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AGRI-TECH REVOLUTION:

Key to Enhancing the Economic and Social Welfare of Smallholder Producers in Tanzania

PROMOTING SMALLHOLDER COFFEE FARMING
for Young Females with Integrated Utilization of Digital Technology for Financial Services

CLIMATE-SMART AGRICULTURE
Practices and Technology: Hope for Farmers in the Face of Climate Change

TECHNOLOGIES FOR CLIMATE
Proofing Sunflower Value Chain and Associated Agribusinesses in Tanzania

ADVANCING AGRICULTURAL AGENDA FOR SMALLHOLDER PRODUCERS

contents

Message from The **Executive Director**

Dear readers,

It goes without saying that agriculture remains the largest and most significant sector of the Tanzanian economy that benefits the country from a diverse production base including livestock, fisheries as well as food and non-food crops. Smallholder farming dominates the country's agricultural practices among about 60% of the population employed in the sector, categorized as smallholder producers (SHPs), and significantly accounts for its food requirements, raw materials for industries and export trade. Despite its food abundance, Tanzania imports wheat, sugar and edible oil to address its deficit of the products. But also, the poorest and most marginalized families continue to undergo months of lean food availability and some regions experience transient food deficits. Poor husbandry and low level of investments are among the major causes of sustained low productivity and even high levels of post-harvest losses. SHPs in Tanzania also face numerous challenges related to quality advisory services and access to reliable information about weather, financing, insurance, timely weeding, pests and diseases control, fertilizer application, timely harvesting, transportation and aggregation centers, drying, sorting and packaging, price and markets.

The Agricultural Sector Development Program (ASDP) II targets, among other things, achievement of enhanced agricultural productivity and profitability through increased adoption of agricultural technology (agritech) and innovation. Agritech and innovation play a key role of enhancing efficiency in all value chain nodes. Thus, this is a momentous opportunity for instance to advance digital extension services and optimize the understaffed public extension system whilst effectively utilizing the Ward Agricultural Resource Centers (WARCs) initiative. Good planning is key for guiding related resources allocations and capacity building initiatives with gender mainstreaming in mind.

This 10th edition of the *Ulimwengu wa Mkulima* magazine comes under the topic

Agricultural Technology and Innovation for Enhanced Productivity and Profitability of Smallholder Producers. It is intended to incite focused analyses and recommendations towards improved policy and practice in enhancing the economic and social welfare of SHPs in Tanzania. This is in conformity with the recently launched Five-Year Development Plan (FYDP) III that focuses on application of science, technology and innovation to improve productivity and yields in the agricultural sector.

Various opportunities prevail for SHPs to advance to a digitalized operational phase and transform their currently unstable and risky traditional practices in the face of numerous structural and cyclic factors. Support services and institutions exist but knowledge about their access and costs must be instigated amongst the intended beneficiaries. Their level of sufficiency must also be assessed with the goal of making them more accessible, reliable and experientially transformative.

We hope that this particular edition of the Ulimwengu wa Mkulima magazine will inspire further discussion on what stakeholders should do to increase uptake of agritech and innovation across agricultural value chain nodes in the country. A key milestone should include seeing the sector surpassing its current and rather persistent less than 5% growth rate with wide associated benefits in terms of increased productivity, import substitution, employment and poverty reduction.

ANSAF is particularly very grateful for financial support from the Vi Tree Planting Foundation, one of its international NGO members, towards the production of this magazine.

We look forward to receiving feedback from you.

—Audax Rukonge
Executive Director

A note from The **Chief Editor**

Dear Esteemed Reader,

Welcome to the 10th edition of the Ulimwengu wa Mkulima magazine. Its predecessor focused on ***Climate Change: Eyes on Smallholder Producers*** on recognition of the fact that climate change poses the greatest challenge facing humanity across the world. The most vulnerable groups are the smallholder producers (SHPs) who lack the right capital to launch climate-smart farming using appropriate technologies. This particular edition carries on with the issue of technology with climate change in mind, under the theme: ***Agricultural Technology and Innovation for Enhanced Productivity and Profitability of Smallholder Producers***. It motivates thought-processes and efforts towards improved policy and practice in enhancing the economic and social welfare of SHPs in Tanzania amid unforseen events like pandemics and the ever-increasing problem of climate change.

Despite the country's strong economic performance of over 6% real GDP growth on average for the past decade, agriculture has continuously lagged behind with a growth of below 5% irrespective of its significance in poverty reduction. Productivity remains low as the sector is dominated by SHPs who are dependent on rain-fed production, limited use of improved seeds and fertilizers, and the low share of cultivated over arable land. Sectoral growth is also constrained by low use of technology and research to increase productivity and yields, reduce food prices, reduce risks and increase profits. As a consequence, SHPs accrue insignificant economic gains from their involvement in the sector. The government and other stakeholders need to invest more in the use of technology and innovation in the sector to improve productivity and profitability for SHPs' as already guided in various national policies.

It is in this context that the topic is designed to not only share practical lessons on the essence of agricultural technology and innovation across agricultural value chains but also provoke further discussions for improvement and upscaling of the same in Tanzania. Please be a part of the discussions as this is actually your platform to discuss solutions to improve the country's agricultural sector for the rural poor. The magazine is one of ANSAF's ways of influencing and facilitating the transformed lives of SHPs through changed behavior of actors as well as agricultural policies and practices.

Please note that the contents and opinions expressed in this publication are not necessarily those of ANSAF and the publisher, but the Authors. While maximum precaution is taken to ensure accuracy in preparing the publication, ANSAF and the publisher assume no responsibility or liability for any inaccuracies or omissions. All submitted materials are accepted on the understanding that they can be edited, amended or abridged for publication.

Enjoy your reading and please share your feedback with us!

—Ian S. Shanghvi
Chief Editor

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Promoting Smallholder Coffee Farming for Young Females with Integrated Utilization of Digital Technology for Financial Services

Digital technology has been seen to transform many sectors including agriculture. In previous years, it was not easy to get information to and from farmers on their needs such as access to different lessons, financial services, inputs, prices, markets and weather. The wide use of mobile technologies is opening new opportunities to integrate smallholder farmers in new digitally driven agricultural systems as is the case in the coffee sub-sector in the Southern Highlands of Tanzania.

By: Salome George Kisenge

Photo Credit: Pixabay

The Southern Highlands of Tanzania is home to many farming communities and possesses a significant agricultural potential. However, these communities are heavily dependent on rain-fed agriculture, communal grazing and shared natural resources for their livelihoods. As for other smallholder farmers around Tanzania, they face numerous challenges with financing being one of them.

BRAC Maendeleo Tanzania (BMT) has resolved to enhance digital financial services to smallholder coffee farmers who are registered in Agricultural Marketing Cooperative Societies (AMCOS) and optimize the understaffed areas where its European Union-funded Smallholders Coffee Development project (CODE-P) is operating.

BMT's intervention builds upon the overall goal of CODE–P that entails contributing to an inclusive and sustainable development of the coffee value chain for enhanced incomes and improved nutrition status of smallholder farmers in Mbeya, Ruvuma and Songwe regions. It focuses on building smallholder coffee farmers' capacity in financial management and investing along the coffee value chain by imparting them with knowledge and skills on financial literacy, business management, entrepreneurship and Village Savings and Loan Associations (VSLAs). Farmers learn about VSLAs methodologies and their formation as well as management. Some of the topics include: *what are VSLAs; schedule of operations; preparatory meetings; introduction of VSLAs to the community; groups leadership and elections; development of policies and rules for Social Fund; share-purchase and credit activities; development of group constitution; first savings meeting and utilization of digital technology in financial transactions in the coffee subsector.*

An effective knowledge system has been established for learning and sharing while ensuring sustainability of the intervention to increase the potential of scaling out to other parts of the country. A marked success has been seen in the first year of project implementation whereby smallholder female coffee farmers particularly in Mbeya and Rungwe districts (Mbeya), Mbinga and Nyasa districts (Ruvuma) and Ileje and Mbozi districts (Songwe) have been involved in training on financial literacy, business skills, entrepreneurship and formation of VSLAs. The training did not leave behind the District Coffee Specialists, District and Ward Community Development Officers and Extension Officers at ward and village levels. They have also been made part of the monitoring team to follow up on project quality as well as performance of the lead farmers and formed VSLAs. In the second

year of CODE-P implementation, 60% of smallholder female coffee farmers and 40% of their male counterparts will be trained in digital technology to access financial services. Moreover, through BRAC Tanzania Finance Limited (BTFL), groups of clients with diversified production activities have been capacitated in getting loans using digital technology in their areas *(Mkopo Kidijitali)*.

Young female farmers who are considerably a more marginalized group are now in a position to make informed choices of types of financial services and proper investments along the coffee value chain. Traditionally, there has been poor or no benefits of coffee returns to women. Like in many other coffee-producing countries, coffee farming in Tanzania is generally seen as a family business with men and women working side by side to grow, maintain and harvest the commodity. But in a practical sense coffee ownership is dominated by men who are customarily owners of land and, by default, coffee farms.

Access to finance: Despite the availability of financial services by providers like commercial institutions ranging from micro-financing to corporate banking as well as Savings and Credit Co-operative Societies (SACCOS), smallholder farmers continue to face financial obstacles. The challenge can be attributed to reluctance amongst the institutions to provide financial support amid many factors affecting performance of the subsector at production, post-harvest and marketing levels. Eventually, financial institutions have little or no interest in supporting coffee farming activities due to low income returns and limited capacity of the farmers to repay debts.

The situation is worse for women who do not own land subject to cultural barriers, thus lacking required collateral.

A total of 1,906 female farmers (854 women above 35 years and 1,052 women aged between 18 and 35 years) are now members of 119 VSLAs formed in Mbeya, Ruvuma and Songwe regions. Following training, they have started to make their savings per agreed rate and are borrowing money to invest in the coffee value chain. Within a four-month period, the groups have already saved TZS 9,218,000 and loaned out to their members a total of TZS 4,730,000 that is used in production activities.

Enhancement of digital financial services: This, paired with corresponding training, will simplify financial services to the smallholder coffee farmers, render their security and shield them against theft by robbers when carrying liquid cash to service delivery centers/shops, homes or production sites. This is more so for the women. It will save them from walking over long distances searching for money to finance their activities. This technology also enables farmers to access information about weather, markets and other aspects of agricultural production. Digital technology is expected to pave way for the young female farmers in the Southern Highlands who are the prime target of the project due to their obsession with use of digital technology in their day-to-day activities (i.e., information exchange, communication, money transactions, social media for buying and selling, etc.).

Photo credit: BMT.

Mkombozi Village Savings and Loans Association (VSLA) leaders during their first meeting on 16 April 2021 in Rudisha Village in Mbinga District. Picture on the right shows Ms. Romana Wilson Nchimbi depositing her first saving.

Romana Wilson Nchimbi is a coffee farmer at Rudisha AMCOS in the Mbinga Town Council in Ruvuma region. She lives in Rudisha village and is a mother of two children. Romana is among a few young women growing coffee in her community. She joined the Mkombozi VSLA on 13 March 2021 that was established by BMT under CODE-P. She testifies that "our group has 30 members and 21 have started to buy shares. This is a tremendous opportunity for us as youths to voluntarily save our limited resources towards meeting our future needs."

On 16 April 2021, Ramona's group conducted a first loan disbursement meeting under the supervision of a Village Agent that facilitated its members to get loans. The group has established an internal loans monitoring task force to audit if the loans are spent according to the objectives for which they were approved.

"I am very thankful for CODE-P since it has made women to access soft loans at a lower interest rate through the VSLA initiative. Initially, I used to borrow from my neighbors at an interest rate that was at least 100%", Romana says.

Romana has used her loan to buy six chickens and her future plan is to sell them away and buy agro inputs for her coffee farm. BMT has trained the group on financial management and business skills to be able to farm coffee as a profitable business.

Photo credit: BMT.

Members of the Mkombozi Village Savings and Loans Association (VSLA) during their first meeting on 16 April 2021 in Rudisha Village in Mbinga District.

"I am very thankful for CODE-P since it has made women to access soft loans at a lower interest rate through the VSLA initiative. Initially, I used to borrow from my neighbors at an interest rate that was at least 100%."

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Agri-tech Revolution: Key to Enhancing the Economic and Social Welfare of Smallholder Producers in Tanzania

Tanzania is one of the best performing economies in Sub-Saharan Africa (SSA) in recent years, which is evident in digital revolution. However, now is the time to ensure that the revolution does not leave smallholder producers further behind.

By: Iraoya Augustine and Gbadebo Odularu

Introduction

Climate change, a growing population and the novel COVID-19 pandemic means that Tanzania and SSA are facing unprecedented agricultural challenges than ever experienced. Traditional agricultural methods practiced by smallholder producers (SHPs) are no longer sustainable enough for Tanzania to achieve food security for her rapidly growing population. In order to tackle these challenges and increase the profitability of SHPs, investments in agricultural technology (agri-tech) and innovations are key. This is essential to increase yield, reduce environmental costs, enable farmers to transcend weak rural infrastructures, drive financial inclusion and higher productivity, support climate-smart agriculture, promote food safety and increase the impact of government support.

Challenges

SHPs are incapacitated in terms of agri-tech use because of limited knowledge and poor access, among other factors.

Human Capital Challenges

The human capital challenges faced by SHPs in embracing agri-tech and innovations include their level of education, gender and household size. With regard to education, SHPs decision to adopt and use agri-tech and innovations is influenced by their level of education. This is because education increases their ability to obtain and use information to make evidence-based decisions. Education also enlightens the minds of SHPs and enables them to analyze the benefits and returns on investment in agri-tech. Analysis of the labour force in Tanzania shows that majority of women work in agriculture[1]. Women and men SHPs have different preferences, face peculiar challenges and different levels of severity of constraints to their adoption of agri-tech and innovations[2]. Moreover, intra-household ownership and control over resources differs and limits the adoption of agri-tech and innovations by women[3].

Economic Challenges

Economic factors such as access to credit, costs and returns on investment in agri-tech limits SHPs digital revolution. In a bid to address these economic challenges and foster access to credit, the Tanzania Cooperatives Act of 1991 provides for the establishment of Savings and Credit Cooperative Societies (SACCOS), while the Cooperative Development Policy of 2002 further reinforced SACCOS as key institutions through which financial services are provided to rural households including SHPs. Recent report shows that about 10.6 million people in Tanzania access financial services informally through SACCOS[4]. Collective action and group access to credit through SACCOS could promote the adoption of agri-tech[5].

Institutional Challenges

Organizational readiness such as financial and technological resources of the SHPs are key to their reception and use of agricultural technologies and

1 Idris, I. (2018). Mapping women's economic exclusion in Tanzania. https://assets.publishing.service.gov.uk/media/5b18ff6f40f0b634d557af84/Mapping_Womens_Economic_Exclusion_in_Tanzania.pdf (accessed on 15 April 2021).

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innovations to enhance their productivity. Many SHPs are hesitant or even resistant to change due to information asymmetry, unwillingness to learn and fear of loses. Tanzania's lowest internet data cost in the East African Community (EAC) poses room for improvement to broaden the internet inclusion of SHPs in the country.

Opportunities

Despite these challenges, opportunities abound for SHPs in Tanzania to maximize agri-tech and innovation for enhanced productivity and profitability.

Precision Agriculture: Precision agriculture (PA) is a farm management approach that involves the use of information technology (IT) to ensure that soils and crops receive exactly what they require for optimum fertility and productivity. Precision agriculture is a key agri-tech revolution through which SHPs can overcome challenges of rising temperatures, varying precipitation, low soil fertility and soil degradation affecting over 80% of African soils. With PA, SHPs can better allocate inputs such as seeds and fertilizers to specific cropland areas based on soil type, fertility levels and other soil characteristics. Tanzania's growing population requires smart and sustainable food production solutions. SHPs need to substitute the 'whole field' approach to farming with specialized and innovative methods of precision land preparations, planting, precision irrigation and precision harvesting. This enables SHPs to minimize production costs and maximize yields.

Global Positioning Systems: SHPs can also adopt global positioning system (GPS) for enhanced productivity and profitability. With GPS, SHPs can track and trace their field operations, crops and livestock. Through GPS devices they can monitor the biochemical and physical properties of their crops as well as monitor and control potential pests and diseases. The GPS innovation is also essential for SHPs to monitor and manage the health of their livestock (especially cattle, which is abundant in Tanzania), their feeding and productivity and, as well, improve the safety and security of these livestock. GPS gives SHPs remote control over their farms even amid the ongoing COVID-19 pandemic.

Photo credit: Industry Europe, 2019

Application of drone in agriculture.

Specialized Drones: The application of specialized drones in agriculture provides reliable knowledge that helps SHPs especially in the horticultural sector to succeed. Using specialized drones for fields monitoring enables SHPs to get long-term access to real-time data needed to improve their enterprises. Such information includes emergence rate, chlorophyl rate, water stress, height and biomass, among others. Trends of collected data enables SHPs to forecast the productivity of their farms.

Mobile Phones and Agri-tech Apps: It has been observed that mobile technology today connects more than 47 million people to various digital initiatives launched by the Tanzanian government4. Mobile phone-enabled solutions play a critical role in the access of SHPs to financial services such as e-payment wallets and online loans through SMS, voice and helplines. They improve data visibility for supply chain efficiency and enhance access to e-commerce and market prices. Mobile phones are used to improve SHPs' access to financial services through mobile payment systems, mobile micro-insurance systems and mobile micro-lending platforms. They are also critical in the delivery of agricultural information to SHPs through phone calls and specialized information Apps. Such information includes production techniques, weather forecasts and commodity prices.

B2B Platforms and Farmer Marketplaces: The COVID-19 pandemic has disrupted traditional supply chains and altered consumer taste and preferences. Many SHPs have encountered challenges in the demand and supply of their produce due to market closures

or travel restrictions. Such challenges can be overcome through business-to-business (B2B) platforms which are digital links connecting buyers and sellers within the food systems network. Farmer's marketplaces are platforms that provide farmers with opportunities for business transactions and connections. It is a healthy alternative to crowded secular markets particularly in rural communities and promotes social interactions. These specialized marketplaces also enhance profits for farmers given that middlemen are eliminated from the transaction chain. Through B2B platforms and farmer's marketplaces, SHPs can establish an online presence, promote their enterprises, deliver products conveniently, track transactions and improve food safety through limited physical contacts.

Photo credit: Business Chief, 2020

Application of mobile phones in agriculture.

Policy Recommendations

Overcoming resource constraints to the use of agri-tech and innovations is not an easy task for SHPs. However, one way to overcome such constraints is by demonstrating the return on investment (ROI) of digital adoption to them. Agri-tech developers and promoters should provide SHPs with clear evidence of perceived benefits and ROI. This will address the concerns of SHPs in adopting and using agri-tech.

Moreover, It is critical for government and private digital technology firms to have a strategy that works for digital transformation of SHPs. This implies that beyond developing modern technologies, digital service providers should have a business model that is SHPs-centric and maintain a skilled workforce that can readily meet the needs of SHPs.

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Technologies for Climate-Proofing Sunflower Value Chain and Associated Agribusinesses in Tanzania

Current agricultural technologies for sunflower production and processing are characterized by lower yields than national potential or global average, worsened by increased climate risk. The Climate Resilient Agribusiness for Tomorrow (CRAFT) initiative is working with small- and medium-size enterprises (SMEs) on a menu of technological options to climate-proof service delivery, inputs supply, production, post-harvest handling, processing and distribution. The project enables smallholder producers to shift from extensive production systems to more ecologically intensive, sustainable and productive market-oriented agribusiness models.

By: Joab Langi Osumba and Godfrey Sadwel Kabuka

Introduction

Sunflower is an oil crop with a high potential for climate change adaptation and mitigation. It has attributes both for stronger climate-resilience and lower greenhouse gas emission compared to cereals[1*2] in a broad range of environments[3]. For clarity in terminology, this article adopts the use of sunflower "seed" to mean the one for planting and "oilseed" or "grain" to mean the one for processing.

The Climate Resilient Agribusiness for Tomorrow (CRAFT) Initiative

CRAFT project has partnered with over 36 SMEs and producer cooperatives to facilitate market linkages for climate-smart agriculture (CSA) to enhance CSA through sustainable intensification along selected oil crops, pulses, cereals and potato value chains in Tanzania, Kenya and Uganda. The objective of the project, which is funded by the Ministry of Foreign Affairs of the Netherlands, is to strengthen food security through inclusive business. The project addresses agribusiness scaling through capacity building, policy alignment, policy reforms and policy advocacy through evidence-based engagement. It works with and through the private sector to promote climate-resilient agricultural technologies in the selected farming systems and value chains and supports public sector partners to create the institutional environment for adoption and scaling of CSA. Private sector partners leverage funds off the CRAFT grant to attract additional investment from commercial financial institutions.

Photo credit: CRAFT

Sunflower demonstration farm managed by Temnar company, showcasing mulching for soil and water conservation.

Sunflower Agribusiness Technologies and Practices

Sunflower SMEs and stakeholders in Tanzania, supported by the CRAFT Project[4], are modernizing technological outlay to increase sunflower productivity and profit margins[5]. The specific objective in the sunflower sector is to strengthen climate risk management technologies in sunflower input supply, production, post-harvest handling, processing and marketing. The sunflower SMEs in CRAFT in Tanzania are Jackma Enterprises (Dodoma), Khebandza Ltd (Mbeya), Kimolo Super Rice Ltd (Dodoma), Magin Ltd (Kondoa), Mwenge Ltd (Singida), Nondo Investors (Katavi) and Temnar Ltd (Mtwara). The partnering SMEs made strategic plans to invest in modern technologies and practices. The seven SMEs have a combined[6] plan to reach 29,000 producers by 2023, leveraging up to TZS 6,495 million worth of investments[7], to increase sunflower productivity from 300 kg/acre to 700 kg/acre through adoption of improved,

modern technologies. To boost productivity and incomes, the SMEs are particularly investing in the following technologies:

- **For productivity:** promotion of good agronomic/ agricultural climate-smart technologies like better quality seeds of certified or quality declared high yielding varieties, intercropping, user friendly pesticides and timely planting.

- **For adaptation/ resilience:** climate resilient, drought tolerant, early maturing varieties; useable agro-weather information; rainwater harvesting and soil moisture conservation; contract farming, assured and reliable market; aggregation centres/warehousing; and tools and equipment for quality assurance and quality control.

- **For mitigation:** promote efficiency through improved post-harvest handling, modern oil processing technology, conservation agriculture, organic manure, user friendly herbicides, soil testing and solar powered facilities.

The SMEs spent 2020 laying groundwork and generating traction through profiling, registration, contracting, sensitization, training and setting up institutional network infrastructure, materials for operations and service delivery and distributing planting seeds. Only Jackma in quarter 4 of 2020 off took 2,875,964 kgs of sunflower oilseeds from 1,878 contracted producers in Bahi and Chamwino.

Challenges in the Sunflower Value Chain

- Partner SMEs assert that abrupt changes in public policies are affecting planned activities. For example, one processor in Katavi region planned to buy more oilseeds in 2020 but abrupt operationalization of the warehousing system caught them off-guard and affected their purchases.
- Access to and from aggregation and training centres was reported to be difficult during the rainy season. Other SMEs reported incidents such as delays in rainfall onset, excessive rains and waterlogging, among others[8]. Weather-related challenges which occur during planning, production, harvesting and post-harvest periods were largely due to climate information not being communicated in time for proper strategic planning and tactical decision-making.
- The other challenge reported was the low cost of imported oilseeds in comparison to domestically produced oilseeds in terms of price and transport costs.

Emerging Lessons in the Sunflower Value Chain

Communicating useable climate information is a vital part of CSA as credible climate information is a valuable early warning service. Provision of climate information is reportedly budding among the sunflower SMEs but needs to be strengthened. A systematic plan to provide climate information and agro-weather advisories needs to be initiated and formalized between the meteorological agency, relevant service providers, the contracting SMEs and contracted producers. If climate information is downscaled with higher precision and timely dissemination it then becomes possible to plan planting dates while avoiding periods of water stress at key developmental stages as has been reported by some of the SMEs.

The partner SMEs reported using mobile wallets or e-platforms to include bulk SMS messaging and to load more content on agro-weather advisories to actors[9]. However, the platforms will need to innovate beyond SMS and be formalised and institutionalized. Additionally, the agro-weather information to be disseminated through the platform should not be the broad national level forecast but downscaled and tailored to audiences in particular localities if the information is to be relevant and useable.

Photo credit: CRAFT

Jackma Enterprises staff operating a sunflower oil processing facility in Dodoma.

Conclusions and Recommendations

Technologies presented in this article for sunflower farming system and value chain have the potential to simultaneously achieve productivity, adaptation and mitigation objectives. To achieve this triple-win objective, we recommend a shift in focus towards ecologically sustainable intensification. In CRAFT, SMEs offer improved technologies such as seed/ inputs and useable climate information as part of their support to the contracted producers. It is not yet conclusive which technologies work and which ones do not, under what circumstances and whether the use of improved technologies can be scaled without the incentives, including what policy issues will need to be addressed to scale the improved technologies. More experiences will be shared as and when they emerge.

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Climate-Smart Agriculture Practices and Technology: Hope for Farmers in the Face of Climate Change

With over two-thirds of the Tanzanian population depending on farming for food and livelihood, climate change is a great threat to their income, food security and their very survival. This calls for the need to support farmers to adopt climate-smart agriculture practices and technologies.

By: Catherine Njuguna – IITA, Tanzania

Climate change has been affecting us greatly. For example, in the past we knew when the growing seasons were. But nowadays the rains sometimes come early and sometimes they are late. Sometimes we get a big harvest and sometimes we get very little," says Mr. Hassan Haji Fumu, a farmer from Mahonda village in Kaskazini B district, Zanzibar.

Agriculture is an important sector in Tanzania's economy providing food, income and jobs for over 60% of the population. However, their livelihoods are greatly threated by climate change, which causes erratic and extreme weather conditions such as floods, droughts and changes in growing seasons.

On the other hand, agriculture also contributes to climate change through greenhouse gas emissions, deforestation and land degradation. In other words, agriculture is a contributor and, likewise, victim of climate change.

In response, the agricultural sector must sustainably increase productivity and adapt to the impacts of climate change to ensure food security for all. One of the approaches to achieve this is adoption of climate-smart agricultural (CSA) practices and technologies.

CSA is an approach to increase food productivity and farmers' income while reducing greenhouse gas emissions and building resilience to shocks and stresses from climate change.

Photo credit: Pixabay

The Government of Tanzania is committed to supporting the agricultural sector to cope with and adapt to climate change through developing relevant policy instruments. These include the Agriculture Climate Resilience Plan (2014-2019), National Climate Smart Agriculture Program (2015–2025) and Climate Smart Agriculture Guideline.

The Building Capacity for Resilient Food Security in Tanzania project is building on and supporting these efforts by addressing capacity gaps within the country to effectively respond to the challenges climate change poses to agriculture. It is an initiative of the Government in partnership with the United States Department of Agriculture (USDA) that is supported by USAID.

The project has brought together various experts to equip farmers with CSA practices and technologies suitable to their agricultural zones and in line with climate/weather forecasts.

Setting Up a Network of 15 Climate-Smart Agriculture Demonstrations

The International Institute of Tropical Agriculture (IITA), one of the project partners, has been working to identify and demonstrate the best-bet agricultural practices and technologies to withstand climate change in collaboration with other stakeholders.

IITA has set up a network of 15 demonstration plots in seven regions across the country to show farmers different CSA technologies and practices suitable for different agro-climatic

zones using a participatory approach involving farmers and experts.

Each demonstration plot is managed by a group of farmers who have been learning alongside the district- and village-level agriculture extension officers. The project is also working with the farmers to try out these practices and technologies in their fields in the process of validating them.

"I like these farming technologies and practices a lot especially the use of tied ridges because, even with little rains, one can manage to get a good harvest compared to our usual ways of farming where we sometimes used to lose all the crops when the rains failed," says Ms. Monica Meshack, a farmer in Kilosa District, Morogoro, and one of the beneficiaries of the project.

"We have learned how to construct terraces and tied ridges. These conserve moisture in the soil for the crops when the rains are low," adds Meshack, and that "we are also growing improved crop varieties that are resistant to drought like drought-tolerant maize varieties and crops that are better suited to the drought conditions, such as cowpea."

The Chairperson of Nghumbi village in Kongwa district, Dodoma, which is one of the locations that the project is running the demonstration fields, notes that the farmers have accepted CSA practices and technologies because of the benefits seen in their semi-arid lands. He acknowledges that *"these technologies have helped our farmers to be resilient to climate change which has been affecting our region. Now you will find a farmer planting on only a small portion of their farm size but harvesting a lot of produce compared to those practicing traditional farming."*

The project is currently being implemented in of nine districts in the Mainland and Zanzibar and has provided training to over 2,000 farmers through a network on 15 demonstration farms.

Using Agrometeorological Information in Planning and Decision-Making

The project is also supporting farmers to cope with climate change by providing localized agrometeorological information and advice to help them plan for their agricultural production activities. These include predictions on the start and end of the rainy season and the amount of rainfall expected.

The United Nations Food and Agriculture Organization (FAO) in partnership with Tanzania Meteorological Agency (TMA) has been organizing meetings to prepare farmers for the upcoming planting seasons. During the forums, farmers are briefed on seasonal forecasts and given advisories for their specific crops, livestock and fishery production.

"In the past I relied on guesswork to determine when to plant and many times I had to manually water my banana field if I got the season wrong. But now I follow the weather forecast keenly as I know it has a large bearing on my farming activities," says Mr. Hassan Haji Fumu.

Building Skills of Current and Future Extension Workers on CSA

The project has also been working with the Training and Extension Department of the Ministry of Agriculture in reviewing the Certificate and Diploma training programs in agriculture to ensure CSA is well addressed. The aim is to ensure graduates and future extension workers are knowledgeable and grounded on CSA and can adequately support farmers to cope with climate change.

The project has also participated in the review of other curricula by the training department to ensure that that they too incorporate CSA. These are crop production, human nutrition, horticulture, food and technology, land use planning and management, irrigation engineering and agro-mechanization.

The project organized a series of training for officials from local government authorities (LGAs) on CSA, including a one-week training on a Landscape CSA Pilot Course that emphasizes using leadership strengths to build collaborative interventions to scale CSA action.

The training brought together 70 action-oriented leaders who can influence others and create an enabling environment to transform agricultural systems in the face of climate change.

It was conducted by a team from the University of California, USDA, EcoAgriculture Partners at Cornell University as well as the project team at IITA, FAO and ICRAF.

"Our intention was for the participants to walk away with information and skills to plan and implement landscape CSA in their regions," says Mr. Freddy Baijukya, a scientist from IITA and one of the lead trainers.

With all these interventions—demonstrating CSA practices and technologies, providing weather forecasts and building the capacity of agricultural extensionists—the project, which is now in its final year, will go a long way in supporting the smallholder farmers in Tanzania to cope with climate change and secure their food and income.

Awareness creation: To cope with climate change, farming cannot be business-as-usual.

Lessons and recommendations

Farmers have to learn to follow the seasonal forecasts and apply appropriate CSA practices and technologies. There is therefore need to continue creating awareness among small-holder farmers on the practices and technologies and when to apply them. There is need to engage all possible experts in this including researchers, extensionists, decision makers and opinion leaders as well as the media to help with awareness creation.

Capacity building: There is need for more training of extensionists, agriculture students and farmers on CSA practices and technologies. For farmers, the use of a Farmer Field school approach was found effective by enabling them to learn by doing. CSA has been incorporated in teaching curriculum for agricultural and livestock training colleges. These need to be enhanced and made practical and also incorporated in other relevant curricula.

Availability of inputs including improved varieties: There is also need to create awareness amongst input suppliers to ensure they provide the right inputs. For example, when the season prediction shows there will be reduced rainfalls, then they should avail short-maturing drought resistant varieties or even switch from, say, maize to sorghum and other drought tolerant crops. For crops such as legumes whose seed systems are not commercialized, there is need to engage the seed systems community to produce Quality Declared Seeds.

Financial support: There is need for districts to ensure they put aside funds to demonstrate CSA practices and technologies for farmers to create awareness and to support farmers' access to necessary inputs under appropriate arrangements including the provision of subsidies.

Multi-stakeholder engagement: To successfully scale up CSA requires bringing together diverse stakeholders to address the challenges farmers face in adopting CSA including enactment and implementation of relevant policies and availing financial support and addressing market challenges.

Implementing CSA at landscape level: Sustainability and effectiveness of some of the CSA practices and technologies will only be seen if implemented at landscape level. This therefore calls for the need to conduct a multi-stakeholder engagement.

Access to markets: Farmers will only grow what they can eat and what they will sell. Therefore, when introducing new crops or new varieties, efforts to ensure their linkages to markets are absolutely necessary in motivating the farmers. Efforts must also be directed towards training the community on processing and ways of preparing newly introduced crop varieties.

Men, women and youths: Climate change affects men and women differently, the youths too. There is therefore a great need to purposely address the idiosyncratic needs of these groups in relation to their adoption of CSA practices and technologies.

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Technological Innovations to Drive Cassava Commercialization in Tanzania

Cassava has been recognized as a strategic crop not only for food and incomes of small-holder farmers in Tanzania but also as a cash crop with potential to earn the country much-needed foreign exchange and create jobs in rural areas. However, various challenges face the crop's production which the International Institute of Tropical Agriculture (IITA) and partners have been keen on addressing.

By: Hadi Rashidi – IITA, Tanzania

Cassava was once considered a poor man's crop in Tanzania. This perception has increasingly changed and, today, cassava is a strategic crop with uses going beyond the kitchen to a potential industrial cash crop. Its production has begun to shift gradually from subsistence to commercialization.

Cassava has been identified as one of the strategic foods and cash crops under the second phase of the comprehensive Agricultural Sector Development Program (ASDP II) towards transforming the agricultural sector in Tanzania.

The government also recently launched a National Cassava Development Strategy to guide cassava commercialization and industrialization initiatives. The strategy identifies priority interventions to triple the crop's current production volume and meet growing domestic and international demands.

Working from its Eastern Africa office in Dar es Salaam, Tanzania, IITA has many years of experience in supporting cassava commercialization and provided technical support in developing the strategy. IITA has been working with partners to develop and scale science-based innovations to address major challenges facing cassava production and commercialization in the country.

Photo credit: IITA

Farmers admiring roots from an improved cassava variety during a farmers' field day when assessing interaction of new varieties and AKILIMO Decision support tools.

Decision Support Tools for Improved Agronomy

Although cassava is an important food crop and widely cultivated in Tanzania, the average yield of around 8 tons/ha is extremely low compared to a potential yield of over 20 tons/ha. Many farmers use poor farming methods such as poor spacing and do not use fertilizers and manure. The low yield, therefore, is a major threat to cassava commercialization.

IITA, through its African Cassava Agronomy Initiative (ACAI), has been working to increase the productivity of cassava and improve the livelihoods of resource-poor farmers by developing cassava agronomy recommendations and tools to support their application. These include site-specific fertilizer recommendations, best planting practices, intercropping and scheduled planting to ensure all-year cultivation and harvesting of cassava. These are critical in the commercialization of cassava. The tools are available on mobile phones and on paper. With the use of various dissemination approaches involving trainings, meetings, videos and the media, over 100,000 cassava growers have been reached.

Fighting Pests and Diseases Using Artificial Intelligence

Several pests and diseases threaten cassava. The most common in Tanzania are the cassava brown streak disease (CBSD) and the cassava mosaic disease (CMD). One of the steps in fighting pests and diseases is a

Photo credit: IITA

A farmer at a demonstration plot in Serengeti, Mara, showing how to apply good agronomic practices in consideration of proper spacing and ridging.

correct diagnosis. Therefore, IITA and the USA-based Pennsylvania State University collaborated to develop and launch a NURU (Swahili for light) App. This artificially intelligent assistant accurately recognizes leaves damaged by these two diseases as well as damages caused by red and green mites. The App is available in PlantVillage and at Google's Play Store and can communicate in Swahili and English languages.

Cassava seed inspectors from the Tanzania Official Seed Certification Institute (TOSCI) and Ministry of Agriculture are also using NURU after receiving training from IITA, the Tanzania Agriculture Research Institute (TARI) and Mennonite Economic Development Associates (MEDA). Over 3,000 farmers have also been trained on using this App through various events like farmer field days and agricultural exhibitions.

Developing Cassava Clean Seed Systems

One of the ways farmers unknowingly spread viral cassava diseases is when they exchange infected planting materials. They also suffer huge yield losses when they grow susceptible varieties. IITA and TARI researchers have developed many improved cassava varieties which have been officially released in the country. However, in the absence of commercial seed systems, farmers could not access the clean seeds of these improved cassava varieties.

IITA, TARI and MEDA have been working to develop a better system to ensure farmers have access to clean seeds through a project known as Building an Economically Sustainable Seed System for Cassava in Tanzania (BEST Cassava).

The project has supported building the capacity of TOSCI on quality assurance of seeds of vegetatively produced crops such as cassava through preparing guidelines for Quality Declared Seed (QDS) and the use of the cassava seed tracker, which is a program for real-time tracking of cassava seed production. It has also supported TOSCI with laboratory equipment to enhance quality and trained seed inspectors with knowledge for seed certification at the local level. Furthermore, the project has supported use of a web-based platform for registration of cassava seed fields and commercial seed producers. IITA and partners have trained over 600 Cassava Seed Entrepreneurs (CSEs) on growing clean seeds of farmers' preferred varieties, both local and improved.

IITA has also introduced Semi-Autotrophic Hydroponics (SAH), a rapid multiplication technology for cassava seed in Tanzania, and trained researchers at TARI to apply the technology in their laboratories.

Photo credit: IITA

Ms. Neema Mbilinyi from IITA demonstrating to the farmers how to use NURU App at a farmer field day in Kibaha, Pwani region.

Supporting Formation of Tanzania Cassava Producers and Processors Association (TACAPPA)

Apart from training, IITA has been addressing processing and marketing challenges for cassava farmers by linking them with processing industries to purchase their crops, thus fueling an increase in cassava commercialization.

In this regard, IITA collaborated with other stakeholders to develop and launch the Tanzania Cassava Producers and Processors Association (TACCAPA) that brings together cassava producers and processors to address challenges facing production and utilization of the crop in the country.

Policy Recommendations

IITA in partnership with the government, training institutions and the private sector has done a lot to scale the innovations to help increase the incomes of many smallholder farmers and support cassava commercialization. However, a lot still needs to be done to scale these technologies to more farmers.

1. **More awareness creation:** Many farmers are still growing local cassava varieties which are highly susceptible to pests and diseases. There is need to continue creating awareness on new improved cassava varieties suitable to their agroecological zones. There is also need to build their capacity in detecting cassava pests and diseases and how they are spread as well as in the importance of planting clean seeds and reduce, as much as possible, the sharing of planting materials as that is how the pests and diseases spread from one farm to another. There is also need to create access to and promote the use of A-kilimo tools and NURU App.
2. **Improve availability of inputs including clean seeds:** Once farmers are aware of the new improved varieties and need to use clean seeds of cassava, as well as inputs such as fertilizers, there is need to ensure the seeds are available throughout all the cassava growing zones at affordable costs. One way to do this is to support more community seed producers to produce clean seeds by providing them with training and financial support.
3. **Institutional support:** It is crucial that the government, especially at the local level, champions the use of clean cassava seeds of improved varieties by farmers to stop the spread of pests and diseases and to increase yields. This includes setting aside budgets and funds for training and supporting clean cassava seed producers and demonstrating improved varieties. There is also need to support the provision of extension services to ensure farmers follow good agronomic practices as developed by A-Kilimo to increase cassava production.
4. **Support cassava research and technology development:** There is still need to continue to support research on cassava to develop high-yielding and improved varieties that are resistant to pests and diseases but which also meet user requirements. It is also important to continue with research on how to better control pests and diseases affecting the crop.

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Transformation of Smallholder Agriculture in the Digital Era: The Potential of Precision Agriculture in Tanzania

Kadeghe Fue & Khamaldin Mutabazi, Sokoine University of Agriculture (SUA), Tanzania

AN OVERVIEW

- Advancement in computing power and global digital technology convergence have paved a way to Precision Agriculture (PA).
- Tanzania as most other countries in sub-Saharan Africa lags behind.
- This article underpins the transformative potential of PA for advanced, sustainable, competitive and inclusive agriculture sector.
- Last but not least, the article draws policy recommendations for supporting inclusive PA.

PRECISION AGRICULTURE IN PRACTICAL PERSPECTIVES

Precision Agriculture (PA) belongs to digital agriculture. Digital agriculture basically refers to tools and technologies that digitally collect, store, analyze and share electronic data along the agricultural value chain[i].

A decision to grow a certain crop or rare an animal requires a set of factor inputs that are normally scarce and with alternative uses – hence bearing an opportunity cost. PA can help farmers make smarter and precise decisions to strike resource allocation trade-offs for optimal agricultural output. PA uses information and communication technologies (ICT) to ensure that crops and soils receive exactly what they need for optimum health and productivity.

Indeed, the hussles that smallholder producers face and the support they hardly get from the traditional extension system justify PA. Luckly, advances in digital technologies have a critical role to transform farming and the agricultural advisory ecosystem. More often than not, traditional Good Agricultural Practices (GAPs) have not delivered optimal results in sustainably improving agricultural productivity and returns on investment. PA offers a transformative solution to bridging the yield gaps more precisely and smartly in a more cost-effective way. Taking an example of fertilizer application, we can imagine how flawed our blanket zonal fertilizer recommendation rates are given the fact that PA wisdom suggests that fertilizing rates need to vary even within the same small farm! In cognizance of this challenge, we address one aspect of PA called Variable Rate Application (VRA) of agricultural inputs. VRA concept is more relevant for resource-poor farmers that in the first place are deprived of the means to afford inputs such as irrigation water, fertilizers and pesticides. The basic argument under VRA is that - due to spatial varying natural soil fertility, health of sowed seeds and load of pests in the same farm – the application rates of inputs over space within the same farm must vary for attaining expected optimal outcomes.

Producing more food with limited land and resources is our new challenge in agriculture. Have you ever thought this method is technically called precision agriculture (PA)? Would every farmer like to know and possibly use this technology? The answer is certainly, YES!

Two big qustions arise - what does it take to practice PA? Why is it not practiced in Tanzania particularly in smallholder agriculture? In contrast, most people would say not only the cost of scouting the farm using PA technology and making appropriate decisions is so high but also the VRA of inputs using advanced machine control technologies is out of proportions for small-scale farming!

PA in the case of VRA uses advanced sensors to characterize the crops and farm so as to specify quantities required for each plant or particular area of the farm. Sensors are used to detect soil moisture (Example Figure 1), soil color and texture, soil organic matter, soil nutrients, soil and air temperature, air humidity, rainfall and plant phenotype characteristics. However, most sensors need a carrying platform and controllers

Photo credit: Dr. K. Fue

Figure 1: Soil moisture and temperature sensor installation at Sokoine University of Agriculture.

Figure 2: Wireless precision irrigation controller developed by University of Florida and SUA.

(Example Figure 2) to accomplish the work. Unfortunately, the cost of the platforms, sensors and controllers to read the data may cost thousands to millions of Tanzanian shillings.

PA in combination with geospatial technologies can also be used in food security planning through timely crop performance assessment by generating spatial maps using satellite data (e.g. Figure 3). It is possible to use drone or satellite data to understand and depict crop information that can be very useful for site-specific management of the farms. With advanced artificial intelligence (AI) technologies, it is now possible to characterize and quantify crop infestations, nutrient deficiencies or irrigation water requirements.

The propects for PA technologies are growing and there are exemplary cases to state. For instance, technologies like Chameleon and the Wetting Front Detectors (WFD), which are commercially available in Tanzania are low-cost tools developed by Commonwealth Scientific and Industrial Research Organisation (CSIRO) to help smallholder producers in undertaking precision irrigation and nutrient management.

Thankfully, smartphones are common in farming areas of Tanzania. The task would be on scientists and entrepreneurs to innovate the technology of tomorrow that would transform the way we grow crops and manage the farm, and the agricultural system at large.

However, affordability of the PA tools (incl. sensors, micro-controllers and carrying platforms such as Unmanned Aerial Vehicles (UAVs) is critical. A favourable taxation regime of the PA tools would help to reduce importation costs hence support the development of PA.

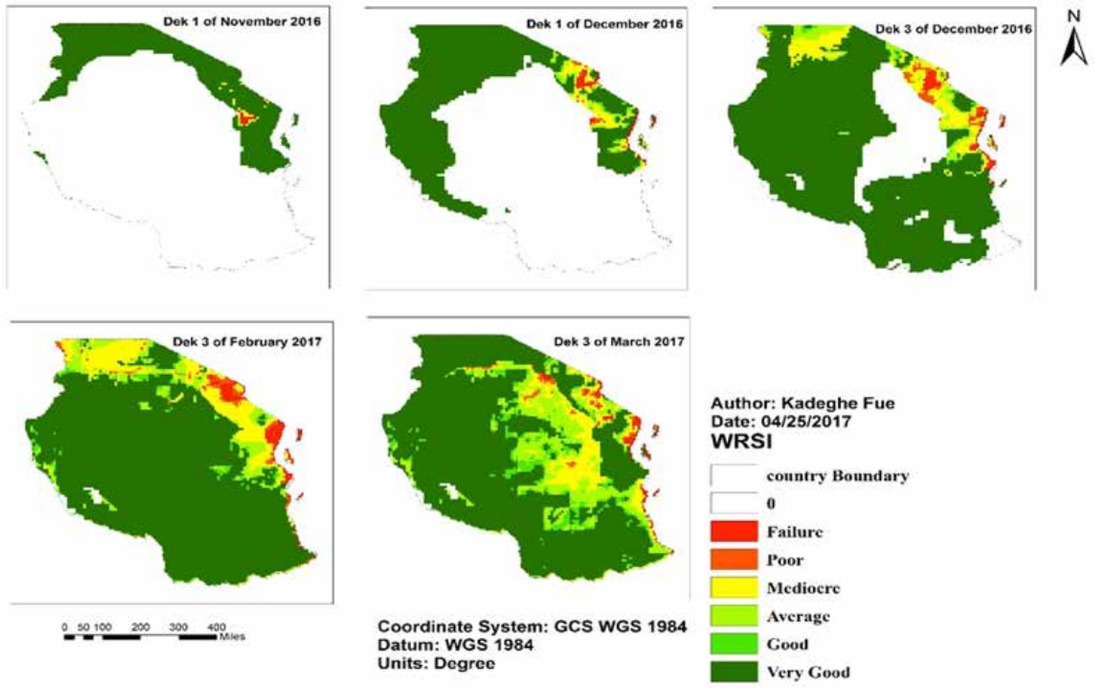

Figure 3. *Maps showing crop performance in Tanzania for the season of 2015/2016. The green color means a very good performance while red is crop failure. This was derived by observing rainfall and temperature patterns and then calculating Water Requirement Specification (WRSI) (Credits: Dr. K. Fue & Prof. S. Tumbo).*

RECOMMENDATIONS FOR POLICY

Last but not least, we draw the following specific recommendations for policy and practice:

- Strengthen coordination, cross-learning and co-innovations in applied digital R&D among the private and public sectors in higher and terciary education and research insitutions in the contry.
- Promote investments in seed funding and investments in AgTech startups in Tanzania. This investment can be achieved through coordination partnerships involving the government, private sector and development partners.
  Agtech seed funding is growing relatively faster in the East African region that had almost none by 2000 – having now grown to more than USD 500 million by 2018. Unfortunately, more than two-thirds of that amount has been invested in Kenya. Tanzania accounts for less than 10% of the investments that include seed capital and start-up funding[ii].
- The government should reform its taxation regime to exempt imported PA designated technologies to make them affordable for advancement of digital agriculture.
- Support adoption and diffusion of PA technologies to farmers by designing business models to support collective action and sharing of costly PA technologies.

[i] Shepherd, Turner, Small, and Wheeler (2018). "Priorities for science to overcome hurdles thwarting the full promise of the 'digital agriculture' revolution". Journal of the Science of Food and Agriculture. 100 (14): 5083–5092. doi:10.1002/jsfa.9346. PMC 7586842. PMID 30191570.

[ii] Krishnan, A. 2018. How AgTech is changing East African economies. https://odi.org/en/insights/how-agtech-is-changing-east-african-economies/ retrieved 10-June-2021

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Private Sector Engagement Facilitates TZS 2 Billion Sorghum Production Using Climate-Smart Technologies for 11,000 Smallholder Producers in Tanzania

More than TZS 2,165,050,622 has been jointly mobilized by the Climate Resilient Agribusiness for Tomorrow (CRAFT) project in partnership with two Tanzanian companies targeting a total of 11,000 smallholder producers (SHPs) for the sorghum crop. Private sector's co-investments in climate smart agriculture (CSA) technologies and practices promote market-driven adoption and scaling of inclusive climate-smart sorghum development in different regions of Tanzania.

By: John Walker Recha & Emanuel Saidi Nkenja

Introduction

The use of climate smart agriculture (CSA) technologies and practices is key to improving productivity and efficiencies of the existing food crop production and supply systems in Tanzania. It however requires concerted efforts and joint investments by supply chain actors, service providers and public sector partners working in different agricultural supply and value chains. The CRAFT project, which is funded by the Ministry of Foreign Affairs of the Netherlands, is leveraging investments in CSA practices that promote market-driven adoption and scaling of inclusive climate-smart business developments that use appropriate technologies along selected agricultural value chains. The CRAFT project through its Climate Innovation and Investment Facility (CIIF) provides co-investment to commercially viable business cases that utilize these sustainable technologies. Companies in the private sector invest their own funds and then leverage off the CRAFT grant to attract additional investment from commercial financial institutions.

In 2020, the CRAFT project partnered with two companies:

Photo credit: CRAFT

A sorghum demonstration farm in Ihanda village in Dodoma's Kongwa district as facilitated by KFS.

Musoma Food Company Limited (MFCL) and Kibaigwa Flour Supplies Limited (KFS) under a two-year partnership arrangement to develop the sorghum value chain for enhanced productivity and profitability of SHPs. Both companies target a cumulative 11,000 SHPs and have invested a total of TZS 2,165,050,622. These companies have contributed 56% of the capital while CRAFT co-investment is 44%.

Sorghum Crop Value Proposition

Sorghum ranks fifth after maize, cassava, rice and wheat as a staple in Tanzania. MFCL and KFS undertake sorghum production using appropriate CSA technologies based on the value chain approach and these companies provide beneficial central linkages to different value chain actors together. Going into the future, MFCL and KFS will work with input suppliers to supply over 106 metric tons (MT) of certified sorghum seeds to 11,000 contracted SHPs. Producers will be supported with extension services which are climate-smart as well as post-harvest handling technologies to improve the productivity of sorghum, with yield moving from the low average of 0.5MT/acre to over 1.5MT/acre for certified seed users and 1MT/acre for

Photo credit: CRAFT

A sorghum demonstration farm in Ndurugumi village in Kongwa district, Dodoma, as facilitated by KFS.

quality declared seed (QDS) users. The project is expected to reduce post-harvest losses from the current 15% to about 5%. By increasing sorghum productivity and creating a reliable market, SHPs are expected to increase income from TZS 70,000 to TZS 350,000 per acre. The increase in productivity and improved quality of sorghum will meet the market demand where these companies need to supply about 30,000MT of sorghum to their customers.

Support to Smallholder Producers in Sorghum Production

Both companies work with existing farmer groups and have supported formation of new ones in different zones to provide extension support to SHPs including training them on CSA practices in sorghum production. The farmers were organized into groups to support the contract farming model and contracts were signed with the groups. At the start of 2021, the businesses were able to supply the SHPs with appropriate climate-smart inputs like seeds on time, such as Hakika, Marcia, Masia, NARCO, Sila and Wahi, sorghum varieties and fertilizers through credit arrangements based on their contracts.

The businesses also made use of seasonal weather forecasts technology from the Tanzania Meteorological Authority (TMA) to determine the appropriate seed variety to plant as well as agro-advisories on suitable planting dates. Other good agricultural practices that farmers were trained on include cost effective land preparation (e.g., conservation agriculture using rippers where appropriate), soil testing, optimum crop spacing, appropriate fertilizer application, weeding, disease control, integrated pest management, proper harvesting and improved post-harvest handling. For training farmers, the businesses established demonstration plots, conducted farmer field days and held farmer exchange visits. In some instances, SHPs are being supported in their groups to acquire post-harvest equipment. In other instances, the companies offer post-harvest services in their bulking centres by having weighing scales, moisture meters, sieves and tarpaulins. All the newly formed farmer groups have been profiled and trained on proper business record keeping for monitoring their yields. Sorghum grain collection zones/ centres have been established to support collective bulking by SHPs. Another alternative is the use of mobile trucks provided by the businesses as collection centres. This requires the groups to agree on specific periods and location when the trucks should visit the locations for farmers to bring their sorghum. MFCL and KFS target to get at least 50% of the sorghum they need from their contracted SHPs at a premium price of 5–10% above the market price.

Crop Insurance Services

This is another innovation the companies have introduced to SHPs. KFS has entered into agreement with Reliance Insurance Company Limited to undertake the climate insurance component with their SHPs. The insurance product is called Multi-peril Crop Insurance (MPCI) that protects against crop yield losses by allowing participation of SHPs to insure a certain percentage of historical crop production. Specifically, the MPCI covers against soil moisture level, drought, destructive animals, floods, historical yield level and input cover. For example, the yield cover works in such a way that if the yield falls below the targeted 8 bags per acre and is attributed to weather challenges then a farmer will be covered on the losses. The price of insurance per acre is TZS 21,000 and 130 KFS farmers are currently benefiting from the product.

Scalability and Sorghum Market

While this project is targeting to directly impact 11,000 SHPs, the establishment of climate-smart interventions in the sorghum value chain within the farmers' location may have an indirect impact on an additional 20,000 SHPs in Singida, Dodoma and Tabora regions through farmer-to-farmer learning.

The main customers for sorghum are the Serengeti

Breweries Limited (SBL) and Tanzania Breweries Limited (TBL). MFCL has a running contract with the two breweries to supply a cumulative total of 15,000MT of sorghum yearly. In April each year, the two breweries issue local purchase orders to MFCL that sets the annual sorghum demand that MFCL is obliged to fulfill on a quarterly basis. Similarly, KFS supplies more than 50% of their sorghum to TBL.

In addition, the companies target wholesale buyers from Kenya, Rwanda, South Sudan and Uganda, a market segment that accounts for 30% of the sorghum. The MFCL and KFS also process nutritionally blended sorghum-maize-cassava flour which is sold to local consumers within Tanzania.

Conclusion

The contract farming arrangement that utilizes appropriate CSA technologies between the supported companies and SHPs is expected to revitalize and facilitate access to input and output markets for SHPs in the sorghum value chain. There is risk reduction for both parties whereby SHPs have a secured market with a good price and access to weather information as well as technical CSA advice and inputs, as well as utilization of climate insurance component, while the private sector actors including TBL and SBL have a guaranteed supply of the appropriate quantities and quality of sorghum. Moreover, there is need to explore ways in which this innovation can also be scaled out to other crops such as wheat, sesame, etc.

Recommendations

The application of an inclusive business approach to climate-smart and resilient agriculture technologies and practices requires champions to spearhead which role the private sector can ably play while ensuring harmony with government policies and plans on food security and climate change. A more enabling environment however needs to be put in place by:

- Enhancing access to good quality seed demanded by the companies and their breweries clients.
- Providing downscaled climate information services useful for on-farm decision making.
- Supporting agricultural and marketing co-operative societies (AMCOS) that are currently the most vibrant cooperatives in Tanzania dealing with production, processing, transportation and marketing of various crops.

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John works with policy makers to identify suitable policy and institutional frameworks to ensure the lessons from the CSVs contribute to achieving food security at country and regional levels, and to integrate climate change and agricultural policies.

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OUR ESTEEMED 93 MEMBERS

- **52 Local Non-Governmental Organizations**
  Actions for Democracy and Local Government (ADLG), Agrilink Tanzania, Arusha NGO Network (ANGONET), Biharamulo Originating Socio-Economic Development Association (BOSEDA), Cafe Africa Tanzania, Centre for Development Initiatives (CDI), Charity Organization, Community Active in Development Association (CADA), Community Environmental Management and Development Organization (CEMDO-Tanzania), Community Support Initiatives Tanzania (COSITA), Community Water & Environmental Association (COWEA), Ekama Development Foundation, Environmental Management and Economic Development Oorganization (EMEDO), Farmers Pride Mkulima Tanzania, Fishers Union Organization (FUO), Free Ambassador Women & Children Mission Tanzania (FAWACM-TZ), Future Development Agency (FUDEA), Hakikazi Catalyst, Ileje Environmental Conservation Association (IECA), Ilkisongo Pastoralist Initiative (IPI), Integrated Development Initiatives in Ngorongoro (IDINGO), Jumuiya ya Wafugaji na Wakulima (JUWAWAKULIMA), Kaderes Peasants Development Ltd, Kaengesa Environmental Conservation Society (KAESO), Kagera Millers & Consumers Cooperative Society LTD (KMCCS LTD), Kilombero Organization for Community Development (KOCD), Life Change Rukwa Development Organization (LCRDO), Maasai Pastoralist Development Organization - LARETO (MPDO – LARETO), Mani Ushiwa Hauperi (MAUH – CBO), Mission for Improvement & Boosting Organizational Services to the Community (MOBOS), MVIWATA – KAGERA, Mvomero Sustainable Development Organization (MSDO), Mwanasatu Development Organization (MWADO), Njombe Agricultural Development Organization (NADO), Organization for Rural Self-Help Initiatives (ORSHI), Rabika Farms, Rice Council of Tanzania (RCT), Rukwa Sustainable Development Organization (RUSUDEO), Rulenge Ngara Catholic Diocese – Justice for Peace Program, Rural Urban Development Initiatives (RUDI), Rural Women Development Initiative (RUWODI), Sokoine University Graduate Entrepreneurs Cooperative (SUGECO), Taasisi ya Kusaidia Wanawake (TAKUWA), Tanzania Coffee Association (TCA), Tanzania Forest Conservation Group (TFCG), Tanzania Grassroots Oriented Development (TAGRODE), Tanzania Life Improvement Association (TALIA), TUSHIRIKI – Mbeya, Umoja wa Wakulima wa Matunda na Mboga mboga (UWAMWIMA), United Peasants of Tanzania (UPT), Wajibika, Water & Environmental Sanitation Projects Maintenance Organization (WEPMO).

- **20 Umbrella Farmer Organizations**
  AMSHA Institute of Rural Entrepreneurship Ltd, Biharamulo Non Governmental Organization Forum Network (BINGO Forum), CARITAS Roman Catholic Diocese of Mahenge (CARITAS Mahenge), Lukwika Growers Association, MIICO Development Agency, Mtwara People's Umbrella Organization- (KIMWAM), Nanyumbu Development Foundation (NADEFO), Newala Farmers Association (NEFA), Organic Farming Association (UHAI or OFA), PELUM Tanzania, Shirika la Maendeleo ya Wakulima na Wafugaji Tandahimba (TAFO), Tanzania Association of Women Leaders in Agriculture and Environment (TAWLAE), Tanzania Food Gardening Network (TAFOGA NET), Tanzania Gender Networking Programme (TGNP), Tanzania Graduate Farmers Association (TGFA), Tanzania Horticultural Association (TAHA), Tanzania Organic Agriculture Movement (TOAM), Umoja wa Wabanguaji Korosho (TASSCPA) and Umoja wa Wabanguaji Korosho Ruangwa (UWAKORU).

- **18 International Non-Governmental Organizations**
  ActionAid Tanzania, Aga Khan Foundation, BRAC Tanzania Finance Ltd (BTFL) and BRAC Maendeleo Tanzania (BM+A3T), Catholic Relief Services (CRS), Farm Africa, Femina Hip, Helvetas Swiss Intercooperation Tanzania, Kickstart International, Oxfam GB, Raleigh Tanzania, RIKOLTO East Africa (formerly VECO), SNV Tanzania, Swissaid Tanzania, Swisscontact, Trias Tanzania, Vi Tree Planting Foundation, VSO Tanzania and World Vision Tanzania (WVI).

- **3 Private Companies**
  Katani Ltd, Match Maker Associates Limited (MMA) and Southern Highlands Agricultural Development Company Ltd (SHADECO).

ANSAF

Agricultural Non State Actors Forum

ABOUT ANSAF

Agricultural Non State Actors Forum (ANSAF) is a member-led forum formed by umbrella farmer organizations, private companies and national and international NGOs operating in Tanzania. Started as a loose entity with eight members in 2006, ANSAF was formally registered in 2009 as an NGO that works in all regions of Tanzania Mainland and Zanzibar. Its current membership comprises of 93 organizations. ANSAF advocates for equitable resources and power allocation, pro-smallholder producer policies and practices and strengthened engagement platforms to ensure the voices of poor men and women are heard.

OUR VISION

A Tanzanian society free of poverty where sound agricultural policies and best practices contribute to the transformation of the country's economy.

OUR MISSION

ANSAF seeks to work with members and non-members to orchestrate collaborative efforts to influence policy and practice change on crucial issues affecting marginalized smallholder producers and other stakeholders through learning, communicating and advocacy.

OUR MOTTO

Our work is driven by the spirit of advancing the ***agricultural agenda for smallholder producers*** in Tanzania based on identified challenges and opportunities.

OUR STRATEGIC PLAN (2018-2022)

The main objective of our Strategic Plan is to promote smallholder producers' access to opportunities and related capacity to respond as entrepreneurs, workers or consumers; transform lives and agricultural systems (policies, institutions and infrastructures) that benefit smallholder producers; and change the mindset of key sector stakeholders towards the common goal of ***advancing the agricultural agenda for smallholder producers*** in Tanzania.

OUR WORK STREAM

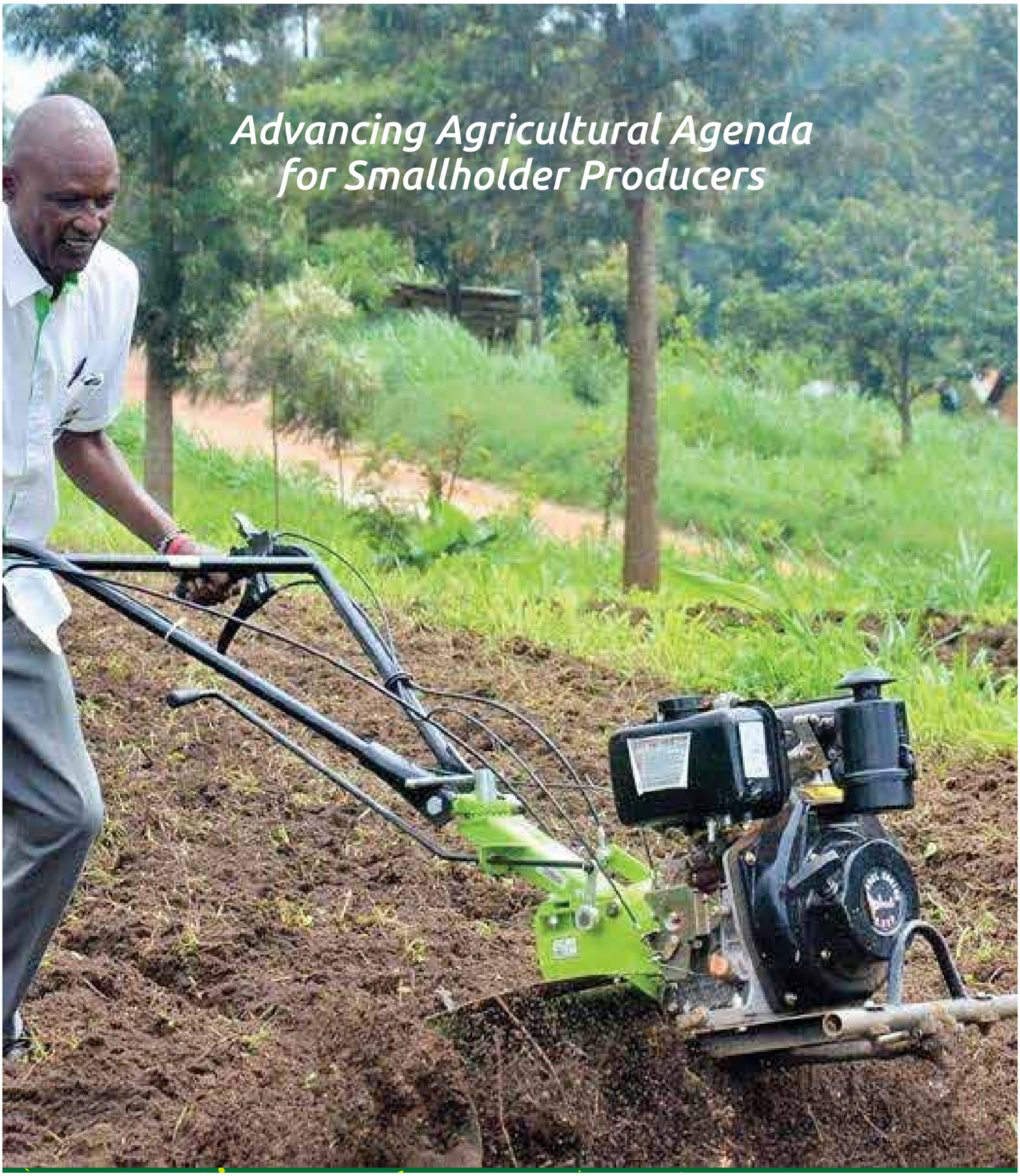
Four work streams guide ANSAF's interventions aiming at contributing to its achievement of a lasting social, economic and structural impact. They include:

- Food and Nutrition Security,
- Policy and Budget Analyses,
- Value Chains, and
- Women and Youths.

Our APPROACHES

These speak of how we fulfill our objectives. They include:

- Social Accountability Monitoring,
- Policy and Budget Analyses,
- Roundtables and Dialogues, and
- Media Engagement.



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