Through Aggregation In Kenya

### 5.6.1 Sectoral overview – Agricultural aggregation in Kenya

Kenya's agricultural landscape is predominantly small-scale, with most farms being family-owned. These smallholder farmers contribute to approximately 75%<sup>187</sup> of the total crop output and are regarded as the engine for rural growth and development. According to the Kenya Agricultural Sector Transformation and Growth Strategy (2019-2029),<sup>188</sup> there are 8.6 million smallholder farmers, representing approximately 4.5 million farming households. These farmers play a crucial role in ensuring food security and sustaining livelihoods across the country.<sup>189</sup>

Agriculture in Kenya faces several challenges, including climate variability,<sup>190</sup> limited access to markets and quality inputs. Climate variability affects food production by causing erratic weather patterns, which leads to crop failures, reduced yields, and an increased vulnerability to pests and diseases. In 2022, drought in most parts of Kenya resulted in a 7% decrease in maize production (the equivalent of 2.4 million bags), a 3% decrease in horticultural export (the equivalent of 13,500 MT), and a 6% decrease in the quantity of milk marketed (as a result of fodder scarcity for livestock).<sup>191</sup> This led to food shortages, price fluctuations, and decreased access to nutritious food, exacerbating food insecurity for vulnerable populations.

The agricultural sector in Kenya is a major contributor to climate variability as it generates 58.6% of the country's greenhouse gas emissions.<sup>192</sup> Some agricultural practices that result in high carbon emissions include tillage, fertilizer use, rice cultivation, livestock production, burning of crop residues, deforestation, and changes in land use change.<sup>193</sup> Livestock farming releases methane and nitrous oxide, while using fertilizers and burning crop residues release nitrous oxide<sup>194</sup> and carbon dioxide, respectively. Energy use in agriculture contributes to carbon emissions through the combustion of fossil fuels. However, low-carbon emissions strategies, such as agroforestry, conservation agriculture, and organic farming, can play a crucial role in mitigating greenhouse gas emissions. These strategies increase carbon sequestration in soils, reduce the use of synthetic fertilizers and pesticides, and promote the conservation of biodiversity.<sup>195</sup>

Historically, smallholder farmers in Kenya have encountered difficulties in accessing inputs for farming and markets for their produce due to fragmented production systems and inadequate infrastructure.<sup>196</sup> However, over the years, emerging aggregation models have played a crucial role in addressing these challenges. While cooperative models have

existed for a long time, over the last two decades, newer aggregation models have emerged in response to market transformations.<sup>197</sup> In Kenya, several agricultural value chains utilize aggregation models but the most common ones focus on higher-value horticulture crops, livestock, dairy, and cash crops such as tea and coffee.



Photo Courtesy : Stock photo.



Highlighted below are some aggregation models commonly used in Kenya:

**Table 18:** Aggregation models in Kenya

<b>Producer cooperatives</b>	These are associations formed by farmers to purchase inputs, collectively market their produce and access various services such as training and financing. Pooling and collectively marketing agricultural produce allows farmers to achieve economies of scale, negotiate better prices, access larger markets, and reduce transaction costs.
<b>Farmer Producer Organizations (FPOs)</b>	Similar to cooperatives, FPOs are formed by farmers to collectively engage in production, processing, and marketing activities. FPOs often receive capacity building support from government agencies, NGOs, or private sector organizations.
<b>Farmer groups</b>	Farmers can negotiate better prices for their agricultural produce, inputs, and services by coming together as a group. Collective bargaining helps them achieve fairer terms while transacting with buyers, suppliers, and other market players.
<b>Outgrower schemes</b>	These involve contractual partnerships between smallholder farmers and agribusiness firms under which farmers grow crops on behalf of a company. The company provides inputs, technical support, and market access, while farmers supply the produce according to agreed-upon terms.
<b>Aggregation centers</b>	Aggregation centers are facilities where farmers aggregate their produce before it is sold to buyers. They can be owned and managed by farmer groups, private companies, or government entities, and play a crucial role in reducing post-harvest losses, ensuring quality control, and facilitating market linkages.
<b>Community-Based Organizations (CBOs)</b>	These are grassroots groups formed by farmers within a community to address common challenges related to agriculture. They often focus on activities such as collective farming, natural resource management, and value addition.
<b>Contract farming</b>	This involves formal agreements between farmers and buyers (often agribusiness firms or exporters) for the production and supply of agricultural commodities. The buyer provides inputs, technical assistance, and sometimes financial support, while farmers commit to delivering the agreed-upon quantity and quality of produce.

## 5.6.2 Challenges faced by the agricultural aggregation sector in Kenya

### Sector-level challenges

**Logistical challenges arising from the fragmentation within the sector:** Research indicates that 28% of agricultural production value in Kenya is allocated to logistics. This is primarily because numerous small-scale producers are located in different regions, making coordination and aggregation of production challenging. As a result, inefficiencies and higher transaction costs are incurred.<sup>198</sup>

**Limited access to digital tools:** Kenya has the highest number of digital agriculture services in Africa; however, only 20%-30% of Kenyan farmers have adopted digital agricultural technologies. Despite efforts to improve rural connectivity, internet penetration remains low (30%). A lot of rural areas in Kenya lack basic infrastructure such as electricity and roads,

which are essential for internet connectivity.<sup>199</sup> Approximately 50% of the farmers surveyed by Safaricom identified the cost of devices and related expenses as additional obstacles to the widespread adoption of digital agricultural tools.<sup>200</sup>

- a. **The complex nature of agricultural markets:** Kenya's agricultural markets are characterized by formal and informal exchanges, entrenched structures, and uneven power dynamics among various stakeholders. This complexity makes it difficult to implement aggregation models, which require end-to-end coordination and integration across the value chain.
- b. **Heterogeneity in the quality of agricultural products:** Due to differences in farming practices, post-harvest handling, and storage conditions, the quality of agricultural products varies. Without standardized grading and certification systems, aggregators struggle to ensure consistent product quality, undermining their ability to access higher-value markets and command premium prices.

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**Infrastructure:** Despite the decline in Kenya's poor road networks from 59% to 37%, most poorly maintained roads are in rural areas.<sup>201</sup> Moreover, Kenya's vision of bringing every Kenyan within two kilometers of an all-weather road has not been realized, thus making it difficult and costly for smallholder farmers to transport and store their produce. The limited availability of reliable electricity, storage facilities, and cold chain infrastructure in many rural areas makes it difficult for farmers to aggregate and store their produce.<sup>202</sup>

### Gender-related challenges

**Access to markets and value chain:** Women farmers face challenges in accessing markets due to their limited mobility and lack of market information, as well as discriminatory practices, such as being offered lower prices for their produce. A 2022 study by the International Food Policy Research Institute (IFPRI) on asymmetric information and the gender price gap found that women farmers in the same village in Kenya sell their crops for up to 20% less than male farmers.<sup>203</sup> These gender inequalities in value chain dynamics, also limit women's participation in, and benefits from aggregation initiatives along the agricultural value chain.

**Unequal access to resources in comparison to their male counterparts:** The challenges faced by women are particularly pronounced in agricultural aggregation models in Kenya. Women smallholder farmers often have limited access to, and control over, productive resources such as land, water, and financing. This unequal access to resources, coupled with limited participation in agricultural decision-making and market engagement as a result of social and cultural norms, creates significant barriers for women to effectively participate in, and benefit from, aggregation models.<sup>204</sup>

**Knowledge and decision making:** Gender disparities in extension services limit women's access to information and technical knowledge. A 2008 study conducted in Western Kenya found that only 27.5% of women had access to extension services compared to 47.5% of men.<sup>205</sup> A similar trend can be found in other parts of Kenya as well. This limitation negatively affects the awareness, understanding and adoption of innovative practices such as climate-smart agriculture. Moreover, patriarchal norms and cultural attitudes often marginalize women's voices and limit their decision-making authority within households and communities, weakening their ability to influence agricultural practices and investment decisions.

**Labor and time burden:** According to a 2019 Household Care survey by Oxfam, women in Kenya undertake 83% of unpaid care work compared to 17% undertaken by men. The disproportionate burden of unpaid care work limits women's participation in agricultural activities by reducing the time and energy available for them to engage in and acquire knowledge about climate-smart agricultural practices. Moreover, the gendered division of labor in agriculture often results in women being responsible for labor-intensive tasks, such as land preparation, planting, weeding, and harvesting. Since these tasks require significant time and energy, they limit women's capacity to engage in climate-smart agricultural activities.<sup>206</sup>

### Climate change-related challenges

- a. **Unpredictable planting season due to erratic weather patterns:** Climate change, through shifts in temperature and rainfall patterns, alters growing seasons significantly. Consequently, smallholder farmers find it difficult to time planting and harvesting, leading to mismatches in supply and demand. This also makes it difficult for aggregator companies to ensure consistent supply to meet demand, causing inconsistencies in the bulk aggregation of smallholder farmers' produce. Aggregator companies' proven ability to adapt their scheduling and logistics to accommodate these changes is a source of reassurance for farmers. However, this comes at the cost of increased logistics and planning expenses.
- b. **Soil Degradation:** Research shows that climate change intensifies soil erosion, desertification, and soil fertility loss, which leads to high input costs and reduced agricultural productivity for farmers. Aggregator companies may struggle to maintain the quality and quantity of produce needed to meet market demands. To address this, aggregators need to help farmers increase their agricultural productivity by providing them with inputs that can improve soil fertility. Furthermore, they need to improve their extension services to ensure that smallholder farmers are well-trained in how to enhance soil fertility.

### 5.6.3 Usomi's Business/Operating Model

Usomi Ltd is a Nairobi-based agritech company that implements a digitally enabled aggregation model. Operational since 2017, the enterprise offers aggregation services. More than 9,000 smallholder farmers in the western part of Kenya have utilized Usomi's services to access inputs for production and formal markets for their produce. The business focuses on finger millet, beans, and groundnut value chains. Usomi's business model integrates climate-smart technologies such as drought-resilient seeds and agroecological farming practices, promoting sustainable farming practices among its farmer networks.

Usomi provides the following products and services to farmers:

- I. **Aggregation of agri-inputs:** Usomi gathers and aggregates farmers' input needs, feeds them into the system and then uses this information to source inputs in bulk from input suppliers. The inputs provided to farmers include high-yielding drought-tolerant seeds, chicks, veterinary services, vaccines, and other agricultural necessities, which enable farmers to optimize their crop and livestock production.
- II. **Market linkages for its grain value chains:** Usomi facilitates market linkages for its various value chains, such as finger millet and fertilizer. Through its platform, Usomi aggregates farmers' produce and sells them to its buyers in the system, such as restaurants, supermarkets,

and other consumers who purchase produce in large quantities.

- III. **Enabling market linkages for poultry:** Usomi connects poultry farmers, particularly those raising indigenous chicken, with local buyers and other domestic markets, thereby enhancing income generation and livelihoods within rural communities.

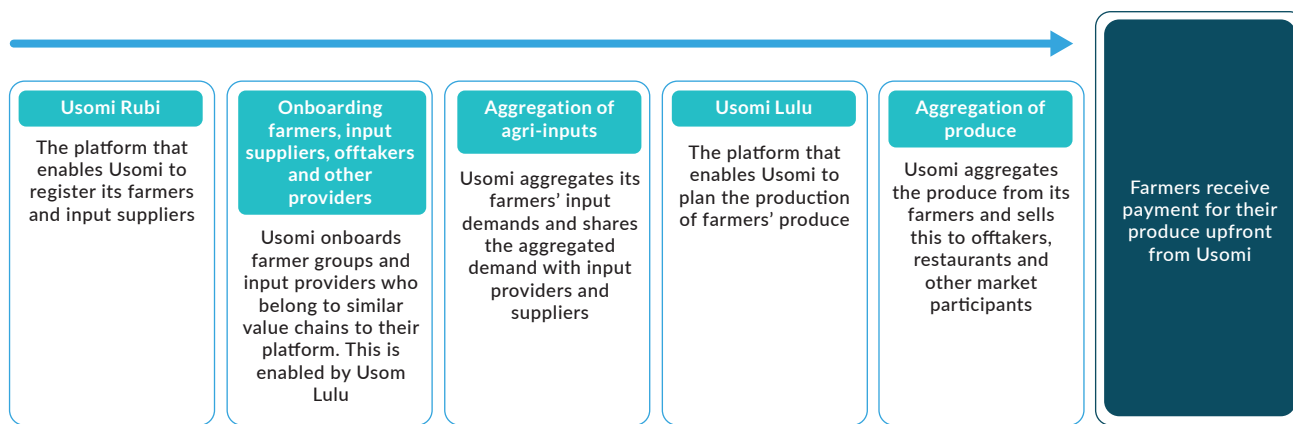
### Box 10. Usomi's agritech platforms

Usomi operates two distinct digital platforms, Usomi Lulu and Usomi Rubi, to improve the delivery of products and services. Usomi Lulu facilitates the registration of farmers and collects their production details, including farmer profiles and crops they grow. The platform is set to expand its capabilities to include weather data dissemination, e-extension services, and data-driven insights. Usomi Rubi, used internally by Usomi focuses on production planning to meet market demands. It enables the monitoring of aggregated production projections and plays a key role in market engagement. Usomi Rubi is expected to evolve into a platform that links farmers directly to markets.



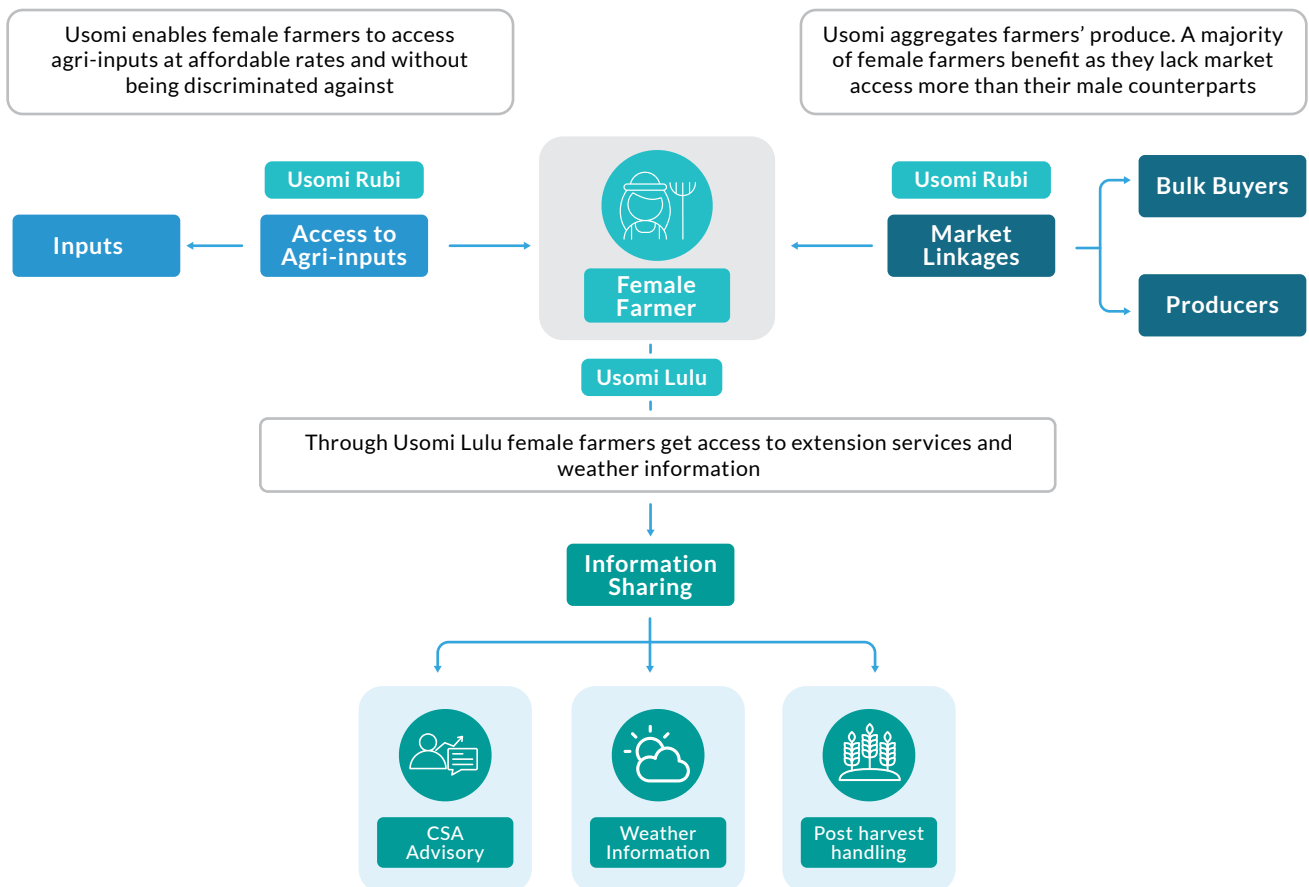
Photo Courtesy : Intellecip's team taken at Usomi head office in Nairobi, Kenya.

Figure 41: Usomi's business model



Usomi's model focuses on reducing the impact of climate change on Kenya's agricultural sector by empowering women economically. The company involves women farmers in its programs, providing them with customized training and capacity-building opportunities. It promotes sustainable farming practices and offers affordable drought-tolerant seeds to women farmers. Additionally, by purchasing produce from farmers and delivering it to more organized and reliable markets, Usomi ensures that farmers sell their produce at consistent and competitive prices, contributing to their economic empowerment, especially for most women farmers.

Figure 42: Gender mainstreaming in Usomi's business model



In line with the overall objectives of the GLOW program, Usomi was selected because of its potential for enabling a low-carbon transition of the agricultural ecosystem and integrating women across the grain and legumes value chain. Its business model demonstrates the following potential benefits and impacts that align with the program's objectives:

- a. **Climate change mitigation and environmental protection:** By providing access to climate-resilient inputs like drought-tolerant millet seeds, Usomi contributes to increased yield stability and resource efficiency, crucial adaptations for regions facing climate variability.
- b. **Competitive prices for farmers' produce:** Similarly, by sourcing produce from farmers and supplying it to more structured and reliable markets, Usomi can obtain consistent and competitive prices for farmers. In this way, Usomi contributes to economically empowering farmers, the majority of whom are women, and by extension, improving the livelihood of the rural communities.
- c. **Improved livelihoods and women's economic empowerment:** Access to high-quality, affordable agri-inputs and market linkages leads to increased yields and incomes, contributing to improved livelihoods. Furthermore, the aggregation model has the potential to increase the participation of women farmers in adopting CSA, thereby empowering them.

### 5.6.4 Support Provided by the Program to Usomi

Through a tailored Gender Action Plan and a comprehensive training program designed based on an in-depth, on-ground needs assessment, Intellectap supported Usomi in addressing specific gender gaps and business challenges. The GAP targeted three broad outcomes that are critical for Usomi to accelerate its transition to low-carbon development and deepen positive outcomes for women's economic empowerment. Below are the outcomes:

- **Increased access to climate-smart agricultural inputs for women farmers.**
- **Increased access to markets for women farmers.**
- **Enhanced financial and operational efficiencies for the business along with gender integration.**



**Figure 43:** A snapshot of Usomi's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased access to climate-smart agricultural inputs for women farmers</b>	<ol style="list-style-type: none"> <li>1. Customer mapping exercise</li> <li>2. Developing a gender-focused marketing and sales plan</li> <li>3. Evaluate farmer engagement</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Revamped marketing and sales strategy</li> </ol>	<ol style="list-style-type: none"> <li>1. A disaggregated customer database</li> <li>2. Development of Usomi's female customer profile</li> </ol>
<b>Increasing access to markets for women farmers</b>	<ol style="list-style-type: none"> <li>1. Identification of partners</li> <li>2. Evaluation of access to market strategies</li> <li>3. Post-harvest management interventions</li> </ol>	<ol style="list-style-type: none"> <li>1. Key stakeholder mapping exercise</li> <li>2. Research on access to market information for female farmers</li> <li>3. Evaluation of possible post management interventions</li> </ol>	<ol style="list-style-type: none"> <li>1. Pilot of post-management activities for women farmers</li> <li>2. Recommendations for Usomi's platform</li> <li>3. List of potential partners</li> </ol>
<b>Enhanced financial and operational efficiencies for the business along with gender integration</b>	<ol style="list-style-type: none"> <li>1. Business line prioritization</li> <li>2. Evaluation of Usomi's key resources</li> <li>3. Benchmarking of aggregation models</li> </ol>	<ol style="list-style-type: none"> <li>1. Development of a business model canvas</li> <li>2. Benchmarking exercise</li> <li>3. Financial model and pitch deck development</li> </ol>	<ol style="list-style-type: none"> <li>1. A refined BMC</li> <li>2. A refined financial model and pitch deck</li> <li>3. Niche focus on grain and legume aggregation</li> </ol>

### Gender mainstreaming TA support interventions

1. Increased access to climate-smart agricultural inputs for women farmers

#### Customer mapping to develop a better understanding of the needs of women farmers

Prior to engaging with the program, Usomi segmented its farmers by their geographical location i.e. Busia region, Siaya region etc. and by the type of crop they planted. This segmentation led to broad and generalized product and service delivery by Usomi. Through the gender mainstreaming and customer mapping support provided by the program, Usomi initiated the collection of gender-disaggregated data. Intellecap further provided Usomi with case studies on how to segregate its customer database by gender and other fields, to enhance the enterprise's understanding of the needs of its female customers. Based on this revised method of data collection, Usomi discovered that 65% (approximately 6,500) of its farmers were women. However, only 25% of the women farmers that Usomi works with have adopted CSA practices compared to 55% of male farmers. Furthermore, Usomi's data on training revealed that a majority of attendees were men, indicating that more male farmers consume CSA training compared to female farmers.

As a result of this data segregation exercise, Usomi surveyed 1,500 customers, of which 840 were women farmers (56%).

By developing a survey aimed at understanding their female customers better, Usomi developed a profile of their female customers as shown in Box 11 below. This profile was used to develop customized marketing and sales outreach programs as well as provide other products and services, specifically aimed at to serving its female farmers.

#### Box 11. Profile of Usomi's female farmer customer

- **Age:** 18-60 years, with a median age of 35 years.
- **Marital status:** Over 85% are married with 3-5 school-going children.
- **Economic activity:** Mainly farming the family land (approximately 2 acres), selling about 50% of their produce which generates 70% of their household income.
- **Access to markets:** Sells their produce to brokers and purchases inputs from the agrovet shops in the town centers.
- **Extensions:** A majority receive adhoc and unstructured extension services from multiple input suppliers and extension officers.

- **Technical capacity:** Basic farming skills and minimal business development knowledge.
- **Farm engagement and decision making:** Largely involved in labor intense activities, with limited participation in decision making such as which inputs to use and markets to sell in.

### Marketing and sales activities to reach more women farmers

At the beginning of the program, Usomi's promotional and training activities were not effectively tailored for women farmers. Through the program's training and advisory support, Usomi developed a marketing and sales strategy that integrated gender considerations to advance gender integration in the enterprise value chain. The marketing strategy and channels targeted women farmers using images with women farmers and inclusive and gender-neutral language. The enterprise also trained its sales team on gender biases and inclusivity. Usomi also used channels that were more accessible to women such as WhatsApp and SMS.

### Engaging female farmers through demo plots and townhalls

Usomi's GAP highlighted the need for regular, affordable training for its women farmers to ensure effective adoption of its solutions. The program proposed using a female farmer's plot as a demo plot to encourage greater participation and engagement among its female farmers. The demo plot would showcase practical CSA techniques, such as improving soil health using Usomi's inputs. The program also proposed that female agronomists or experienced female farmers lead the demo to create a more relatable and motivating learning experience. Additionally, the program suggested that Usomi organize interactive training sessions and workshops such as townhall meetings for their female farmers. Such interactions provide hands-on experience and promote peer learning among women farmers. By offering access to necessary inputs and continuous support through demos and workshops, Usomi can effectively empower female farmers to adopt and sustain these climate-smart practices. Monitoring progress and providing feedback will further enhance the success of these initiatives.

## 2. Increasing access to markets for women farmers

### Identifying partners to promote the adoption of CSA practices among its women farmer customers

Usomi's GAP highlighted the need to identify new and existing partners that could support the enterprise in increasing women farmers' access to markets. Drawing on insights about Usomi's women customers (as illustrated in section 6.1.1.1); the program assisted Usomi in identifying various potential collaborators to enhance the visibility of their female farmers in the market. As part of its strategic initiative to expand services for women, Usomi undertook a thorough assessment to identify key partners who could complement its

existing offerings. Intellectap provided Usomi with a structured framework to categorize partnerships that would enhance its value proposition. These partnerships included suppliers of climate-smart solutions such as irrigation systems and storage bags, as well as financing institutions, and access to more competitive markets.

Usomi identified 11 potential partners and initiated discussions on potential collaboration and partnership agreements. Among the partners identified were financial service providers such as Rabo Bank and local MFIs, seed suppliers such as YARI, organic and fertilizer suppliers, and extension service providers. In the short term, Usomi plans to engage with these partners to support women farmers by providing capital, market information, and extension services, to improve market access.

### Improving access to market information

Usomi's GAP highlighted that its platform for providing market linkages, Usomi Rubi, could be improved to ensure that more women access market information promptly. The program advised Usomi to add features in Usomi Rubi that would:

- Provide market prices to its farmers in a simple manner using SMSs, particularly for their women farmers.
- Provide regular updates on market trends to assist its female farmers in making informed decisions, especially regarding crop choices and the best times to sell.
- Provide information on relevant events and forums where women farmers could meet potential market stakeholders

### Supporting female farmers in post-harvesting

Usomi's GAP emphasized the importance of supporting women farmers in managing post-harvest activities to reduce spoilage and waste, as well as improving their access to markets. To achieve this, Usomi identified 8 women farmer groups in Kenya's Busia and Siaya regions and launched a pilot program to assist them with post-harvest activities. The pilot involved helping the farmer groups use asset financing to purchase threshing and winnowing machines to enable farmers, especially finger-millet farmers, preserve the quality of their produce. Usomi plans to use the data collected from the pilot to compare market access for women with access to post-harvest machines to those without such access. Insights gained from this exercise will serve as the basis for extending the initiative to other women farmers in Usomi's database.

## Business efficiency interventions

1. Enhanced financial and operational efficiencies for the business along with gender integration

### Prioritization of Usomi's business Lines

Through the WEE program, Intellectap supported Usomi in analyzing its multiple business lines and prioritizing those with the greatest potential for growth. Using a prioritization framework that analyzed factors such as market demand,

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profitability, core competencies, competitive landscape, risk management, and supply chain complexities, Intellectap and Usomi identified its grain and legume aggregation business as a priority. This business line was selected as it has potential demand, profitability, limited competition, and manageable risks. Usomi has the skills and expertise needed to excel in grain and legume aggregation and has developed innovative solutions to address supply chain complexities, linking farmers to climate-smart solutions and competitive markets.

### **An Assessment of Usomi's core resources to improve its operations and achieve its long-term goals**

Usomi's GAP highlighted four critical resources that the enterprise possessed: a skilled workforce, an aggregation infrastructure, a digital platform, and financial capacity. Through the development of a business model canvas (BMC), the GAP emphasized Usomi's skilled technical and operational team and digital platforms (Usomi Lulu and Usomi Rubi). To enhance its financial sustainability, the program supported Usomi in developing financial projections and refining its pitch deck. The program also provided networking opportunities to facilitate Usomi's fundraising efforts to raise USD 500,000 for improving its aggregation infrastructure. Additionally, the program provided support to raise gender lens investing by refining Usomi's business model to incorporate gender considerations. The program provided Usomi with opportunities to pitch its business to investors and funders that include gender considerations in their investment thesis.

### **Benchmarking against similar aggregation models**

The GAP identified an opportunity for Usomi to learn from more advanced business models in Africa and Southeast Asia. By benchmarking these models, Usomi gained valuable insights into business efficiency and identified best practices that could be adopted to optimize its operations and performance. The program supported Usomi in conducting a comparative analysis of aggregation models such as the agripreneur / farmer hub model in Southeast Asia and Africa, the farmers service center in East Africa, village-based advisors in Africa, and the Aquarech business model in Kenya. Through this analysis, the program recommended the following:

- **For the aggregation model to serve women farmers effectively, Usomi should consider collaborating with rural-based aggregators.**
- **Aggregation models work best with farmer groups, thus Usomi should encourage its female farmers to form or join farmer groups to be served effectively.**
- **Aggregation models that embed an insurance product in their model can protect farmers against risks such as crop failure, price fluctuations, and post-harvest losses. Therefore, Usomi should consider partnering with agri-insurance providers.**

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## **5.6.5 Learnings across the key research questions**

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**Research Question 1: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

**Aggregation models that incorporate demos and training activities, and post-harvest management can increase access to high-quality inputs and adoption of CSA practices among rural women farmers**

Agri-techs with aggregation models greatly contribute to the adoption of CSA practices by women farmers by embedding demonstration and training activities into their models. Simply providing CSA inputs and services to a rural female farmer is not enough, PSEs must actively encourage the use of these products and the adoption of CSA practices to ensure a successful harvest. Additionally, models that incorporate post-harvest management techniques contribute to a high demand for farmer's products, ultimately increasing farmers' incomes, fostering economic independence and promoting sustainable production.

**Research Question 2: What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?**

**Aggregation models contribute to the growth of the agricultural sector's supply chain ecosystem, thus increasing women's participation in the sector**

Agri-tech businesses benefit other actors in the supply chain ecosystem, such as agro-dealers and bulk buyers, by providing accurate data about the needs of rural farmers through their platforms. This enables agro-dealers to aggregate inputs, allowing farmers to access them at fair prices. Rural farmers can also use agri-tech platforms to aggregate their produce for bulk buyers, leading to better market access and increased incomes. This benefits smallholder female farmers and improves their economic independence.

**Aggregation models that incorporate a gendered approach in their outreach programs increase the participation of women farmers**

Training and capacity building initiatives that are a part of sales and marketing activities, equip women farmers with the knowledge required to make informed decision, adopt climate smart-solutions, and access markets for their produce. This equips women farmers to make better economic decisions based on the competitiveness of markets and the benefits of adopting climate-smart practices.

**Research Question 3: Who are key stakeholders working in the climate change adaptation and WEE space, and what support are they providing / can they provide to climate-smart PSEs to scale their solutions while increasing women's participation?**



## Collaboration with rural-based aggregators is crucial for success

Rural-based aggregators were identified as critical actors in the model. By partnering with these local aggregators, Usomi can more effectively plan and mobilize input supplies and oversee produce aggregation for market supply. This strategy streamlines coordination and ensures timely delivery, improving Usomi's operational effectiveness.

## Support from the public and private sector is critical for success

Usomi can optimize its business model through ongoing partnerships with private sector organizations and public institutions. For instance, public institutions provide technical assistance, training programs, and capacity-building initiatives for farmers and agribusinesses. Collaborating with such institutions could aid Usomi in expanding its reach and saving on costs.

**Research Question 4: What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale climate-smart PSEs to enhance their impact on women?**

## A combination of training, technical assistance, and access to funding are critical to scale climate-smart PSEs

**Short-term interventions:** Implementing customized gender-based training for PSEs has been crucial in building their capacity to address gender biases, raise awareness about gender roles and needs, and implement necessary changes. Gender mainstreaming training has enabled Usomi to better

target their female customers by analyzing data through a gender-specific lens. This has allowed them to integrate gender considerations into their sales and marketing activities as well as their day-to-day operations.

In the short term, Usomi aims to improve women farmers' access to and use of climate-smart solutions. By leveraging existing farmer networks and structures, Usomi's aggregation model has the potential to introduce other climate-smart practices such as agroforestry, water-efficient irrigation methods, and the use of renewable energy sources like solar-powered equipment and biomass energy.

Also, by providing training programs specifically for women farmers and establishing fair market connections, Usomi emphasizes inclusive economic empowerment and community engagement and ensures women's active participation in sustainable agriculture.

Additionally, Usomi can use its digital solutions to provide farmers with crucial weather data and e-extension services, enhancing their ability to effectively adapt to climate variability. Usomi's experience highlights the critical role that private sector entities can play in promoting gender-responsive climate-smart agriculture, especially in reaching smallholder farmers and marginalized communities.

**Medium to long-term interventions:** Financial support is critical for PSEs to maintain a sustainable growth trajectory. With new funding, PSEs can increase their geographical coverage, improve their aggregation infrastructure, improve their marketing efforts and training activities, and as a result reach and impact more women actors in the ecosystem.



**Photo Courtesy :** Intellecap's team taken during interaction with Usomi farmers in Kenya.



# 5.7 NJORDFREY

## Smallholder Aquaponic Farming In Rwanda

### 5.7.1 Sectoral overview – Aquaponics in Rwanda

The Rwandan economy primarily depends on agriculture, with 69% of rural households involved in small-scale farming on limited arable land.<sup>207</sup> However, the sector is regularly disrupted by a combination of factors, including irregular rainfall, drought, floods, pests, and diseases, which impact overall agricultural productivity. Limited availability of land for agriculture and a growing population continue to affect food security in Rwanda.<sup>208</sup> The lack of sufficient and nutritious food for many has led to widespread malnutrition and undernutrition in the country.

The Government of Rwanda and private sector programs are increasingly focusing on innovative food production, and intensification,<sup>209</sup> approaches that can overcome the most pressing challenges before Rwandan farmers. Aquaponics is one such integrated approach, with the potential for efficient and sustainable intensification of agriculture. Aquaponics combines aquaculture and hydroponics to create a closed-loop system where fish and plants thrive. This system has been applied globally and has proven to be effective in sustainable food production. With its resource-efficient design aquaponics offers a low-carbon alternative to traditional agricultural practices and has emerged as a useful tool for addressing challenges related to climate change. Multiple research reports estimate that aquaponics uses up to 90% less water than conventional farming techniques,<sup>210</sup> significantly reducing the strain on the region's already limited water resources. Aquaponics also has significant potential to transform the lives of farmers across the continent, offering them opportunities for economic empowerment, food security, and environmental sustainability. A successful aquaponics farm demonstrating the technology and its benefits to Rwandan farmers could help address the myriad challenges affecting the collective health and well-being of low-income communities in Rwanda.

**Aquaponics has the potential to significantly contribute to the empowerment and well-being of farmers and their communities, and a create positive impact on the environment.**

This includes -

**Food security:** Aquaponics results in a 30% faster growth for plants compared to soil,<sup>211</sup> and therefore has the potential to increase farm output while providing affordable fish protein for low-income populations, leading to improvements in their nutritional status,<sup>212</sup>

**Women's empowerment:** Aquaponics systems are inherently self-sufficient, requiring very low agri-inputs and labor, aiding in employment and income generation for women<sup>213</sup>;

**Positive impact on the environment:** Aquaponics systems use 90% less water than traditional farming methods.<sup>214</sup> This is because the water in an aquaponics system is recycled and reused with minimum evaporation and no run-off. Further, since crops are grown in water, there is no soil degradation. Moreover, aquaponics limits the use of chemicals that can damage soil and affect water quality and utilizes areas with poor soil without competing with fertile land, forestry, etc.

### 5.7.2 Challenges faced by the aquaponics sector in Rwanda

#### Sector-level challenges

Rwanda's aquaponics sector faces multiple challenges related to its agriculture landscape.

**Food insecurity and poverty are intertwined challenges in Rwanda.** As of April 2024, a fifth of the Rwandan population experiences food insecurity and 38% of the population lives in poverty,<sup>215</sup> with more than 52% living on less than USD 1.90 per day (2019).<sup>216</sup> Low-income communities cannot afford enough nutritious food to live a healthy life or invest in their livelihood. Low-income households are also more vulnerable to high food prices—especially during the lean season<sup>217</sup> when their food stocks have run dry. There is no monetary buffer to protect low-income households from the consequences of climatic shocks such as drought, floods, crop diseases, etc.<sup>218</sup>

Figure 44: A view of agricultural land along steep slopes in Rwanda



Photo Courtesy : Intellectap's team taken at NjordFrey demo farm in Kayanza, Rwanda.

**Limited agricultural productivity on small landholdings** further threatens food security. Most Rwandan farmers have only tiny plots of land; research indicates that 60% of farming households in Rwanda cultivate plots smaller than 0.5 hectares.<sup>219</sup> Since close to 90% of Rwanda's terrain is made up of slopes,<sup>220</sup> most farming happens on steeply sloped farms, which consequently suffer from soil loss, erosion, and decreasing fertility. A rapidly growing population also affects the availability of land for agricultural production.

**While aquaponics as a technology can alleviate some of these challenges, the high upfront cost associated with an aquaponics system acts as a significant barrier for Rwandan farmers.** Setting up an aquaponics system requires a higher initial investment compared to traditional cultivation methods,<sup>221</sup> as well as a steep learning curve for those new to the system. Since Aquaponics is still a nascent technology, farmers require extensive training to become comfortable with the system. The cost and expertise required to maintain the system further add to farmers' woes. Moreover, farmers often need more agronomic expertise to grow non-native crops suited to aquaponics such as lettuce and manage fish farming. The high cost and limited market knowledge for non-traditional crops have influenced farmers' perceptions and have created a barrier to adopting aquaponics in Rwanda.

### Gender-related challenges

**Women are disproportionately affected by food insecurity in the country due to various social, economic, and cultural factors.** Women in Rwanda typically bear the primary responsibility for household chores, including food preparation, childcare, and fetching water and firewood. Lack of access to sufficient food for the household leads to women dedicating more time to acquiring food, water, and firewood. Combined with the time and energy spent on unpaid care work, these factors limit women's opportunities for engaging in income-generating activities and education, further perpetuating the cycle of poverty and food insecurity.

**Women play a significant role in Rwanda's agricultural sector; however, there is a dominant gendered division of roles.** More than 70% (2021) of economically active Rwandan women are engaged in farming activities;<sup>222</sup> with most organized into cooperatives. While both men and women can own land in Rwanda, cultural norms and traditional inheritance practices restrict women's ownership and control over land.<sup>223</sup> Limited ownership of assets restricts women's ability to provide collateral required to access formal credit. This, in turn, restricts women's access to quality inputs and technology. Lack of access to inputs, coupled with the small sizes of farmland managed by women (farms managed by women are 10.5% smaller than farms managed by men),<sup>224</sup> leads to lower crop yield. Persistent inequalities in accessing markets, with men responsible for selling both small-scale and large-scale crops, further hinder women's involvement in, and control over food production. As a result, women largely remain engaged in subsistence farming. This impacts the food and nutritional security of women farmers and their families. Continued food insecurity often exacerbates gender-based

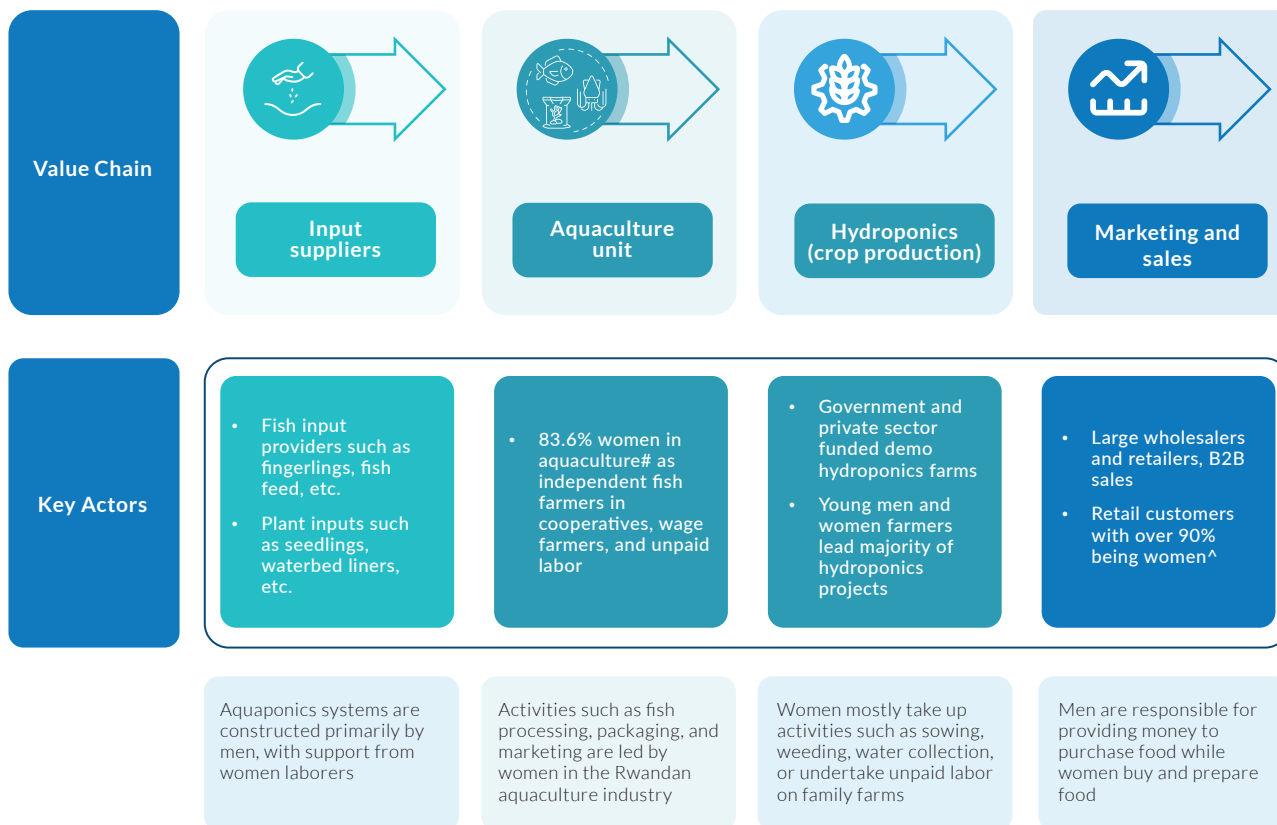
violence and leads to maternal malnutrition and poor birth outcomes.

**Approximately 83.6% (2018) of women engaged in agriculture participate in the aquaculture sub-sector in Rwanda,<sup>225</sup>** highlighting the vital role women play in its development and their existing skills in managing aquaculture. However, women's contributions are often overlooked, and they bear the dual burden of domestic and productive responsibilities. Women also face challenges such as the high cost of fish feed (pellets) since these are imported, and an insufficient supply of fingerlings from both private suppliers and the Rwanda Agriculture Board, which struggles to meet the demand for restocking, among other issues.



Photo Courtesy : Stock photo.

Figure 45: Value chain of Rwanda's aquaponics industry



Sources:

#'Contribution of women to Aquaculture in Rwanda', Mindje M., Funmilola A., Kibogo A., April 2018

^ 'Gender roles and masculinities in leveraging milk for household nutrition: Evidence from two districts in Rwanda', Food Policy, July 2023

### Climate change-related challenges

Climate change is increasingly threatening agriculture and aquaculture productivity in Rwanda, underscoring the need for greater adoption of good agricultural practices across the country. With 97% of Rwandan agriculture being rain-fed,<sup>226</sup> the country is heavily reliant on rainfall patterns, which makes it vulnerable to climate shocks. This has resulted in persistent water scarcity for agricultural use; the inefficient use of water for irrigation further exacerbates the unpredictability of agricultural production from one season to another.<sup>227</sup> In addition, climate-related disasters like droughts and floods are becoming more frequent. While Rwanda's eastern and south-eastern regions are most affected by prolonged drought, the northern and western regions experience heavy rainfall leading to floods, landslides, and erosion.<sup>228</sup> These extreme climate events have a detrimental impact on agricultural productivity.

Additionally, Rwanda's fish production is adversely affected by increased temperatures, algae blooms, diseases, changes in rainfall patterns and alterations in the natural balance of ecological systems resulting from climate change.

Further, the impact of climate change on agriculture is intensified by poor agricultural practices that lead to soil depletion. It has been observed that Rwandan farmers typically use low agriculture inputs, production techniques that are unsuitable for farm terrains, and inefficient practices.

Moreover, despite efforts, such as the Crop Intensification Program (CIP) by the Government of Rwanda, fertilizer use remains low compared to other countries in the region.

The introduction of aquaponics had led to significant environmental benefits including increased crop and fish production, reduced pollution, and more efficient water use for agriculture.<sup>229</sup>

### 5.7.3 Business/Operating model of NjordFrey

Started in 2022, NjordFrey developed one of Rwanda's first commercial-scale aquaponics starter kits. In aquaponics, plants are grown in the grow bed (constructed in other spaces filled with water with a top layer of Styrofoam or similar other material to hold plants in place), and fish are produced in a fish tank. Nutrient-rich water, generated from fish waste within the fish tank, is channeled into the grow bed, where naturally occurring bacteria break down ammonia into nitrites and then into nitrates. Plants in the grow bed absorb these nitrates and other nutrients, and the cleaned water is channeled back into the fish tank for the cycle to begin again. Overall, this allows for faster growth and increased stocking densities.

NjordFrey provides high yield aquaponic farming solutions to smallholder farmers with the aim of significantly increasing growth while being sustainable and climate resilient. The

enterprise sources aquaponics components, seeds, and fingerlings from domestic and international suppliers and uses these components to construct an aquaponics farm. Using its starter kit, the enterprise can set up its aquaponics system (combining fish and crops in a closed-loop system) anywhere, to produce highly nutritious food products. Due to the increased yields (+3000% fish & +700% crops while using 95% less water than traditional farms),<sup>230</sup> users of NjordFrey’s solution can potentially experience a 10-fold increase in income.

NjordFrey is piloting its aquaponic technology with over 100 smallholder farmers in Rwanda’s Kayonza province on 0.4 acres of land, which is 1/6<sup>th</sup> the size of its planned commercial farm (i.e. 1 ha) The enterprise is testing the aquaponics technology at its Kayonza farm, producing vegetables and fish for wholesale and export. It currently sells ten varieties of lettuce and is also pilot testing more than 22 other crops for wholesale and export.

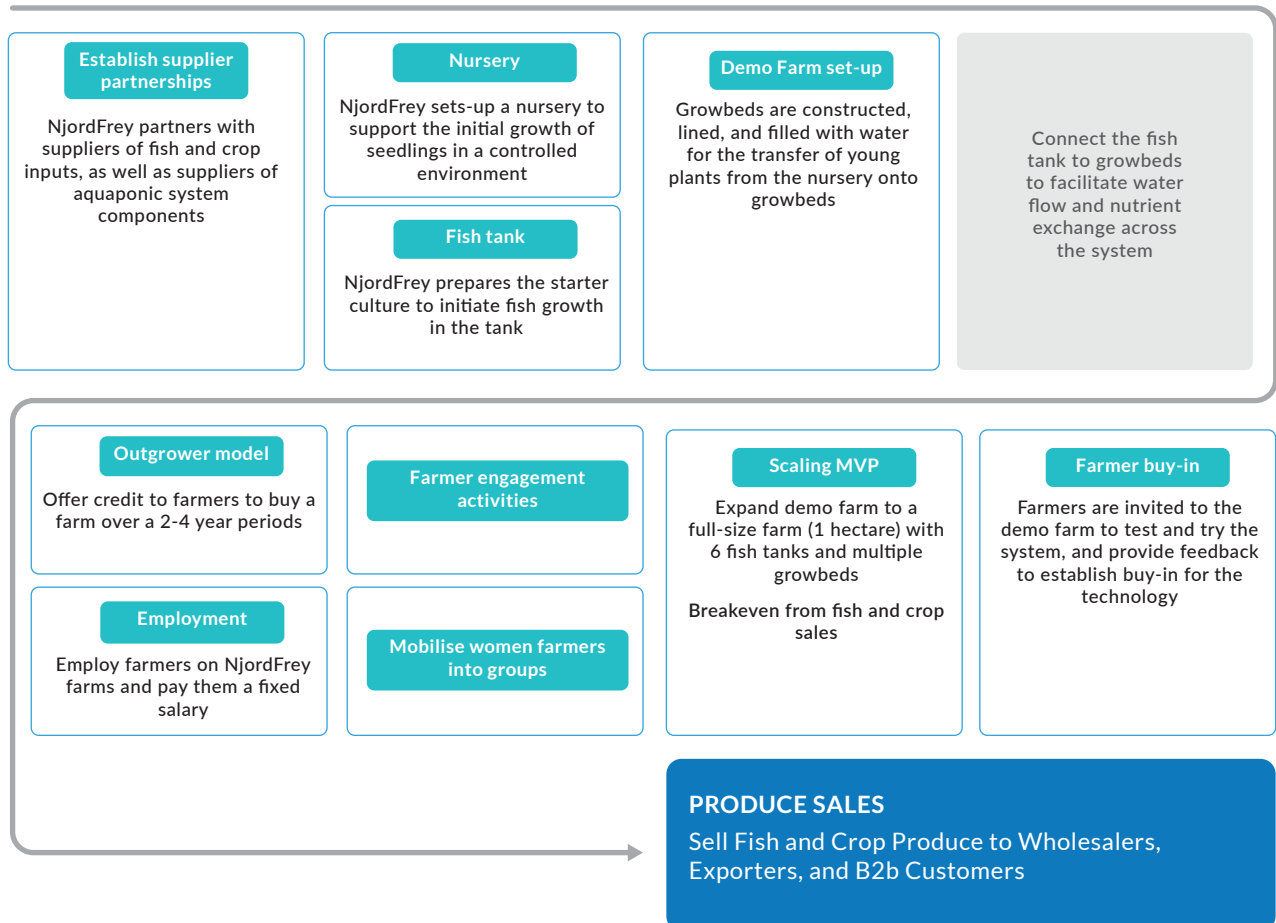
NjordFrey is at the MVP stage currently. To commercially scale, **some critical innovations that NjordFrey plans to leverage include:**

- **Outgrower credit/partnership model:** The enterprise will set up the aquaponics system (grow beds for crops with fish tanks for aquaculture) on a 1 ha plot of land which will be sold/leased to a group of about 40 farmers.

The enterprise plans to offer such farmers a 2-4 year credit period to repay capital costs, lowering their upfront investment, and also allowing farmers to learn how to operate and maintain the system. At the end of the credit period, majority ownership will be transferred to the farmers providing them with equity and the ability to reinvest in their futures.

- **Agronomy model:** For the first two years after partnering with farmers on the aquaponics system NjordFrey plans to provide extensive agronomy services to optimize farm yield and build farmers’ confidence in the technology. Trials conducted with smallholder farmers on NjordFrey’s demo farm revealed that while most farmers were able to carry out day-to-day tasks with ease, they were less comfortable managing a completely new technology. Hence, the enterprise developed a plan to provide onsite training and support during the first 2 years of the payback period.
- **Digital monitoring system:** NjordFrey is also developing a ‘Non-Invasive Digital Health Monitoring System’, which uses AI/machine learning to collect 24X7 real-time farm data through sensors. This data will be used to improve efficiencies on the farm as well as refine production parameters and the agronomy services offered to farmers.

Figure 46: NjordFrey’s business model





**NjordFrey aims to tackle the adverse effects of climate change on Rwandan agriculture.** Aquaponics offers a resilient and low-carbon solution to food insecurity by ensuring consistent food production and eliminating the continent's high dependence on rainfall for food production. To enhance food security in the region, NjordFrey offers aquaponics starter kits to a group of approximately 40 farmers. The company's technology is set up on a separate 1 ha plot, resulting in significantly higher yields—up to 700% more crops compared to traditional farming practices while using 90% less water.<sup>231</sup> Not only does the NjordFrey system result in increased crop yields, it also produces 3000%<sup>232</sup> more fish than conventional aquaculture set-ups.

At the start of the support program, NjordFrey planned to rollout a feature to test water parameters in aquaponics system such that farmers could periodically monitor conditions in the grow beds and maintain farm health to maximize crop production. Farmers were required to use a simple color-changing testing strip and match it with a color chart to ascertain the current pH, nitrate, and ammonia levels in the system. This would ensure that farmers were able to maintain optimal growth conditions for crops and fish by taking corrective action like adding precise amounts of fertilizer to water to ensure nutritional balance. Monitoring water parameters would also help farmers reduce/eliminate the use of fertilizers and other chemicals from agricultural systems and thereby contribute to the environment. However, farmers were reluctant to adopt this feature since testing was alien to them. As a result, NjordFrey removed all testing and test interfacing requirements and embedded a remote sensing technology in the system to monitor vital production data such as water temperature, pH levels and nutrient levels (such as ammonia and nitrates). A digital dashboard was developed to store and analyze data from the sensors, currently used exclusively by NjordFrey. Recognizing the enormous potential of sensor-based monitoring for improving farm productivity, the enterprise plans to use this data to provide feedback and agronomic insights for training farmers.

**Furthermore, NjordFrey aims to empower women and other marginalized groups.** Farm trials conducted by NjordFrey revealed that most women farmers found soil farming hard, primarily because of the difficulty in getting access to water (with typically 2 wet seasons in Rwanda) and manure, as well as the high cost of manure and inputs needed. Aquaponics requires minimal land, eliminates reliance on rain, uses less water, and reduces hard labor, making it an ideal solution for women smallholder farmers. Women farmers participating in NjordFrey's trials reported that using grow beds to grow crops reduced physical labor and allowed them to grow more produce in a smaller space. With the ability to cultivate a variety of crops in limited space, women can grow culturally significant / indigenous crops, helping to address nutritional deficiencies in their region.

Moreover, cultivating fish alongside crops provides additional income for women and helps increase their access to high-quality protein for household consumption. During farm trials, women farmers indicated that they had limited experience with fish production and would need support for aquaculture.

However, women also recognized that protein from fish would help reduce malnutrition in their families. As women embrace aquaponics, they can become drivers of food security within their households and communities. To facilitate wider adoption of NjordFrey's aquaponic kits, the enterprise is searching for a secured credit / investment partner who will offer credit to cooperatives to access its kits.

**At the beginning of the GLOW program (in June 2023), NjordFrey planned to scale up its Minimum Viable Product)<sup>233</sup> to improve food security and enhance farmer incomes.** The enterprise is expanding its aquaponics pilot to private and commercial-scale farm size (spanning over 1 ha) and aims to achieve financial break-even from the sale of fish and crops produced on the expanded farm. Over the next few years, NjordFrey plans to raise capital to build additional aquaponics partner farms and sell them to farmer groups. These groups (consisting of approximately 40 farmers) will be mobilized through farmer engagement efforts and will benefit from the dual income generated from the sale of crops and fish, alongside income from their primary agricultural land. Once the cost of the aquaponic system is paid back, the farmers will gain majority ownership of the farm, giving them agency and a means to reinvest. NjordFrey will support farmers by providing extensive training on operating and maintaining the farm while also connecting them to markets/buyers to ensure sales and minimize post-harvest losses.

**Figure 47:** Intellecap team interacting with the NjordFrey team at their demo farm in Kayonza



**Photo Courtesy :** Intellecap's team.

In line with the overall objectives of the GLOW program, NjordFrey was selected because of its potential to enable low-carbon transition in the food production ecosystem and for integrating women farmers in the sector's value chain. NjordFrey's business model demonstrates the following potential benefits and impacts that align with the program's objectives:

- **Increasing awareness about aquaponics technology in Rwanda through its demo farm.**
- **Providing farmers with easy access to a low-carbon technology such as aquaponics to improve agricultural productivity.**
- **Reducing soil and land degradation by eliminating the**

- use of soil fertilizers and other chemicals through the hydroponic system.
- Training programs for farmers on good aquaculture practices, climate change effects, and coping mechanisms.
- Creating entrepreneurship and employment opportunities for women by aiming to target women-only and mixed farmer groups proactively.
- Offering remote sensors to farmers to monitor production data and suggest improvements that help farmers adapt to climate change.
- Increasing farmer incomes through the dual production of crops and fish on the same farm.
- Reducing vulnerabilities of women farmers by linking them with credit, inputs, and markets.
- Showcasing the impact of aquaponics on climate and women's empowerment to attract relevant donors and funders.

**Figure 48:** Intellecap team examining eggplant growth on soil versus reported growth in the waterbeds during the baseline assessment



Photo Courtesy : Intellecap's team.

### 5.7.4 Support provided by the program to NjordFrey

Through a tailored Gender Action Plan and a comprehensive Technical Assistance program designed on the basis of an in-depth, on-ground needs assessment, the program supported NjordFrey in increasing awareness about aquaponics in the country, enhancing engagement with women farmers, and improving access to B2B partnerships for market linkages. The GAP identified four broad outcomes crucial for NjordFrey to accelerate its transition to low-carbon development and deepen positive outcomes toward women's economic empowerment:

- Increased awareness in the farming community about Aquaponics technology in order to enhance agricultural productivity.
- Improved adoption of NjordFrey's products, particularly by women farmers
- Double the sources of income for farmers through additional income generation—fish sales along with new varieties of crops.
- Improved inclusivity in the business' operational policies and procedures.





**Figure 49:** A snapshot of NjordFrey's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased awareness about Aquaponics technology in the farming community to enhance agricultural productivity</b>	<ol style="list-style-type: none"> <li>1. Understand the market opportunity for aquaponics</li> <li>2. Create awareness about aquaponics in the farming community</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. One-on-one training sessions with marketing experts</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased engagement on social media through posts every week</li> </ol>
<b>Improved adoption of NjordFrey's product, particularly by women farmers</b>	<ol style="list-style-type: none"> <li>1. Identify strategies to increase engagement with women-only/ mixed farmer groups</li> <li>2. Onboard women farmer groups</li> </ol>	<ol style="list-style-type: none"> <li>1. Mentorship on market sizing and customer segmentation</li> <li>2. Outline farmer engagement models through case studies of other agribusinesses in East Africa</li> </ol>	<ol style="list-style-type: none"> <li>1. Identified 3 user types within farmers - female, youth, and people with disabilities. Working towards gathering more information for youth and farmers with disabilities</li> <li>2. Identified low barriers to on-board farmer groups, so targeting youth and women became easier</li> </ol>
<b>Double farmer income sources through additional means of income generation - fish sales along with new crop varieties</b>	<ol style="list-style-type: none"> <li>1. Create awareness among women farmers on the potential for additional income generation</li> <li>2. Potential partnerships for off-taking of produce from NjordFrey's farms and supported farmers</li> </ol>	<ol style="list-style-type: none"> <li>1. Awareness creation for women based on evidence generated from farmer trials</li> <li>2. Identification of potential wholesalers and exporters</li> </ol>	<ol style="list-style-type: none"> <li>1. Periodic social media posts with a focus on engaging women</li> <li>2. Outreach to new buyers beyond the 1 contract NjordFrey has in place</li> </ol>
<b>Improved inclusivity in the business' operational policies and procedures</b>	<ol style="list-style-type: none"> <li>1. Connect with relevant grant opportunities in the sector</li> <li>2. Enhance pitch deck to highlight gender impact for fund raising</li> <li>3. Scout for relevant investors</li> <li>4. Appoint gender champion to drive internal gender diversity</li> </ol>	<ol style="list-style-type: none"> <li>1. Investment readiness training</li> <li>2. Mentorship on investor identification, and concept note and pitch deck refinement</li> <li>3. Pitch day</li> <li>4. Review of internal policies</li> </ol>	<ol style="list-style-type: none"> <li>1. Team became more confident of speaking to various types of investors and also more flexible in changing asset class preferences depending on the investor</li> <li>2. Hired and promoted female program manager and country lead, respectively.</li> </ol>

### Gender mainstreaming TA support interventions

1. Improved adoption of NjordFrey products, particularly by women farmers

#### Undertake customer segmentation to identify the most relevant target segments

The GAP emphasized the need for NjordFrey to undertake marketing exercises to reach the right customer segments. The objectives of these exercises were to 1) create customer segments based on farmers' needs and demographics and 2) develop customer-focused segmentation strategies, such as deciding whether the enterprise would like to employ farmers or have them own the farm, and onboard farmers based on their need for alternate income generation, etc.

At the beginning of the program, NjordFrey was engaging individual farmers to gather feedback on its technology; however, it had not yet identified the most suitable farmer segments for the business.

Hence, the program provided NjordFrey with technical advisory support to develop a customer segmentation strategy based on three distinct user groups within the farming community – women, youth, and people with disabilities. By the end of the TA support, NjordFrey had successfully identified segments of women farmers as target customers and was planning to use the suggested approach to segment youth and farmers with disabilities, who could potentially become a part of its customer base.

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## Identify & implement successful approaches for farmer engagement

Field trials conducted by NjordFrey to gather feedback on the ease of operation of its aquaponics farm primarily saw participation from male farmers. NjordFrey, while open to engaging women, needed a detailed understanding of what could be offered to women and the benefits this may have for the business. However, the assessment conducted at the beginning of the program identified aquaponics' immense potential for economically empowering women. Therefore, the program recommended that NjordFrey expand its engagement to include women-only and mixed groups. This became a critical intervention under the Gender Action Plan, leading to NjordFrey initiating the identification of and engagement with women farmers.

In line with the GAP, Intellectap identified successful approaches for farmer engagement that have been implemented across countries in East Africa. These approaches included a community-level participation, capacity-building training, financial inclusion support, peer networks, bundling value-added services, recognition and incentives, and ecosystem collaboration. In addition, Intellectap outlined approaches implemented by a few select agribusinesses to help NjordFrey understand the different engagement models and the benefits of engaging women.

Understanding these engagement models led to NjordFrey developing a better understanding of women-focused businesses in Rwanda by the end of the program. This resulted in more women farmers being engaged as part of NjordFrey's farm trials and field surveys —56% of farmers (26 women) involved in field trials were women.<sup>234</sup> Aquaponics has lower input costs, requires less time and is physically less-taxing, as compared soil-based farming which involves hoeing, clearing, sowing, and harvesting; thereby making it easier for women farmers to adopt and operate aquaponics systems. NjordFrey's increased engagement with women farmers is expected to further increase the adoption of its product by women farmers and double their income sources by providing an additional source of income, i.e., from the sale of fish and agricultural produce. With its improved understanding of the benefits of gender inclusivity, the enterprise plans to deepen its engagement with farmer engagement and implement successful approaches to offer credit, seeds, fingerlings, and bundled services (digital aggregation, processing/ drying, storage, etc.).

### 2. Double income sources for farmers through additional means of income generation—sale of fish along with new crop varieties

#### Create awareness among women farmers about the potential for additional income generation

The GAP highlighted the need to focus marketing efforts on raising awareness of aquaponics as a pathway for the economic empowerment of women farmers (by way of entrepreneurship and income generation opportunities). While the primary aim of the marketing efforts was to increase awareness about aquaponics in Rwanda, a key focus was women farmer groups.

For instance, NjordFrey's aquaponics system enables women farmers to increase their earnings by cultivating and selling fish alongside organic vegetables. Data from NjordFrey's demo trials conducted shows that the aquaponics starter kit can increase farmers' income tenfold; from an average of USD 125/year to USD 1250/year.<sup>235</sup> Intellectap used this data from field trials to help NjordFrey create social media content showcasing the positive impact that aquaponics adoption can have on women farmers. NjordFrey used this content to increase the frequency of its LinkedIn posts—from one post in a few months, to one post every week.

#### Establish partnerships for off-taking produce from NjordFrey farms and supported farmers

For NjordFrey to successfully increase farmer incomes, it is crucial for them to profitably sell their farm produce and fish in the market through long-term partnerships. At the start of the program, NjordFrey was working with two wholesalers to sell produce from its demo farm to B2B customers, since the enterprise produces organic vegetables (such as lettuce and eggplant) which are not native to the region and therefore have limited demand. However, these buyers could only buy a limited quantity of NjordFrey's produce. With NjordFrey planning to scale its demo farm to full size (6 times the current farm size to 1 ha), it realized the importance of partnering with multiple buyers and expanding crop varieties to maintain sustained demand.

The GAP, therefore, recommended establishing partnerships with additional B2B partners to sell farm produce. Intellectap compiled a detailed list of potential wholesalers and exporters in Rwanda, which NjordFrey subsequently reached out to. By the end of the program, NjordFrey had secured three contracts for the sale of its farm produce. However, the fish are expected to reach full growth by June/July 2024, when NjordFrey will start engagement with fish buyers.

### 3. Improved inclusivity in the business' operational policies and procedures

Although, NjordFrey had, at the beginning of the program, initiated various efforts such as the developing inclusive workplace policies, a policy for sexual harassment at the workplace, and a safeguarding policy, among others, women were not adequately represented on its team, and gender sensitivity was not built into its processes.

The GAP recommended integrating gender-sensitive policies and processes, starting with gender-responsive job descriptions and tracking gender-disaggregated data throughout its value chain, among others. To make the organization more inclusive, NjordFrey has been undertaking periodic reviews to identify bottlenecks in creating increased gender impact. Intellectap also supported the development of an impact monitoring and measurement framework with gender and climate indicators to enable NjordFrey to track inclusivity in its business.

#### Appoint a Gender Champion to drive gender outcomes for the business



Although NjordFrey was invested in increasing its engagement with women farmers, the enterprise did not have an internal strategy to drive such engagement. The GAP recommended the appointment of a Gender Champion who would work towards achieving gender outcomes for NjordFrey. Ideally, the Gender Champion would be someone from middle or senior management with the ability to influence staff members.

The appointment of a Gender Champion will allow NjordFrey to deep dive into successful models for engaging with women farmers in different agricultural value chains and prioritize activities to enhance its engagement with women and youth. This process has also helped NjordFrey sensitize its staff on gender roles and work on eliminating unconscious biases within the team. This sensitization has improved working conditions in the enterprise and helped create a buy-in for the enterprise's roadmap for engaging more women farmers.

### **Business efficiency interventions**

- 1. Increase awareness about aquaponics technology in the farming community to enhance agricultural productivity**

#### **Enhance marketing activities for awareness creation of the nascent technology**

Aquaponics is still in its nascent stages in Rwanda, and there is a need to establish its commercial viability in the country. Not only is NjordFrey's system a new technology for farmers, the crops produced are also new to the region. The Gender Action and TA Plan developed for NjordFrey identified the need to create awareness about the technology in Rwanda's farming community, while also showcasing the products and the produce on their farms. Focused marketing and market analysis training has helped NjordFrey identify the dos and don'ts of a successful marketing strategy. Intelicap also supported NjordFrey in creating content for a series of social media posts on aquaponics technology and NjordFrey's role in the sector.

From posting sporadically on social media at the beginning of the program, NjordFrey has transitioned to posting weekly by the end of the program. These posts have helped build an understanding of the technology, generate awareness about the types of crops that grow effectively in the system, highlight cropping cycles in water beds vis-à-vis soil, increase understanding about NjordFrey's offering, showcase NjordFrey's demo farm, and celebrate its successes. In addition, the posts also strive to promote an understanding of aquaponics' potential to empower women as well as enable low-carbon development. The enterprise is planning to hire a dedicated communications expert to streamline its social media engagement and marketing activities.

- 2. Improved inclusivity in the business' operational policies and procedures**

#### **Revision of investor pitch deck to highlight climate and gender impact of the business**

The GAP recommended refining NjordFrey's pitch deck to

highlight the enterprise's gender and climate impact. The TA support helped NjordFrey refine its pitch deck structure and narrative from an investor's perspective. The pitch deck included impact parameters to help the enterprise attract gender-focused and climate-focused investors.

As a result, by February 2024 NjordFrey had successfully updated its pitch deck with better graphics and created different versions of the deck targeting different types of capital, i.e., grants/awards and equity. On average, NjordFrey has applied to at least 1-3 grants / funding programs over the last six months. With the award of the InnovateUK round 10, NjordFrey has been able to establish a strong business case for aquaponics as a gender-transformative and climate-friendly agricultural technology.

### **Box 12. NjordFrey is transitioning to solar power for its aquaponics farm with support from Innovate UK**

NjordFrey has secured an exciting two-year opportunity with the Renewable Energy Agro-Processing (REAP) Hub project, funded under the Innovate UK Energy Catalyst Round 10. The program aims to revolutionize clean energy access and value-added food production in rural Rwanda. Its objective is to utilize off-grid energy solutions to deploy the hub in more rural locations.

With support from Innovate UK, NjordFrey plans to integrate renewable power and solar-powered cold storage into their demo farm in Kayonza, Rwanda. This will help make the aquaponics farm a truly off-grid and sustainable solution.

The project is expected to result in

- 1) boosting livelihoods by allowing smallholder farmers to engage in value addition activities;
- 2) increasing inclusivity through the opportunity to work with women and youth in integrated agro-processing facilities;
- 3) improving food security by sustainably operating a high-yield agriculture system; and
- 4) reducing carbon emissions through an advanced automated sensor and control system which manages energy consumption.

### **Box 13. NjordFrey selected for incubation support as part of the Innovate Africa Challenge by GIZ**

NjordFrey has been selected as one of the 8 finalists of the Innovate Africa Challenge. The program focuses on deploying AI-powered climate-smart solutions across Ghana, Kenya, and Rwanda. The challenge aims to foster innovative uses of AI to mitigate the impacts of climate change and/or to support climate adaptation efforts in the African continent, while strengthening the AI and start-up ecosystem.

As part of this, NjordFrey will secure access to 3-month incubation support to enhance its solution as well as its gender impact across the value chain.

### **Training for investment readiness and opportunities for investor networking**

Finally, as part of the program, NjordFrey received hands-on training in investment readiness. Through advisory support and direct investor engagement facilitated by Intellectap, the training covered topics like identifying relevant capital sources and aligning with investor expectations. NjordFrey was provided technical advisory on scouting the market for relevant investors and shortlisting the most appropriate ones based on the stage of the business. Investor introductions were also facilitated, where possible. In addition, Intellectap helped refine NjordFrey's pitch deck through mock pitches. Throughout the program, Intellectap shared relevant and high-potential opportunities for grants and other types of support with NjordFrey.

In February 2024, as part of the program, Intellectap organized a Pitch Day, which saw participation from over six capital providers from East Africa, representing both debt and equity. The Pitch Day allowed enterprises to pitch to real investors and receive feedback on their business models, market opportunities, and investment potential. NjordFrey was also provided an opportunity to participate in the Sankalp Africa Summit2024.<sup>236</sup> At the beginning of the program, the enterprise had not yet approached any investors for fundraising and only had a long list of potential investors. In February and March 2024, NjordFrey's founder was able to network with multiple investors and other ecosystem stakeholders, showcasing the business model during the Sankalp Summit as well as in individual investor meetings.

## **5.7.5 Learnings across the key research questions**

**Research Question 1: What is the extent of the economic impact of climate-smart agriculture PSEs on women's economic empowerment in their value chain? Does this translate to any social impact?**

### **Engaging in aquaponics could lead to increased incomes and improved agency for women farmers**

Women farmers traditionally face challenges in accessing capital and high-quality inputs. Aquaponics is a closed-loop system where fish waste is broken down for use as fertilizer for crop growth, eliminating the need to purchase expensive fertilizers and saving input costs for farmers. It requires minimal land, eliminates dependency on rain, uses less water, and reduces physical labor, making it an ideal solution for farming by women smallholder farmers. Women can establish profitable ventures by cultivating and selling fish and organic vegetables, breaking the cycle of poverty and financial dependency.

Data from NjordFrey's demo trials are positive and support

the finding that the aquaponics starter kit can generate a 10-fold increase in income for farmers. Establishing sustainable buy-back linkages for women farmers ensures offtake for their crop and fish produce, thus guaranteeing a threshold level of income. Such linkages also ensure fair prices for women farmers as businesses can lock in prices for bulk quantities through contracts at the enterprise level.

**Research Question 2: What is the role of PSEs in accelerating the transition to a low-carbon economy while keeping women's economic empowerment at the core of this transition?**

### **Amplifying women's leadership has the potential to transform the aquaponics landscape**

Aquaponics is a low-carbon technology that shifts food production from soil-based cropping to growing crops on water. This helps reduce the depletion of nutrients in the soil, soil erosion, and contamination from the use of chemical fertilizers, as well as GHG emissions from irrigation and fertilizers used in conventional farming. Estimates suggest that a 1 ha aquaponics system can help eliminate up to 1893 kg CO<sub>2</sub> equivalent emissions while transitioning from conventional soil farming, and about 1603 kg CO<sub>2</sub> equivalent while transitioning from organic farming.<sup>237</sup> The aquaponics system itself results in negligible emissions, and in some cases may lead to negative emissions i.e. the system fixes CO<sub>2</sub> into plant biomass rather than adding emissions into the atmosphere.<sup>238</sup>

In addition, NjordFrey's existing system utilizes grid electricity to circulate water between the fish tank and grow beds; an estimated 15-20kWh is used to run the pump and other system components. Field data shared by NjordFrey indicate that powering the system entirely through solar power can potentially save around 147,000 kg of CO<sub>2</sub> emissions per hour.<sup>239</sup>

Given that women face greater risks and bear significant burdens as a result of climate change, it is only logical that they become drivers of low-carbon practices for their communities. Studies indicate that countries with more women in social and political arenas have 12% lower CO<sub>2</sub> emissions.<sup>240</sup> Therefore, the sector needs to become more inclusive and strive towards gender equality, not only at the organizational level but across value chains. By adopting climate-smart technologies such as aquaponics, African women could become agents of environmental conservation. As sustainable farming practices gain momentum, these empowered women could contribute to mitigating the adverse effects of climate change on their communities and promote food security / nutrition by increasing farm productivity and obtaining high-quality protein for household consumption.

A key step in this direction is the appointment of a Gender Champion within enterprises to lead the gender inclusion agenda within the business. The roles of a Gender Champion includes raising awareness about gender roles in the business model, improving working conditions, and creating awareness of gender issues, among others. These efforts will allow the



aquaponics sector to develop a clear roadmap for engaging women value chain actors. Furthermore, these gender champions will encourage women smallholder farmers to take on leadership positions within their communities and drive the adoption of climate-smart / low-carbon solutions contributing to gender equity.

**Research Question 3: What support models/approaches used by these climate-smart PSEs are most instrumental in increasing women's participation in the sector?**

**Providing handholding support for new technologies has a vital role to play in transforming gender norms in the industry**

Offering ongoing support such as 2 years of continuous training and onsite assistance to farmer partners may go a long way in onboarding more women farmers. Building capacity for women farmers incentivizes and motivates them to adopt sustainable practices and agricultural solutions. Such capacity-building efforts must be tailored to meet women farmers' unique needs and preferences while fostering community engagement and individual farmer development. Using local language, practical demonstrations, and covering of gender issues to reflect women's challenges and opportunities will ensure active participation from women farmers. Such solutions can break through traditional gender roles and pave the way for more women to adopt aquaponics technology and produce crops and fish. Implementing a feedback mechanism as part of the core business processes can channel customer (mainly women) feedback to the enterprise, resulting in innovations and improvements in the business model and service delivery.



**Photo Courtesy :** Intellecap's team taken during interactions with women farmers in Rwanda.



**Photo Courtesy :** Stock photo.

**Bundling offerings to improve access to inputs and support for farmers**

Women farmers are typically unable to adopt innovative solutions effectively due to limited technical support. Bundling value-added services (such as handholding support, onsite training, input credit, market linkages) tailored to women's needs allows for effective engagement, contributes to their economic empowerment, increases overall adoption of sustainable agricultural practices, and improves food security.

Enterprises could facilitate bulk procurement of seeds, tools and fertilizers from manufacturers, and ensure that women farmers can access these at fair prices with or without input credit. Providing inclusive extension services that consider the unique needs of women farmers (such as involving female extension workers or conducting training sessions at convenient times) can further enhance their farm productivity. Finally, exploring market linkages and integrating digital tools for production tracking by can improve the efficiency and earning potential of women farmers.



# 5.8 GREEN HARVEST

## Hydroponics And Greenhouse Production Systems For Smallholder Farmers In Rwanda

### 5.8.1 Sectoral overview – Greenhouse and hydroponics in Rwanda

Rwanda covers about 2,633,800 ha of land, of which 76.62% (1.9 million ha) is dedicated to agricultural activities. Characterized by a majorly sloping landscape, only about 49% of this land is arable, with domestic cropland frequently affected by erosion and soil loss.<sup>241</sup> Furthermore, urbanization and rising food demand have contributed the development of fragmented farming systems, with small-scale rural farmers typically owning less than 1 ha of land and accounting for 72.4% of farmers in the country. Also, Rwandan agriculture is mostly rain-fed and therefore more exposed to climate-related risks, especially long droughts, erratic rains, floods, and run-offs, which significantly limit the country's agricultural potential.

Hydroponics and greenhouse production systems are uniquely suited to Rwanda's agricultural landscape and offer a host of benefits for Rwanda's agricultural and environmental ecosystems. Both systems are water-efficient, enable year-round crop production, and take up less space than traditional production systems, making them a perfect fit for smallholders. According to the Rwandan Ministry of Agriculture, hydroponics can help farmers harvest up to 500 MT of crops per hectare, a significant increase compared to traditional methods. Moreover, hydroponic systems promote sustainable agricultural practices, since they are less susceptible to pests and diseases which reduces the need for agrochemicals that release greenhouse gases and environmental contaminants. Hydroponics uses up to 90% less water than traditional farming methods and promotes 30%–50% faster plant growth.<sup>242</sup> Crops that are hydroponically grown in greenhouses benefit from the combination of climate control resulting from the greenhouse effect and water efficiency resulting from the hydroponics system and thus have optimal growth and development conditions. This is particularly beneficial in Rwanda's eastern and southern regions, where droughts and desertification are common.

Real-life success stories from Rwandan farmers who have adopted hydroponics and greenhouse production systems are a testament to their potential.<sup>243,244</sup> These farmers have reported increased yields and improved incomes, making a strong case for widespread adoption. Encouraged by early results, the Rwandan government has partnered with various organizations to train more farmers in hydroponics cultivation. The government's commitment is further demonstrated by the allocation of 38.1 ha of land for hydroponic cultivation, the provision of special subsidies for individuals adopting

hydroponics technology in Rwanda, and an investment of RWF 8.28 billion (approximately USD 8 million) to establish greenhouses and hydroponic facilities by the end of 2024.<sup>245</sup>

In addition, in May 2020, the Government of Rwanda announced an ambitious target to reduce greenhouse gas emissions by 38%<sup>246</sup> compared to the projected business-as-usual emissions of 12.1 MT CO<sub>2</sub> equivalent. Hydroponics can play a significant role in reducing emissions, since agriculture accounts for approximately 46% of the country's total GHG emissions.<sup>247</sup> For example, [a case study](#) found that a hydroponic fodder system produced 7.4% fewer GHG emissions per nutrient mass than conventional barley grain fodder farming. At the same time, [this publication](#) showed that the greenhouse gas emissions of soil crops and hydroponics crops are 0.23 kg CO<sub>2</sub> equivalent and 0.11 kg CO<sub>2</sub> equivalent, respectively.

According to a 2020 McKinsey report, greenhouse farming practices can achieve about 20% of the required reductions in emissions from the agriculture sector by 2050.<sup>248</sup> As such, given their efficient use of resources, hydroponics and greenhouse farming in Rwanda are crucial for achieving food security, promoting sustainable land management, and adapting to climate change. For small-scale farmers, especially women, hydroponics and greenhouse technology provide a sustainable and efficient farming method to overcome poverty by optimizing resources, increasing productivity and income, and protecting the environment.

### 5.8.2 Challenges faced by hydroponics and greenhouse systems in Rwanda

Despite the potential benefits of the hydroponics and greenhouse systems, the sector faces several challenges which also impact women's economic empowerment. There is a widespread lack of skilled labor, and targeted and higher-quality inputs, as well as poor efficiency in adapting to the local landscape in Rwanda. In addition, while hydroponics and greenhouse systems are generally more environmentally friendly than traditional farming, there are environmental concerns given their reliance on electricity and automation. Outlined below are sector-, gender-, and climate-related challenges in Rwanda.

#### Sector-level challenges

- a. **Lack of technical expertise:** Setting up and managing hydroponic systems requires an in-depth understanding





of plant nutrition, water chemistry, and system management. Since hydroponics technology is relatively new to Rwanda's agricultural sector, few stakeholders have developed expertise in setting up, managing, maintaining, and optimizing the system. Consequently, local farmers interested in exploring hydroponics do so on a trial-and-error basis, leading to the inefficient use of resources and time. They struggle to maintain optimal conditions for plant growth, leading to lower yields or crop failure and discouraging further adoption.

- b. **Adoption challenges:** Most farmers in Rwanda are smallholders accustomed to traditional cultivation methods. Hydroponics and greenhouses represent a significant departure from these methods. As a result, many farmers are hesitant to adopt these production methods due to a lack of understanding or fear of the unknown. Overcoming this barrier requires technical training, demonstrations, and community engagement to raise awareness about the benefits and processes, while dispelling misconceptions.
- c. **Investment-intensive:** While hydroponic and greenhouse systems can be more productive and water-efficient than traditional farming methods, they require a large initial investment. A significant portion of the investment in setting up a hydroponics system is spent on importing raw materials from countries like India and China. Additional costs include energy expenses, research and development, and building technical expertise. Setting up a high-tech greenhouse covering an agricultural area equivalent to 800 square meters costs about RWF 40 million (~USD 30,000), while a low-tech option costs about RWF 10 million (~ USD 7,600).<sup>249</sup> In Rwanda, where 70% of farmers are smallholders,<sup>250</sup> the high investment required for hydroponics and greenhouse systems excludes many farmers from adopting the solution. Overcoming this challenge requires exploring the possibility of sourcing raw materials locally to lower set up costs.

### Gender-related challenges

- a. **Poor access to finance:** Women in Rwanda often face challenges in accessing credit or loans to establish or scale their agribusinesses due to factors such as lack of collateral, discriminatory lending practices, and limited financial literacy. Since starting a hydroponic farm requires significant investment, the inability to access necessary financial resources limits the ability of women farmers to invest in hydroponic systems.
- b. **Restriction to lower-income value chains:** In Rwanda, as in many other African countries, high-value crops, including cash crops and exported crops, are typically farmed by men, while women are more likely to plant subsistence crops. This is a result of gender-related sociocultural norms that limit women farmers to certain crops, especially in rural areas. For example, in the Kayonza district in Rwanda, beans, vegetables, and maize are considered crops for women, while banana and tree

crops are considered crops for men.<sup>251</sup> This ultimately translates to lower incomes and resources for women farmers, resulting in their limited motivation to invest in innovations such as hydroponics and greenhouse systems.

- c. **Poor access to technology and innovation:** Hydroponic and greenhouse farming require technical knowledge and skills for optimal success. However, Rwandan women farmers face limitations in accessing the necessary training and education due to limited mobility, household responsibilities, lack of information, the prevailing digital divide, and poor access to extension services. As a result, women farmers in Rwanda are less likely to encounter information about innovation and sustainable practices such as hydroponics technology. Even when they do, the same barriers prevent them from exploring such technologies on a commercial scale.
- d. **Access to markets:** Women farmers in Rwanda often face challenges in accessing markets due to a lack of transportation, limited market information, and gender-based discrimination. A study comparing the market participation between potato producers (dominated by men) and bean producers (dominated by women) revealed a high degree of commercialization for potatoes, with 75% of farmers participating in output markets compared to only 26% of bean farmers selling their produce commercially.<sup>252</sup> Most women farmers interviewed as part of the study preferred to store their harvests for household consumption rather than taking them to the market. When produce is sold, it is typically sold in local, informal markets where prices are low. Without participation in formal markets and access to fair prices for their produce, women farmers are discouraged from investing in hydroponic farming or establishing greenhouses, as the profitability of such investments is uncertain.

### Climate-related challenges

- a. **Energy dependent:** Hydroponic systems and greenhouse structures rely on energy for artificial lighting, water circulation, temperature control, and waste disposal. Optimizing energy efficiency through well-managed systems and renewable energy sources is crucial. A key challenge for hydroponics entrepreneurs is finding light sources that burn at the required intensity and for the required duration while minimizing energy consumption. However, with only 38.2% of Rwanda's rural population having access to electricity,<sup>253</sup> the need for alternative sources of power further increases the cost of setting up hydroponic greenhouses in rural areas.
- b. **Plastic usage:** Hydroponics systems often use channels, containers, and pipes made of plastic for plant cultivation. Moreover, many farmers repurpose plastic containers and tires. This is because other materials such as glass and stones are more expensive. Often, the roof and walls of greenhouses are also made of plastic, contributing to plastic waste. To minimize the use of plastic, hydroponic



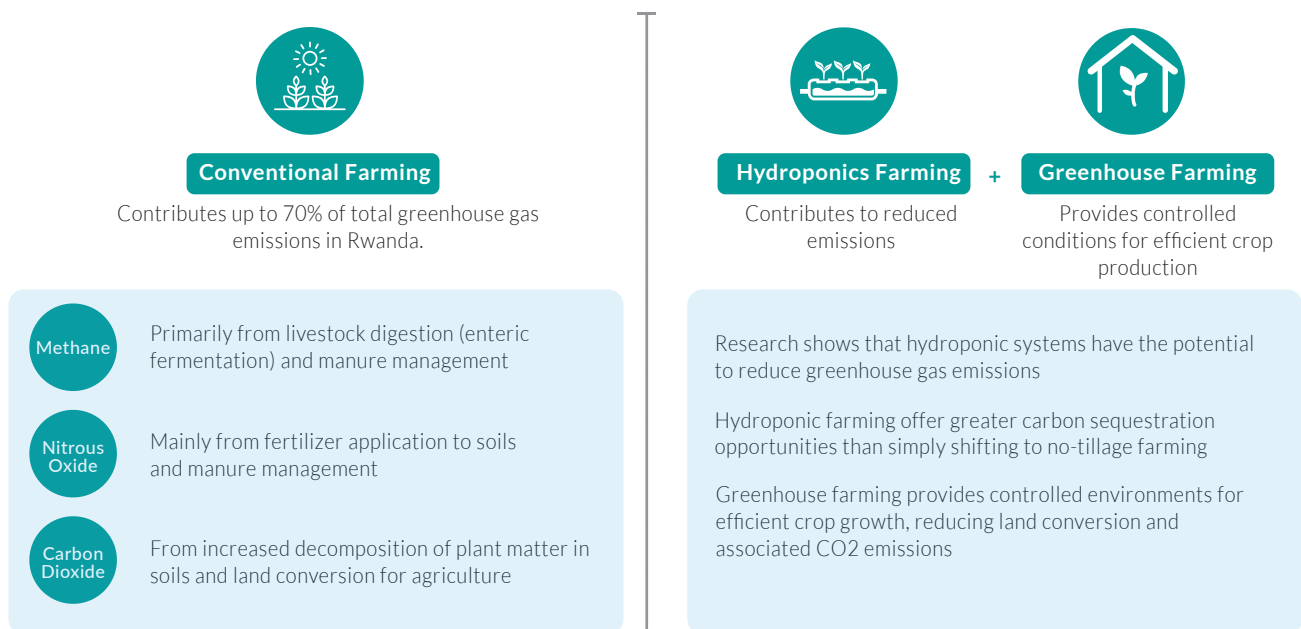
and greenhouse providers must devise a way to repurpose old plastic materials or explore sustainable alternatives such as glass and cement.

- c. **Poor waste management:** The improper disposal of used nutrient solutions from hydroponics production systems can pose several environmental risks. Hydroponic nutrient solutions that are improperly disposed of often contribute to runoff, leach into drinking water, and affect water quality. Therefore, it is important for hydroponics providers to employ efficient recycling and waste management strategies.

### 5.8.3 Business/Operating model of Green Harvest

Founded in 2020 and based in Rwanda, Green Harvest Limited aims to help farmers by addressing the concerns of limited arable land, declining yields, seasonal harvests, and environmental risks on farmlands. The enterprise focuses on promoting climate-smart agriculture and sustainable land management by combining hydroponics technology and greenhouse systems. According to the Rwanda Environment Management Authority, the agricultural sector contributed 70.4% to the country's total greenhouse gas emissions in 2016.<sup>254</sup> Green Harvest's focus on leveraging hydroponics and greenhouse farming is, therefore, a welcome sustainable alternative to reducing these emissions, as depicted in Figure below.

**Figure 50:** Greenhouse gas emissions from conventional vs greenhouse/hydroponic farming



Green Harvest's greenhouses are glass- or plastic-enclosed framed structures that are adapted for the cultivation of a wide variety of crops, including vegetables, fruits, and grains. The sides and roof are glazed with materials such as fiberglass, plastic films, or polyethylene or polyvinyl, allowing plants to receive natural sunlight throughout the day. The frame is made of either aluminum or galvanized steel, protecting crops from winds and rain during cold months, which helps extend the growing season and increase yields. The greenhouse is designed in a way that it is partly heated by the rays of the sun and partly by artificial means, such as circulating steam, hot water, or hot air. To regulate air circulation, the greenhouse includes a ventilation system through openings in the roof, which can be operated mechanically or automatically, and through end-wall openings where electric fans can circulate air throughout the greenhouse's interior. Green Harvest installs three sizes of greenhouses based on farmers' needs: large (16m by 36m), medium (14m by 36m), and small (18m by 30m). For the hydroponics system, Green Harvest uses

the nutrient film technique (NFT) and deep-water culture (DWC) technique,<sup>255</sup> typically set up indoors in a greenhouse or spare room or outdoors on a balcony or rooftop.

By combining the greenhouse and hydroponics systems, Green Harvest offers farmers an efficient and sustainable technology that conserves resources (especially water and land), minimizes waste, produces year-round, and improves yield.



Photo Courtesy : Stock photo.

**Figure 51:** Setting up a greenhouse for smallholder farmers



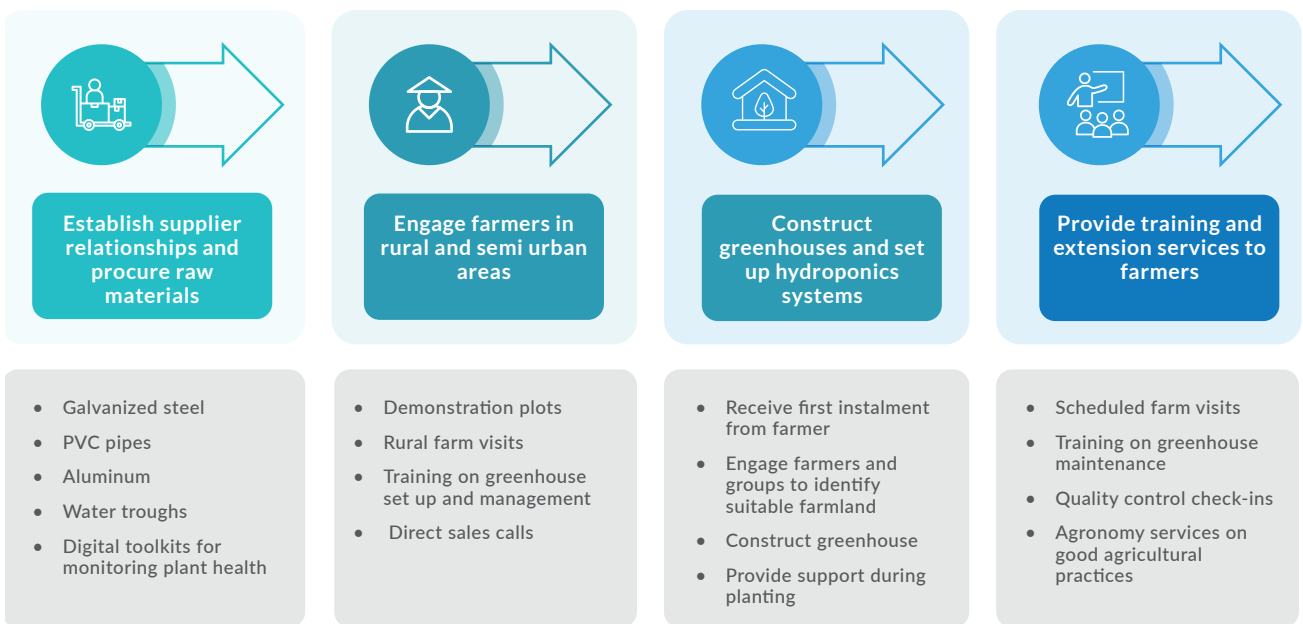
**Photo Courtesy :** Intellecap's team taken at Green Harvest's farmer greenhouse in Rwanda.

Green Harvest's target customers include farming cooperatives, individual farmers, youth, and women-based farmers groups in the eastern (Rwamagana, Gatsibo, Bugesera), northern (Rulindo), and southern (Nyanza) provinces of Rwanda. Over 70% of its customers are women.

Green Harvest works with these groups to create a system that allows them to pool resources and establish hydroponics systems and greenhouses to increase yields and income. The company also provides training and agronomy services to help farmers optimize their harvests. Green Harvest engages its target market primarily through awareness campaigns that highlight the benefits of greenhouse and hydroponics systems. These efforts include farmer meetings, greenhouse demonstrations, and training sessions. By working with women farmer groups, Green Harvest disseminates information about its offerings across a wide network of farmers who often belong to multiple value chain associations and groups. From 2020 to 2023, the company installed over 50 greenhouses across Rwanda, with 42 of them belonging to women farmer groups.

Green Harvest sources its input materials, such as galvanized steel, aluminum, and PVC pipes, from China and Kenya. These materials are used to construct greenhouse structures while the hydroponics systems are set up using locally sourced pipes and other materials. The integration of the greenhouse and hydroponics technology is carried out by Green Harvest's technical team who also train farmers on how to operate the system. Figure below summarizes the Green Harvest model.

**Figure 52:** Green Harvest's business model



By 2025, Green Harvest plans to introduce market linkages as part of its offerings; it intends to aggregate the output from its greenhouse customers for sale to stores and outlets such as supermarkets, hotels, restaurants, exporters, and open-air markets.

Green Harvest Limited is a beneficiary of the USD 300 million Commercialization and De-Risking for Agricultural Transformation Project (CDAT), funded by the Government of Rwanda through the Ministry of Agriculture and Animal Resources (MINAGRI) and the World Bank Group. The project aims to commercialize and de-risk the agricultural sector in Rwanda. Through this project, Green Harvest offers

small-holder women and youth farmers, up to a 90% subsidy on greenhouse systems installations. Green Harvest has reached and supported over 20 smallholder women groups in eastern Rwanda under this project.

**In line with the overall objectives of the GLOW program, Green Harvest was selected because of its potential for low-carbon transition through the hydroponics greenhouse system and its focus on smallholder women farmers in rural Rwanda.** The Green Harvest business model demonstrates the following potential benefits and impacts that align with the program's objectives:



- a. **Efficient resource use:** The efficient use of resources demonstrated by the greenhouse and hydroponics system offered by Green Harvest is a key feature of climate-smart agriculture. By using greenhouses, Green Harvest helps farmers grow produce in small spaces, including in urban areas. This reduces the need for deforestation and land degradation, which are major causes of GHG emissions.
- b. **Adaptation to climate change and lower emissions:** Farmers who have installed Green Harvest’s greenhouse and hydroponics systems have been able to produce food all year-round, regardless of weather conditions or climate change. This resilience to climate variability is crucial for attaining food security in Rwanda and achieving the country’s climate targets. Furthermore, hydroponics systems have been found to produce fewer GHG emissions compared to traditional farming methods.
- c. **Reduced pesticide use:** Due to the highly controlled environment, crops grown in greenhouses and hydroponics systems are less susceptible to pests and diseases. For farmers in the Green Harvest network, this reduces the need for pesticides, the production and use of which contribute to GHG emissions.
- d. **Gender inclusion and employment creation:** By targeting women farmer groups, Green Harvest is creating opportunities to empower women and increase their earning potential through improved and sustainable production.

**Figure 53:** Mixed (women and men) group engaged by Green Harvest



Photo Courtesy : Intellecap’s team.

#### 5.8.4 Support provided by the program to Green Harvest

Through a tailored Gender Action Plan (GAP) and a comprehensive Technical Assistance program designed on the basis of an in-depth, on-ground needs assessment, the program supported Green Harvest scale the adoption of its climate-smart solutions by enhancing engagement with women farmers. The GAP targeted three broad outcomes, critical to ensuring Green Harvest accelerates its transition to low-carbon development and deepens positive outcomes for women’s economic empowerment:

- **Increased accessibility to Green Harvest’s climate-smart farming solutions for women farmers in the region.**
- **Improved market positioning, visibility, and brand awareness for Green Harvest.**
- **Increased adoption of Green Harvest’s climate-smart farming solutions by more women farmers through the provision of formal consumer financing.**
- **Enhanced financial and operational efficiencies for the business based on a competitive revenue model and resource optimization.**



Figure 54: A snapshot of Green Harvest's Gender Action Plan

Priority GAP Areas	Key Activities	Interventions	Key Results
<b>Increased accessibility to Green Harvest's climate-smart farming solutions for women farmers in the region</b>	<ol style="list-style-type: none"> <li>1. Identify strategies and models to increase engagement with individual farmers and women-only/mixed farmer groups</li> <li>2. Connect with and onboard women farmers and groups</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender 101 training</li> <li>2. Access to women only/mixed groups and women-focused organizations</li> <li>3. Build capacity of the gender champion</li> </ol>	<ol style="list-style-type: none"> <li>1. Connected with over 5 new women only/mixed groups and women-focused organizations</li> <li>2. Articulated challenges restricting the adoption of solutions and delegated gender champion to directly address challenges</li> </ol>
<b>Improved market positioning, visibility, and brand awareness for Green Harvest</b>	<ol style="list-style-type: none"> <li>1. Increase awareness for hydroponics and greenhouses in target regions in Rwanda</li> <li>2. Identify unique marketing channels</li> <li>3. Position Green Harvest as a leader in the sector</li> </ol>	<ol style="list-style-type: none"> <li>1. One-on-one marketing sessions with experts</li> <li>2. Development of marketing strategy</li> <li>3. Gender 101 training</li> </ol>	<ol style="list-style-type: none"> <li>1. Established social media accounts for the company as new marketing channels for targeting urban farmers</li> <li>2. Developed gender-focused marketing messages and created a one-year marketing plan and budget</li> </ol>
<b>Increased adoption of Green Harvest's climate-smart farming solutions by more women farmers through the provision of formal consumer financing</b>	<ol style="list-style-type: none"> <li>1. Support more women farmers to access sources of financing</li> <li>2. Increase adoption of Green Harvest's solutions</li> </ol>	<ol style="list-style-type: none"> <li>1. Development of a customized consumer financing strategy for Green Harvest</li> </ol>	<ol style="list-style-type: none"> <li>1. Ongoing engagement with women's groups and local savings groups to provide financing for women farmers</li> <li>2. Conducted trainings on financial literacy and savings for women farmers</li> </ol>
<b>Enhanced financial and operational efficiencies for the business, based on a competitive revenue model and resource optimization</b>	<ol style="list-style-type: none"> <li>1. Connect with relevant funding opportunities in the sector</li> <li>2. Improve processes and optimize operations</li> </ol>	<ol style="list-style-type: none"> <li>1. Gender-lens-investment readiness training</li> <li>2. Ongoing business advisory through dedicated mentorship</li> <li>3. Participation in Pitch Day with investors</li> </ol>	<ol style="list-style-type: none"> <li>1. Hired 1 female mid-management staff, bringing the male-female employee ratio to 55:45</li> <li>2. Transition to impact-focused fundraising</li> <li>3. Developed a business model canvas</li> </ol>

## Gender mainstreaming TA support interventions

### 1. Increased accessibility to Green Harvest's climate-smart farming solutions for women farmers in the region

While Green Harvest's model already engaging with women farmer groups, the GAP identified an urgent need to expand access and include more women farmers. As part of the support provided to Green Harvest, the program developed a strategy to engage with more women farmers, exploring diverse models tailored specifically to the unique needs of women farmers in Green Harvest's locations. An example includes leveraging bundled value-added services that allow women access to inputs, extension services, processing centers, and market linkages through Green Harvest, thus positioning Green Harvest as a one-stop solution for their farming needs. Another initiative involved leveraging ecosystem partnerships with NGOs, government agencies, community-based organizations,

and research institutions to scale Green Harvest's ongoing efforts and increase reach to women farmers, especially in rural communities. By incorporating these initiatives into its business model, Green Harvest is able to amplify its work, reach new markets, identify new solutions, and integrate more rural women farmers into productive, profitable, and sustainable agricultural value chains.

### 2. Improved market positioning, visibility, and brand awareness for Green Harvest

Before joining the program, Green Harvest did not have a defined market strategy and marketing plan. One of the key factors for success identified by the GAP included focusing on the most effective marketing channels and making data-driven marketing decisions to position Green Harvest as a leader in climate-smart agricultural solutions in Rwanda, and deepen its impact on women farmers. The program developed a comprehensive marketing strategy that aims to help Green

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Harvest generate demand for its products and services and reach more small-holder women and youth farmers in rural areas. It includes a SWOT analysis of the business, a detailed approach to marketing, budget allocation, monitoring and evaluation, as well as a timeline for implementation. To increase direct engagement with the women farmers, the marketing approach identified certain critical components such as defining the characteristics of the target audience, introducing product bundles, adopting flexible and customer-centric product pricing, and investing in traditional and digital marketing channels. This approach has enabled Green Harvest to cater to the diverse needs and financial capabilities of different customer segments, use customer-specific messaging that resonates with its target audience, address the unique needs of women and youth farmers who may face different barriers to adoption, offer a range of products/services that cater to different needs and budgets, engage smallholder farmers who may have limited access to internet and/or smartphones, and allocate its marketing resources more efficiently.

Following the development of a marketing strategy, the program also provided Green Harvest with gender-focused training and one-on-one expert sessions on marketing, aimed at helping the enterprise implement a range of gender-responsive marketing strategies. For example, one of the trainings helped Green Harvest deepdive into the challenge of limited access to information and poor awareness of hydroponics and greenhouses among rural and urban women farmers. This led to the development of strategies for information sharing, education, and motivating women farmers to embrace hydroponics and greenhouse systems. Initiatives included creating social media accounts aimed at urban women farmers that simplified and demystified hydroponics, creating video content to demonstrate the practices and benefits of greenhouses, and showcasing success stories of women farmers who have adopted hydroponics greenhouse systems, especially in rural areas. These efforts have put women farmers at the center of Green Harvest's marketing strategy, generated new interest from women farmers in Green Harvest's sustainable farming solutions, and increased their knowledge of sustainable agricultural practices.

### **3. Increased adoption of Green Harvest's climate-smart farming solutions by more women farmers through the provision of formal consumer financing**

Out of the 49 customers served by Green Harvest, 7 are individual farmers while 32 clients are women-only / mixed groups. These groups were offered discounts through the Commercialization and De-Risking for Agricultural Transformation Project (CDAT) project while individual farmers, none of whom are women, paid in full. The baseline assessment for Green Harvest revealed that women farmers are largely unable to afford its hydroponics and greenhouse solutions due to lack of capital and are therefore locked out of the opportunity without the support of special programs such as the CDAT. Currently, greenhouse installation costs a Rwandan farmer USD 1,900. Green Harvest offers farmers the option to pay in instalments, with 50% of the cost paid

before installation, 40% after installation, and 10% after the final handover of the hydroponics greenhouse structures (typically two months after completion). Despite this, women farmers are unable to afford these solutions. The GAP emphasized the critical crucial need to explore consumer financing options for farmers in Green Harvest's target regions. The Intellecap team assessed and presented several relevant options to Green Harvest including individual/group savings schemes, establishing a no-collateral funding scheme for qualified farmers, negotiating off-take agreements for farmers to guarantee markets, and facilitating microfinance partnerships for credit access. Green Harvest has committed to working with new and existing farmer groups to establish savings groups and explore partnerships with local financing institutions, thereby creating new opportunities for women farmers to access financing and adopt climate-smart solutions to improve productivity and income.

## **Business efficiency interventions**

### **4. Enhanced financial and operational efficiencies for the business along with gender integration**

#### **Building investment readiness**

Crucial for attracting gender-lens and other types of investment, the program provided dedicated support to build Green Harvest's investment readiness by identifying relevant capital sources, communicating the enterprise's gender, environmental, and social impact, and building its understanding of the investment cycle. Green Harvest's Operations Manager, who participated in the session said that the training and practical sessions were eye-openers and enabled them to understand gender-lens investors and their investment processes. The sessions also facilitated a shift from ineffective fundraising tactics to investor- and donor-friendly approaches that prioritize impact, growth, and sustainability.

#### **Ongoing business development support**

Green Harvest's GAP highlighted the need for ongoing business development support to implement and evaluate of key strategies. This support was provided through mentorship and handholding. A key output from this intervention facilitated opportunities for collaboration between Green Harvest and 10 women-led / women-focused organizations in the sector to amplify and accelerate Green Harvest's work. The program also included a thorough audit of Green Harvest's operations and provided recommendations such as hiring more female employees, conducting regular employee training, and documenting its business model. These recommendations have been implemented with Green Harvest hiring one mid-level management female employee, conducting two employee training sessions, and developing a business model canvas. These steps have been critical in improving daily workflow processes, fostering a gender-responsive work environment, and increasing the business' efficiency in responding to gender-specific challenges.

**Figure 55:** The Intellecap team with women employees at Green Harvest



Photo Courtesy : Intellecap's team.

### 5.8.5 Learnings across the key research questions

**Research Question 1:** What is the role of PSEs in accelerating the transition to a low-carbon economy while keeping women's economic empowerment at the core of this transition?

**Hydroponics and greenhouse farming systems have the potential to increase productivity, income, and financial agency for women farmers**

Hydroponics and greenhouse farming can be done on a small- and large-scale, providing flexibility and accessibility for both smallholder rural and urban women farmers. Women can produce 20% to 25% more crops per square meter—depending on the crop variety planted—thereby addressing women's lack of land ownership and control, particularly in rural households. Women farmers can also produce healthier crops, target premium markets, and negotiate better prices for their produce. For example, Green Harvest farmers aggregate their produce and sell directly to large processors at prices 10% higher than market rates. Given the reduced post-harvest losses in greenhouse systems and savings from reduced water and fertilizer use, profitability and income are higher, contributing to women's financial stability and empowering them to make independent financial decisions. By targeting women, Green Harvest offers women farmers

a pathway to economic empowerment, food security, and sustainable livelihoods.

**Research Question 2:** What are the short-term, medium-term, and long-term interventions (financial and non-financial) required to support and scale climate-smart PSEs to enhance the impact on women?

**Investment and technical assistance to PSEs are critical tools to scale innovative solutions**

Green Harvest's experience with the financial handicap of women farmers is a call to action to provide financial and non-financial support to PSEs in the landscape. More so, the cost of setting up hydroponics and greenhouse systems are prohibitive, which limits the capacity of PSEs to provide direct consumer financing to women farmers. Providing grants or subsidies to local enterprises for setting up hydroponic and greenhouse systems can help cover initial costs, such as infrastructure, equipment, and seeds. This helps to lower operational costs, reduce product prices, and improve affordability for women farmers. Also, facilitating access to credit or microloans for both the PSE and farmers enables enterprises to invest in technology, training, and expansion and empowers farmers to invest in sustainable farming solutions. Non-financial support such as training and mentorship as provided under this program are essential for knowledge exchange, capacity building, and improving the productivity of women farmers engaged by the PSE.





Photo Courtesy : Intellecap's team with Green Harvest's greenhouses in the background in rural Rwanda.

# 6. Recommendations for the Ecosystem



Learnings from this implementation research program were used to identify key support areas for climate-smart PSEs and outline strategies to provide such support in order to scale their solutions while increasing women's participation. These learnings have been organized into strategic recommendations for the ecosystem according to the types of support required by enterprises and their areas of operations.

## Digitization of value chain

### 1. Digitization of the agriculture and aquaculture industry through an online platform for trading and training:

- Aggregating suppliers of agricultural and fish produce, linking them onto a digital platform, and training women to use such platforms, has the potential to eliminate exploitative practices such as FFS while ensuring continuous access. For instance, simplifying access to fish and reducing/eliminating middlemen from the value chain can significantly reduce existing vulnerabilities for women fish traders.
- Poor-quality inputs in the fishing industry, like feed, lead to low quality fish production and degrades water bodies due to the accumulation of feed, resulting in a decline in fish species. Given their limited access to capital and restricted mobility, women, in particular, struggle to access inputs. Integrating technology to improve access to critical inputs such as feed, fertilizers, capital, markets, among others, particularly for women, could go a long way in advancing gender equality in the sector. Development of an online platform/app can be explored to address gender-specific needs.

### 2. Rural e-commerce solutions utilizing agent models can accelerate access to high-quality inputs and promote the adoption of CSA practices among rural female farmers. Agents provide price comparisons and link farmers with suppliers offering the best prices, thereby improving access to affordable and high-quality inputs for women farmers. The agent model also allows farmers to connect with buyers, manage inventories and product delivery.

## Access to targeted support for PSEs

Provision of a 'Capital+' program that offers technical assistance along with capital disbursement to PSEs:

1. **Capital and technical assistance are critical for PSEs to scale innovative climate solutions.** Providing grants or subsidies to local enterprises can help cover initial costs, such as infrastructure, equipment, and seeds. This can also reduce operational costs and product prices and improve affordability for women farmers.
2. **Facilitating access to credit or microloans and training for enterprise and farmers enables the enterprise to invest in technology, training, and expansion, and empowers farmers to invest in sustainable farming solutions.**

**Access to capacity building and advisory support provides businesses** with expert knowledge and emerging industry information allows them to make informed decisions, leading to effective use of funds and better returns in the long term.

## Provision of consumer financing

1. **Explore consumer/customer financing to help farmers access solutions provided by PSEs.** Climate solutions and interventions in the agrifood landscape are relatively new, and hence PSEs operating in this emerging sub-sector face challenges in both adoption and affordability, which inhibits their ability to scale. Women are more often unable to access these solutions as they have lesser access to credit facilities compared to their male counterparts. PSEs can partner with financial institutions to provide a credit facility for farmers / value chain partners who need such credit to facilitate their access to climate smart agricultural solutions. Such partnerships can also offer financial literacy training to farmers to create awareness on prudent financial management and timely repayment.

## Use of IoT in production

1. **Application of IoT to help farmers optimize the use of inputs.** Providing farmers with real-time information on the efficiency of the production processes, (such as the level of dissolved oxygen, pH levels, moisture content of soil and water temperature) can help them monitor the growth of crops better. This also enables farmers to use inputs more efficiently, saving on costs by using only the required amount of inputs such as fertilizers and pesticides, thereby limiting environmental harm.

## Farmer training/handholding support

1. **Training farmers is key for the successful and effective adoption of climate-smart solutions.** Across the cohorts, many PSEs used farmer trainings (both free and paid) as a way of reaching individual women farmers and farmer groups in their communities, to promote their climate solutions and offerings, and provide information on how to use their products. Such training helps to drive adoption, increase awareness on climate issues, and improve outcomes (e.g., productivity) for farmers. Enterprises may integrate training as a key component of their offerings as a way of enhancing access to economic opportunities and climate-smart solutions in agriculture, especially for women. Ongoing training through demonstration plots and group sessions is critical for increasing women's participation in CSA.
2. **Introducing farmers to a new solution/technology requires a lot of handholding and engagement.** Continuous farmer engagement is required for generating awareness, ensuring that farmers are comfortable and confident in using the offered technology, and for establishing a business case for farmers to invest time and resources in adopting the technology. Moreover, farmers need to be confident

that there is an assured market for outputs produced as a result of using climate-smart solutions. Providing ongoing support and engagement activities for farmers, with a focus on women, is crucial, as they often struggle to participate due to time constraints. Organizing these activities at times convenient for both men and women is also important.

### Access to markets

1. **Increased market access for women smallholder farmers can increase their incomes and improve their agency.** Establishing sustainable buy-back linkages for women farmers will ensure offtake for their crop and fish produce, thus guaranteeing a minimum income level. The enterprise can assure offtake for women farmer's produce by either partnering with large wholesalers and exporters or linking women directly to larger domestic markets. Enterprises with similar business models have the potential to improve productivity and market linkages, leading to increased incomes and improved agency for women farmers.

### Ease access to capital

1. **Provision of blended financing.** It is often observed that more micro and small enterprises offer impactful solutions for smallholder farmers as compared to mediumsized businesses. Agribusinesses that have raised Series A funding tend to focus on profit maximization, to align with the financial interest of investors. Thus, they tend to serve medium- to large-scale farmers in order to increase business margins and efficiency. However, this also shifts their focus away from climate and gender impact. Offering an innovative/blended financing option for agribusinesses will allow enterprises to reduce their dependency on commercial equity investors and allow them to scale while focusing on maximizing impact as well as profits.

### Internal commitment towards gender mainstreaming

1. **Appointing a gender champion is a key step in leading the gender inclusion agenda within the organization.** Women are key stakeholders affected by climate change and agriculture is one of the sectors most significantly impacted by changing climatic patterns. However, since most businesses, industry associations, and other ecosystem organizations are led by men, policies and processes at the sector level as well as within the businesses tend to be gender blind. Effective gender mainstreaming across the sector requires a targeted approach and commitment from implementing businesses. Appointing a gender champion within an organization helps raise awareness about the benefits of gender equality, generate buy-in from employees, and drive gender integration within the organization and across its value-chain. As women form a large majority of the stakeholders in agriculture, it is important to integrate gender-responsive policies that empower women to take up economic opportunities and advance their social and economic empowerment.

### Ecosystem support

1. **Support from public and private sectors is critical for success.** Partnerships with municipal bodies and government agencies often help enterprises access land and aggregated resources. Public sector support also helps enterprises undertake sensitization for households, farmers, and market vendors, thereby contributing to knowledge dissemination and capacity building for women in the sector. On the other hand, partnerships with private investors and microfinance institutions / banks provide funding required to scale operations while women farmer groups and other private sector players are important allies for reaching and engaging women farmers across various geographical locations.

### Learnings from varied business models / value chains:

1. **Agribusinesses focused on production in agricultural value chains are more likely to mainstream gender compared to those focused on aggregation.** PSEs that aggregate agribusiness services for farmers are less likely to mainstream gender across their value chain, as compared to agribusinesses involved in production. This is largely because aggregators act as intermediaries between suppliers and farmers and therefore are limited in their scope of operations. However, such companies may evolve and engage in gender impact creation programs that support women farmers through extension services, thus reducing gender inequality in the sector.

On the other hand, businesses offering climate-smart agri products/solutions are more likely to engage more women in production as well as in market outreach (as agents, traders, distributors, etc.). For instance, PSEs producing organic fertilizers have a very high potential for women's inclusion since they undertake waste segregation or directly source segregated waste, a task traditionally undertaken by women. Mainstreaming gender across this value chain may lead to women becoming more economically empowered.

2. **Innovative agricultural technologies such as hydroponics and greenhouse farming systems could greatly increase productivity, income, and financial agency for women farmers.** These systems allow women farmers to produce more crops per square meter, thereby maximizing land use and removing the need for large expanses of land, as well as addressing the problem of land ownership. Moreover, by increasing utilization of resources, these systems contribute to producing lower emissions as compared to traditionally cultivated lands.
3. **Agribusinesses that offer more than one product to their customers are more likely to withstand headwinds.** This is because if one product fails, they can direct their attention to other products. Additionally, offering multiple products allows the business to better assess market needs based on the uptake of their various products. Support programs could provide TA on how



to integrate various products and services into their business model to avoid operational redundancies and increase efficiency.

### Other operational recommendations for enterprise sourcing/cohort formation:

Programs offering high-touch technical assistance, capacity building, and advisory support typically segment enterprises across multiple cohorts to be able to deliver customized training and mentorship to each participant. Similar programs may adopt some of the best practices and learnings from the current program to enhance efficiency and relevance for the sector. Such programs should:

1. Focus on a smaller group of PSEs to better manage high-touch support over a six-month period.
2. Divide enterprises into cohorts to allow for continuous feedback and iteration.
3. Assess PSEs' commitment and alignment to the program at the on-boarding stage to establish relevance and reduce dropout rates.
4. Establish a business case for gender mainstreaming across the value chain to demonstrate the benefit of: a) on-boarding more women (as suppliers, partners, customers); and b) offering services that help eliminate structural barriers hindering women's participation in the value chain.
5. Create and share success stories and case studies periodically, to track progress and outcomes, as the baseline, midline and end-line assessments of the different cohorts take place.



Photo Courtesy : Intellecip's team taken at Usomi head office in Nairobi, Kenya.



Photo Courtesy : Intellecip's team taken during field visits in Kenya.

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