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Market analysis report for crops and associated technologies in Togo

Improving Agricultural RESilience to SALinity Through DEVelopment and Promotion of Pro-poor Technologies and Management Strategies in Selected Countries of Sub-Saharan Africa (RESADE project)

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Executive Summary

Farmers' engagement in the markets underlies the unlimited potential for improving agriculture worldwide. To ensure the development of the agricultural value chain, it is important to

strengthen farmers' capacity to produce, process, and integrate into markets, thus the intervention of the RESADE project to develop the agricultural value chain from the production stage to the market supply. This report delivered a market analysis of the crops and technologies promoted by the RESADE project to identify opportunities raised and develop the market in the targeted countries. To do so, focus group discussions, key informant interviews with different actors, and direct observation as well as literature review results were used to highlight the main crops and agriculture technologies covered in the study area, the country's government agricultural and market improvement policies, the challenges faced by the market development as well as the trends and opportunities brought by the project in market development.

The country has an emerging marketplace with the rapid development of agriculture these recent years through government policies and agricultural development projects. However, many challenges to the full development of the agricultural sector and the market still exist and are reported by the actors. These include: -Agriculture is essential in small-scale farming based on traditional agricultural inputs and technologies and rainfed, leading to low productivity level. -A poor market organization. -Limited access to credit and subsidies. -Lack of inadequate information, education, and knowledge. -Inadequate and late supply and availability of critical production inputs (including seeds, fertilizer, farm tools, and so on). -In addition, the official agricultural input prices are not affordable for farmers. -Poor productive enterprise options for producers to invest in. -Skilled labor shortages; -Poor marketing skills, and extension services. -Inadequate infrastructure (storage facilities, transportation, road conditions, market conditions, equipment, irrigation, and processing facilities). -Limited access to credit and subsidies for actors to purchase inputs and develop their activities.

On the other hand, according to the stakeholders and analysis, there are great potential and opportunities to stimulate local and regional market demand. The investment made by the project has raised several market potential development opportunities: Considerable farm input including new crop varieties seeds and machines has been distributed to the farmers facilitating crop production and processing. From this, agricultural crop yields and food production have been increased as well as crop diversification, food diversification, and food security. Small farmers and other market actors' income source in the market is developed and their connection

to each other. Thanks to the establishment of farmers cooperatives and the connection with credit institutions, farmers are getting access to credit and forming themselves into small saving groups. So, the access to credit and extension services for farmers to develop their activities has been facilitated support. Women have been empowered through their active integration in the project activities and food processing. Agricultural market development through supporting the food-processing is one of the ways to contribute to increasing agricultural output food diversification and food security. Therefore, food processing training has been provided to women farmers to empower women's capacity and involvement in economic development. Women have transformed maize, sorghum, cassava, yams, tomatoes, oranges, and pineapple into couscous, juice, tomato paste, marmalade, and cakes, leading to increased food diversity, food availability, food security, revenue source diversification, and market development. New market development businesses have been developed, showing that the market is expanding to the national and regional levels. In Togo for example, the biochar production and biochar machine fabrication business are on the way to developing.

However, for market a full market potential development, the following relevant recommendations implementation are necessary for stakeholders in the agricultural sector, including farmers, technology providers, policymakers, and investors.

- Promote sustainable agriculture and empower small-scale farmers through quality seeds and fertilizers, irrigation systems development, modern farm materials, capacity-building training, and extension services support as engaged in the project.
- Empowering smallholder farmers, especially women, is crucial for achieving sustainable and climate-resilient agriculture.
- Farmers should be motivated to adopt and implement the promoted technologies and the successful technologies should be expanded to more areas in the country. In addition, market prices should be regulated and market access to farmers and conditions should be improved.
- Farmers should be trained on entrepreneurships and agribusiness.

- Farmers should be motivated and help to follow the path of market-oriented farming in market development.
- Farmers should be demonstrated how to effectively act in the market and teach them to develop their commercial skills.
- Consequent investments should be made in sustainable agro-processing businesses to transform products locally before selling or exporting to the international market. Food processing is recognized to contribute to increasing agricultural product availability and agricultural market development.
- New sustainable agricultural business and entrepreneurship development should be strongly encouraged and supported financially as well as technical.
- Access to financial loans is still at a low stage, which is why it is important to improve access to credit. Many market actors are either unaware of the existence of credit or have limited access due to the terms and conditions involved. By providing farmers with easier access to credit, they can invest in advanced agricultural technologies, increase production, and expand their activities. Additionally, the government should increase agricultural and market subsidies to facilitate market transactions.
- Building and improving rural infrastructure, such as roads, irrigation systems, transport, and storage facilities, can help farmers transport their produce to market and minimize crop waste due to climate shocks and post-harvest losses. Improving access to markets and services in rural areas is a way toward good market development.
- To improve market accessibility, farmers need access to markets with favorable conditions to sell their products and generate profit.
- To add value to agricultural products, governments can help establish linkages with rural, national, regional, and international markets.
- Providing farmers with constant information on market developments and supporting the creation and development of new agricultural businesses as well as the expansion of agro-processing enterprises are also important.

- A gradual improvement in the domestic production capacity especially for women in relation to the promoted crop and commodities and processed products should be fostered.

1 Introduction

Background

This report focuses on market analysis for crops, associated agricultural technologies introduced, and developed foods in the framework of the RESADE project, an agriculture project funded by the International Fund for Agricultural Development (IFAD) and the Arab Bank for Economic Development in Africa (BADEA). The project is implemented by the International Center for Biosaline Agriculture (ICBA) in partnership with the national partners- the National Agricultural Research and Extension Services (NARES). RESADE project has been introducing and promoting adapted climate-smart technologies and new crop varieties with high tolerance to salinity and drought-resilient crops to small-scale farmers in several villages in the targeted seven (7) countries since 2019. The targeted countries are Gambia, Liberia, Sierra Leone, and Togo in Western Africa, and Botswana, Mozambique, and Namibia in Southern Africa. Using the best practice hubs and farmer-field schools' approaches, the project allowed dissemination technologies, to increase awareness and to strengthen smallholder farmers with knowledge of new agriculture technologies to especially overcome the growing soil salinity problems, increase crop yield, and ensure household food security in the targeted areas.

The RESADE project aims to support national agricultural development policies and strategies of the targeted countries by rehabilitating and increasing the productivity of salinity-affected lands and providing technical assistance in salinity management to other IFAD- and BADEA-funded projects being implemented in these countries as well. The initiative will utilize ICBA's previous and current projects as a basis for pertinent and valuable experience in implementing salinity management techniques for small-scale farmers residing in harsh surroundings.

The RESADE project aims to enhance food security and alleviate poverty among smallholder farmers in salinity-affected areas, especially women, in selected countries. To achieve this, the project's objective is to boost agricultural productivity and income in these areas by Introducing salt-tolerant crops and best agronomic management practices; developing value chains and markets for introduced cropping systems; and enhancing the skills of farmers and extension workers in agriculture that is resilient to salinity and climate-smart, in partnership with (NARES). As an outcome, the project is expecting the following results:

- The project aims to help around 11,550 smallholder farmers, with a focus on at least half of them being women, in specific areas. The goal is to encourage these farmers to adopt new cropping systems that can withstand changes in climate and salinity.
- To increase the productivity of saline lands by 30% and the economic returns of the targeted smallholder farmers by 20%.
- The incorporation of climate-smart and salinity-resilient agricultural models and approaches into national agricultural development policies and strategies in the seven targeted countries.

Objectives of the analysis

The project has used a best practices hub, farmer field schools' approaches, and multiple capacity building training in the experiments hub and surrounding to disseminate technologies, increase awareness, and empower smallholder farmers with requisite knowledge on technologies to overcome salinity challenges and increase crop yields. The principal technologies introduced include the use of salt-tolerant crop varieties, the use of soil amendments, irrigation methods to reduce salinity through leaching, and soil and moisture conservation and management practices. Foods and recipes based on crops tested at the BPH with farmers and farmers cooperatives installed were also developed in a bid to create a strong agricultural value chain and market development. Creating a market study report for crops and associated agriculture technologies involves evaluating technology adoption by farmers, assessing the current state of the agricultural sector development from the intervention, understanding market trends,

constraints, and opportunities raised, and identifying other future market growth opportunities to develop.

The agricultural market system includes two sub-systems: input marketing and final product marketing. The input marketing sub-system includes all these actors involved in making available various farm production inputs to farmers such as input manufacturers, government and nongovernment institutions, individual input suppliers, and dealers. The output product marketing sub-system includes farmers, cooperatives, processors, traders, wholesalers, retailers, importers, and exporters. The main objective of this market study as part of the RESADE project intervention impact assessment in the targeted communities is to provide a comprehensive understanding and inform stakeholders in the agricultural value chain, including farmers, agro-industry players, policy-makers, and investors, about the dynamics, trends, and opportunities created in the market development for crops and technologies promoted by the project. This information as well as provided recommendations enables them to make better informed decisions about their intervention in the agricultural sector, improve productivity, and meet the challenges facing agriculture in the context of natural shocks such as climate change. Specifically, this report addresses the following objectives: Assess current agricultural market trends and demand, assess supply chain efficiency and potential constraints, determine the adoption of agricultural technologies, and analyze the competitive landscape of the market.

The rest of the report is structured as follows: after detailing the methodology framework, the agricultural sector overview, the market trends and demands, the technology adoption, the market opportunities and challenges, and the government policies and support for the country and the study site are provided.

2 Methodology Framework

The information included in the report has been collected from two principal sources: primary data and secondary data. To collect the primary information, a mission to the mentioned countries' project sites was organized to meet different stakeholders in the agricultural value chain from the input supply, and production stage to the consumption. We used three qualitative

data collections including focus group discussion (FGD) key informant interview (KII) and direct observation to interview the agricultural value chain actors and gather the necessary information. Concerning the secondary data acquisition, using a literature review and various publicly available data sources, some useful information has been collected to build the report. During the in-depth interviews with the actors, the gathered primary information allowed us to validate the secondary data. Finally, the report was constructed using narrative and qualitative content analysis methods to analyze the information and produce valuable results for policymaking in the pathway of expansion and better market construction.

3 Results and Discussions

3.1 Agricultural Sector Overview

The following analyses have been carried out in the context of the Togo agricultural market analysis and development. Togo with its capital Lomé is a country located in West Africa bordered by Ghana, Benin, and Burkina Faso with a population estimated at more than 9 million in 2022 with an estimation of 57% living in rural areas (World Bank, 2022; WFP, 2022). The country covers an area of 5,679,000 hectares out of 5,439,000 ha are landmass and 240,000 ha is water. The country has one of the largest arable lands per capita in West Africa accounting for more than 70% of the total land and only 40% was being used in 2016 (IFC, 2023). Lowlands are estimated at 175,000 hectares and irrigable land at 86,000 hectares, of which 2,300 hectares are equipped with a total or partial hydroagricultural development system (IFC, 2023). The Togolese economy cornerstone is largely based on rainfed agriculture, which accounts for 40% of the country's GDP and 39% of total employment (World Bank, 2022). Togo's main staple crops primarily for local consumption are maize, sorghum, millet, rice, yams, cassava, groundnuts, beans, and soya. The main cash crops of the county are coffee, cocoa, and cotton. Among the estimated 800,000 small-scale farming households, only 2% are engaged in commercial farming (FinMark Trust, 2017). Also, these crops are exported as raw products, making the market non-competitive. Despite the agricultural sector's potential to stimulate growth and create jobs, it faces numerous constraints, including climate change impact, lack of finance, poor quality investment, limited availability of

technical expertise, poor water resources management, difficulties in accessing land, and lack of infrastructure (Abudu, 2023). Access to input and output markets is one of the main obstacles to agricultural development in Togo. Factors such as limited access to inputs (seeds and fertilizers), limited access to storage and market information, limited access to credit and extension services, poor quality certification, and trade barriers contribute to difficulties in accessing product markets. These factors may partly explain the trend towards lower farm-gate prices for some of Togo's main crops over the last decade (Abudu, 2023). Therefore, Togo has good potential in agricultural production given the diversity of its climate and commodities and the arable land availability. So, agricultural development via innovation and the use of modern technologies, such as improved seeds and irrigation methods, as well as other soil and water management strategies and the development of the agricultural value chain, can play a key role in poverty reduction and increase the population welfare of the country.

3.2 Government Policies and Support to Agricultural Market Development

This section evaluates government policies, subsidies, and incentives affecting crop production and the role of government in promoting sustainable agriculture and technology transfer.

Conscious of its potential, the agriculture sector plays a crucial role in Togo’s government's development plans. Agricultural development plans figure among the pillars of the government national’s development roadmap for 2020-2025. Toward the development of the agricultural market, the government aims to boost and promote sustainable agriculture and technology transfer, create jobs, and increase income by placing the agricultural sector at the center of development. To this end, the government plans to increase agricultural productivity and yields, implement new agricultural technologies, develop the network of rural roads, accelerate the Mechanism to Incentivise Agricultural Financing based on risk sharing, develop an agropole (the Kara agropole), and reform agricultural land access policy. The agricultural sector is at the heart of Togo's Nationally Determined Contribution (NDC), through the integration of a climate-resilient production system to develop agricultural productivity. The target welcomes projects

such as RESADE, which provide a new generation of agricultural innovation and climate-smart agriculture solutions.

The national diagnosis of the private sector takes into account cotton, soya, and cashew nuts for the potential development of the value chain and opportunities for private investment, which have maintained strong export performances throughout the last decade. However, Togo's export potential in sesame seeds, cashews, phosphates, soybeans, cocoa, lumber, palm oil, coffee, and vegetable fats and oils is also highlighted by the United Nations Conference on Trade and Development (2023). However, the sector's development is hampered by low productivity growth, owing to limited access to agricultural input and output markets, low mechanization, high taxation, and minimal state expenditure on agriculture (Abudu, 2023). Togo plans to modernize the agricultural sector through the National Programme of Investment for Food Security (PNIASA) from 2010 to 2015 and the National Agricultural Investment and Food and Nutritional Security Programme from 2017-2026.

Togo's government launched the National Programme of Investment for Food Security (PNIASA) from 2010 to 2015. The program aims for a 6% yearly agricultural growth rate. To achieve this goal, the government has first built a sustainable expansion of crop industries by regenerating maize, rice, cassava, cocoa, coffee, cotton, and horticulture production and exports, as well as increasing the production of small ruminants, fish, and poultry. Second, they alleviated and enhanced access to agricultural inputs, as well as produced agriculture research support services such as coffee cuttings, cocoa pods for crop industries, feedstuffs, fingerlings, and immunization to aid fish and animal production. Furthermore, advanced irrigation infrastructure has been created to meet the needs of both smallholder and large farms. Finally, they improved governance and institutional coordination by establishing the Agricultural Transformation Agency in 2023 to improve the institutional framework for easing land access and creating a central location to carry out fresh investment strategies in the agriculture sector. In addition, the government has taken steps to improve access to agricultural credit through several initiatives, including the Agri-PME component of the “Fonds National de Financement inclusive”, which subsidizes 30-50% of agricultural inputs such as fertilizer, and the PNIASA guarantee fund, which supports lenders such as microfinance institutions (Julien et al., 2021). Thanks to these changes

in agricultural regulations, between 2000 and 2019, Togo's agriculture industry experienced some significant advancements, including for example being self-sufficient in maize production (World Bank, 2022). However, some gaps existed after the program, leading to the implementation of the National Agricultural Investment and Food and Nutritional Security Programme (PNIASAN) from 2017-2026.

PNIASAN has outlined four key priorities to boost the agricultural sector. These include: (1) developing planned agricultural development zones and agri-parks in rural areas to increase agricultural production, attract large-scale investment, and promote economic growth, (2) improving access to agricultural inputs such as land, labour and finance, (3) enhancing agricultural research and innovation, and promoting knowledge transfer to help farmers adopt best practices and improve their yields, and (4) improving the institutional framework of the agricultural sector, including land titling for larger landholdings, to ensure a more conducive environment for agricultural development.

In the pursuit of these objectives, the government of Togo has initiated several programs to modernize agriculture in different regions of the country. The aim is to boost food self-sufficiency and increase agricultural exports. To achieve this, the government intends to create 400 agricultural development zones by 2025, which will provide access to land and necessary infrastructure such as warehouses, irrigation systems, and dry inland port facilities. Public-private partnerships will be formed to establish ten agricultural growth poles to increase agro-processing (UNCTAD, 2023). The Togo Agri-Food Processing Zone in Kara, the country's northernmost region, is the first agropole project that was piloted in 2019. The government intends to increase the productivity and production of crops such as rice, maize, soya, broiler meat, cashew nuts, and sesame. The aim is also to increase processing from 19% to 40% by attracting private investment (World Bank, 2022).

Furthermore, Togo plans to create special economic zones to increase the size and competitiveness of the private sector, particularly in agro-processing. These special zones will provide access to land, infrastructure, and logistics to improve the competitiveness of the private sector. The Adetikopé Industrial Platform (PIA) was launched in 2021 as a pilot program to this

effect. The PIA, a joint venture between the Togolese government and a private entity, is Togo's first industrial platform (PIA Togo, 2022). It is a 400-hectare vertical industrial zone that focuses on textiles to process intermediate products and export finished products. It will also host other sectors such as soya, wood, and assembly.

Overall, the success of all these strategies, policies, and actions toward the agricultural sector as well as the economic development depends on the real determination, commitment, and investment of the government.

3.3 Study Site and Technology Adopted

This section briefly presents the study site and evaluates the adoption and utilization of agricultural technologies related to the selected crops in the study community. Identify the technologies that have contributed to improved crop yields, resource efficiency, and the agricultural value chain.

As part of this analysis, we especially collected data and information from two locations: Atti-Akpedokoe village, which is the Best Practices Hub of the project, located in the Assahoun canton of the Maritime region; and Keve, the capital of the Avé prefecture. Assahoun and Keve are located less than one kilometer apart and share administrative and banking services. The economy of the area is predominantly based on agriculture, which is still traditional and rainfed with most farming practices being carried out by small-scale or family farming, and productivity is limited due to low yields. Subsistence crops such as rice, maize, yam, cassava, sweet potato, palm oil, cowpea, groundnut, and vegetables are grown in the region, with maize being the predominant crop. The people of Atti-Apedokoe realize that salinity is a crucial development issue in their area, which is among the main challenges related to the quality and quality of arable land as well as yield losses. According to the farmer's interview reports, most farming households are suffering from natural disasters such as drought, crop disease, and pest outbreaks, the decline in farm gate prices, a decline in household income, an increase in food prices, and food insecurity reduction in irrigation and drinking water. On the other hand, access to storage and transport

facilities is difficult as well as access to market information and the market itself. Thus, the RESADE project interventions are targeted to tackle these challenges.

On the project site (Atti-Apedokoe site) and nearby communities, the technologies implemented focus principally on salinity and drought-tolerant crop varieties, and other climate-smart agricultural practices grouped into five (5) main technological packages. The technologies comprise new crops and varieties, soil amendments (usage of organic materials such as Leucaena leaves, biochar, chemical materials like natural phosphate, and dolomite lime for soil amendment…), fertilization (usage of organics compost, formula calculated based on soil fertility, foliar fertilizer…), crop management (assesses different sowing periods to minimize the impact of soil salinity on plant development…), and screening varieties of rice (ARICA-11, Jasmine 85, IR841, ARICA-6, BRRI…) all supporting with a drip irrigation system to meet water demand (Table 1). The crops involved in these endeavors include rice, sorghum, millet, panicum, quinoa, barley, and cowpea varieties. Some of these technologies are in an experimental stage (in the plot), while others are potentially being used in the site farming community and in surrounding villages communities as well. The experiment hub/Best Practice Hub (BPH) has involved 55 farmers (with 62% women) who were supposed to implement the technologies in their farms outside the BPH and teach others in the neighborhoods to transfer the knowledge acquired and help other farmers build their capacity.

Table 1. Technologies and crops implemented.

Crops	Technologies	Treatments and crop varieties
Rice	Screening of rice varieties	▪ *ARICA-6* ▪ *ARICA-11* ▪ *Jasmine 85* ▪ *IR841* ▪ *BR-47* ▪ *BR-78* ▪ *BRRI* ▪ *dhan-61* ▪ *dhan-67*
Sorghum	Soil amendments	▪ *Control* ▪ *Rock phosphate* ▪ *Dololime* ▪ *Biochar* ▪ *Leucena leaf*
	Fertilization	▪ *Control* ▪ *Organics compost* ▪ *Formula calculated based on soil fertility.* ▪ *Foliar fertilizer*
	Crop management	▪ *ICSV 700*
	New crops and varieties	▪ *ICSV 700* ▪ *ICSR93034*
Millet	Soil amendments	▪ *Contrôle* ▪ *Rock phosphate* ▪ *Dolomi* ▪ *Biochar* ▪ *Leucena leaf*
	Fertilization	▪ *Contrôle* ▪ *Organics compost* ▪ *Formula calculated based on soil fertility.* ▪ *Foliaire fertilizer*
	Crop management	▪ *IP 19586*
	New crops and varieties	▪ *IP 19586* ▪ *MC94C2*
Cowpea	New crops and varieties	▪ *IRLI-9334* ▪ *IRLI -9643*
Barley	New crops and varieties	▪ *CM72* ▪ *581/A*
Panicum	New crops and varieties	▪ *BP-1*
Quinoa	New crops and varieties	▪ *ICBA-Q3* ▪ *ICBA -Q4* ▪ *ICBA -Q5*
	Crop management	▪ *ICBA-Q5*

3.4 Market Challenges

This section discusses the challenges and regulatory issues affecting crop production and technology adoption, as well as market access and development. Although many opportunities have been created to develop the agricultural value chain and the market through the project intervention, several challenges faced by the actors make it difficult to reach their full potential.

-Production level: The sector is characterized by small-scale farming and farmers heavily rely on traditional agricultural inputs and technologies. In addition, there is insufficient water, poor quality of water and soil, and rural infrastructure with a continued use of rudimentary agricultural equipment make it difficult the sector development. Thus, the low productivity growth and low processing of agricultural production, adversely affect the incomes of farmers, particularly smallholders.

-Difficulty in accessing seed, fertilizer, and farm tools: farmers are struggling to get access to seed especially new seed varieties tolerant to climate change. In addition to being expensive, getting authorized seed and fertilizer is a long administrative process so farmers are not able to get those inputs on time for the farming season. Moreover, farmers don't have access to modern farm materials such as tractors and other machines. These mentioned difficulties addition to climate change consequences are the reason why crop yields are low and not competitive in these countries.

-Low education level and limited access to extension services: Most of the farmers are illiterate, so have difficulties developing their production activities. Extension services agents are supposed to assist and help farmers from the production process to the market. However, most of the farmers don't get the extension services.

-Market organization and status: Rural markets are small, not well organized, and offer few opportunities so most of the markets are weekly market open only once a week. The social and physical status of the markets is precarious and uncertain, with high levels of poverty and extremely low literacy rates, not to mention the lack of adequate shops and sanitary facilities, which has always been a major obstacle to the growth of this trading place.

-Access to storage and transport facilities: Farmers have difficulties getting access to storage and transport facilities. Farmers used to stock their products in their rooms and in case of flood and wet periods, they lost most of their product. The roads to access markets are not very practicable and well-established transport means do not exist. Farmers walk for miles to get to the market or sometimes use so-called horses and donkeys' cars.

-Lack of information and communication means: One of the big problems is that farmers have a lack of market information including market demand, consumer needs, and the determination of market price. Market prices fluctuate too much and are fixed in the market according to what the demander is ready to give to the farmers leading to a low income for farmers, and farmers do not communicate with market participants besides those times. Despite, the products being seasonal sold, sometimes, the supply exceeds the demand and vice versa which can be a huge loss for farmers who don't have adequate storage and transport facilities.

-Financial and subsidies support: One of the most significant obstacles is access to financial support, resulting in limited development of new market businesses. All the actors in the value chain claim that they need financial support to improve their business or create new one. For example, in the framework of the project, while interviewed, the biochar business developers need financial support to build a store and get biochar production machines to start making biochar in large quantities and sell it to farmers. The biochar machine maker is also facing a lack of means and needs financial support to start his business. Most of the actors stated to not have access to credit and credit access information and are not connected to credit institutions. Otherwise, the ones who have access to credit are suffering with the repayment because of the high credit interest rate that goes from 18 to 20%. However, the poor organization of the value chain exacerbated the lack of access to credit, as credit institutions mostly provide credits to cooperatives rather than individual farmers. Furthermore, Togo's low agricultural productivity is partly caused by taxation and production market rules, as well as insufficient subsidies and budget allocations to agriculture (Republic of Togo, 2015).

-Barriers to market access: Market access for small-scale farmers has obviously been hampered by a wide range of factors, such as distance, asymmetric information, high transaction costs, education, lack of commercial skills, and financial access.

3.5 Market Opportunities

This section highlights the current market trends for the selected crops and associated technologies, including production volume, consumption patterns, preference, and demand drivers. It also identifies growth opportunities for the selected crops and technologies, based on emerging market trends and consumer demands. To develop the agricultural value chain, farmers must be empowered to produce, transform, and integrate markets. The intervention of the RESADE project has created many market development opportunities in the study region, country, and at the regional level.

-Input access: The agricultural market begins with input supply. More input has been provided to farmers including seed, soil amendment, agricultural, and processing machines. This has facilitated farmers in their agricultural production and processing. Input (seeds, fertilizers, soil amendments, machines…) demand from individual input suppliers as well as from research centers like ITRA that produce new crop seed varieties have increased. Thanks to the new technologies introduced by the project, farmers are now able to produce in saline areas that were abandoned because of soil salinity issues, decreasing productivity performance.

-Agricultural production and diversification: Through the implementation of the mentioned technologies, the project has introduced new crops and varieties and thus increased crop diversity in agriculture and agricultural productivity and yield. Besides the farmers involved in the BPH, more than 1000 farmers have received new crops and varieties, and biochar and other amendments production training are estimated to adopt these technologies. Furthermore, in the region, the survey results show that the three rice varieties namely JASMINE 85, ARICA 11, and IR841 have attracted attention and are now being cultivated by more farmers in the surrounding villages. Regarding taste after cooking, farmers have affirmed that these varieties have a good

flavor appreciated by consumers. This has led to increased demand for these varieties in the market, presenting a good opportunity for farmers and other market participants and local and regional market development. Research has shown that crop diversification increases rural communities 'food security (e.g. Adjimoti et al., 2018; Mango et al., 2018).

-**Crop/food processing and women empowerment**: The development of food processing for agricultural products has two primary effects. Firstly, the connections between inputs and outputs create influential upstream multiplier effects on agriculture, which stimulate its growth. The additional value-added generates demand, leading to economic growth and contributing to household livelihoods. Secondly, value added is created in processing and agriculture, leading to job creation and returns on capital (Miller et al., 2019). Research has shown that simply increasing agricultural production without developing the value chain can lead to negative outcomes for farmers, such as lower prices for their products. However, a study conducted by Kinkpe et al in 2023 found that improving food processing can increase the demand for agricultural raw materials, resulting in higher output and prices. This, in turn, reduces income inequality and poverty rates. The researchers conclude that investing in food processing has the potential to promote agricultural development and reduce poverty in economies that rely heavily on agriculture, such as those in sub-Saharan Africa.

The project has however captured this aspect of development. Besides, the agricultural new technologies implementations in the project intervention, women farmers have been empowered and trained on how to transform different crops and products into consumable local foods. Women now are able to transform more crops into local food, leading to food diversification, food security improvement, and market expansion as well as revenue improvement. Farmers have processed maize, sorghum, cassava, yams, tomatoes, oranges, and pineapple into couscous, juice, tomato paste, marmalade, and cakes. These products can be consumed at the household level and also be sold in the market. In addition, the rice miller activities have been developed thanks to the increase of rice cultivation in the community. In addition to hushing rice, the miller is also planning to improve his business and revenue by supplying rice husks as one of the biochar production inputs.

-Business development and entrepreneurship: The biochar training and implementation have developed the biochar production chain and market in the region and nearby communities. This will likely develop and spray the wide use of biochar, this climate-friendly soil amendment with many advantages and which is not commonly used in Africa. Biochar business cases exist where some local palm oil production industry managers who received biochar production training have developed the idea to make it an additional business. They are ready to produce biochar in large quantities at the local level near farmers where farmers can get access easily to biochar at a lower price than chemical fertilizer and low transport cost. These industries already process a large quantity of Biochar input (which is the palm nutshell) to produce biochar in large quantities. If realized, this is a big advantage for the industries as well as farmers in terms of revenue and job creation. In addition, the biochar machine maker is also ready to make more machines as he said that local industries as well as farmers are interested in the machine and are ready to buy it. These last businesses are prominent, and while developing, they can grow in the local and regional markets.

-Market actors' linkages development: The project has brought actors together through a series of activities and thus developed the rural economy. Farmers have been connected to extension services, credit institutions, and input suppliers. As farmers are now organized into cooperatives, credit institutions have started providing credit to them to develop their activity. This will be a great opportunity for farmers' activities, so the market development.

-Income source diversification and revenue increase: All those mentioned activities development have enabled the market actors especially farmers to diversify their income source, meet market and consumer demand, and increase their revenue, food security, and household and community welfare. For example, researchers have stated that crop diversification is the source of food security and establishment and income increase.

Table 2 summarizes the market opportunities raised by the RESADE project and the existing challenges.

Table 2. Market opportunities and challenges

Opportunities raised in market development	Challenges to overcome
More input has been supplied to the farmers	Poor production technology and production level
Agricultural crop yields and food production have increased	Difficulty in accessing seed, fertilizer, and farm tools
Crop diversification, food diversification, and food security have been increased	Poor market organization and market status
Small farmers' income source in the market is developed	Difficult access to storage and transport facilities
Market actors' revenue and activities are developed	Lack of information and communication means
Women have been empowered	Difficult access to rural infrastructure
Access to financial support information is developed	Lack of investment, difficult access to credit, and subsidies support
Capacity building, developing the linkages with the market's different actors.	Poor education level and limited access to extension services
Facilitated farmer's cooperatives access to credit	Most of the market actors don't have access to credit and the information to access credit
New market businesses and entrepreneurship have been developed	Poor connection between market actors
The market is expanding to the national and regional level	Market development and expansion remain slow with trade barriers

Conclusion and **Recommendations**

This report aims to deliver a market analysis of the crops and technologies promoted by the RESADE project in order to identify opportunities raised and develop the market in the targeted countries. As findings, many opportunities have been developed toward the local, regional, and international markets through the multiple strategies implemented in the framework of the project to strengthen agricultural systems and related chains. The opportunities raised to develop the market are: Considerable farm input including new crop varieties seeds and machines has been distributed to the farmers facilitating crop production and processing. From this, agricultural crop yields and food production have been increased as well as crop diversification, food diversification, and food security. Small farmers and other market actors' income source in the market is developed and their connection to each other. Women have been empowered through their active integration in the project activities and food processing. Access to credit and extension services for farmers to develop their activities has been facilitated support. New market development businesses have been developed, showing that the market is expanding to the national and regional levels.

However, some challenges to the market's full potential development still exist. These include poor production technology (mostly using traditional technologies) with difficulties in accessing seed, fertilizer, and farm tools. The production level is still at small-scale farming not enough to feed the population with a poor market organization. Difficult access to storage facilities at home and stores in the market and transport facilities to the market (in addition to difficult access to rural infrastructure like adequate rods), and lack of education, information, and communication means are among the biggest challenges. Lack of investment, subsidies support from government institutions, difficult access to credit, and limited access to extension services as well as a poor connection between market actors makes the market development and expansion remain slow.

Based on the analysis, for market development, the following relevant recommendations execution (to enhance crop production, technology adoption, and market competitiveness) are

necessary for stakeholders in the agricultural sector, including farmers, technology providers, policymakers, and investors.

- Farmers should be provided with modern agricultural technologies to accelerate crop production and motivate them to adopt and implement the promoted technologies.
- Promote sustainable agriculture and empower small-scale farmers through quality seeds and fertilizers, modern farm materials, capacity-building training, and extension services support as engaged in the project.
- Empowering smallholder farmers, especially women, is crucial for achieving sustainable and climate-resilient agriculture. This can be achieved by providing farmers with more access to new and improved seed varieties, identifying beneficiaries, promoting collaboration, enabling continuous seed production, and continuing to share modern cropping knowledge.
- Farmers should be motivated and help to follow the path of market-oriented farming in market development.
- Farmers should be demonstrated how to effectively act in the market and teach them to develop their commercial skills.
- Consequent investments should be made in agro-processing businesses to transform products locally before selling or exporting to the international market. Food-processing is recognized to contribute to increasing agricultural product availability and agricultural market development.
- New agricultural business and entrepreneurship development should be strongly encouraged and supported financially as well as technical. Especially, consequent investment should be made for food processing sector development.
- Access to financial loans is still at a low stage, which is why it is important to improve access to credit. Many market actors are either unaware of the existence of credit or have limited access due to the terms and conditions involved. By providing farmers with easier access to credit, they can invest in advanced agricultural technologies, increase production, and expand their activities. Additionally, the government should increase agricultural and market subsidies to facilitate market transactions.

- Building and improving rural infrastructure, such as roads, irrigation systems, transport, and storage facilities, can help farmers transport their produce to market and minimize crop waste due to climate shocks and post-harvest losses. Improving access to markets and services in rural areas is a way toward good market development.
- To improve market accessibility, farmers need access to markets with favorable conditions to sell their products and generate profit.
- To add value to agricultural products, governments can help establish linkages with rural, national, regional, and international markets.
- Providing farmers with constant information on market developments and supporting the creation and development of new agricultural businesses as well as the expansion of agro-processing enterprises are also important.
- A gradual improvement in the domestic production capacity especially for women in relation to the promoted crop and commodities and processed products should be fostered.

By addressing these aspects, the initiative contributes to the broader goals of improving agricultural productivity, enhancing rural livelihoods, and fostering regional agricultural sustainability and market development.

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