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Scaling Gender-Smart Agriculture through Sustainable Finance in the Sahel

CSA Impact Assessment of Participants of the Gender-Smart Accelerator Challenge in Senegal

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Key messages

- A rapid assessment on climate smart agriculture (CSA) impact potential (Mitigation, Adaptation and Productivity) was conducted on 20 agri-food companies supported by the Gender-Smart Accelerator, an initiative aimed to create a pipeline of gender-responsive business models to match with private capital in Senegal.
- As the Accelerator technical assistance is implemented, companies' CSA impact significance are likely to double for climate change pillars. Major interventions driving these changes are:
 - Adaptation: climate information services (CIS), water and soil management.
 - Mitigation: agroforestry systems, efficient use of fertilizers and use of renewable energy sources.
 - Productivity: improved agronomic practices and reduction in food losses (improved storages).
- Through these significant improvements, there are several opportunities to further enhance CSA impacts that can be achieved by implementing the following principles: (1) avoid land-use change; (2) implement soil conservation practices; (3) enhance production diversity; (4) use of improved crop varieties and livestock breeding and feeding; (5) efficient use of water, energy and fertilizer; (7) avoid food loss; (8) use of renewables; (9) Use of CIS and (10) promote women and youth participation.
- This info note provides a baseline for future comparison and indicates opportunities for enhancing climate change resilience and food security through Accelerator-supported companies in Senegal.

Transforming and reorienting agricultural value chains with gender inclusivity through the implementation of CSA practices is a necessary pathway for meeting global demands on food security and climate change. CSA practices deliver productivity, adaptation, and mitigation, which are identified as the three interlinked pillars necessary for achieving this goal.

However, achieving the required systemic change for large-scale adoption of CSA remains a challenge, especially for smallholder farmers in developing countries. Smallholder farmers need sufficient

finance, technical assistance, and skills to implement and maintain improved production practices. In this context, gender equality encompasses women and youth's increased resilience, as well as reduced vulnerability to climate change. Women's agency about climate resilience is the ability to access and make choices based on the information and to participate in decisions that affect their lives ([Kabeer, 1999](#); [Rothman, et al, 2019](#)).



Access to finance remains a key challenge to increasing women's resilience to climate change. Women-owned agri-SMEs operating in Africa face a businesses and to invest in technology, logistics, service provision, and trade with remote farmers (A2F Consulting, 2016).

The Accelerator integrates gender-responsive approaches to ensure participation from women value chain actors to provide them with access to the productive resources, information, and finance, to implement CSA innovations (Derenoncourt, et al, 2022).

As part of its support to rural development, the Accelerator assists gender-smart agriculture in Senegal, which could serve as a critical driver of CSA-oriented agricultural transformation in the country. However, the potential to harness climate change and food security co-benefits in the Accelerator portfolio has not been analyzed comprehensively. Understanding the investment impacts of current activities and the key factors affecting those impacts could help increase and scale up gender-smart agriculture support to farmers to mitigate and adapt to climate shocks as well as enhance food security impacts for future investments.

This info note provides a rapid assessment of selected Accelerator supported companies and value chains with three key objectives: (i) assessing their potential impacts on agriculture productivity and climate change mitigation and adaptation; (ii) identifying key gender-smart agriculture mitigation and adaptation options appropriate to the investments; and (iii) assessing the organizational gaps that need to be addressed by the Accelerator companies' to implement CSA practices at scale r reducing climate impacts and enhancing food security.

Methodology

Company selection

The rapid assessment was conducted for 20 Accelerator supported agri-food companies operating in Senegal focusing on the (i) climate-smart agriculture (CSA) impact potential on Mitigation, Adaptation, and Productivity KPIs and (ii) organizational gaps in the implementation of CSA interventions and scaling of

their business models. Figure 1 gives the geographical distribution of the selected companies.

The Accelerator companies' selection was based on a set of criteria in which companies needed to demonstrate a business model with (i) a minimum of two years of operations, (ii) a clear gender and social inclusion strategy that benefits women, and (iii) activities committed to improving at least two of the three CSA pillars (productivity, adaptation, and mitigation) (Derenoncourt, et al, 2022). The selected companies were clustered as business models with:

- **Value addition and efficient processing** through reduction of post-harvest losses, and compliance with food safety standards (10 companies),
- **Sustainable intensification of production** through access to finance, inputs, and CSA advisory (4 companies),
- **Improvement of market linkages** through the promotion of sustainable and inclusive retail food brands (3 companies) and
- **Uptake of CIS and CSA practices** (such as index-based insurance) by smallholder farmers (3 companies).

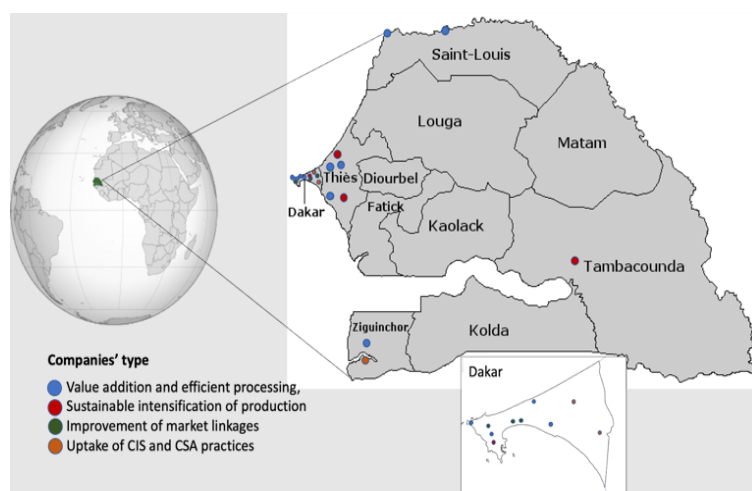


Figure 1: Geographical location and distribution of the selected Accelerator-supported companies across Senegal.

This rapid assessment technique is intended for contexts where aggregate data is available on agricultural land use and management practices. The method indicates the directions of CSA effects among companies' interventions, cropping systems, and value chains. As such, the results provide evidence of companies' trends in the selected value chains, rather than a comprehensive or precise mitigation,

adaptation, and productivity footprint for the companies' operations.

CSA impact assessment

The CSA impact of selected companies was estimated using the CGIAR CSA Screening Tool. This excel-based, qualitative tool uses multiple-choice questions to assess the potential impact of agri-food companies on adaptation, mitigation, and productivity KPIs considering their current actions and future interventions. This results in an overall score as follows:

- High: By implementing the proposed climate-smart interventions, the investee is likely to achieve a *significant impact* on the KPI.
- Medium: By implementing the proposed climate-smart interventions, the investee is likely to achieve a *moderate impact* on the KPI.
- Low: By implementing the proposed climate-smart interventions, the investee is likely to achieve a *low impact* on the KPI.

These key questions relate to the level of implementation of interventions on:

- Mitigation (greenhouse gas emission reduction): use of farming inputs (e.g., fertilizers), land use change, soil tillage, crop management, and energy.
- Adaptation: climate information services, climate hazards, water use and management, job creation, and soil management.
- Productivity: increase in productivity and management of food loss & waste.

Due to a lack of existing field data, the primary method of data collection was based on a limited set of interviews done with the 20 companies.

Organizational gap analysis

The assessment also allowed the CGIAR hub for sustainable Finance (OneSF) to identify the organizational gaps and challenges that would need to be addressed to facilitate the companies in accessing finance required for the implementation and scaling of the recommended CSA interventions. This assessment was based on a multiple-choice questionnaire to collect qualitative data on six areas:

(1) Business Model, (2) Growth Plan, (3) Investment Readiness, (4) Marketing Strategy, (5) Financial Management, and (6) Human Resources. The data collection method consisted of individual interviews with all 20 company representatives. The assessment identified the challenges faced by the companies and areas where they need capacity-building support. The information gathered informed the curriculum of the pre-investment technical assistance of the Accelerator.

Findings

Overall Impact

The average performance of all 20 companies shows that current CSA impacts range from low to low-medium significance across CSA pillars. As the Accelerator technical assistance is implemented, this impact is supposed to increase from low-medium to medium significance and more than double the companies' climate change mitigation and adaptation significance (Figure 2).

An increase in adaptation impact was due to the provision of climate services, practices on water management and conservational tillage, uptake of improved varieties, and an increase in job opportunities within the companies. The key drivers for mitigation impact were the implementation of agroforestry systems, efficient use of synthetic fertilizers, and management of livestock and pasture systems as well as the implementation of renewable sources of energy. Finally, the increase in agricultural productivity was due to a reduction in food loss and waste (improved storage) and diversification of income sources.

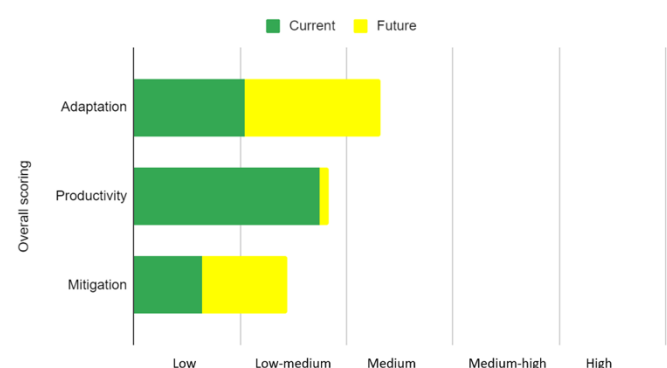


Figure 2: Impact of current and future interventions and practices (on adaptation, mitigation, and productivity across 19 investments) in Senegal -Africa.

Interestingly, none of the companies interviewed have a system in place to monitor CSA impacts on their operations and only a few knew how much their services and products affect crop productivity.

Although a significant increase in CSA impact is expected as a function of the Accelerator support, results clearly show that there are several opportunities to further enhance companies' CSA impacts.

Organizational gaps

At the organizational level, companies lack the required documentation for due diligence by potential investors and have limited capacity to set internal processes for financial management. There is a strong overall need to hire and strengthen the capacity of human resources. Companies also need to define their growth plan and establish a sound business model for sustainable scaling (Figure 3).

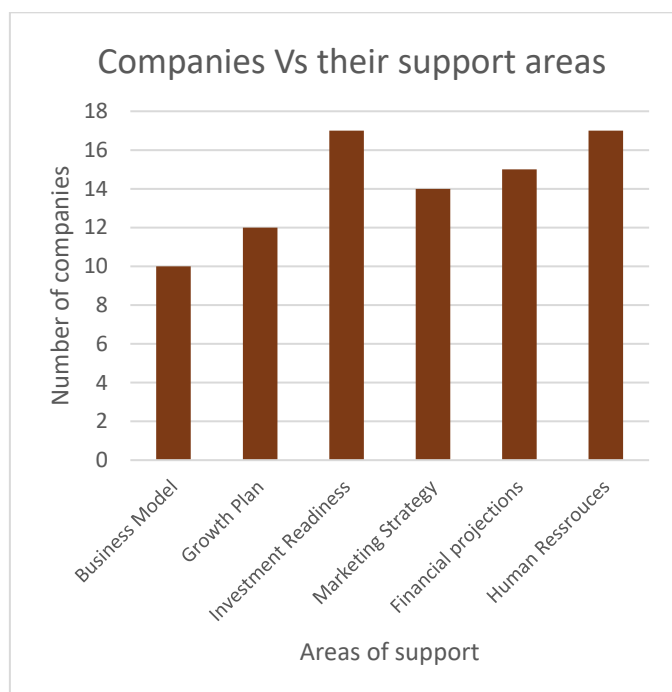


Figure 3: Organizational Gaps and areas of support/reinforcement needed by the companies participating in the Gender Smart Accelerator

The following sections provide a cluster-wise analysis of companies' CSA impacts and outline recommendations to increase the likelihood of achieving higher cost-effective CSA impacts.

Cluster 1: Value addition and efficient processing

The ten (10) commercial companies assessed in this cluster are based in Dakar, Ziguinchor, and St Louis regions of Senegal. Their business activities include

- Promotion and processing of medical and aromatic plants, fruits and vegetables, herbal tea processing, oily macerate, and derivative products,
- Processing of local cereal into enriched infant flour used against malnutrition, and into granola for health-conscious consumers.
- E-waste processing of fruits into food, cosmetics, and compost.
- Processing of cashew nuts, peanuts, potatoes, and horticultural produce value-added products.
- Production of gluten-free vegetarian food from local ingredients.

The value-added products are packaged and then supplied within Senegal.

CSA impact

With their current interventions companies in this cluster are likely to promote on average a low to medium impact significance on CSA pillars with the highest impacts on productivity and adaptation (low-medium). With the Accelerator support, 'Impact on the CSA pillars will increase, especially for adaptation, as additional interventions and the expansion of current practices take place (Figure 4).

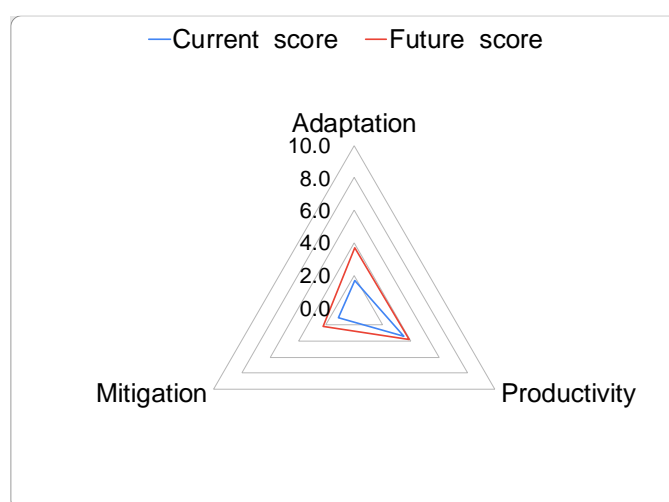


Figure 4: Current and future CSA impact average of Accelerator-supported companies working on value addition and efficient processing

Mitigation: The current low-impact significance of this pillar is due to the limited number and scale of practices avoiding or reducing GHG emissions. Currently, only three companies (Out of ten) are promoting forest protection (e.g., avoiding land conversion) and adoption of agroforestry systems (in less than 30% of the cultivated area). Two companies reported activities on recovering degraded lands and improving pasture management and animal feeding (from 30% to 70% of livestock herds). Currently, only one company is using renewable energy, by combining conventional and renewable energy matrixes at 50% Each (Table 1).

The protection of natural landscapes avoids GHG emissions of carbon sequestered in trees and soils, especially in high-carbon landscapes (IPCC, 2006). And the adoption of agroforestry and land restoration can remove carbon from the atmosphere and sequester above and below-ground biomass (Feliciano et al., 2018). Better animal and pasture management tend to sequester carbon in the soil, optimize feed quantity and quality, increase food conversion (productivity) and, consequently reduce losses of carbon and nitrogen and GHG emissions per unit of product (Herrero et al., 2016).

Mitigation interventions are supposed to gain more traction with the Accelerator technical assistance support, resulting in a higher impact significance for the mitigation CSA pillar. This increase is due to the expected expansion of interventions on renewable energy and nutrient management. Nine companies expect to implement the use of renewable sources of energy in at least 50% of the energy matrix and three companies plan to implement improved nutrient management in the future (Table 1).

The use of renewables usually displaces fossil fuels (e.g., diesel), avoiding CO₂ emissions from fuel transportation and combustion (IPCC, 2006; 2019). Improving nutrient management helps balance soil nutrient inputs with crop nutrient requirements to improve productivity without compromising environmental quality. This practice may reduce the over-application and further the effectiveness of fertilizer application, especially nitrogen, that may otherwise lead to N₂O emissions, a powerful GHG (IPCC, 2006). The application of appropriate rates of fertilizers is the most important practice for minimizing N₂O emissions.

CSA interventions	Company									
	1	2	3	4	5	6	7	8	9	10
Mitigation	Current Impact Significance									
Forest protection	0	5	0	0	0	0	5	0	0	5
Recovery of degraded	0	0	0	0	0	0	1	0	1	0
Agroforestry	0	0	0	0	0	0	5	0	5	5
Nutrient management	0	0	0	0	0	0	0	0	0	0
Renewable energy	5	0	0	0	0	0	0	0	0	0
Livestock	0	0	0	0	7	0	0	0	3	0
Adaptation										
CIS	0	2	0	3	3	2	0	2	3	5
Water management	0	0	3	0	3	3	0	0	5	0
Irrigation	0	0	0	0	0	1	0	0	0	0
Soil management	0	0	0	3	0	7	0	0	0	0
Jobs	7	3	0	3	3	3	3	0	3	3
Diversify production	3	0	0	0	7	0	0	0	3	3
Productivity										
Food production	0	3	3	3	3	3	8	0	3	3
Food loss	1	3	3	3	3	1	3	3	0	3
CSA interventions	Company									
	1	2	3	4	5	6	7	8	9	10
Mitigation	Future Impact Significance									
Forest protection	0	5	0	0	0	0	5	0	0	5
Recovery of degraded	0	0	0	0	0	0	1	0	1	0
Agroforestry	0	0	0	0	0	0	5	0	5	5
Nutrient management	0	0	5	0	0	1	0	0	0	3
Renewable energy	5	5	5	1	1	1	5	3	5	5
Livestock	0	0	0	0	7	0	0	0	3	0
Adaptation										
CIS	0	3	3	7	7	7	2	7	7	7
Water management	0	0	0	5	5	5	0	5	5	0
Irrigation	0	0	0	0	0	1	0	0	0	0
Soil management	0	0	0	8	0	1	0	0	0	0
Jobs	8	5	8	8	8	8	8	5	8	8
Diversify production	5	5	0	5	8	5	0	5	5	5
Productivity										
Food production	0	3	8	3	3	3	8	0	3	3
Food loss	1	3	8	3	3	1	3	3	3	3
Low Impact significance or estimated										
Medium impact significance										
High impact significance										

Table 1: Current and future CSA interventions and impact of Accelerator-supported companies working on value addition and efficient processing

Adaptation: Key actions driving the current low impact significance across companies in this cluster relate to low CIS, low irrigation uptake, soil, and water management practices, diversification of production/income, and less jobs compared with the future scenario with medium impact significance (Table 1; Figure 4). This is expected as the companies in this cluster operate in the processing segment of the value chain and are often not directly involved in production.

With the Accelerator technical assistance support, there will be a significant expansion of current interventions, especially CIS, and the impact significance of this pillar is expected to more than double on average across companies.

CIS have been accessed by seven companies, two of which have increased their current resilience to the identified hazards. A total of seven companies will

continue addressing climate hazards in the future. Only four companies have currently provided access to CIS, and a total of eight companies will expand this CIS in the future. Four companies have currently promoted the edification of production and income sources by 30% while eight companies have committed to increasing this 30% to 70% in the future.

The use of improved water management practices was reported by one company and committed by five companies in the future. Two companies require less water to run their daily businesses and one company mentioned that they currently use up to 5% of the harvested water. The companies described that their future water use could increase to 10% of harvested water. One company is currently recycling more than 50% of its water while three companies will increase water recycling by at least 30% in the future. One company is implementing irrigation techniques in more than 70% of cultivated land and this will be similarly replicated and expanded in the future with Accelerator assistance. Water management helps determine better irrigation controls during off-seasons of low rain and future irrigation programming with the application of drip technologies. Improved water management also helps protect public health (Clean water and availability), industrial (manufacturing and packaging), agricultural and social mechanisms.

These interventions have been reported to create jobs along the value chain by less than 30% whereas all 10 companies have described future job creation to increase by up to 70%.

Productivity: Seven companies reported that current practices have increased productivity and that they will be enhanced in the coming years. Nine companies are avoiding current food losses and 100% of the companies will expand these measures in the future.

Post-harvest losses can occur at every point along the value chain (e.g., during storage, processing, and transporting). Such losses decrease the amount of available food and waste the resources used to produce the lost food that emits GHG (e.g., livestock and fertilizer) (CCAFS, [2020](#)).

Organizational gaps identified for Cluster 1

Companies in this cluster face the challenge of securing the quality supply of raw materials needed for processing activities. By formalizing their relationship with their producer base they can increase loyalty and decrease price volatility. Capacity building in good manufacturing practices to comply with food safety regulations is a need specific to companies in this cluster.

Below is a summary of the gaps identified for cluster 1 comprising companies working towards value addition and efficient processing.

	Gaps Identified for Cluster 1
Business Model	Formalize relationships with suppliers, and ensure continuous availability of quality raw materials
Growth Plan	Increase processing and logistic capacity for more efficiency, reduce food losses and meet additional customer demand
Investment Readiness	Prepare business plan Assemble legal, governance and administrative documents in preparation for due diligence by potential investors
Marketing Strategy	Identify and segment customer markets, and develop a targeted marketing mix (products, price, promotion, placement) to sustainably cater to market demand
Financial Management	Establish financial records, standard operating procedures, reporting and forecasting
Human Resources	Build capacity in good manufacturing practices and quality control to comply with local and international food safety standards

Cluster 2: Sustainable intensification of production

The companies in this cluster include Farmer Based Organizations, with a combined membership of more than 10,000 farmers. They are involved in the production, aggregation and commercialization of onions, poultry farming, horticulture, production and processing of organic food, agroforestry, capacity building for young and women farmers of millet and fonio in Dakar and Tambacounda regions of Senegal.

CSA impact

Companies working on sustainable intensification of production are likely to have low-medium CSA impact significance on productivity, adaptation and mitigation. With the Accelerator support, the impact significance increases to medium-high because of

additional CSA practices and the expansion of current practices (Figure 5).

Mitigation: Currently, companies have a low-medium mitigation impact significance mostly related to actions on forest protection and recovery of degraded lands, followed by adoption of agroforestry, and improvements in livestock management (Table 2).

Protecting natural landscapes avoids GHG emissions, especially in high-carbon landscapes, such as tropical forests, whereas restoring degraded lands and adopting agroforestry systems remove carbon from the atmosphere and sequester above- and below-ground biomass (Roe et al., [2021](#); Feliciano et al., [2018](#)). Better pasture management also tends to sequester carbon in soil along with animal feeding optimization that increased food conversion (productivity) and reduces emissions of GHG per unit of product (Roe et al., [2021](#); Herrero et al., [2016](#)).

With the Accelerator support, companies are planning to expand interventions on livestock management (to 70% of livestock herd) and agroforestry, especially on renewable energy (Table 2).

With the implementation of these additional practices, the mitigation significance of this cluster will increase to medium. Expanding renewable energy use will reduce CO₂ emissions by reducing and replacing the use of diesel and fossil fuel transportation (IPCC, 2006).

Adaptation: The current low-medium adaptation significance of companies is primarily a consequence of actions on CIS within their services and products, implementation of irrigation and diversification of production/income. The existing interventions have currently created jobs across the company value chain. Companies have also taken interventions for improvement in soil management.

With the Accelerator technical support, companies in this cluster are expected to expand and implement measures that will enhance adaptation impact significance to medium-high (Figure 5; Table 2). For example, by implementing water management practices such as water harvesting and recycling. Companies will also expand: (i) access to CIS (e.g., weather forecasting), (ii) diversification of production, and irrigation systems (the latter from less than 30% to more than 70% of the area), (iii) the adoption of soil management (e.g., use of cover crops) to more than 70% of the cultivated land, and (iv) jobs (Table 2). With these interventions, all four companies reported having increased jobs in their value chains by 30% and expect future expansion beyond 30%.

These interventions would improve farmers' ability to manage climate risks and make decisions (Howden et al., 2007), increase soil fertility and health, and enhance productivity.

Productivity: While in theory current practices of the four companies should result in productivity increases, the companies are not estimating these productivity impacts since their current and future impact significance are not changing. With the introduction of additional interventions and technical support, the impact on productivity is expected to increase further. All companies in this cluster have interventions to avoid food losses (e.g., improved storage and transportation), but these are not being measured. Technical support in quantification will assist the companies in better understanding their current productivity impacts to support the expansion of activities (e.g., improved storage, processing and transportation).

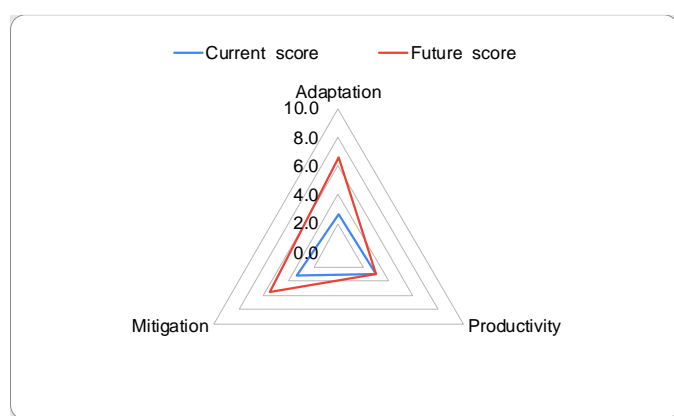


Figure 5: Current and future CSA impact average of four Accelerator-supported companies working on sustainable intensification of production

CSA interventions	Company			
	1	2	3	4
Mitigation	Current Impact Significance			
Forest protection	5	5	5	5
Recovery of degraded lands	0	0	10	10
Agroforestry	0	5	5	5
Nutrient management	0	0	0	5
Renewable energy	0	0	0	0
Livestock Management	3	3	3	3
Adaptation				
CIS	7	2	3	3
Water management	0	0	0	0
Irrigation	8	3	3	0
Soil management	3	0	3	7
Jobs	3	3	3	7
Diversification of production/income	7	7	0	3
Productivity				
Food production	3	3	3	3
Food loss	3	3	3	3

CSA interventions	Company			
	1	2	3	4
Mitigation	Future Impact Significance			
Forest protection	5	5	5	5
Recovery of degraded lands	0	0	10	10
Agroforestry	0	8	8	8
Nutrient management	0	0	0	5
Renewable energy	10	10	10	10
Livestock Management	3	7	7	7
Adaptation				
CIS	7	7	7	7
Water management	5	7	4	6
Irrigation	8	8	10	5
Soil management	8	0	10	10
Jobs	8	5	8	8
Diversification of production/income	8	8	5	8
Productivity				
Food production	3	3	3	3
Food loss	3	3	3	3

Low Impact significance or estimated
Medium impact significance
High impact significance

Table 2: Current and future CSA interventions and impact of four Accelerator-supported companies working on sustainable intensification of production

Organizational gaps identified for Cluster 2

By formalizing the relationship with off-takers including processors, aggregators and exporters, the companies in this cluster can address price volatility and unsold production risks. The companies in this cluster identified price volatility and uncertainty of sale in cases of increased production. By formalizing the relationship with off-takers, including processors, aggregators and exporters, they will be able to address these challenges. The companies in this cluster also identified the need for capacity building in CSA practican in CIS for their farmer member to increase their resilience to climate change.

As CSA interventions are implemented, there is an important impact potential on all members Below is a summary of the organizational gaps identified for these companies:

	Gaps Identified for Cluster 2
Business Model	Formalize relationships with off-takers to secure revenues from current and future scaling of operations. Subscribe to index-based insurance to mitigate risks of adverse climate events.
Growth Plan	Increase storage facilities to help reduce post-harvest losses
Investment Readiness	Prepare business plan Assemble legal, governance and administrative documents in preparation for due diligence by potential investors
Marketing Strategy	Develop partnerships with aggregators, supermarkets, and exporters
Financial Management	Establish financial records, standard operating procedures, reporting and forecasting
Human Resources	Build capacity on climate-smart agricultural practices and disseminate through farmer members

Cluster 3: Improvement of market linkages

The improvement of the market linkages includes three companies with activities in Dakar Senegal. Their major interventions are the aggregation and distribution of fruits and vegetables to supermarkets and the commercialization of organic local products, livestock and waste management.

CSA impact

Currently, companies working on improving market linkages are likely to have low to medium impact significance across productivity, adaptation and mitigation pillars. Productivity is the CSA pillar with the highest impact significance (low-medium), followed by adaptation and mitigation (low) (Figure 6). With the Accelerator technical assistance/support, the significance of these impacts will increase to medium-high and balance out across CSA KPIs because of additional CSA interventions and the expansion of current practices.

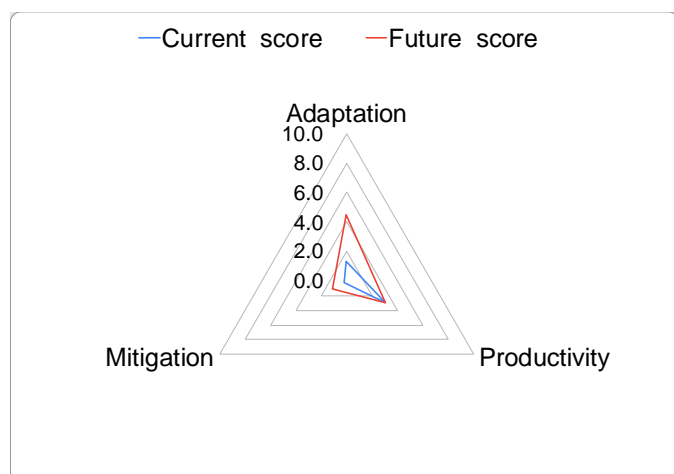


Figure 6: Current and future CSA impact average of three Accelerator-supported companies working on improvements to market linkages.

Mitigation: The low impact significance potential of these companies is due to the limited adoption and scale of interventions that reduce GHG emissions or promote carbon sequestration. The only CSA intervention driving estimated impacts on mitigation is related to livestock management systems (only one company is implementing this practice on less than 30% of the livestock herd) especially the practice of optimal animal feeding to increase food conversion and consequently, reduce GHG emissions per unit of animal product (Herrero et al., 2016).

In the coming years, companies expect to adopt agroforestry and renewable energy use in addition to expanding existing livestock management systems. These additional interventions will increase the mitigation impact significance of companies through carbon sequestration (agroforestry) and reduction in CO₂ emissions from combustion and transportation of fossil fuels (renewable energy) (IPCC, 2006; 2019).

Adaptation: CSA interventions related to adaptation involve access to Climate information services and identification of climate hazards. Two companies have used weather forecasting in the design of their products and services. One company in this cluster has reported the use of irrigation, promotion of soil management and diversification of production. The three companies have implemented interventions to increase jobs and diversification of production. They will increase these in the future with Accelerator technical assistance (Table 3).

Promising interventions for climate adaptation are related to access and use of agri-advisories, weather

forecasting, and water use and management, especially improved irrigation systems (e.g., drip irrigation). These practices can help farmers to manage climate risks and inform decisions across food value chains (Howden et al., 2007).

With technical support, the adaptation impact significance is expected to increase from low to medium as companies are likely to expand these activities and additionally adopt water management practices (Table 3).

The adoption of improved water management, for example, with better irrigation controls during off-seasons of low rain, helps protect public health (Clean water availability), industrial (manufacturing and packaging), agricultural and social mechanisms.

CSA interventions	Companies		
	1	2	3
Mitigation	Current Impact Significance		
Forest protection	0	0	0
Recovery of degraded lands	0	0	0
Agroforestry	0	0	0
Nutrient management	0	0	0
Renewable energy	0	0	0
Livestock Management	0	3	0
Adaptation			
CIS	3	3	0
Water management	0	0	0
Irrigation	0	8	0
Soil management	0	3	0
Jobs	0	3	0
Diversification of production/income	0	3	0
Productivity			
Food production	3	3	3
Food loss	3	3	3
CSA interventions	Companies		
	1	2	3
Mitigation	Future Impact Significance		
Forest protection	0	0	0
Recovery of degraded lands	0	0	0
Agroforestry	0	5	0
Nutrient management	0	0	0
Renewable energy	3	5	3
Livestock Management	0	3	0
Adaptation			
CIS	5	10	0
Water management	0	5	0
Irrigation	0	10	0
Soil management	0	8	0
Jobs	5	8	5
Diversification of production/income	5	8	5
Productivity			
Food production	3	3	3
Food loss	3	3	3
Not measured			
Low Impact significance			
Medium impact significance			
High impact significance			

Table 3: Current and future CSA interventions and impact of two Accelerator-supported companies working on improvements in market linkages

Productivity: Current practices within the three companies promote increased productivity and avoided food losses. However, they lack information on productivity impacts, and therefore, need further evidence. This aligns with the area of intervention of these companies as they operate in the aggregation and distribution stage of the value chain, and less in the agricultural production stage.

Organizational gaps identified for Cluster 3

The companies in this cluster have identified the need to secure continuous availability of supply for their operations. In that case, they need support in formalizing and retaining their producer networks. The second major gap identified is the streamlining of the logistics operations needed to deliver services in line with market demand and expectations.

Below is a summary of the gaps identified for the companies in cluster 3 that are aggregators and create market linkages between agricultural producers and retailers/end consumers:

	Gaps Identified for Cluster 3
Business Model	Formalize relationships with their suppliers to ensure continuous availability of quality supplies
Growth Plan	Invest in processing and logistic capacity to increase efficiency, reduce food losses and meet additional customer demand Streamline and digitalize logistics platforms to improve inventory management and customer relationship management
Investment Readiness	Prepare business plan Assemble legal, governance and administrative documents in preparation for due diligence by potential investors
Marketing Strategy	Identify and segment customer markets, and develop a targeted marketing mix (products, price, promotion, placement) to sustainably cater to market demand
Financial Management	Establish financial records, standard operating procedures, reporting and forecasting
Human Resources	Build capacity building in good manufacturing practices and quality control to comply with food safety regulations,

Cluster 4: Uptake of CIS and CSA practices

The companies are located in Dakar and Ziguinchor regions of Senegal. They carry out coaching, training, capacity building, follow-up, and evaluation of women and young farmers and provision of techniques in building "school farms," and provision of preventative

livestock care programs for farmers and animal health workers through mobile applications.

CSA impact

Companies working on the uptake of CIS and CSA practices are likely to promote low to medium CSA impact significance across productivity, adaptation and mitigation pillars. With the Accelerator support, the significance of these impacts will increase to medium to high due to additional CSA practices the and expansion of current practices (Figure 7).

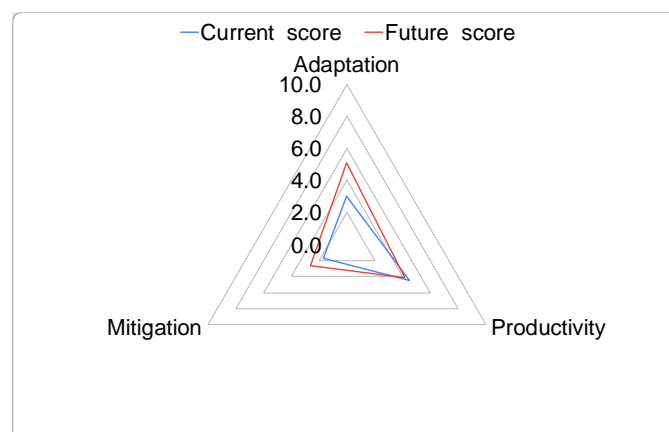


Figure 7: Current and future CSA impact average of three Accelerator-supported companies working on uptake of CIS and CSA practices.

Mitigation: Major interventions driving current impacts related to forest protection, recovery of degraded lands, agroforestry, livestock, and pasture management (Table 4). With the Accelerator technical support, most of the current mitigation interventions will be sustained along with the adoption of renewable energy sources, which is targeted at 100% of the energy matrix the of two companies. The use of renewables has the potential to replace fossil fuels (e.g., diesel in generators), which avoids the emissions of CO₂ from fuel combustion (IPCC, 2006; 2019).

Adaptation: Primary CSA interventions favoring adaptation to climate change among the three companies are related to improved soil management practices (e.g., implementation of cover crops), followed by diversification of production/income and water management. The companies have reported that their interventions are creating jobs across the value chain and this will increase in the future with Accelerator assistance (Table 4).

With Accelerator technical support, the adaptation impact significance is supported to significantly

increase as the company is likely to expand irrigation, diversification of production, and CIS, with a potential increase in job creation (Table 4).

CSA interventions	Company		
	1	2	3
Mitigation	Current Impact Significance		
Forest protection	0	5	0
Recovery of degraded lands	0	10	0
Agroforestry	0	5	0
Nutrient management	0	0	0
Renewable energy	0	0	0
Livestock Management	0	0	10
Adaptation			
CIS	0	5	0
Water management	1	1	5
Irrigation	0	3	3
Soil management	3	10	10
Jobs	3	3	3
Diversification of production/income	7	3	3
Productivity			
Food production	3	3	10
Food loss	0	8	3
CSA interventions	Company		
	1	2	3
Mitigation	Future Impact Significance		
Forest protection	0	5	0
Recovery of degraded lands	0	10	0
Agroforestry	0	5	0
Nutrient management	0	0	0
Renewable energy	0	10	10
Livestock Management	0	0	10
Adaptation			
CIS	2	5	3
Water management	2	4	5
Irrigation	5	8	10
Soil management	8	10	8
Jobs	8	5	8
Diversification of production/income	10	5	5
Productivity			
Food production	3	3	10
Food loss	3	8	3
Low Impact significance or estimated			
Medium impact significance			
High impact significance			

Table 4: Current and future CSA interventions and impact of three Accelerator-supported companies working on the uptake of CIS and CSA practices

Productivity: Companies have reported productivity increases because of their current practices with an additional opportunity to enhance impacts through measures to avoid food loss such as improved harvesting, transportation, and storage systems.

This cluster has supported and planned several CSA interventions while there are still significant opportunities to deliver further CSA impacts (Table 3; Figure 5). Promising opportunities for companies to enhance their CSA impacts could be achieved by adopting interventions on agroforestry, livestock and nutrient management, avoiding land use change and recovering degraded lands (mitigation), and soil and water management (adaptation) (Table 4).

These interventions would help reduce emissions due to more efficient livestock production (Herrero et al., 2016), and avoid N₂O emissions by eventual over-fertilization of crops (Feliciano et al., 2018; IPCC, 2006). The protection of natural landscapes avoids GHG emissions of carbon sequestered in trees and soils, especially in high-carbon landscapes (IPCC, 2006).

Improving water management would further help determine better irrigation controls during off-seasons of low rain and future irrigation programming with the application of drip technologies.

Organizational gaps identified for Cluster 4

The companies in this cluster identified the need to build their human resources capabilities and knowledge in CSA practices, CIS, good agricultural practices, and food safety and standardize the training modules that they deliver to the farmers.

Below is a summary of the gaps identified for the companies in cluster 4 that provide capacity-building services to farmers and farmer-based organizations:

	Gaps Identified for Cluster 4
Business Model	Promote participation of women smallholder farmers as suppliers to ensure continuous availability of quality supplies
Growth Plan	Standardize training modules for scalability
Investment Readiness	Prepare business plan Assemble legal, governance and administrative documents in preparation for due diligence by potential investors
Marketing Strategy	Participate in national professional networks, and partner with farmer-based networks to extend market share
Financial Management	Establish financial records, standard operating procedures, reporting and forecasting
Human Resources	Build capacity in climate change, CSA practices, CIS, good agricultural practices, food safety, and financial management

Achieving a higher gender-oriented CSA impact

CSA interventions have been supported and planned by companies in the assessed clusters. There are still significant opportunities to deliver further CSA impacts. The promising opportunities for these clusters to enhance their CSA impacts could include gender mainstreaming in expanding interventions related to the recovery of degraded lands, forest

protection, implementation of renewable energy, livestock management, and agroforestry (mitigation); improved agro-advisories, weather forecasting (CIS), and water use and management, especially on improved irrigation systems (e.g., drip irrigation) (adaptation). These practices and interventions have the potential to support producers in managing climate risks over the coming years by informing decisions by farmers, agribusinesses, investors, and policymakers with implications over a range of timeframes from the short (tactical) to the long-term (strategic) (Howden et al., 2007). Monitoring the CSA impacts on the companies' business operations to track products and services to increase (productivity) impact significances is highly desired since most cluster productivity impacts remained unchanged in the current and future scenarios.

The recommended CSA interventions would help avoid emissions from land use change, promote higher carbon sequestration in trees and soils, reduce emissions per unit of animal product from optimization of livestock production, improve farmer's ability to manage water use and irrigation controls - especially during off-seasons of low rain, and enhance productivity (Feliciano et al., 2018; Herrero et al., 2016; IPCC, 2006).

There are several options to enhance CSA impacts through gender-oriented interventions in agri-food systems. Table 5 shows core agriculture value-chain interventions that may enable future Accelerator companies to enhance gender-responsive CSA impacts while presenting economic feasibility.

These interventions tend to simultaneously provide co-benefits across multiple dimensions, such as soil health, water quality, GHG mitigation, and productivity. However, it is important to mention that CSA practices are context-specific and usually applied in tandem so that no single practice can guarantee impacts on CSA pillars. Therefore, guidance toward improved CSA pathways relevant to the investments may be initiated through the use of checklists applying the following principles:

- Avoid land use change.
- Implement soil conservation practices.
- Enhance production diversity.
- Use of improved crop varieties and livestock breeds.

- Efficient use of water, energy, and fertilizer.
- Efficient use and conversion of feed in livestock production.
- Avoid food loss or waste.
- Increased use of renewables.
- Use of weather information.

Pillar	Key gender-responsive CSA interventions	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Adaptation	Decrease in agricultural workloads	x	x	x	x
	Improved role in decision-related to change in cropping pattern		x		x
	Better access to information through mobile-based agro-advisories	x	x	x	x
	Better implementation of information/knowledge from agro-advisory	x	x	x	x
	Better implementation of information/knowledge gained from these training/workshops/seminars				x
	Better access to markets (input and output)			x	
	Better participation in the sale of livestock products			x	
	Better participation in training/workshops/seminars				x
	Increased use of weather-based insurance/crop insurance	x	x	x	x
	Better awareness that climate variability can be a risk to agriculture	x	x	x	x
	Improved water use efficiency	x	x		x
	Better access to information to manage agricultural risk	x	x	x	x
Mitigation	Improved soil/land quality	x	x		x
	Better access to machines	x	x	x	x
	Better usage of these farm equipment/tools	x	x	x	x
	Better crop diversification/ any change in cropping pattern		x		x
Productivity	Improved income through selling output	x	x	x	x
	Better access to nutrient application practices	x	x		x
	Better access to improved seeds	x	x		x
	Better access to quality agricultural inputs	x	x		x

Table 5: Core gender-oriented interventions for enhancing productivity, mitigation, and adaptation to climate change across the cluster agricultural investments

The accelerator companies can assess the gender-responsiveness of their CSA intervention based on the gender-equality indicators from the [Gender Empowerment Index](#) evaluating the impact on the men and women participating in their supply chains.

- Increased income and production in the face of climate impacts
- Access and control of CSA technologies, farm inputs, assets
- Access to climate information services
- Access to credit
- Decreases in workload freeing time to participate in high-value productive activities

In addition, improving activity data collection is the best means to generate more precise productivity, mitigation, and adaptation evaluations of Accelerator companies. Increasing the ability to gather quantitative information would allow the use of more sophisticated approaches for higher sensibility on CSA impacts and lower uncertainties.

In this context, companies' reporting could be designed to capture more climate-relevant information, particularly for land use change, management of crop and pasture areas (e.g., soil management), level of farm inputs (e.g., energy and nitrogen fertilizer), as well as energy and water use. Collecting quantitative information using the checklist above would allow the Accelerator companies to improve the certainty of estimates and better guide future decision-making for the implementation of gender-responsive CSA interventions.

Final considerations

The rapid assessment of CSA's potential impact on 20 companies operating in Senegal across four strategies shows that Accelerator-supported agri-food companies will enhance farmers' crop and livestock production while reducing the emissions of GHG and, more consistently, better adapting them to climate change.

Although significant, results show that there are several opportunities to further enhance companies' CSA impacts. This info note provides not only a baseline for future comparison but also indicates opportunities for reducing climate change impacts and enhancing food security through Accelerator-supported companies in Senegal.

Despite the benefits of CSA practices for strengthening agriculture value chains, it is worth noting that further deep dive into the interventions supported by the Accelerator technical assistance to companies and farmers are recommended as gender-responsive CSA practices are applied in the coming years.

While the companies are adopting and scaling the recommended CSA practices, they are receiving organizational support to address the gaps identified. The companies' ability to scale and secure financing post-accelerator will provide the basis to evaluate the resource mobilization of the accelerator investments.

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Further reading

Climate Change Agriculture and Food Security (CCAFS) CSA Guide. <https://csa.guide>

Costa, C., Wollenberg, E., Benitez, M. *et al.* Roadmap for achieving net-zero emissions in global food systems by 2050. *Sci Rep* 12, 15064 (2022). <https://doi.org/10.1038/s41598-022-18601-1>

Low Emissions Development – Resource Platform:
<https://agledx.ccafs.cgiar.org>

World Bank - Climate Smart Agriculture.
<https://www.worldbank.org/en/topic/climate-smart-agriculture>

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