

ULIMWENGU WA

ANSAF
Agricultural Non State Actors Forum

Mkulima

FARMER'S WORLD

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CLIMATE CHANGE: EYES ON SMALLHOLDER PRODUCERS



Agroforestry
makes life better

Indigenous seeds
are indispensable
heritage

Let us' preserve and sustain them

ADVANCING AGRICULTURAL AGENDA FOR SMALLHOLDER PRODUCERS



Agricultural Non State Actors Forum

ABOUT ANSAF

Agricultural Non-State Actors Forum (ANSAF) is a member-led national advocacy platform comprised of national and international non-governmental organizations, farmers' umbrella organizations and commercial companies. Members are joined by common focus -inclusive agricultural transformation through increased public accountability. Started as a loose entity with 8 Members in 2006, ANSAF was formally registered in 2009 as non-governmental organization that works in all regions of mainland Tanzania and Zanzibar. Its Membership has increased up to 79 organizations by 2020.

OUR VISION

A Tanzania society free of poverty where sound agricultural policies and best practices contributes 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 practices change on critical issues affecting marginalize smallholder producers and other stakeholders through learning, communication and advocacy.

OUR SLOGAN

"Advancing Agricultural Agenda for Smallholder Producers"

OUR STRATEGIC PLAN (2018-2022)

The main objective of Strategic Plan is to promote smallholder producers access opportunities and capacity to respond as entrepreneurs, workers, or consumers; Transform lives and agricultural systems (policies, institutions and infrastructures) that benefit smallholder producer; Changing mindset among the key stakeholders in agriculture sector.

OUR WOK STREAM

Several work streams have been identified to guide ANSAF interventions that aim to contribute to achieve a lasting social, structural and economic impact. These work streams include

- Value chain
- Policy and Budget Analysis
- Food and Nutrition Security
- Youth and Women

Our APPROACHES

- Social Accountability Monitoring,
- Policy and Budget Analysis,
- Round Tables Meetings and Dialogues;
- Media Engagement.



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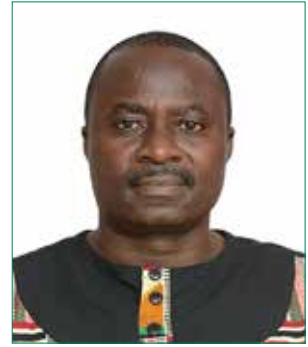
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Message from The **Executive Director**



Dear Readers,

Climate change has become a global concern. Its impact on the planet has been socially, economically and environmentally devastating. In the past two decades, the country experienced rising temperatures with frequent and severe droughts. Since 1960, average annual temperatures increased by 1.0°C and it is projected to rise between 1.7°C and 2.5°C in the semi-arid areas by 2030. Mean temperature and rainfall changes including increased variability of rainfall are expected to have devastating effects on agriculture, food security and the ecosystem. It is predicted that climate change will drive over 100 million more people into poverty by 2030 if solutions are not found earlier. Increased crop failures will affect the price of food, forcing poorer families to spend more money on feeding their family. Tanzania is ranked 26th in the list of vulnerable countries to climate.

This 9th edition of *Ulimwengu wa Mkulima* (Farmer's World) magazine comes under the topic "**Climate Change: Eyes on smallholder producers.**" The topic resonates very well with global debates on how to reduce the effects of climate change and save the planet. Besides, climate change is not gender-neutral because it highly affects women and youth as they are the main producers at the family level. Hence, Tanzanian agriculture that depends highly on rain-fed is prone to climate change.

The impact of climate change on food insecurity to urban areas is anticipated to bring adverse danger to childhood malnutrition that may cause growth issues for the future generation. These noted extreme effects of climate change influence ANSAF and its members to learn how smallholder producers and the nation at large can take measures towards climate change adaptation.

What we see happening in terms of recurrent shortage of food and water is an evidence that climate change is not a myth but a reality! In 2019, ANSAF in collaboration with members organized its Annual Learning and Sharing Experience Event to discuss climate change as one of the challenges affecting smallholder producers. The main theme was "**The alarming danger and opportunities of climate change to the agriculture sector: Are we ready?**" Subthemes focused on climate smart agriculture, policy options and practical solutions, climate change and agro-processing, and climate-smart agriculture and gender.

The Guest of Honour was the Minister of State in the Office of the Vice President responsible for Environment and Union Affairs, Hon. George Simbachawene. In his opening remarks, the Guest of Honour urged stakeholders to use the event as a platform to deliberate on strategic approaches to reduce the impact of climate change on smallholder producers. At the end of the event, participants committed themselves to work with the government and its agencies to harmonize, coordinate and create linkages of policies to better address climate change. They also agreed to help disseminate climate change policies to communities and create awareness on the implications of those policies to their livelihoods.

We hope this edition of *Ulimwengu wa Mkulima* magazine will be used to widen the discussion on what stakeholders should do to lessen the negative effects of climate change to smallholder farmers in Tanzania. We invite your views and recommendations on how to move onwards.

**—Audax Rukonge
Executive Director**

A note from The Chief Editor

Dear Esteemed Reader,

Welcome to the 9th edition of *Ulimwengu wa Mkulima* magazine. The previous edition focused on: “the shrinking of the coffee subsector in Tanzania due to increased pests and diseases and the fall of international markets.” In this edition, the focus has been directed to “Climate Change: eyes on smallholder producers” because climate change is currently one of the greatest challenges facing humanity across the world. Among the impacts of climate change in Tanzania include: higher temperatures and increased frequency and magnitude of droughts and floods as well as rising sea levels. Heavy rains are known for causing soil erosion, landslides and vegetation damage. Erratic droughts also cause evaporation of soil moisture and soil nutrients. The most vulnerable groups are the smallholder producers - men, women and youth - who do not have the right capital to launch climate smart farming using appropriate technologies.



Natural disasters sometimes occur in linkage with climate change. All of these impacts threaten the livelihoods of smallholder producers in Tanzania. We have seen floods washing away irrigation infrastructure and rural roads and prolonged droughts drying up pastures and water sources for livestock. Extreme weather condition is estimated to cause around US\$200 million loss per year for the agricultural sector alone. The magazine opens up a dialogue for readers to discuss the best ways to adopt the impact of climate change to smallholder producers' livelihoods. For instance, greenhouse farming technology has proved to have the potential to increase productivity amidst harsh weather conditions. Likewise, the use of renewable energy can facilitate irrigation and increase food security among smallholder producers in Tanzania. This magazine published by ANSAF provides a platform to discuss solutions to improve the country's agricultural sector for the rural poor. Through focusing on smallholder producers, ANSAF intends to promote accountability, transparency and citizen engagement in agricultural policy making processes.

The contents and opinions expressed in this publication are not necessarily those of the editor or any other organization associated with this magazine. While maximum precaution is taken to ensure accuracy in preparing this publication, the printer and ANSAF assume no responsibility or any liability for any inaccuracy or omission. All submitted materials were accepted on understanding that the materials could be edited, amended or abridged for publication purpose. We welcome comments, suggestions and more articles related to the agricultural sector development. Please enjoy reading this magazine!

—**Rehema Msamy**
Chief Editor

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Chief Editor

Climate change: Eyes on smallholder producers

By Owen Nelson Mghweno and Diana Elinam

Agriculture is the mainstay of the Tanzanian economy, contributing about 29.1% to the country's GDP, 95% to the national food requirements, at least 70% of total employment, and more than 30% of exports. However, while the country has 44 million ha classified as arable, only 24% is under cultivation.



Despite most of the producers being small-scale farmers with limited access to improved technologies and mostly depending on rainfed agriculture as only 2.5% of the area under cultivation is irrigated, there has been expansion of land cultivated by 7.7% annually. Statistics from the 2016/17 Agricultural Survey Report; FAO Report on Tanzania-driven response to climate change, food and nutrition insecurity; and The World Bank Tanzania Economic Update of 2019 suggest that if agriculture continues to be mainly rainfed with expanding cultivation land, then the sector's growth potential will be limited by climate change variables.

Various sources define climate change as resulting from temperature variability caused

by emissions of greenhouse gasses from human activities, such as air pollution from industries, and fossil fuels. When these greenhouse gasses are released they trap the heat in the atmosphere which automatically results in climate change. The impact of climate change in Tanzania can be noted in two folds: bio-physical and socio-economic. This article specifically focuses on the social-economic impacts of climate change to smallholder producers' activities in Tanzania and suggests measures to minimize the harsh consequences of the same.

Climate change has been easily explained and witnessed through droughts and floods among farmers because of costs associated with such natural calamities. For instance, heavy rains

cause soil erosion, landslides, and vegetation damage. Erratic droughts cause evaporation of soil moisture and soil nutrients.

Tanzanian smallholder farmers are victims of heavy rains which debilitate crops and destroy infrastructure. There are examples of reported crop losses due to heavy rains every year. For instance, *Mwananchi* Newspaper dated 20th April 2020 reported that crops in more than 900 acres were damaged in Hai district in Kilimanjaro region. Also, the ITV news media reported on 20th February 2016 that more than 9,000 acres of maize, beans and sunflower were damaged in Hanang district in Manyara region. *Mtanzania* newspaper had on 20th January 2019 reported that more than 300 acres of crops were damaged in Bariadi district in Simiyu region. In February 2020, consumers felt the pinch of the effects of climate change when the price of one tomato rose to the unprecedented price of TZS 300. EATV media's interview of 18th February 2020 with value chain actors revealed their association of heavy rains in major production areas with high costs of production due to increased costs of soil, pests and diseases management and destruction of farms and road infrastructure. These are a sample of cases showing the negative impact of heavy rains on producers and consumers.

Tanzania has also experienced prolonged droughts sometimes due to short and uneven distribution of rains. Droughts cause unsustainable land use in the country, a phenomenon highly observed in the northern and central parts of the country particularly in Arusha, Manyara, Simiyu and Dodoma regions. A good case in point is the famine that was experienced between 2000 and 2011 due to drought that disrupted food crops production. One easy way to mitigate the effects of drought could be irrigation. However, according to the 2016/17 Agricultural Survey, majority of smallholder farmers in Tanzania do not practice irrigation whereby only 2.5% of the cultivated land (about 351,831 ha) is irrigated. With such a situation, the Sustainable Intensification of Maize-Legume Systems for Food Security in Eastern and Southern Africa (SIMLESA) Report launched in February 2019 estimated that Tanzania loses about TZS 222 billion (about US\$96.6 million) yearly which is equivalent to 1.65% of the GDP to drought affecting maize and beans.



Climate change has also hit hard the livestock sub-sector. Prolonged droughts have caused pastures scarcity and water sources drying, forcing pastoralists to relocate to regions with pastures and water. As a consequence, their migration has characteristically caused tense conflicts with other land users particularly farmers.

Generally, consequences of climate change are felt in the form of rising costs of production and rising commodity prices in the market due to reduced supply. In other instances, easy-to-produce crops tend to saturate the market and distort prices.

Smallholder producers usually depend on financial institutions for loans to purchase inputs, hire tractors and manpower, as well as pay for storage facilities and transportation. As a result, financial institutions have been reluctant to extend loans to smallholder producers in fear of climate change and other multiple risks facing farming activities.

Investment in irrigation infrastructure and other improved water management technologies, improvement of rural transport and storage infrastructures, and provision of insurance products suitable to smallholder producers are highly recommended to minimize the burden of losses and costs caused by climate change on consumers, producers and the government alike.

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A million reasons behind climate-smart farming: an adaptation window to smallholder producers in Tanzania

By Reuben James

An overview

Being contributors of 75% of total agricultural outputs in Tanzania and 85% producers of food crops, smallholder producers are more vulnerable to climate change and extremely likely to be exacerbated in the context of technological, financial and institutional constraints at large. We have a million reasons behind our turn to climate-smart agriculture, a million reasons to create an adaptation window for smallholder farmers in Tanzania to prosper. *'It can be done.'*



Why climate change?

If we are talking about climate change, we imply any lengthy-term paradigm shift in a given area's normal weather patterns. Normal weather trends include reasonable temperature, rainfall, wind, and so many other climatic conditions. Such shifts may occur as a result of the earth's dynamic processes (e.g., volcanoes or earthquakes) due to external forces (e.g., variations in radiation from the sun intensity or dropping of large meteorites) or human activities (e.g., deforestation, forest burn or the three forms of pollution - land, air, and sea), resulting in an agricultural productivity decrease, ecological disparity as well as the extinction of some plants and animal species and the presence of others.

So why is climate change an agricultural concern?

Climate change is currently and widely agreed at the global level to be a threat to our universe.

Its existence is now a reality. Its diverse impacts on the world communities from a health point of view, water bodies, biodiversity, soil health to agricultural productivity, and production has been a point of discussion for decades. Agricultural sector vulnerability to both climate change and uncertainty has been well documented in the literature. The general sentiment is that changes in temperature and precipitation will make a substantial difference in the soil and water system, which will potentially affect agricultural productivity and production.

Smallholder farmers and climate change

From 19th to 22nd of March 2020 I had a technical scoping visit to Karatu as one of the districts where I worked as a Freelance Consultant and an Associate of Aid environment East Africa to technically assist the development of Wheat Outgrowers' Implementation Plan for Camel Flour Mills under the African Agriculture and Trade Investment Fund (AATIF) Technical Assistance Facility of the Netherlands. I met John Tippe, one of the influential wheat farmers and the politician in Karatu. Tippe had witnessed over several decades of unpredictable rainfall, floods, soil erosion and drought affecting his farming operations, and many sloppy farms being vulnerable to soil erosion and flooding due to poor farming techniques with no terraces and other measures. According to Tippe, Karatu observed a massive drought back in 2000 at *Kambi ya Simba* and he is still worried about the same in the near future. What a tragedy!

According to Rosenzweig *et al.*, 2002, climate change is expected to result in long-term shortages of water and other resources, worsening soil conditions, drought and desertification, disease and pest outbreaks on crops and livestock, sea-level rise, and so on. Vulnerable areas are expected to experience losses in agricultural productivity primarily due to declines in crop yields. Smallholder producers' vulnerability will almost certainly be intensified in the context of poor technological advancement, limited financial access and unsupportive institutional framework as has largely been experienced in Tanzania.

Smallholder farmer's vulnerability to climate change

According to the *Tanzaniainvestment.com* website, smallholder farmers in Tanzania dominate the agricultural sector, cultivating 5.1 million ha annually, of which 85% comprises food crops. They contribute over 75% of total agricultural outputs in Tanzania. This means any effect of climate change on production and productivity in Tanzania will be affecting this group directly and immensely. Research papers have been showing that poor countries, especially tropical developing countries, are more vulnerable to the effects of climate change, especially in agricultural production and productivity. Smallholder farmers have been more vulnerable than middle- and large-scale farmers who can at least afford some coping means in the form of finances and technology to minimize the impact of climate change on soil health, production and productivity *Ngano* - as the case of Limited of Hanang district and Illovo sugarcane farms of Kilombero district in Morogoro. These have special measures to combat climate change effects and have installed weather stations to at least predict and prepare for uncertainties.

What should be done?

- There is no direct link and system of national climate database and smallholder farmers, especially the rural farmers in inner villages. The government is therefore urged to invest in creating systems like Village Agricultural Information Centres (VAICE) at the village level to provide farmers with agricultural technical services including climate change and advice to suit the changes.
- Tanzania as a country should turn back to

climate-smart interventions of smallholder farming systems and adaptation through crop modeling interventions. The government and agricultural research centers should play this role better to even simulate the application of adaptable models in crop production which are climate-smart agriculture to intensify crop improvements through plant breeding.

- It is time now for technologists in the country to invest in automated climate smart agriculture. For example, the Commission for Science and Technology (COSTECH) and other entities should create automated models which will help smallholder farmers to make decisions as well as access climate information and improve efficiency in resource usage for improved production and productivity. Early warnings to climate change and automated advice could also be part of this initiative.
- Geo-spatial technologists must also be part of the initiatives in developing the remote sensing technologies for crop health monitoring and forecasting the yields. This will permit a timely detection and mitigation of climate change effects.
- Policymakers and enforcers should also focus on being proactive and apply policies that will provide solutions to climate change through mitigation and adaptation strategies, e.g., reducing greenhouse gasses emission and use of renewable energy resources.
- The government should invest fully in irrigation schemes for smart water use with the understanding that water is a limited resource worldwide.
- Suitable agro-ecological and spatial development models should be developed together with climate-smart interventions in the smallholder farmers' world. Academic institutions like the Sokoine University of Agriculture (SUA) need to take the lead.

It is now time for governments and institutions, especially in the developing world, to subsidize technologies that support more diverse climate-adapted agricultural production systems. Climate compatible agriculture should be endorsed as an adaptation strategy in the country before it is too late.

—*Reuben is economic development and agribusiness consultant. For more information, write to: reubenjames12@yahoo.com*

Building resilience in the Pangani river basin with solar-powered irrigation systems

By Eliud Doto

An overview

Agriculture consumes 90% of water in Tanzania, with most farmers using an unproductive open canal method and diesel-powered pumps for irrigation. Rikolto and its partners have been supporting smallholder farmers to access finance for switching to solar-powered irrigation systems. These innovative systems reduce the impact of climate change and increase farmers' incomes, making communities more economically and environmentally resilient.



Santaheri Solomoni, a farmer from Mbuguni village in Arumeru district in Kilimanjaro region testifies: "Farmers in our village were for many years suffering from the effects of climate change. Everyone lost hope and we were like a candle during wind. Agriculture was performing worse than usual because of its vulnerability to droughts. Inefficient irrigation systems and dependence on rainfed agriculture could no longer result in a good harvest. No single farmer could plan and produce with an erratic rainfall or afford high operational costs due to the use of fuel engines and open canal irrigation. Successful farmers could only be those who had been endowed with efficient irrigation

systems and who do not depend on rainfall and rudimentary irrigation technologies."

Transforming farmers' irrigation practices into sustainable and efficient systems benefits both farmers and the community at large. Efficient water irrigation systems increase productivity and crop production, resolve food shortages in the community, and enhance the export of cash crops. It also makes more water available for other economic activities and social purposes. Good water-use planning and management are therefore crucial to support food security, poverty reduction, and environmental sustainability.

From setting up a successful pilot project to achieving outstanding results

Rikolto and its partners have established an irrigation financing pilot project in Moshi, Arumeru and Simanjiro districts in Kilimanjaro region. These rely on water supply from the Pangani River Basin. The pilot project involves more than 3,000 smallholder farmers with a high potential to produce fruits and vegetables. It also makes the value chain more inclusive by empowering women and young people to participate in production management, record keeping, marketing, and facilitating their access to market information, inputs, and agronomic services.

Despite the farmers' willingness to improve their irrigation practices, they had failed to adopt new technologies due to limited information, skills, and access to technological innovation, as well as financial constraints to upgrade their irrigation systems. The pilot project involves coaching farmers on the use of solar-powered irrigation systems and good agricultural practices to improve the productivity and quality of the fruits and vegetables. Solar-powered irrigation and drip kit application systems play an important role in climate change mitigation, reducing greenhouse gasses emissions by replacing power generation by fossil-fueled engines with a renewable energy source. The pilot project has therefore set up a financing mechanism to enable farmers to switch from open canal irrigation to efficient and sustainable solar-powered irrigation and drip kit systems.

Throughout the pilot project, Simusolar Company Ltd, the main supplier of the solar systems, continues to coach farmers on the use of solar-powered irrigation systems by setting up demonstration plots, troubleshooting, developing promotional materials with a strong business case, and providing periodic training to farmer groups. They have also set up an internal credit scheme which is more accessible to smallholder farmers. To further support access to finance, the Financial Sector Deepening Trust (FSDT), Water Resource Group 2030 and Private Agriculture Sector Support (PASS) have refined the design of irrigation financing. The new package involves assistance with technical know-how in finance and banking, provision of credit

guarantees and coaching smallholder farmers on financial literacy. Local government authorities are creating a supportive business environment and raising awareness on the use of efficient irrigation technologies through their well-placed extension officers.

The success of the pilot project depended on the following essentials:

- Well-managed demonstration plots to collect evidence for market testing and rolling out various irrigation packages.
- Rikolto and the Tanzania Horticulture Association (TAHA) organized Focus Group Discussions to sensitize and train farmers on the benefit of using solar-powered irrigation systems, loan accessibility, payback period, system quality and good agricultural practices.
- Development of the culture of working with commercial banks and other financial institutions for tracking farmers' eligibility to access loans for investing irrigation system.
- Careful tracking of business performance to ensure the agribusinesses of smallholder farmers become profitable.
- Ownership is ensured by having all stakeholders around the table in an irrigation finance working group, led by Rikolto and TAHA. Several NGOs, agribusinesses, and farmers are represented in this working group, which creates linkages between value chain actors and ensures useful information is collected from all stakeholders for improving and commercializing technology and financial products.





The irrigation financing pilot project already had a huge impact on the economic and environmental resilience of the farmers and the wider community. Reduced amount of water used for irrigation and less dependency on rains, coupled with the assurance of water supply, has enabled farmers to produce based on the market trends for particular commodities – thereby increasing their incomes and improving their businesses. Santaheri Solomoni from Mbuguni explains: “In previous years I used to grow tomatoes in this one acre without assurance of how much I would harvest. But with the solar irrigation system, the cost has decreased, and I have more time at my disposal to follow up on the market calendar and increase my understanding of agribusiness processes. As a consequence, my improved knowledge has had the impact of decreasing the number of crops affected by diseases.”

Food and nutrition security has increased because farmers cultivate gardens to feed their families and use the increased income to buy other food items such as rice and maize. In Mbuguni, for instance, farmers have stepped up production from two to four crop cycles per year. Solar-powered irrigation systems also increased the food and nutrition security of communities with poor access to water. In Makiba as well, farmer groups were able to provide vegetables for the daily meals of the secondary school pupils after Simusolar installed a solar irrigation system in the fields around the school.

Not only did the incomes of farmers improve but

also a group of young people who were employed as temporary workers for preparation and installation of the irrigation systems increased their employment potential on the basis of their newly-acquired skills. Mama Jackson from Msitu wa Tembo, for example, shares her son’s success story: “My son completed his secondary school in 2017 but, unfortunately, could not continue studying. However, the project has helped him to get a short-term job and now he supports the installation of solar systems, which has allowed him to gain some valuable skills. With the earned income, he can satisfy his basic needs like buying clothes and providing support to the family.”

These personal accounts show how the irrigation financing pilot project has successfully increased the environmental and economic resilience of smallholder farmers and communities. The work, however, is far from being accomplished. Lack of trust between farmers, service providers, and financial institutions needs to be addressed when scaling up this pilot project. Despite high returns on investments in solar-powered irrigation and drip kit systems, the initial investment cost remains unbearable for most of the farmers. Financial institutions perceive the risk as too high due to being unfamiliar with the technology. Only by addressing these challenges can farmers and communities become reasonably resilient in the fight against climate change.

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Agroforestry improves livelihoods

By James Ishenda

Wilson Karwani (62) is a banana farmer from Ibosa village in Bukoba rural district in Kagera region who also keeps a few livestock. Karwani decided to intercrop 50 vines of vanilla with banana trees in 2003 for the first time. His first harvest in 2004 was seven kilograms of vanilla which he sold through his 21-member group called *Umoja wa Wakulima wa Vanila Ibosa* (UWAVAI). The UWAVAI group aggregates vanilla from its members and sells it collectively through *Maendeleo ya Wakulima* (MAYAWA), which is an umbrella association for vanilla producers in Bukoba rural district.



Wilson is showing vanilla intercropped with banana in his farm

Karwani's vanilla production has now increased to about 70 kg per year and his annual earnings have more than doubled from TZS 4 million to TZS 10 million depending on the market price. In 2018, for instance, Karwani harvested 64 kg from which he earned TZS 9.6 million.

With support from Vi Agroforestry through its Agroforestry for Livelihood Empowerment (ALIVE) Programme, MAYAWA builds the capacity of vanilla farmers to adopt agroforestry with the view of conserving the environment. Specifically, the role of ANSAF is to advocate for public resource allocation for promoting climate-smart agriculture among vanilla farmers.

The Vi Agroforestry's support through the ALIVE Programme has encouraged Karwani to plant 200 more vanilla vines. Karwani says that after adopting the agroforestry approach soil fertility



in his farm has improved. In his own words, he testifies: "I earn more income from banana, vanilla and the livestock and use the income earned to pay school fees for my five children. My first born is a diploma holder employed by the Ministry of Education while the other ones are pursuing college and secondary school education." In 2018, he constructed a new house and rehabilitated the old one, he also purchased a motorcycle and bought furniture for his new house. He adds: "I installed electricity and started rearing dairy goats." Karwani has now become a role model to other farmers in his village, as he personally acknowledges that: "My neighbours are learning from what I do."

—James Ishenda works for *Maendeleo ya Wakulima* in Bukoba. For more information, write to: advocacy4@ansaf.or.tz

Greenhouse farming: new dawn for farmers in drought prone regions

By Billy Marwa

Anna James is a mother of six children and has four dependents. She is a strong, hardworking woman from Nyida village in Shinyanga rural district in the Lake Zone. Anna lost her husband in 2012. As a breadwinner for her family, she has to work in the farms to generate income. She says: "It is not easy to raise a big family like this all by myself."



Earlier in 2019, Anna received training on value addition and greenhouse farming to improve her farming practices and earn more income. She confesses that: "This training helped me to identify other opportunities for diversification. For instance, I now can mix sweet potatoes with wheat flour to make pancakes and improve my income." She cultivates sweet potatoes, sunflower and onions.

Oxfam is working with a partner, namely Rural Urban Development Initiatives (RUDI), to train five women groups in the Lake zone regions on modern farming techniques. Through a cost sharing approach, the Irish Aid-funded project has enabled groups like the *Akina Mama Tunaweza* women group to construct a greenhouse facility for horticulture farming. Small-scale food producers have been provided with improved seeds as well as training on management of greenhouse and market analysis to identify crops which are optimally beneficial for them. The group opted to plant tomatoes which, once sold,

will boost their sales two-fold compared to any traditional method of tomato farming. Anna is a treasurer of the group. She explains: "We expect a great yield of tomatoes from this greenhouse innovation. Greenhouse farming ensures crops are grown under controlled climatic conditions thereby causing us to harvest more crops from a small space."

Anna also benefited from a five-day training of trainers' session on greenhouse farming which she attended during a learning visit in the neighboring district of (name it). "I acquired a great deal of skills which I am proud to share with other women in my village." Anna expects to sustain her family and improve her household's living standard, noting that "with income generated from greenhouse farming I am assured to keep my family going, and start building a house."

—The author is the Communications Manager for Oxfam Tanzania. For more information, write to: BMarwa@oxfam.org.uk

Invest in the vital biodiversity – plant trees

By Anna Tibblin

“If we do not reverse the current trend with diminishing biodiversity, we simply threaten our own existence.”



Today, one million animals and plant species are threatened with extinction and everyday species are lost to never come back. It is both a sad and scary thought, but did you know that biodiversity is a prerequisite for human survival? Nature, as we know it, is dependent on a huge variety of life forms—different habitats, a big variety of species, and a great genetic variation within the species—for the earth’s ecosystem to function. If the diversity is threatened, the ecosystem that gives us clean water, crops and fertile soils would simply collapse.

Deforestation is one of the reasons why biodiversity is threatened. When forests are harvested to become arable land for a single crop, or tree plantings with a single tree species, many species and vital functions such as pollination and water purification disappear. The way we practice agriculture and forestry today often contributes largely in destroying the habitats of different species. Globally, agriculture accounts for about 70% of the estimated loss of biodiversity on land.

This is a difficult question – we need large and productive farms to practice agriculture and feed the growing population in the world. But there are ways to both increase agricultural efficiency and preserve biodiversity. One way is agroforestry, the method of planting trees and crops together on a farm. In addition to the trees contributing to the binding of carbon in vegetation and soil, thus reducing climate change, they help farmers protect themselves against the effects of climate

change. Trees provide shade, bind the soil and increase resistance to pests, droughts and floods. They provide access to firewood and a variety of nutritious foods. Trees in the agricultural landscape can also increase the soil’s ability to capture and retain water and replenish groundwater.

In addition, agroforestry helps to preserve biodiversity. In agroforestry farming, diversity—when cultivating several different crops and planting a variety of different types of trees—is crucial to its success.

Agroforestry can create important habitats for a wide variety of plant and animal species, such as pollinators like bees, which are a prerequisite for plants. Agroforestry also contributes to creating the so-called “ecological corridors,” where species can spread in the landscape, which is crucial for their survival. Trees are the superheroes of nature. Vi Agroforestry believes where trees grow, people grow. One of the ways to save the state of the planet is by planting trees. “If we do not reverse the current trend with diminishing biodiversity, we simply threaten our own existence.” Vi Agroforestry partners must become people who push for the superpowers of trees—and more people who demand that we invest in functioning, nature based, farming methods on a larger scale.

About Vi Agroforestry

Vi Agroforestry (Vi-skogen) is a Swedish development cooperation organization, fighting poverty and improving the environment through agroforestry. It has reached over 2.3 million people through education, advisory services and planted more than 120 million trees in the Lake Victoria basin. Vi Agroforestry works in Kenya, Rwanda, Uganda, and Tanzania—four countries that are severely affected by deforestation and climate change and that for many years have endured its devastating effects on both humans and nature.

—The author is Secretary General for Vi Agroforestry.
For more information, visit the website:
<https://viagroforestry.org/>

Cattle fattening registers high hopes for progress for hardworking Juliana

By Bill Marwa

Meet Juliana Ngasa, a proud mother of six children from Ngundangali village in northern Tanzania. She is a farmer, a livestock keeper, and sells sardine at a local market to sustain her family. With funding from Irish Aid through Oxfam, Juliana has received training on modern farming techniques, seeds and farming inputs to boost her income and reduce shocks of climate change by planting drought resisting crops. "I have become a confident woman," she says.



Earlier in 2019, Juliana was among 13 small-scale food producers from different districts who took part in the two days training funded by Oxfam. The training was conducted at the Sokoine University Graduate Entrepreneur Cooperative (SUGECO). "We were trained on entrepreneurship, value addition on our agricultural produce and cattle fattening. This training changed my life entirely" Juliana says, adding: "I was glad to share this training with other women in my village."

Immediately after Juliana's return from the training, she bought two cows at TZS 300,000 each. She put the cattle fattening training into good use by feeding the cows with sunflower remains mixed with other grains, and confesses that: "I started seeing results." After three months, she sold them at TZS 700,000 each. Having doubled her income, Juliana bought three cows which she later sold and

bought five cows. "I wanted to focus on increasing my capital," she says. Juliana now plans to sell the five cows and buy 10 cows.

Juliana comes from a drought prone Shinyanga region. Oxfam's partner Relief to Development Society (REDESO) has trained 10 women groups to plant drought tolerant crops such as oranges, sweet potatoes, sunflower and millet, to ensure their increased yields in the wake of unpredictable rainfalls caused by climate change. Juliana is part of the *Upendo* Women Group with 30 members who have benefited from such training. She has planted millet, sunflower, orange trees, sweet potatoes and rice. She proudly narrates: "With these crops, I can sleep well knowing that I have a stable source of income. As a group, we plan to start our own company and sell our food products in bulk, so that we should have better bargaining power in the market place."

Juliana works at the farms with her husband, whom she says used not to support her initially. "He didn't want me to get involved in these women groups, until when he started seeing the benefits," she smiles and points to her newly built house. "This building is a result of almost 10 years of struggles, hard work, and commitment," she says. "Thanks to this project, rice sales from last year helped in finishing the house." Juliana's achievements have registered her a seat at the table in most decision-making forums, proudly noting that "I now have a voice in my community, people respect me and look up to me as a role model. I love it."

—The author is the Communications Manager for Oxfam Tanzania. For more information, write to: BMarwa@oxfam.org.uk

Effects of climate change and post-harvest losses

By Jacqueline Massawe

The majority of Tanzanians are farmers living in rural areas who rely on agriculture as the main source of income for sustaining their livelihoods. The slogan that says “agriculture is the backbone of the economy” implies its importance as a source of food and livelihood particularly in the form of agribusiness, which farmers capitalize on. They strive to practice efficient farming to guarantee food security at household and community levels while contributing to the national income.



Despite their efforts, farmers are faced by various challenges such as lack of: agricultural farming inputs, unfriendly infrastructure, low interest rate loans, lack of market information, limited knowledge on commodity value chains, and untimely extension services. Climate change is another challenge affecting many sectors beyond agriculture. Climate change manifests in the form of frequent droughts, floods, strong winds, plant diseases, as well as low and unpredictable rainfall which ultimately result in food shortages at household level.

There are many methods that a farmer can apply to mitigate the effects of climate change. They include irrigation, use of trenches as water reservoirs, planting short-term maturing and drought-resistant crops, timely planting, crop rotation practices, getting updates on the weather forecasts and proper crop management systems in the field and during post-harvest in order to guarantee food security.

Generally, loss of food is caused by inappropriate crop management techniques mainly during harvesting, drying, cleaning, packaging, transportation, and storage in the warehouses. Poor processing also contributes to crop losses. It is therefore crucial for a farmer to exercise proper crop management practices to avoid losses during and after harvest especially for cereals such as maize, millet, sorghum, rice, wheat, and paddy.

Factors leading to crop losses

Crop losses occur in various stages of the value chains as previously noted, is caused by:

1. Damage due to insects such as snails, insects, termites, rodents, and exotic animals including birds which feed on crops in the field.
2. Losses during transportation of crops from the farms to storage places or markets.
3. Careless use of weights and measures during packaging that could also cause spillage, and spillage occurring in the field.
4. Poor drying of harvests causing crops to retain high moisture contents that attract fungi, and simply storing moist crops.
5. Delay in selling the produce (due to the prevalence of unreliable markets) makes it easy for pests to attack improperly stored produce.
6. Losses during processing.
7. Break up of grains during threshing caused by excessive drying of crops.
8. Unpredictable weather especially wet conditions during harvesting which cause mold to crops still in the field.



What should the farmer do to prevent crop loss during harvesting?

Farmers can adopt the following methods to minimize or prevent crop losses during harvesting:

1. During the rainy season, harvest the maize with their cobs to avoid aflatoxin.
2. Separate the affected crops from the good ones.
3. Clean the containers before packing the crops to avoid infection from previous season crops.
4. To reduce infection, ensure that the rugs, sacks and packaging materials are clean and dry.
5. If possible, harvest crops during the sunny season.



Safe and efficient post-harvest transportation methods

It is recommended for farmers to transport their harvests in the following ways:

1. Once harvested, transport the produce directly to the warehouse. Farmers can use trucks, bicycles, head-bearings, and horse-drawn or hand-driven carts depending on the distance and the volume of products transported.
2. For long-distance transportation, cover the maize with canvas to protect them from the rain and prevent fungi development at the warehouse.
3. Ensure that the cars and carts are clean, dry, and treated by pesticides to kill insects without causing any harm to the users.
4. Avoid crop spillage during transportation.

Many farmers cultivate and store crops for a long time waiting for favorable prices. In this case, they need to ensure quality preparation of cereals before storing them by drying them properly as well as cleansing and packaging them carefully to prevent air passage.

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Research: in search for climate change-resistant coffee varieties

By Our Correspondent

Kilimanjaro is a renowned coffee growing region of Tanzania. It is believed that the Catholic Missionaries planted the first seed in the country in Moshi in 1898. The crop has been grown by the natives of the region while intercropping it with other crops especially banana, making most of the mountains have an evergreen vegetative cover.



However, in recent years, coffee farmers in the region opted to uproot the coffee trees especially due to drought and pests. In addition, poor market prices compared to higher costs of production have been the cause of ongoing complaints from the farmers. In a move to resolve the effects of drought and pests, the Tanzania Coffee Research Institute (TaCRI), which was established by coffee stakeholders in 1999 - comprising of small- and large-scale farmers, traders and the government - researched view to developing new drought and disease tolerant coffee varieties.

Research on better varieties

Speaking to the author of this article recently at the research centre in Moshi, the Head of TaCRI's Crop Quality Unit, Dr. Damian Mtenga, says they searched for high yielding coffee breeds that are tolerant to drought and diseases.

"We use 'tissue culture' to produce the seedlings of our choice and insert the traits we need. Then we release and continue with the research on their performance in other areas. After production, we evaluate if the breed has the desired characteristics including disease resistance and drought tolerance," says Dr. Mtenga. He cites disturbing diseases as including coffee berry disease and coffee leaf rust for Arabica coffee and wilting for Robusta coffee.

"In 2005 we successfully came up with 10 Arabica coffee breeds that are resistant to drought and diseases. In 2012 we released five breeds of Arabica seeds which, although they were among the first batch, we boosted them with some additional characteristics to make them more resistant to diseases," he says.

He goes on to say: "In that year [2012] we launched four types of Robusta coffee. In 2013, we launched



four other Arabica modified breeds called *Compact*. The aim was to improve their productivity." From the study, Dr. Mtenga says, a farmer can plant up to 5,000 seedlings in a field of one ha at a distance of 1 by 1 meter. In addition, he says, there are nine other breeds that are still under study as they were noticed to lack some of the required traits. The researcher advised farmers not to exchange seeds randomly as this causes them to lose their established resistance traits.

Field preparation

The Head of Best Agricultural Practice Programs in TaCRI, Suzanna Mbwambo, says farmers need to check the quality of the soil before they start planting coffee seedlings. "Soil analysis enables us to identify different areas with low acidity level (i.e., low pH). These are the areas where a farmer cannot harvest anything even if they use fertilizers," says Mbwambo.

She says in 2006 TaCRI launched a campaign called "Know Your Farm" in which soil samples from farmers were tested daily. Mbwambo says the research centre trained farmers on techniques of intercropping coffee and bananas where a farmer plants three rows of coffee after every two rows of banana trees. "This technology has been well received by many coffee growers since banana performs well in coffee plantations. Intercropping coffee and banana according to TaCRI is beneficial to the farmer," she says.

Elaborating further, the Director of TaCRI, Dr. Deusdedit Kilambo says a farmer should choose coffee breeding ground with consideration of the fact that Arabica flourishes in altitudes ranging from 1,000 to 1,800 metres above sea level and Robusta in altitudes ranging from 900 to 1,100 metres above sea level. "The farmer should make sure that the field has at least 1,300 trees. One tree should have at least 30 fruit-bearing branches. The tree produces between two and six kgs of coffee parchment," says Dr. Kilambo.

On his part, the Program Manager for Technology Transfer, Dr. Jeremiah Magesa, says they have introduced 1,632 demonstration plots and distributed 218,311 leaflets that explain the technology. "We are working with 68 districts in 18 regions and have trained 12,184 extension officers, 4,206 community promoters, and 401,611 farmers," says Dr. Magesa.

In order to improve coffee production in the country, Dr. Magesa says TaCRI has built capacities





to produce 10 million seedlings per year in collaboration with various stakeholders. "The 68 district councils have established improved coffee tree nurseries. There are 300 farmer groups, 15 large farms and 15 private farmers," he says.

Farmers

The breeds that were confirmed to be resistant to disease and drought motivated many farmers to uproot and replace old trees with high yielding trees.

Some villagers have been inspired to use the improved varieties in order to transform coffee farming. Mariam Foya (29), the Head of Mbokomu Coffee Kids Group says "the 22-member group of youths was registered in 2017. After registering our group, we decided to focus on coffee farming by taking over farms from our parents. We have uprooted the old trees that were not doing well and replaced them with new trees from TaCRI. We were trained on how to grow and manage new coffee breeds. We can now plant them in nurseries before transplanting them in our farms as well as selling some to other farmers."

Godlisten Materu, a member of the group, says the objective of the group was to boost themselves economically by using coffee produce. In Mrimbo village, North Mwika, in Marangu District, there is another group with the name of Faraja Women Group, which specializes in coffee farming.

"Unlike the old seedlings, these new seedlings produce harvests between two and a half and three years and produce much coffees.

Chrisanta Lyimo, a Chairperson of that women group, says they have been trained on the production of new coffee seeds and are now producing and selling seedlings to other farmers, and have planted some in their farms. "Each year we produce 10,000 seedlings and each is sold at TZS 300. Each group member has a nursery in her home. In 2018 I harvested 420 kgs from my farm, and this year I am looking forward to harvesting more", she says.

About markets, they have decided to grow coffee without using chemical fertilizers and pesticides to target the coffee market in other countries. "We realize that there are challenges in the price of coffee, but we have decided to produce organic coffee which does not use chemicals in its care and we have already found the market where we sell each kg for about TZS 5,000", says Lyimo.

In Msaenganyeni village there is a farmer named Elinaja Mlay who spends most of her time on a one-acre farm. Mlay has now replaced the old coffee plants attacked by diseases and pests and replaced them with seedlings from TaCRI.

"Unlike the old seedlings, these new seedlings produce harvests between two and a half and three years and produce much coffee. The improved coffee is not affected by corrosion and corneal diseases", says Mlay. However, she says there are coffee stem borer pests but are controlled by brewing their favorite spice.

Moshi District Council Agricultural Officer, Violet Kisanga, says in the district there are 47 coffee farmer groups which have been trained in quality coffee production. "The whole council has 22,337 ha of coffee plantations and we receive seedlings from TaCRI that are distributed to farmers to improve this crop," she says.

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Better income, food and nutrition from agroforestry for Bunda communities

By Baraka Kamese

Mashaka Charles (47) is a farmer, husband and father of two children in Sazira ward in Bunda district, Mara region. Mashaka and his wife, Agnes (42), are members of *Hifadhi Mitsu* Group established in 2017 to multiply and sell tree seedlings. The group was registered in 2018 to enable its access to financial support from the ALIVE Programme of Vi Agroforestry.



Mashaka (second from left) with visitors in his farm

In 2018, Mashaka and Agnes participated in a training on agroforestry organized by the ALIVE Programme in collaboration with Bunda Farmers Development Support Organization (BUFADESO). After attending the training, they resolved to apply the acquired skills to adopt the effects of climate change - erratic rains, prolonged droughts - as well as effects of bad agricultural practices. The couple launched an agroforestry project throughout their approximately 3.75-acre farm. They divided the land into four portions

where beans and trees were planted in a 0.25 acre. They also intercropped potatoes and trees in another 0.25 acre, 1.5 acres of maize, 1.5 acres of cotton and 0.25 acres of vegetables and fruits.

Mashaka's farm has papaya, guava, banana, avocados, and oranges with annual crops like maize, potatoes, beans, vegetables, and cotton. The intercropping has enabled Mashaka to harvest about 600 kg of maize which is more than double what other



Mashaka carrying fruits from his farm

farmers harvest from each acre. The family also harvested 600 kg of cotton from a one-acre farm, 30 papayas per week, and 10 kg of guava. Each papaya fetches TZS 500 and a kilo of guava is sold at TZS 3,000 in the market.

Using the skills acquired from the ALIVE Programme, Mashaka established an agroforestry woodlot with 1,306 trees of *Grevillea Robusta*, *Cinderella Odorata*, *Casuarina Equisetifolia*, *Azadirachita Indica* (Neem), *Khaya Anthotheca*, *Acacia Nilotica* as well as some of the indigenous trees in the 3.75 acres farm. The use of agroforestry approach has changed the life of Mashaka and Agnes, who say “we get healthy food and our income has increased from less than TZS 2,000,000 to about TZS 5,000,000 per year.



Mashaka attending his trees nursery

We have renovated our house as well as bought a TV set and a refrigerator.”

ALIVE Programme has built the capacity of the five-member *Hifadhi Mitsu* Group to multiply about 5,000 tree seedlings for members and sell to other farmers. The ALIVE Programme has built the capacity of 2,168 farmers in

Bunda district on agroforestry practices. The Programme is targeting to reach 4,700 farmers in Bunda district by 2022 and continues to advocate for the Bunda district council to promote agroforestry practices.

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Indigenous seeds are an indispensable heritage: Let us preserve and sustain them

By Jacqueline Massawe

Despite many efforts undertaken by researchers to produce various seed varieties in the country, it remains a fact that indigenous seeds have more qualities and taste that cannot be found in non-traditional seeds. Efforts by farmers and other stakeholders to defend the preservation and sustenance of the indigenous seeds system have led to the formation of various platforms and groups at different levels in the country. Stakeholders are determined to gather the increased political will to achieve the formalization of indigenous seed systems.



At an exhibition to celebrate indigenous seeds and foods, the Member of Parliament for Hanang in Manyara region, Hon. Mary Nagu, who is also a member of the Parliamentary Committee for Agriculture, Livestock and Water, attended the PELUM Tanzania-organized Indigenous Seeds and Food Exhibition at Chamwino Ikulu village in Dodoma. During the event, Hon. Nagu urged farmers around the country to continue to produce, preserve, and sustain indigenous seeds as one of the ways to rescue them from extinction and sustain them over generations to come.

Hon. Nagu said her participation in the

exhibition was an eye-opener and an indication that there is an established treasure of indigenous seeds that have not been fully utilized. Indigenous seeds contribute 75% of the seed sub-sector in the country. Hon. Nagu who was accompanied by 28 members of the Parliamentary Committee pledged to support and promote initiatives of indigenous seeds and food whenever an opportunity arises.

Addressing the exhibition participants, Hon. Nagu gave a testimony of how her community back home valued and used indigenous seeds and traditional foods. She urged farmers and other stakeholders to maintain the attitude of producing and storing indigenous seeds.



She congratulated farming communities that value and use indigenous seed resources in their agricultural production. “These seeds are original, that is, they have not been altered or genetically modified,” she stressed. She concluded her speech by asking PELUM Tanzania to convene a joint meeting that will bring together the parliamentary committee, representatives of the agricultural sector leading ministries as well as the ministry of justice and constitutional affairs to discuss the future of indigenous seed resources.

The traditional seed system initiative was backed up by the Chief Executive Director of National Agricultural Seed Production and Development Agency (ASA), Dr. Sophia Kashenge. She said seed multipliers and researchers use indigenous seeds as the foundation for coming up with new seed varieties. She hinted that in 1991 the government established and managed two research centers, one of them being the Tropical Pesticides Research Institute (TPRI) that was tasked to conserve different types of seeds and local vines.

Dr. Kashenge, who represented the Deputy Minister for Agriculture at the exhibition,

urged stakeholders to give due attention to the agricultural sector since it is the source of food security in the country. “Indigenous seeds and food exhibitions have created awareness among farmers, consumers, researchers, agricultural experts, policymakers, and the community at large on the importance of indigenous seeds in ensuring the availability of improved seeds to farmers,” she said. She further challenged participants to use this event as an avenue for finding lasting solutions for challenges facing both formal and informal seed systems in the country. Meanwhile, a researcher from the National Herbarium of Tanzania Section, Dr. William Hamisy, stated that until the end of 2019 a total of 6,420 samples of indigenous seeds and vines from different parts of the country were catalogued. Among them, 4,000 samples were scientifically researched and evaluated. He also explained that the institution works with 12 farming groups in the conservation of indigenous seeds and vines. These farmers have gained requisite skills in proper collection, transportation, and storage of indigenous seeds and vines.

Other agricultural experts who had a chance to give their views included Dr. Laurent Kaburire from INNODEV Consulting Limited,





Dr. Kaburire, said “any researcher who is involved in the development of improved seeds has to start working with indigenous seeds. Therefore, to preserve this indigenous tradition, the government should encourage farmers to produce using the resources that surround them including indigenous seeds.” The PELUM Tanzania’s Agricultural Program Officer, Zakia Mohamed, confirmed that indigenous seeds are drought tolerant and adoptive to harsh environmental conditions and are usually timely available in required quantities and at cheap prices.

Some of the suggestions agreed during the discussion were as follows:

- ***Policies and laws that recognize indigenous seed systems***
Stakeholders, including the government, agreed that indigenous seeds are vital and contribute over 75% of seed requirements in the agricultural sector. However, despite this contribution, indigenous seed systems are unrecognized in existing law. The consensus was therefore for policies,

laws, and guidelines to be formulated in support of the promotion of indigenous seeds.

- ***Provision of extension services for the development of indigenous seeds***

Strategies in the agricultural sector focus on the provision of extension services for the production and development of seeds through formal systems. Data reveal that not only is the formal seed system unable to satisfy the seed sector’s requirements but also only 25% of farmers apply it. It was therefore proposed for extension workers to also support the informal seed systems just as much as they do the formal seed systems.

- ***Initiate research focusing on the production and development of indigenous seeds***

Indigenous seeds are largely used in researches for the production of improved seeds that are incorporated into the formal system. Therefore, researchers were asked to concentrate on the development of indigenous seeds to ensure they are also preserved as a large population of



farmers in the country depend on them.

- **Communication and information systems**
The discussion also revealed that there have been concerted efforts to ensure that indigenous seeds are valued, preserved, and developed. These efforts intend to further ensure that the indigenous seeds are officially recognized by the government. Actors should include not only NGOs but also the government and its relevant agencies.

Other suggestions included the following:

- Establishment of indigenous seeds production farms.
- Farmers should be licensed to distribute and sell indigenous seeds within the country.
- Each region can promote core crops originating from indigenous seeds based on their comparative advantage.
- The government should promote local foods and traditional crop market as a way of encouraging the use of indigenous seeds.

One of the participants of the exhibition, Janeth Nyamayahasi, also shared challenges facing indigenous seed producers in the country. According to Nyamayahasi, indigenous seed producers have a shortage of extension officers supporting farmers and are faced with the spread of diseases and pests. She complained that the few available extension officers do not go to the villages, instead, they keep in their offices at the ward level where they are assigned odd jobs that are irrelevant to agriculture. The extension officers do not attend refresher courses which would enable them to abreast themselves with rapid changes in the agricultural sector. The sector is faced with many constraints including climate change, untoward outbreaks of diseases and pests, and lack of reliable markets for farmers' crops. All these challenges require adequate extension service providers and thorough training. In conclusion, Nyamayahasi requested the government to provide regular training opportunities to extension officers on how to preserve and develop indigenous seeds in the country.

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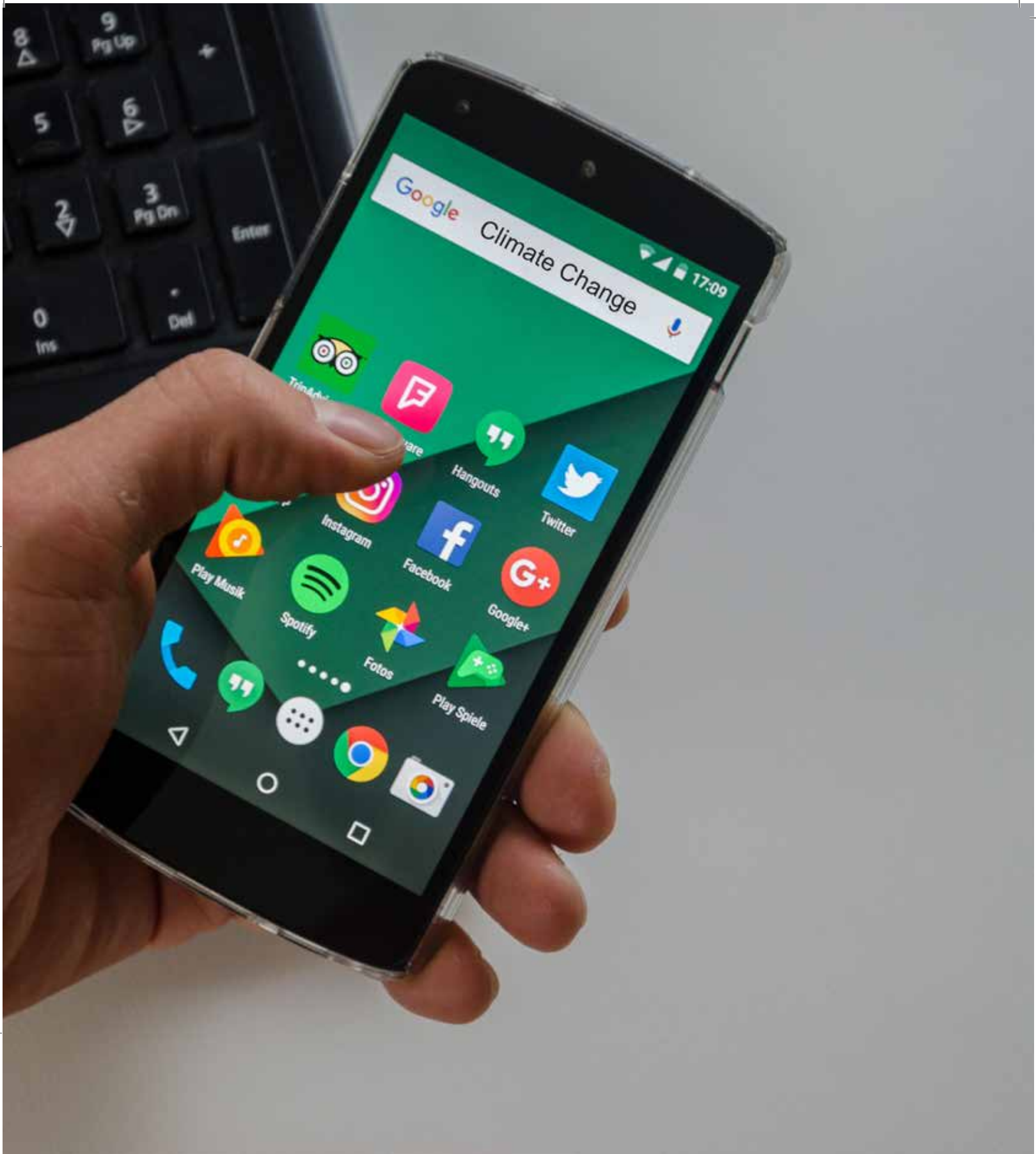
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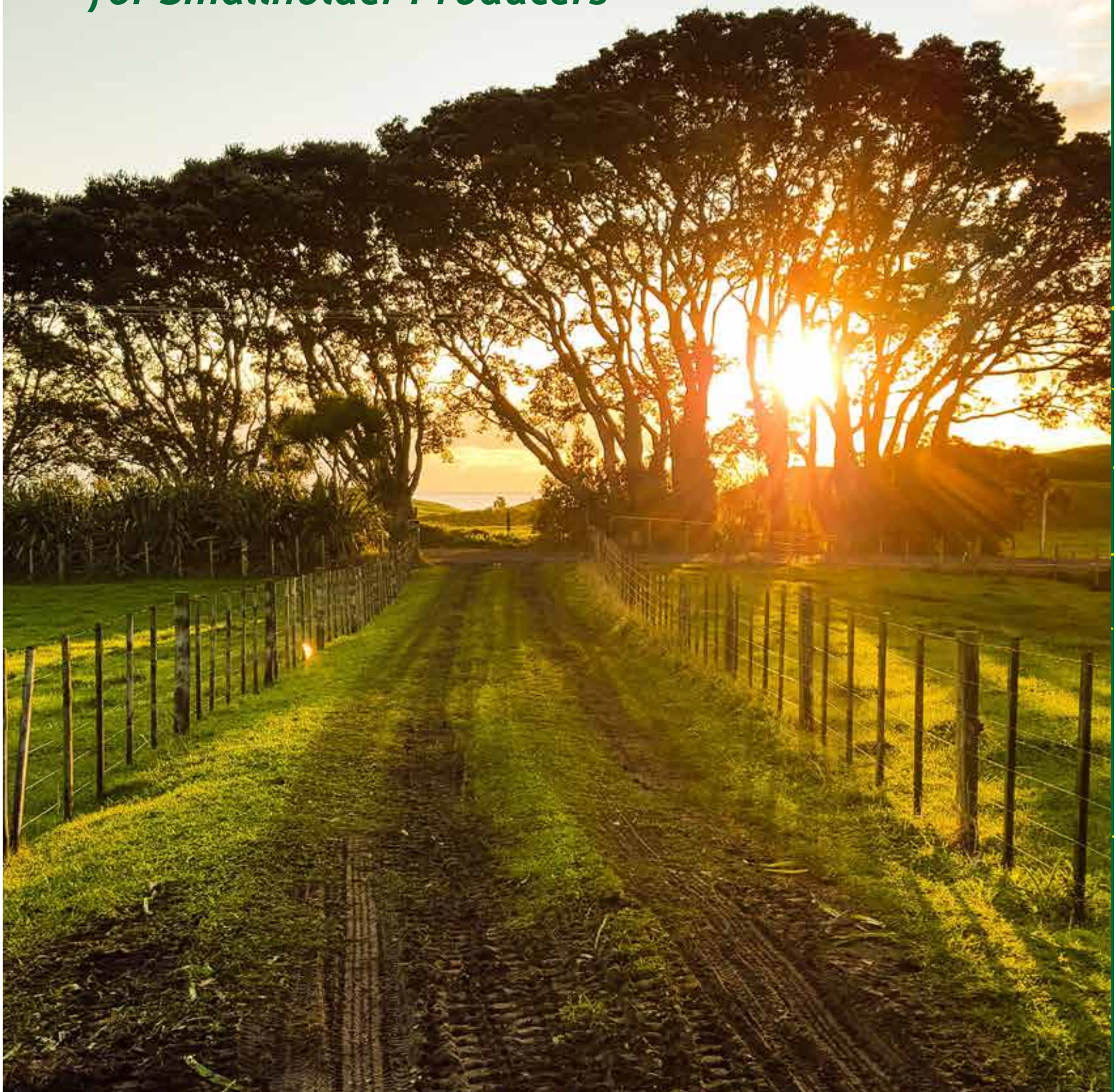


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