

Technologies for African Agricultural Transformation

2019 ANNUAL REPORT



Pathways to Transformation



AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE
DE DEVELOPPEMENT



Technologies for African
Agricultural Transformation



Fish drying technology promoted by TAAT Aquaculture Compact in Ghana

Pathways to Transformation 2019 Annual TAAT Corporate Report



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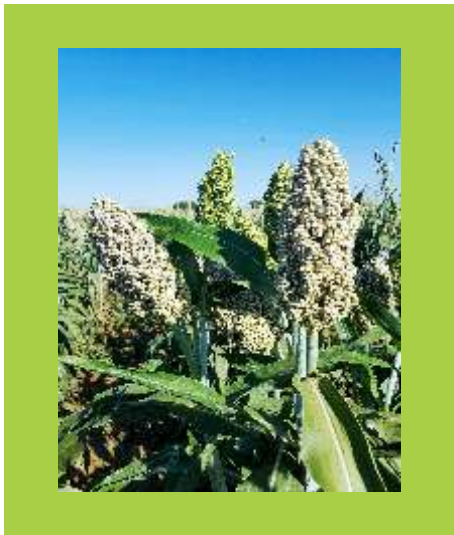
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Abbreviations

| | |
|---------|---|
| AATF | African Agriculture Technology Foundation |
| AEZ | Agro-Ecological Zones |
| AfDB | African Development Bank |
| AOAD | Arab Organization for Agricultural Development |
| APMEP | Agricultural Productivity and Market Enhancement Project |
| BMPs | Better Management Practices |
| CAADP | Comprehensive African Agricultural Development Programme |
| CAGR | Compound Annual Growth Rate |
| CIAT | International Centre for Tropical Agriculture |
| CIP | International Potato Centre |
| CGIAR | Consultative Group for International Agricultural Research |
| CNRA | Centre National de Recherches Agronomiques |
| COMESA | Common Markets for East and Southern Africa |
| CPES | Cellule Présidentielle d'Exécution et de Suivi des Projets |
| CPPF | Cassava Plantlet Production Facility |
| CSA | Climate Smart Agriculture |
| DACO | District Agricultural Coordinator |
| DRC | Democratic Republic of Congo |
| EAC | East African Community |
| ECOWAS | Economic Community of West African States |
| ETB | Ethiopian Birr |
| FAO | Food and Agricultural Organization |
| FARA | Forum for Agricultural Research in Africa |
| FAW | Fall Armyworm |
| FCM | Food Chain Millers |
| FCR | Feed Conservation Ratio |
| FD | Fortenza Duo |
| GAP | Good Agricultural Practices |
| GDP | Gross Domestic Product |
| GEM | Grain Quality Enhancer, Energy-efficient and Durable Material |
| HIB | High Iron Beans |
| HDPE | High-Density Polyethylene |
| HQCP | High-Quality Cassava Peels |
| ICARDA | International Centre for Agriculture in Dry Areas |
| ICRISAT | International Crop Research Institute for Semi-Arid Tropics |
| IFDC | International Fertilizer Development Centre |

| | |
|---------|---|
| IITA | International Institute of Tropical Agriculture |
| ILRI | International Livestock Research Institute |
| IPM | Integrated Pest Management |
| IRAG | Institute de Recherche Agronomique de Guinée |
| ISFM | Integrated Soil Fertility Management |
| ITRA | Institute Togolais de Recherche Agronomique |
| IWMI | International Water Management Institute |
| KALRO | Kenya Agricultural and Livestock Research Organization |
| M&E | Monitoring and Evaluation |
| MEL | Monitoring, Evaluation and Learning |
| MT | Metric Tonnes |
| NARS | National Agricultural Research Systems |
| NARES | Nyala Agricultural Research Station |
| NARES | National Agricultural Research and Extension Systems |
| NGO | Non-Governmental Organization |
| PABRA | Pan Africa Bean Research |
| PCI | Project Concern International |
| PIIRD | Projet pour le Développement Intégral de la Rive Droite |
| PIA | Priority Intervention Areas |
| PICAGL | Integrated Agricultural Growth Programme in the Great Lakes |
| PPR | Peste des Petits Ruminants |
| PPP | Public-Private Partnership |
| PVC | Polyvinyl Chloride |
| RMRDC | Raw Materials Research and Development Council |
| RPS | Raised Pond System |
| RTDI | Regional Technology Delivery Infrastructure |
| SADC | Southern African Development Community |
| SAH | Semi-Autotrophic Hydroponics |
| SARD-SC | Support to Agricultural Research for Development of Strategic Crops |
| SBF | Seed Bulking Facility |
| SENASA | Service National de Semences |
| SNNPR | Southern Nations, Nationalities and Peoples Region |
| SWCS-FD | Soil Water Conservation Structures-Forage Development |

| | |
|------------|---|
| TAAT | Technologies for African Agricultural Transformation |
| TAC | Technologies for African Agricultural Transformation-Aquaculture Compact |
| TCC | Technologies for African Agricultural Transformation-Cassava Compact |
| TAAT-CDTO | Technologies for African Agricultural Transformation-Capacity Development and Technology Outreach Compact |
| TAAT-FAWEC | Technologies for African Agricultural Transformation-Fall Armyworm Enabler Compact |
| THC | Technologies for African Agricultural Transformation-High Iron Beans Compact |
| TOFSP | Technologies for African Agricultural Transformation-Orange-Fleshed Sweet Potato |
| TAAT-PEC | Technologies for African Agricultural Transformation-Policy Enabler Compact |
| TSMC | Technologies for African Agricultural Transformation-Sorghum and Millet Compact |
| TAAT-SFEC | Technologies for African Agricultural Transformation-Soil Fertility Enabler Compact |
| TAAT-WEC | Technologies for African Agricultural Transformation-Water Enabler Compact |
| TDHS | Tanzania Demographic and Health Survey |
| TLC | Technologies for African Agricultural Transformation-Livestock Compact |
| TMC | Technologies for African Agricultural Transformation-Maize Compact |
| ToT | Training of Trainers |
| TRIPLE S | Storage, Sand and Sprouting |
| TWC | Technologies for African Agricultural Transformation-Wheat Compact |
| USD | United States Dollar |
| WEMA | Water Efficient Maize for Africa |
| ZARI | Zambia Agricultural Research Institute |



For the past two years, the Technologies for African Agricultural Transformation (TAAT) program has been an important engine focused on boosting farmer productivity and livelihoods through the deployment of proven agricultural technologies. What makes the program even more unique is the framework by which it operates, bringing together a consortium of Consultative Group on International Agriculture Research (CGIAR) and non-CGIAR partners to move proven technologies forward across a wide ecosystem of strategic partners intended to provide sustainable and cost-effective solutions to farmers. As TAAT efforts intensified in 2019, the program partners working within compacts, have been contributing more climate smart agricultural solutions and best practices across the continent to farmers and other stakeholders. This is done through the delivery and scaling of improved cultivars of crops and breeds of livestock, and increased use of best farm management practices. TAAT intends to continue moving forward in this effort in 2020.

A Mid Term Review (MTR) of the program conducted in March 2019, concluded that the program is on track to achieve its developmental objectives despite the challenges of implementing such a complex program in diverse environments across many institutions. Some issues were identified and they are being addressed accordingly. Another milestone achieved was the convening of all implementing partners to chart the way forward with the

Foreword

Message From The TAAT Program Management Unit (PMU)

planning of TAAT phase 2 in order to build on the achievements of TAAT phase 1 and use some of the lessons learned to refocus the program where needed.

In highlighting the Program's 2019 achievements in this report, I need to mention there will be some negative impact to program implementation due to the COVID-19 pandemic in 2020. The 2020 work plans take this into account, putting in place mitigation measures. As we have seen with the reduction in imports to the continent, fragility to food access requires now more than ever, effective value chain systems that support the whole agricultural sector including the smallholder farmers as well as the large scale producers.

There is no doubt in my mind that TAAT is well poised to accelerate existing efforts while working amidst the COVID19 pandemic that is negatively impacting farmer productivity and livelihoods. This report highlights how TAAT stands ready to accelerate long-term sustainable agriculture interventions that enhance delivery of agriculture, continue to maintain food supplies and boost local production in a way that does not allow the pandemic to win. Through TAAT, agricultural transformation will continue on the continent – putting farmer productivity and livelihoods in the forefront of the pandemic.

Dr Chrys Akem
TAAT Programme Coordinator

Message From The TAAT Clearinghouse

TAAT works through partnerships that help move proven technologies to scale for nine commodities and six enablers. The synergy between the Commodity Compacts, Enablers and other partners ensures that the African farmer gets “**a package of practices and technologies**” that will increase productivity of African agriculture. We know that it is not possible to achieve scaling up in agriculture development without the public and the private sector. TAAT works closely with the private and public sectors to enable countries to realize the potential of the agriculture sector for economic growth and job creation, particularly among farmers, women, and youth. The TAAT management structure is flexible and agile having a program management unit that manages the program and ensures that there is a proper and compliant fiduciary and procurement system in place to support the compacts and their partners. The Clearinghouse assists the technology owners and assembles the validated technologies ready for the next users. Clearinghouse brokers appropriate partnerships with research organizations, private sector, value chain actors, and farmers and works closely with multilateral donor institutions to ensure TAAT technologies are linked to country investments. This arrangement has delivered great results and makes TAAT the place to go for donor communities who want to contribute to the development of agriculture value chains.

In 2019 we disseminated 144 technologies in 27 countries. We reached more than 9 million beneficiaries with technology packages. Around 1.3 million farmers were trained on the technologies and there were 6,000 promotions



and outreach campaigns. We also reached 12,000 processors and linked them to farmers to build effective 28,000 value chains. This effort has linked over 32,000 beneficiaries to the agri-business supply chain and that greatly improves their income. TAAT currently has seed funds from the AfDB and it is expected to work with government to access multilateral loans to scale up the technologies. In 2019, TAAT compacts worked with various agencies and leveraged an extra US \$ 2.5 million and that contributes to the scale up effort. TAAT partners will continue to accelerate this fund-raising effort with individual countries and regional blocks to scale up the successful technologies. We believe that in 2020 and in subsequent years, we will have an enhanced agricultural production that will be the beginning of the anticipated agricultural transformation in Africa.

Dr. Innocent Musabyimana
Head of TAAT Clearinghouse

TAAT Program Achievements in 2019

9,175,403 Beneficiaries,

 Male - 72.12%, Female - 27.6%,
 Youth - 0.28%

7 Government policies,
 laws and regulations
 influenced by TAAT

 Attribution - 14%; Contribution - 86%

USD 2,525,950 Leveraged from
 independent initiatives

 Attribution - 60%; Contribution - 40%

1,359,991 Farmers trained

 Attribution 92%; Contribution 8%

133 Functional Multi-
 stakeholder Platforms

 Attribution - 100%

144 Technologies deployed in targeted
 specific agro-ecological zones

 Attribution - 100%

3,617 Farmers using improved
 post-harvest technologies

 Attribution - 100%

12,082 Farmers & primary processors
 with access to and use of
 market facilities

 Attribution - 100%

6,039 Promotional & outreach campaigns
 organized

 Attribution - 47%; Contribution - 53%

32,255 Beneficiaries engaged in commercial
 agri-business supply chain

 Contribution - 53%; Attribution - 47%

28,506 Value Chain actors
 registered

 Attribution - 100%

TAAT's Footprint Across Africa



TAAT Commodity Compacts are on ground in 29 countries

- ❑ 7 Commodity Compacts in East
- ❑ 5 Commodity Compacts in Central
- ❑ 6 Commodity Compacts in Southern
- ❑ 8 Commodity Compacts in West
- ❑ 6 Commodity Compacts in the Sahel

Summary

Technologies for African Agricultural Transformation (TAAT) program is funded by the African Development Bank in an effort to increase agricultural productivity in Africa through the deployment of proven and high-performance and climate smart agricultural technologies.

It originated from the declared need *“to execute a bold plan to achieve rapid agricultural transformation across Africa by raising agricultural productivity,”* made by participants in the Dakar High-Level Conference in October 2015 that led to the formulation of the **Feed Africa Strategy** by the Bank in June 2016. TAAT is also aligned with the objectives of the Comprehensive African Agricultural Development Programme (CAADP) of the African Union Commission's New Partnership for Africa's Development (NEPAD), namely to:

- ***Eliminate extreme poverty***
- ***End hunger and malnutrition***
- ***Turn Africa into a net food exporter, and***
- ***Position Africa at the top of agricultural value chains where it has a comparative advantage.***

TAAT has been under implementation for two years and is able to highlight successes that are being recorded in terms of developing infrastructures to enable scaling up of technologies and actual impact on the ground. TAAT has deployed proven technologies to African farmers at scale hence enabling them to increase yields and improve their livelihoods in a sustainable manner through selected commodity value chains: Maize, Rice, Wheat, High Iron Bean, Cassava, Orange-Fleshed Sweet Potato, Sorghum/Millet, Livestock, and Aquaculture. With the support of Enablers, TAAT continues with its accelerated momentum to significantly address the issues of low yields by tackling more transversal issues in African agriculture. These are: improving soil fertility, discovering the untapped potential for improved water management, coordinating and advocating agricultural research initiatives, providing the necessary policy support, attracting African

youth in agribusiness, and helping farmers respond to transboundary plant pests and diseases such as Fall Armyworm.

TAAT has also sustained the momentum and its commitment to deliver high quality seeds to beneficiaries to help countries respond to food insecurity remains intact. In 2019, TAAT produced and disseminated 54,868 MT of breeder seeds, 1,253 MT of EGS, 5,589.207 MT of Basic/Foundation seeds, 79,311 MT for Certified seeds, 6,338 MT of Quality Declared Seeds, and 2,004 MT of Hybrid seeds. The numbers, disaggregated by cereals and grain legumes are as follows: 65,525 MT for wheat; 20,134.347 MT of maize; 292.915 MT of rice, 1008.718 MT for sorghum, and 620.450 MT of millet; and 4,957 MT of High Iron Beans (HIB). Looking at the seed for roots and tubers, the program has produced 81,315 bundles of cassava, 20,328,750 cassava cuttings, and 32,995,950 potato vine cuttings. TAAT has also made strides towards improving self-sufficiency in inland fish production with 127,011,842 fingerlings disseminated to farmers.

In 2019, TAAT reached 9,064,161 beneficiaries with men constituted 6,506,153 (71.78%) while women beneficiaries were 2,532,424 (27.94%) and youth beneficiaries constituting 25,593 (0.28%). Cumulatively, the program has reached 48% of its target so far and that includes expected beneficiaries for the 5-year TAAT program.

This publication brings to light, achievements of the program in 2019, documenting success stories to highlight the deployment of proven climate smart agricultural technologies for large scale adoption across the continent. The stories are first-hand accounts of how TAAT is helping farmers improve livelihoods through a mechanism that provides sustainable support to farmers. Indeed, with help from TAAT, Africa's agricultural sector appears to be firmly placed on the pathway to sustainable agricultural transformation.

Introduction

The transformational vision of the 2030 Agenda for Sustainable Development Goals calls on all countries and stakeholders to work together to end hunger and prevent all forms of malnutrition by 2030. This ambitious goal can only be fulfilled if agriculture and food systems become sustainable, so that food supplies are stable, and all people have access to adequate nutrition and health. There

are today, approximately 795,821 million people suffering from chronic undernourishment globally, 36.4 million more than in 2015. Of these, 25.72 million people live in Africa and the number is

projected to increase exponentially to almost 22% or 2.2 billion by 2050 (OECD-FAO, 2016). Sixty-six million primary school-age children attend classes hungry across the developing world, with 23 million in Africa alone. These figures point to a vulnerable sector on the African continent that need resources and the right programs to improve the lives of the impoverished. Progress towards food and nutrition security has been slow and can be attributed to low productivity of agricultural resources, rapid population growth rate of 2.7% per annum, political instability, and civil strife. There are frequent food shortages that continue to occur in African countries due to a set of factors that include climate change, population growth, regional conflict and lack of adequate investment in the agricultural sector by the African governments. A mix of these factors varies from country to country. However, African countries need to address these negative factors that decreases its ability to feed its citizens.

Agriculture remains a key driver for Africa's economic transformation and development. Africa has 60% of the world's arable land. However, despite this huge potential, the

continent is yet to reap the multiple benefits from agriculture that could help lift millions out of poverty. Agriculture provides up to 60% of all jobs on the continent and is the primary source of income for 10% to 20% of urban households accounting for about 15% of the Gross Domestic Product (GDP).

Africa has also remained a net importer of agricultural products during the last three decades. Annual food import costs are US \$45 billion currently and are expected to reach US \$110 billion by 2025. Each billion dollars of food imports is



Sorghum in water conservation design in Toma, Burkina Faso

equivalent to 670,000 on-farm jobs and 200,000 off-farm jobs. Africa has been exporting jobs abroad through food imports. Yet, Africa is the only region where the youth bulge will continue to grow in the foreseeable future, presenting an opportunity to reap the demographic dividend and avoid an imminent time bomb and threat to social cohesion. There is also the potential scenario for massive migration out of Africa in search of opportunities as long as an enabling environment is not fostered to harness the dividend. One in five youth will remain unemployed, uneducated, or without training (NEET in 2019). This state of joblessness has been steadily growing since 2012 mirroring the trends in the global rate. The NEET rate is projected to increase slightly by 0.3 percentage points to 20.8 in 2021 (Global Employment Trends for Youth 2020: Africa, ILO (2020)). If Africa was to improve and grow its agricultural sector through import substitution, the continent would mitigate the potential time bomb that is caused by unemployment among its youthful section of the society.

CAADP has been a catalyst for African initiatives, including defining national priorities and

facilitating an African control of the dialogue with technical and financial partners. Indeed, CAADP has established itself as the expression of reclaimed ownership of agricultural policy by African States and citizens of the continent. It is therefore a means of breaking away from the conditions and restrictions imposed by 20 years of structural adjustment. Nevertheless, public commitment to boosting agriculture has been limited and has failed to match the targets set. To date, few countries have reached or exceeded the target of allocating 10% of public expenditure to agriculture. To address these challenges holistically, the African Development Bank, in 2018 launched the TAAT program under the Bank's Feed Africa Strategy.

The TAAT program seeks to ensure the growth of the agricultural sector, improve food security, and encourage inclusive growth by catalysing enhanced involvement of women and youth in Agriculture. It also promotes improved resilience to climate variability and shock. The overall goal of TAAT is to improve agriculture as a business across Africa by deploying agricultural productivity-increasing technologies within nine priority commodities (cassava, wheat, rice, maize, sorghum/millet, orange-fleshed sweet potato, high iron beans, aquaculture, and small livestock). By focusing efforts on these initial priority commodities, TAAT is poised to increase agricultural productivity and diversification. This will lead to improved food and nutrition security, job creation through expanded commercialization and industrialization. It will also improve the socio-economic status of farmers including women and youth, through the expected improved livelihoods. Other benefits are: reduced vulnerabilities to market fluctuations as a result of more reliable supply chains better organized and accessible markets, improved soil, land and water management practices as a result of Good Agricultural Practices (GAPs), and increased resilience to climate variability and stress through the deployment of Climate Smart Agriculture (CSA) technologies and innovations.

Africa has many agricultural research organizations operating in the research and development sectors. These are the CGIAR centers, National Agricultural Research Institutes, Regional and Africa-wide bodies. These bodies and centers seek to address the

problems of low agricultural productivity, food insecurity, malnutrition, lack of agribusiness skills, lack of use of modern technologies and many others. Yet, while these institutes, over the last 50 years, have assembled many groundbreaking agricultural technologies, moving these technologies from the institute's shelves to the end users has been the missing link. It is for this reason Africa ranks low in the world in terms of utilization of modern seeds, inputs and other scalable agriculture solutions. Technologies have not moved to scale in Africa due to many factors. These are weak agricultural extension systems, poor linkages between research and extension services, lengthy technology verification and release systems, national boundaries, and insufficient attention to private sector players along the commodity value chains. Africa has 33 million farms of less than 2 hectares, accounting for 80% of all farms. Hence, getting these farmers to adopt new technologies requires a new way of thinking if we are to truly transform agriculture on the continent.

TAAT is a program that seeks to address these challenges by ensuring the holders of technologies develop the appropriate sustainable partnerships with research organizations, government agencies, financial service providers, and private sector to accelerate technology deployment to farmers and rural communities.

TAAT Program's Implementing Structure

The International Institute of Tropical Agriculture (IITA) is responsible for TAAT program execution in close partnership with CGIAR centers and specialized institutions. These institutions come together with specific objectives within selected agricultural value chains and form Commodity Technology Delivery Compacts for technology delivery to millions of agricultural producers. The TAAT program includes fifteen (15) Commodity and Enabler Compacts led by African Agricultural Technology Foundation (AATF), AfricaRice, the Alliance of Bioversity International and CIAT, the Centro Internacional de la Papa (CIP), the Forum for Agricultural Research in Africa (FARA), the International Centre for Agricultural Research in the Dry Areas (ICARDA), the International Centre for Research in Semi-Arid Tropics (ICRISAT), the International Fertilizer Development Corporation (IFDC), the International Institute of Tropical

Agriculture (IITA), the International Livestock Research Institute (ILRI), the International Water Management Institute (IWMI), and WorldFish Centre.

TAAT Management

In order to coordinate implementation across numerous partners, TAAT is overseen by a Regional Technology Delivery Infrastructure made up of four entities: The Programme Steering Committee (PSC), the Clearinghouse (CH), the Programme Management Unit (PMU), and the Commodity Technology Delivery Compacts, also known simply as Compacts.

Program Steering Committee (PSC)

The Program Steering Committee is the highest decision-making body composed of representatives of the Africa Development Bank, African Ministers of Agriculture of participating RMCs, representatives Centers, Private sector, NARES and regional farmer organizations. The committee provides oversight functions to Regional Technology Delivery Infrastructure (RTDI).

Program Management Unit (PMU)

The Program Management Unit oversees day-to-day implementation of program's fiduciary and administrative activities. The PMU organises the transfer of program resources to the institutions leading the compacts; coordinates the compilation and review of reports from compacts for submission to the Bank; and coordinates all financial management guidelines to be used across the implementing agencies. The (PMU) undertakes legal, fiduciary, procurement, and audit functions and it is responsible for the entire program.

Clearinghouse (CH)

The Clearinghouse is the main decision-making body of the RTDI when it comes to selecting technologies to disseminate and scale up. The objective of the Clearinghouse is to decide which proven agricultural technologies proposed by each crop/livestock compact group can be rolled out and taken to scale. The activities of the Clearinghouse include: evaluating requests from the compacts for technologies to be rolled out and scaled up, validating the design and plan with stakeholders for buy-in and commitment; identifying the optimal mix of partners that accompany the implementation, providing technical backstopping and monitoring of the proposed plan; monitoring and assessing milestones and KPIs, and working with governments and private sector on investment opportunities and financing mechanisms for taking technologies to scale

Commodity Technology Delivery Compacts (CTDC)

The TAAT commodity Technology Delivery Compact (CTDC) leads the technology deployment effort. CTDC is an agreement between the CGIAR center with a mandate for the commodity, NARES, the RMCs and the entire ecosystem of value chain actors—from input supplier, processors, aggregators, equipment



Members of the TAAT Program Steering Committee pose for a group photograph with representatives of the bank, TAAT PMU and CH respectively.

manufacturers, extension agencies, etc. to work together for agricultural transformation providing accessible solution to farmers

The "Compacts" assemble needed technologies, provide information and training in their application, and deploy solutions through local and National partnerships. Technology delivery activities, include technology demonstrations, technology dissemination campaigns, farmer training/field days, and partnerships with the private sector seed production and value chain development. This ecosystem of partners accelerates deployment of agricultural technologies and their accompanying good agricultural practices to scale in a sustainable manner

TAAT partnerships

At the core of TAAT lies an extensive partnership network which comprises both public and private sectors. A key group in this partnership is the CGIAR which represents the world's largest global agricultural innovation network and provider of agricultural solutions to farmers. It is the proven agricultural technologies coming out of these institutions that TAAT deploys with assistance from a wide range of partners in each country led by agricultural experts. TAAT secures and directs the vast store of proven agricultural technologies that are widely available but have not been systematically deployed at scale to reach millions of farmers. The ecosystem of partners includes over 150 public and 150 private partners. The vast majority of public partners are

represented by International Agricultural Research Centers (IARCs) and National Agricultural Research and Extension systems (NARES). IARCs have a comparative advantage in strategic and applied research as well as the advantage of having headquarters in developing countries and regional offices in a wide array of locations around TAAT countries. NARES have the responsibility for generating, adapting, and transferring technologies that help farmers improve food security in a sustainable manner. NARES comprise not only the national agricultural research institutes (NARIs) of a country or region, but also universities, the private sector, extension services, NGOs, and farmer organizations all of whom come together as a network of technology transfer agents. The private sector comprising mostly of seed companies, input supplies and processors. Public-private partnerships bring both sides of the agricultural sector together under one roof to accelerate research into products and solutions.

TAAT implementation Model

The TAAT value chain approach begins with technologies from research centers that are then taken to scale by agricultural experts (from these centers) in close collaboration with public private partners along the value chain. TAAT leverages the expertise and influence of partners to help deliver lasting benefits to smallholder and large-scale farmers. This infrastructure begins with assembling various technologies and optimising the production and multiplication of basic/foundation, certified and quality-declared seeds. This is carried out by public research organisations as well as private sector. Then farmers are given access to various appropriate bundles of technologies that increases productivity. The program also utilizes innovation platforms to demonstrate the various bundles of technologies available.

To ensure that seeds and inputs get closer to the farmers as possible, a critical mass of input suppliers are enlisted. The model ensures that the promoted inputs are as close to the end users as possible, In most of the crop compacts, they are promoting



TAAT PSC Chair, Hon Gaston Doussouhoui welcomes DR Congo's Scientific Research and Technological Innovation Minister, Hon Jose Mpanda Kabungu to a TAAT Demonstration plot in Bukavu

high-yielding and drought tolerant technologies. These are accompanied by appropriate water and soil management techniques provided by the enablers.

To ensure that the model is sustainable, TAAT has adopted a value chain or market system approach in developing the commodities. While There are variations in approaches within compacts, TAAT focalises on facilitating productive linkages between agricultural market actors. This approach emphasizes impact, scalability, sustainability, value for money, and return on investment. The value chain approach to the TAAT agricultural program implementation seeks sustainable results by leveraging existing local, commercial, public and civil systems for farm- to -market service delivery. The principles of facilitation take center stage in this systems approach although the tactics and intensity applied in the field may vary initially, depending on existing local capacity. The key is to introduce incentives that stimulate local actors to invest their own capital and labor to upgrade services without creating a dependency on TAAT resources, and without TAAT projects introducing parallel structures

Overview of TAAT activities in 2019

In 2019, Commodity Compacts deployed 41 lead technologies and over 100 accompanying technology solutions. Table 1 comprises lead technologies by value chain commodity. TAAT lead technologies are grouped into what is known as “technology toolkits” or “technology packages” that describe the agricultural solutions by crop and location. These technologies help mitigate impact of climate change, shorter fallow periods, deforestation, worsening farmland and the loss of labor due to migration of the youth from rural areas to the urban centers.

Due to agro-ecological zone differences, agricultural practices vary from region to region. Hence, different technologies and their accompanying solutions are packaged and applied accordingly.

TAAT Monitoring Evaluation and Learning system

In 2019, the TAAT MEL unit successfully worked with the implementers to refine the Monitoring, Evaluation and Learning (MEL) Key Performance Indicators (KPIs) and Tools. The system was then rolled through trainings and support from the unit. The Program is reporting 29 KPIs in total. These KPIs are fully aligned with the Feed Africa Strategy as defined in the TAAT Program document. In 2019, efforts were focused on deploying performance reports and updates to stakeholders on program targets. The reports were on achievements in seed production, dissemination and accessibility, To this end, two main output KPIs are highlighted in this report as milestones that describe the number of direct beneficiaries reached and the volume of seeds produced through December 2019. Also reported are outcome cases studies that provide the validation of how African farmers are gaining access and making use of TAAT technologies. The stories are provided below.



Participants at TAAT MEL visit to Doyogena, Ethiopia

Table 1

Lead Technologies per Compact

**TAAT Value Chain
Commodity Compact**

Lead Technology (around which toolkits are built)

Rice



- Release of new improved inbred varieties and hybrids
- Good agricultural practice (GAP) through RiceAdvice digital support
- Efficient irrigation and water management

Maize



- Hybrids of water efficient Maize as a climate smart option and their licensing to seed producers

Sorghum



- Dual Purpose varieties (feed and grain)
- Mobile forage choppers
- Utilization of crop residues
- Fertilizer microdosing
- Small-scale mechanization

Millet



- Improved Pearl Millet Varieties
- Release of parasitoid wasps
- Land reclamation
- Fertilizer micro-dosing

Wheat



- Heat tolerant and climate smart wheat varieties
- Mechanized support of raised planting beds
- Conservation agriculture (e.g. no-till planters)

Cassava



- High starch and disease tolerant varieties
- Vegetative propagation systems (e.g. Semi-Autotrophic Hydroponics (SAH))
- Mechanized tuber processing (e.g. peelers)
- Mechanized and value added processing

**Orange-fleshed
Sweet Potato**



- Vegetative propagation of virus and drought tolerant varieties
- Seed systems establishment
- Good Agronomic Practices
- Good harvesting practices
- Post-Harvest Handling
- Puree production and utilization
- Silage production of harvested stems and leaves

| | |
|---|--|
| <p>High Iron Beans</p>  | <ul style="list-style-type: none"> • Varieties of high-iron and zinc beans • Seed systems • Good agronomic practices • Value addition |
| <p>Aquaculture</p>  | <ul style="list-style-type: none"> • Pond-and cage-based tilapia production • Pond-and tank- based catfish production • Feed production • Fish processing (e.g. kiln smoking) |
| <p>Livestock (Poultry)</p>  | <ul style="list-style-type: none"> • Improved breeds • Low input rearing • Improved health systems (e.g. vaccination) |
| <p>Livestock (Goats)</p>  | <ul style="list-style-type: none"> • Improved feeding systems (e.g. short-term fattening and cassava peel-based seeds) |
| <p>Livestock (Sheep)</p>  | <ul style="list-style-type: none"> • Improved feed systems (e.g. cassava peel utilization) • Improved health systems (e.g. deworming) |
| <p>TAAT Enabler Compacts</p> | <p>Lead technologies (supporting commodity value chains)</p> |
| <p>Fall ArmyWorm (FAW)</p>  | <ul style="list-style-type: none"> • Fortenzo Duo Seed treatment • Bio-rational pesticides (e.g. neem oil, Bt pesticides others) • Strategic pesticide application (e.g. Emamectin benzoate, Lufenuron, Ecotrex) timed to Maize growth stage. |
| <p>Soil Fertility Management</p>  | <ul style="list-style-type: none"> • SMART (Soil Sampling, Mapping and Recommendations Transfer) • Integrated Soil Fertility Management (primarily combined mineral and organic fertilizers) |
| <p>Water Management</p>  | <ul style="list-style-type: none"> • Water harvesting and delivery • Pressurized and supplementary irrigation techniques |

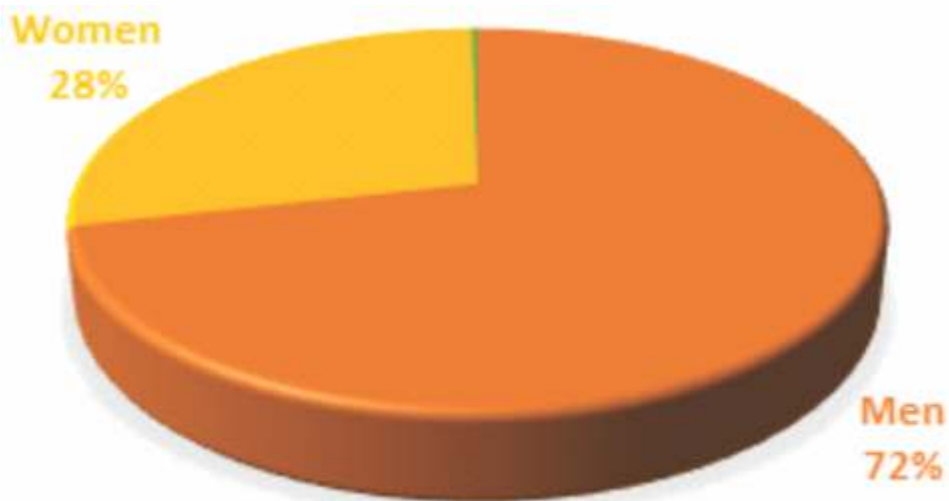
Overview of TAAT Activities Per Milestone

TAAT has 29 Key Indicators which the compacts report on, as per the activities conducted on the ground. All (Table 2) indicators are derived from the program document from the Bank that aligns to the Feed Africa Strategy.

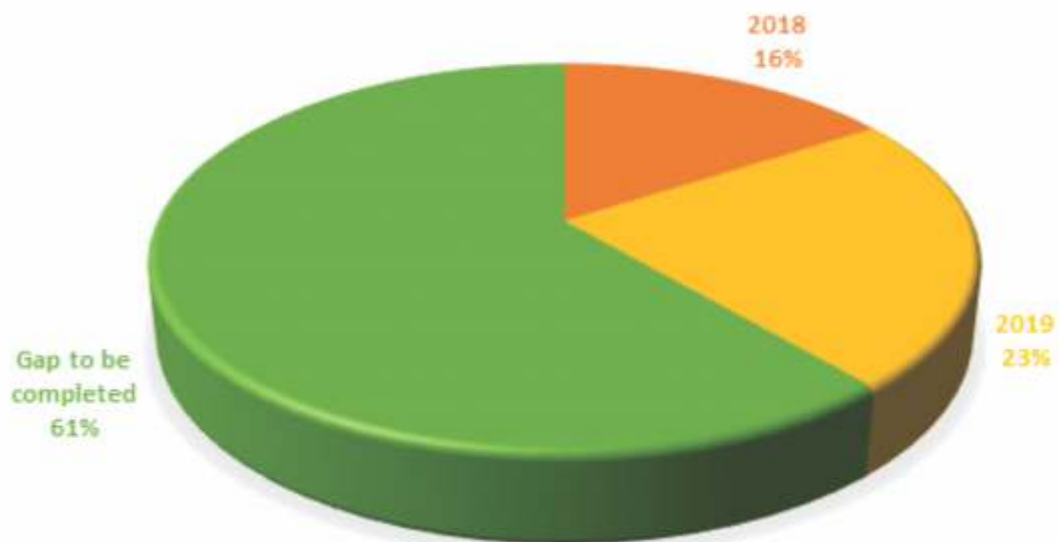
Milestone 1: Number of Beneficiaries Reached

TAAT Milestone 1: The program will reach 40 million beneficiaries by 2025. Graph 1 highlights TAAT's progress towards meeting this target. In 2019, 9,175,403 beneficiaries were reached. That is 6,617,395 men (72.12%), 2,532,415 women (27.60%) and 25,593 (0.28%) were Youth. This represents a completion rate of 23% for 2019 (and 16% for 2018.) The gap to be completed by 2025 is 61%.

Graph 1. TAAT beneficiaries reached in 2019



Graph 2. TAAT beneficiaries in 2018 and 2019



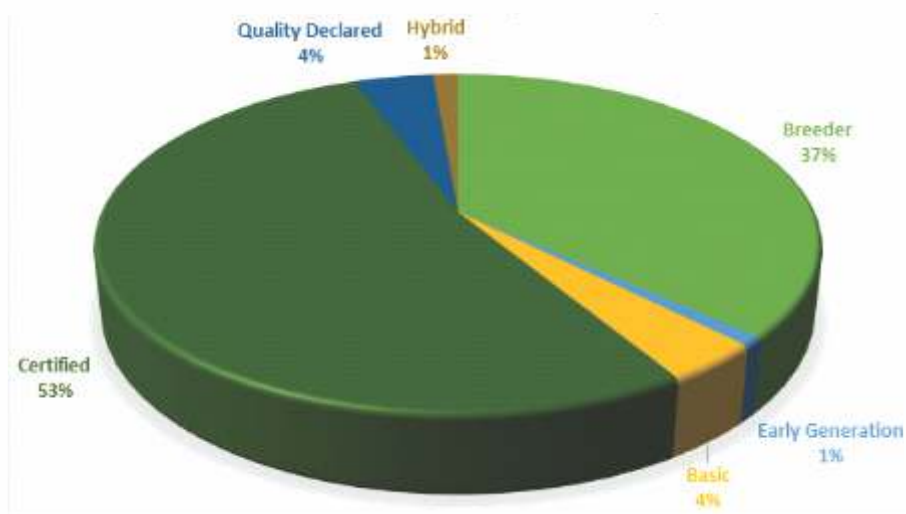
Milestone 2: Volume of Seeds Produced

By working through strategic partnerships, TAAT commodity compacts and their contracted seed partners develop and strengthen seed systems to ensure that farmers have sustainable access to high quality certified seeds. In 2019, seed distribution through TAAT commodity value chains, in partnership with seed companies, achieved the following:

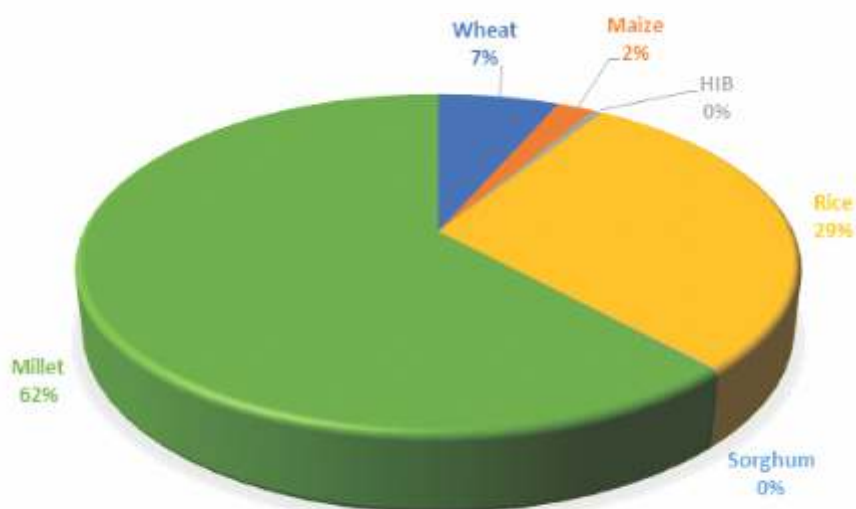
- * Seed Type: 54,868 MT for breeder seeds, 1,253 MT for EGS, 5,589.207 MT for Basic/Foundation seeds, 79,311 MT for Certified seeds, 6,338 Quality-Declared seeds, and 2,004 for Hybrid seeds. (Graph 3)
- * Certified seeds were the largest category distributed accounting for 53% followed by the breeder seeds. However, hybrids and early generation seeds is the lowest each having 1% of production and distribution.

For grain legumes (HIB) and cereals (wheat, maize, rice, sorghum, and millet), seed producers are strategically identified and contracts are entered into usually with formal seed companies. The agreement specifies the quantity of seed of specific category they have to produce per season. Graph 4 shows the distribution of grain and cereals

Graph 3. Seed type distributed (Metric tons)



Graph 4. Volume of grains and legumes seeds per Compact (Metric tons)



The volume of seed distributed are as follows per value chain: 65,525 MT for wheat; 20,134.347 MT for maize; 4,957 MT for HIB; 292,915 MT for rice, 1,008.718 MT for sorghum, and 620,450 MT for millet. Millet and rice dominate the amounts distributed having 62% and 29% respectively. Wheat is a distance third with 7% and maize 2%.

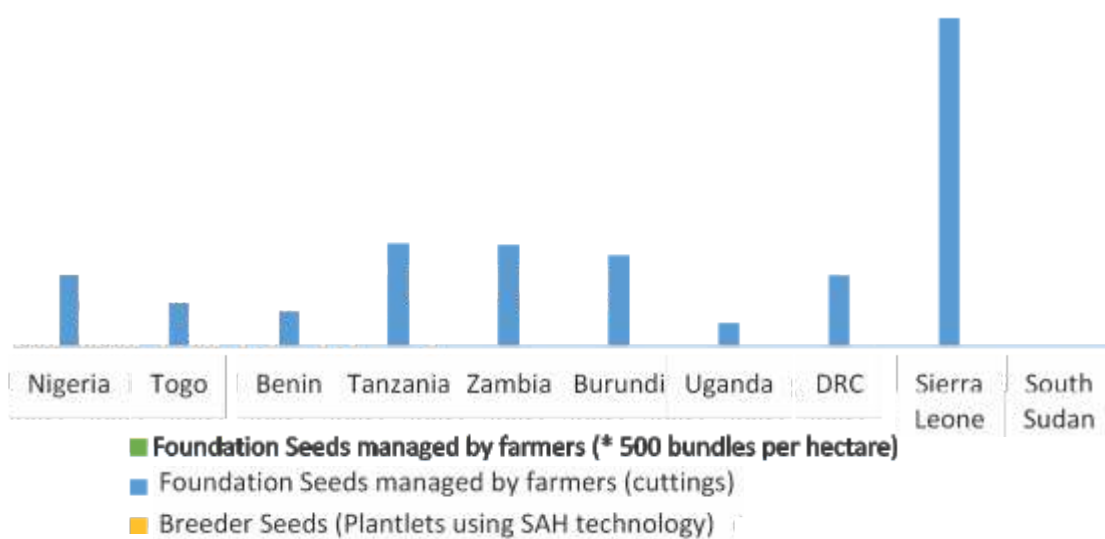
Clonally Propagated Seeds Production Arrangement

For cassava and Orange-Fleshed Sweet Potato (OFSP) seed system there is a slight difference in terms of how the seeds are produced. This is because there are few formal seed producers growing the seeds for the market. Historically, there has been limited engagement from the private sector in seed production of vegetatively propagated crops due to the absence of smart and cost-saving seed propagation technology and a reliable market. The incidence of yield suppressing diseases such as cassava brown streak virus and sweet potato motley virus combined with the absence of supply-demand relationships in the cassava and sweet potato commodities has led to a high-risk operating

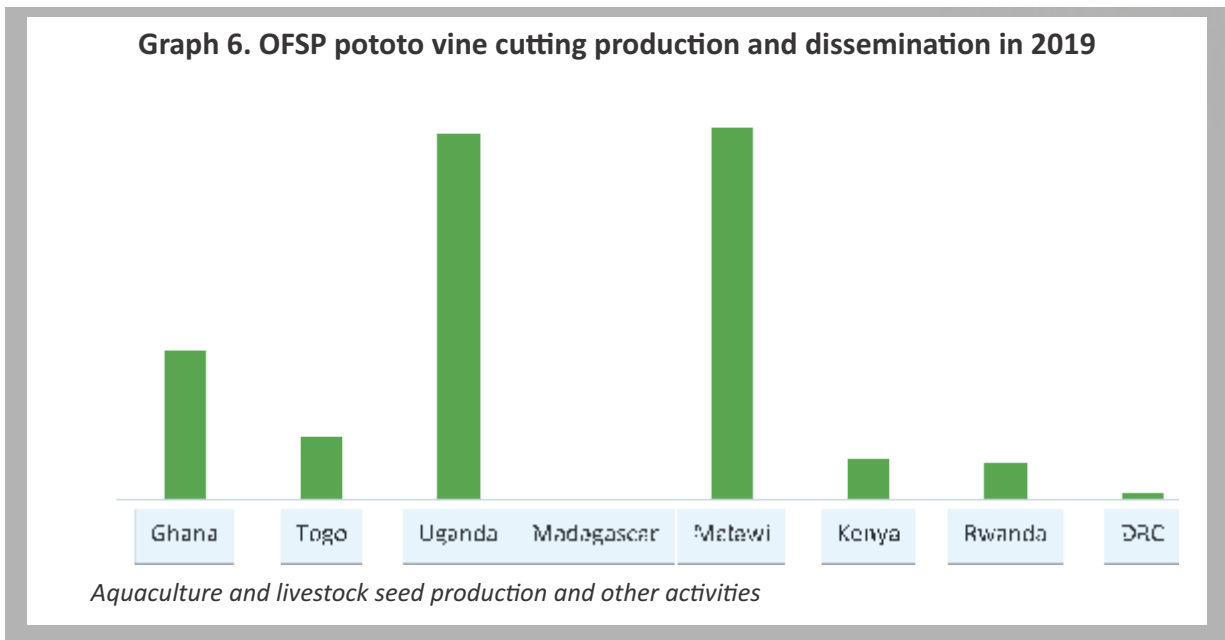
environment that discourages growth of commercial seed enterprises. As a result, the cassava and OFSP Compacts are working with private seed firms to strengthen early generation seed (EGS) business. These are linked to the public-based seed producers. The compacts are also working with partners to adopt new seed propagation technologies by collaborating with public sector seed producers to achieve a successful business with higher efficiency and low costs. A lot of effort goes through promotion of the high-quality seeds and linking them to the buyers.

Hence, unlike cereal or grains, cassava and sweet potato compacts are evaluated differently when looking at seeds produced and distributed to beneficiaries. Cassava cuttings are very different from the sweet potato cuttings and the two cannot be compared. The figures produced are 81,315 bundles of cassava (500 bundles are required to plant 1 hectare) hence they produced 20,328,750 cassava cuttings. Orange Fleshed sweet potato produced 32,995,950 vine cuttings.

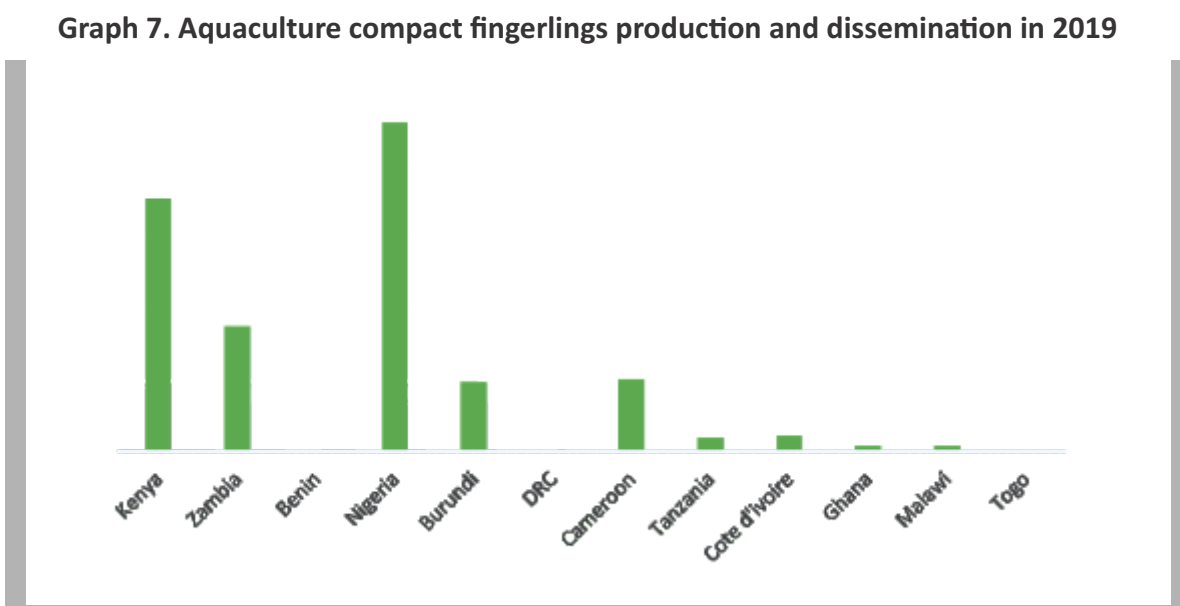
Graph 5. Cassava plantlets and bundles production in 2019



Graphs 5 and 6 below shows where the seed were produced per country for cassava and OFSP respectively.

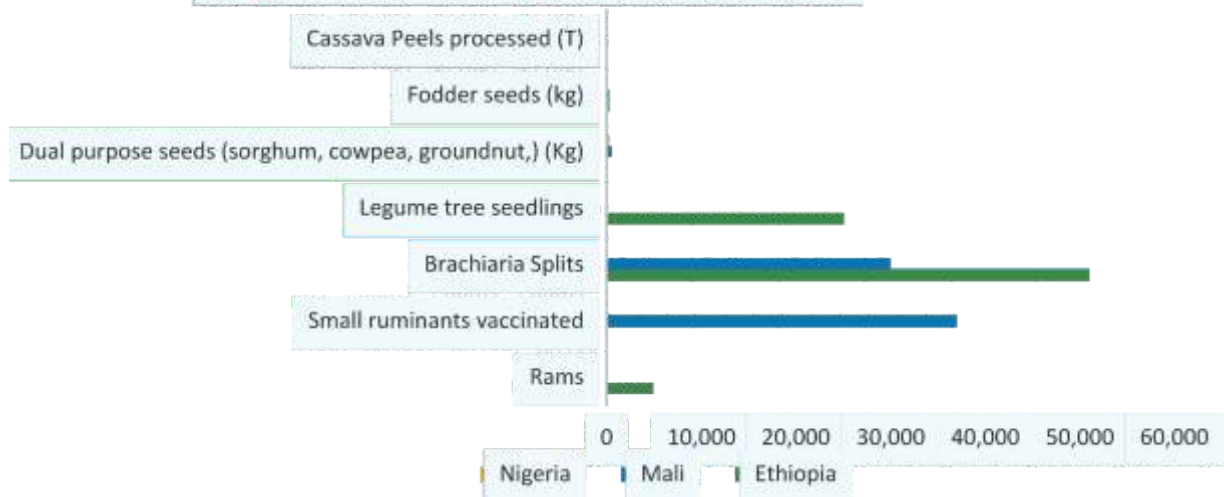


Taking into the cognizance, the differences in institutional arrangements for the livestock and aquaculture compacts, it would be apposite to present the production details separately. There are very few private sector seed producers in this sector with the exception of poultry. The aquaculture fingerlings production is emerging with pond production of fish in many countries. However, the aquaculture compact is working with the NARES in their countries of operation. The NARES backstop's the private sector where possible with the necessary capacity building for farmers engaged in fingerling production. The Aquaculture Compact produced and distributed 127,011,842 fingerlings to farmers within the period under review. Graphs 7 and 8



The livestock compact's activities have been geared towards sheep breeding and improved fattening processes through various activities. See graph 8 below

Graph 8. Livestock dissemination activities in 2019



Focus Group Discussion at a TAAT MEL Meeting in Addis Ababa, Ethiopia

Table 2: Key Outcome Results Generated In 2019

| Compacts | Baseline Values (t/ha) (a) | Actual (t/ha) (b) | Target Values (expected value at project completion) (t/ha) (c) | Progress towards end target (% realized) (b - a/c - a) |
|---|----------------------------|-------------------|---|--|
| Increased income USD (%) | | | | |
| Aquaculture | 0 | 923 | 1,800 | 51% |
| Cassava | 2,598 | 2,857.80 | 3,000 | 65% |
| Wheat | 1,560 | 1,872 | 2,340 | 40% |
| ENABLE - TAAT | 840 | 1,356 | 2,440 | 32% |
| OFSP | 0 | 8 | 15 | 50% |
| Maize | 300 | 495 | 770 | 41% |
| Increased productivity grain and cereal t/ha, tilapia g, sheep g/day (%) | | | | |
| Aquaculture | 0.4 | 0.8 | 1.3 | 44% |
| HIB | 0.8 | 1.25 | 1.2 | 113% |
| Wheat | 1.5 | 2.2 | 3 | 47% |
| OFSP | 5 | 7 | 10 | 40% |
| Forage | 1.5 | 2 | 2.2 | 71% |
| Livestock | 50 | 66.5 | 100 | 33% |
| Rice | 2 | 2.21 | 2.50 | 42% |
| Maize | 1.5 | 2.25 | 3.5 | 38% |
| Sorghum | 1.25 | 3 | 6 | 37% |
| Millet | 0.75 | 1.75 | 3 | 44% |
| Cassava | 10.5 | 16 | 25 | 38% |
| Increased employment inclusively (%) | | | | |
| All | 0 | 4,009 | 450,000.00 | 0.90% |

| Increased food production MT (%) | | | | |
|---|---------|-----------|------------|----------------------|
| Aquaculture | 479,608 | 16,243 | 142,640 | 138% |
| Cassava | 200,000 | 10,952 | 12,500 | 101% |
| Wheat | 0 | 0.6 | 2.2 | 27% |
| Maize | 0 | 1,892,790 | 12,000,000 | 16% |
| OFSP | 0 | 240,000 | 500,000 | 48% |
| Value addition of TAAT USD (%) | | | | |
| Wheat | 0 | 98 | 300 | 32.67% |
| OFSP | 0 | 24 | 100 | 24.00% |
| Land covered ha (%) | | | | |
| OFSP | 0 | 20,000 | 200,000 | 10% |
| Rice | 0 | 420,000 | - | - |
| Maize | 0 | 841240 | 1500000 | 56% |
| Cassava | 0 | 49 | 88 | 55% |
| Completion rate | | | | 48% |
| Status of achievement | | | | In progress (25-49%) |

Case Studies:

Measuring outcome productivity increase within the TAAT Ecosystem

Case Study of the Maize Compact in Kenya

A TAAT ground truthing monitoring field mission was conducted in December 2019 in Kenya to verify results reported by the compact between August 2018 and



Doris Anjawa of Rural Outreach Program (ROP) and Rachel Zozo during the TAAT MEL visit to Kenya

December 2019. The mission's aim was to corroborate and validate successes reported by the Maize Compact on the ground by reviewing documents from seed companies and hearing first-hand from beneficiaries, implementers, and other stakeholder groups. The mission also sought to highlight key observations and lessons learnt to help guide compact activities moving forward. The Maize Value Chain is very complex and takes long to reach the final consumers. The starting point is hybrid seed production. There are many actors involved in the value chain whose contributions are instrumental to its success. Moving along the value chain, we find that there are key drivers of technology uptake.

The findings of the ground truthing mission showed that through a network of NARES, Public-Private Partnerships (PPP) and farmer groups, 1,003,640 direct beneficiaries have learnt about the value add of climate smart maize hybrids seeds. This is through field days, open days, hands-on training sessions and small seed pack distribution. In partnership with 28 seed companies (Kenya - 4, Uganda - 4, Tanzania - 6, Zambia - 8 and Zimbabwe - 6), the Maize Compact has facilitated the establishment of 4,256 field demonstration plots, conducted 757 field days. The Compact partners have

distributed 84,321 free small pack seeds to boost the scale up of over 17,340 tons of climate smart maize seeds produced in partnership with the seed companies. For Kenya alone, compact outputs include; 548 field demos established, 5 large field days with 8,640 farmers recorded to have participated, 973 small field days to create awareness on the performance of the climate smart varieties, 15 radio episodes, 2 road shows organized to promote the climate smart varieties, 4,500 MT of climate smart varieties sold, 160 Lead Farmers technically supported to promote the climate smart varieties, and 25,000 small packs of KH500-31A distributed to 10,000 farmers.

We also found out that millers give farmers ready markets for their produce. The farmers sold a bag of 90 Kg of grains for Kshs 3,000 giving them a marginal benefit (profit) of Kshs 1,000 per bag. To back up testimonials and information given by farmers during the TAAT Maize MEL mission in Western Kenya, the team further validated the findings through the review of journals from previous studies on the farmer adoption and on-farm performance of the similar Drought-TEGOTM (WE1101) variety.

Investments in outreach dissemination activities where shown to have resulted in learning and increase in knowledge sharing among different actors from different backgrounds. The intervention by the TAAT Maize Compact has benefited from an enabling ecosystem as a result of the established partnerships that the program continues forge. The compact's partnership with the local millers increases the adoption of the high-yielding maize varieties because the farmers are assured of a ready market.



Bags of maize to sold Food Chain Millers by technology-adopting farmers in Nakuru, Western Kenya

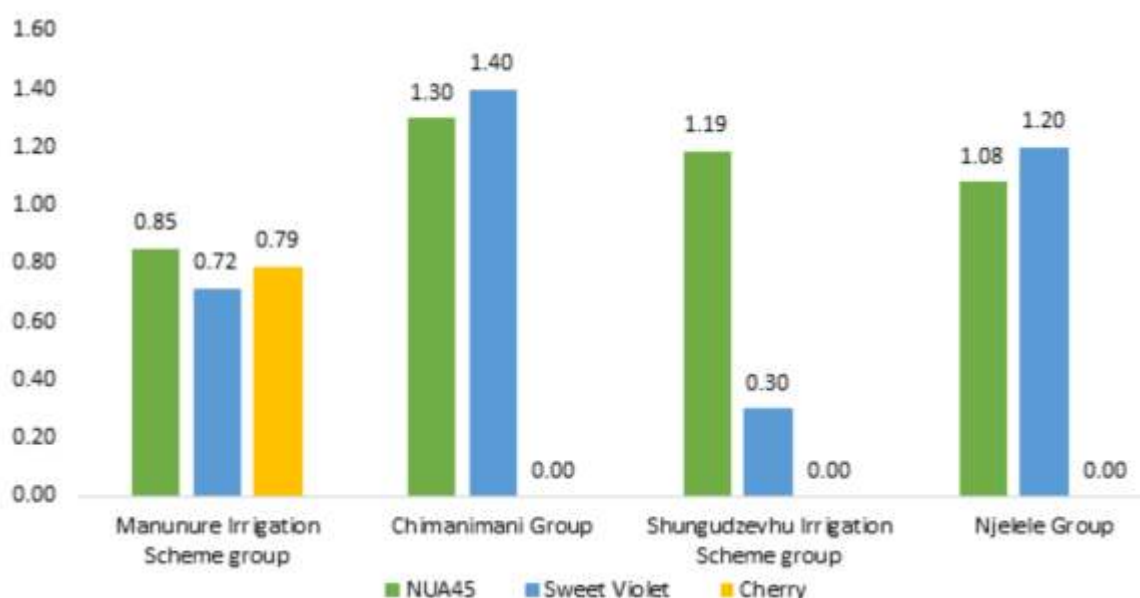
Case Study of the High Iron Bean Compact in Zimbabwe

As part of the data verification, the TAAT MEL unit selects randomly a Compact and a location of the reported data to be visited for ground truthing and verification. One of such case studies is the August 2019 study on the High Iron Bean (HIB) Compact's reported productivity increase in Zimbabwe. Hence, a visit was undertaken to the location. The results are presented in graph 9 below. During the team's mission to Zimbabwe to validate outcome of outputs reported, the team found that there was an improved productivity from a baseline of 0.60 t/ha to 0.76 t/ha (of the new varieties) despite the impact cyclone Idai that destroyed a large proportion of the crops at germination stage in the country. Based on the finding, it is estimated that, the HIB Compact has generated on average, a Return on Investment (RoI) of US \$ 8.35 for an average investment of US \$ 5.08 per farmer. That is an increase of about US \$ 0.64 for every dollar invested. It was further reviewed that women are engaged in NUA45 by-products processing, and the youth were venturing into seed production.

Graph 9 below highlights the yields of new varieties of HIB introduced through TAAT and deployed for their nutritious value and palatability as well as the increased Return on Investment (RoI) to farmers harvesting the crop.



Graph 9. Yield (ton/ha) of NUA45, Sweet Violet and Cherry HIB varieties



TAAT Policy Enabler Compact



Creating an enabling policy environment for technology scale up through policies that deliver certified seeds at scale, accreditation of agro-input suppliers, harmonization of regional variety release and registration, and policy reforms to facilitate performing value chains!

Introduction

The agricultural sector comprises the collective business activities performed from farm to fork. As mentioned at the introduction, agricultural sector is very important because it employs a great percentage of African population but also contributes a significant proportion of the GDP. TAAT program is promoting a bundle of technologies with a goal of increasing agricultural productivity in Africa. Therefore, these agricultural technologies must play a key role in Africa's economic development. This section is particularly concerned with the enabling environment for technology development, specifically the policies and regulations that affect input availability, the interactions of the private sector with public agricultural research, and agricultural enterprise development. It is well acknowledged that the growth in the agricultural sector is often hindered by policy, regulatory and institutional bottlenecks that prevent agricultural development. Examples of these bottlenecks include:

- **Inefficient systems governing variety release, certification and registration**
- **Deficiencies in the policy and the regulatory environment** slowing domestication and implementation of regionally harmonized seed regulations across the four major Regional Economic Communities (RECs) in Africa (COMESA, ECOWAS, SADC and EAC)
- **Inadequate supply** of quality seed and other important agro-inputs (fertilizer, pesticides) with high incidences of fake agro-inputs
- **weak and non-competitive agricultural value chains** and low intra-Africa agricultural trade.

To address these challenges in a holistic manner, the TAAT Policy Enabler Compact's (TAAT-PEC) goal is to facilitate the increase and use of improved seeds by farmers in Africa from 30 percent to 60 percent within the next 8-10 years. Led by the African Agricultural Technology Foundation (AATF), TAAT-PEC works to facilitate farmers' access to high-quality seeds and supply of agro-



TAAT Policy Enabler Compact's focal areas

inputs through well-accredited input markets across the continent.

TAAT-PEC is implementing a four-pronged approach organized around four work streams that include: (i) enabling seed policies that deliver certified seeds at scale, (ii) accreditation of agro-input suppliers, (iii) harmonization of regional variety release and registration, and (iv) policy reforms to facilitate performing commodity value chains. The compact provides expertise to all TAAT Compacts and countries that include Benin, Burkina Faso, Burundi, Cote d'Ivoire, DRC, Ghana, Liberia, Mali, Nigeria, Rwanda, Sierra Leone, Uganda, Malawi, Tanzania, Togo, Kenya, Zambia, Zimbabwe. The compact also works at Regional Economic Community (REC) levels. It is working with Economic Community of West African States (ECOWAS), Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC).

TAAT-PEC's impact is already being felt across the African policy environment as it has engaged approximately 600 high-level policy makers and stakeholders. The objective of these advocacy is to facilitate seed policy, regulatory and institutional reforms leading to the establishment of eight regulatory reforms and policies across Africa. The compact has conducted seed policy assessments in 12 countries, identified gaps and challenges as well engaged policy makers for redress. Several high-level evidence-based policy dialogue events have been organized with policy makers and stakeholders to prioritize interventions. Through the efforts of the TAAT policy compact, 120 agro-input dealers have been accredited to facilitate access to quality inputs and reduce proliferation of counterfeit agro-inputs.

Success Story

Non-Harmonization of Seed Policies (EAC, ECOWAS and COMESA Regions)

What was the problem?

Many farmers in Africa face challenges in accessing quality seeds due to policy and market related constraints. Most critical are the lengthy procedures of variety testing, release and registration, and barriers to variety movement as a result of country-specific regulations. The movement of seeds across countries and regions in Africa is hindered by policies that focus on national boundaries rather than agro-ecological zones that spread across multiple countries. Full harmonization of seed policies will imply that a variety released in one country can be accessed by farmers in another country within a framework, mutually agreed to by countries with a view to fostering knowledge sharing on crop performance. Having this infrastructure in place will avail more than 100 high-quality varieties to millions of farmers in 39 African countries represented by ECOWAS, COMESA and EAC.



Participants at the Dakar meeting organised by TAAT-PEC to assess the status of Implementation of the regionally Harmonized Seed regulations in ECOWAS member states.

Outcome and Impact

The TAAT-PEC conducted rapid assessments of the policy environment around seed sub-sectors in 12 countries. The goal of the activities was to identify and prioritize policy, regulatory and institutional gaps for targeted advocacy. The advocacy activities will then stimulate commitment from policy makers to implement desirable reforms. Significantly, this effort was catalytic to the passage of the seed policy in Uganda, establishment of a variety catalogue in DR Congo, and the recent enactment of the Plant Variety Protection Law in Malawi. In addition, interventions by TAAT-PEC resulted in the development of guidelines and protocols

for accreditation of seed suppliers and agro-dealers in Tanzania and Nigeria to mitigate against proliferation of counterfeit agro-inputs.

In November 2019, the Regionally Harmonized Guidelines for Registration of Pesticides was adopted by the East African Community (EAC) member states. TAAT-PEC was a partner in the

technical working group brought together to finalize the draft. Months after adoption of the guidelines, six firms submitted application dossiers for testing and registration of promising pesticides for control of the FAW in a move that is poised to help both agro-chemical companies to register products in a cost-effective manner

thereby creating faster access to quality pest control products for millions of farmers in the EAC partner states. As noted by Dr. Nang'ayo, TAAT Policy Compact Coordinator, *"The finalization of these guidelines is not only important but very urgent to set the stage for adoption of implementation of processes that will ensure availability of promising pest control products to address the threat caused by the recent outbreak and spread of the Fall Army Worm (FAW) in the region"*.

TAAT-PEC subsequently convened high-level policy dialogue events throughout the year to review progress made and identify challenges hampering implementation of other regionally harmonized regulations for seed in COMESA and ECOWAS regional economic blocks, and for pesticides in EAC region. The action plans that resulted from these events helped in stimulating and fast-tracking engagements focused on domestication and implementation of harmonized regulatory instruments.



***Intensifying the production of Africa's strategic crops
(Maize, Rice, Beans, Wheat, Sorghum and Millet)***

The TAAT Maize Compact

Transforming the savannah zone into Africa's breadbasket by increasing uptake and use of high-yielding climate-smart maize hybrids by smallholder farmers and increasing profit margins in the maize value chain



Climate-smart maize seeds ready for distribution by the TAAT Maize Compact in Western Kenya

Introduction

Maize is one of the most important cereal crops in Africa. More than 300 million Africans depend on maize as the main staple food. Maize accounts for 30–50% of low-income household expenditures in Africa where its production was around 75 million Metric Tons in 2018, representing 7.5% of global maize production. However, several challenges severely undermine maize production. These includes drought, diseases and insect pests such as the fall armyworm invasion.

Fortunately, many proven technologies such as climate smart maize technologies, pest and disease tolerant varieties among others, have been developed by researchers worldwide to address some of these challenges. As part of its mandate in the program, the TAAT Maize Compact (TMC) embarked on activities to: increase maize productivity, increase uptake and use of high-yielding climate-smart maize hybrids by smallholder farmers; increase income in the maize value chain by facilitating improved market linkages and entrepreneurship; increase number of women and youth participation in the value chain; and create employment in Africa.

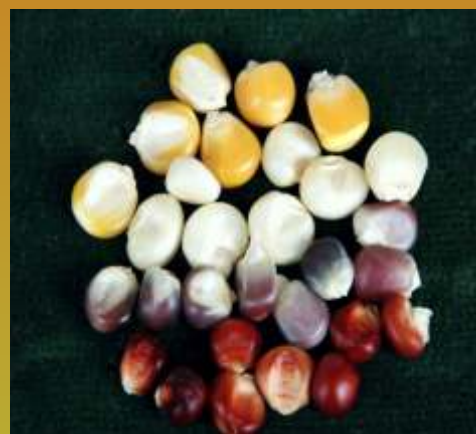
These technologies are being deployed in the following countries: Benin, Cameroon, Central African Republic, Congo DR, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. The TMC is led by African Agricultural Technology Foundation (AATF). The Compact works closely with the TAAT Fall Armyworm Management Enabler Compact (TAAT-FAWEC) led by IITA.

TAAT-FAWEC is responsible for the scaling up and deployment of proven and/or promising FAW management technologies to smallholder farmers in Africa. The Compact achieves this by creating an enabling environment for accessing and deploying IPM-based FAW management technologies; disseminating FAW monitoring/surveillance and scouting tools in Regional Member Countries (aligned with the initiatives of country programs and development partners); and building the capacity of implementing partners and farmers in FAW identification, field scouting/assessment and pest management.

TAAT-FAWEC further fulfils its mandate by validating field performance of novel

Technologies being scaled up:

- *Climate smart maize technologies – Water Efficient Maize for Africa (WEMA) and Drought Tolerant Maize for Africa (DTMA)*
- **Appropriate Fertilizer blends**
- **Optimal Maize Planting Density**
- **Efficient Pest and Weed Management**
- **Post-harvest Management**
- **Supportive Marketing**
- **Mechanization and Good Agricultural Practices.**



management technologies either as a stand-alone solution or as toolkit combinations. It also leads in upscaling and deploying proven and/or promising FAW management technologies. One of the strategies used is showcasing proven/promising management technologies through Demos and Field Days to enhance participatory learning and uptake by farmers. The final piece is conducting monitoring and evaluation to measure progress and achievements of the Compact and its activities.

Success Stories

Low Maize Productivity *(Countries: Kenya, Uganda, Tanzania, Zambia and Zimbabwe)*

What was the problem?

The production of maize in Africa is expected to register a Compound Annual Growth Rate (CAGR) of 3.2% by 2025. And Africa consumes 30% of the maize produced in the world, with West, East and Central Africa accounting for 21% of the consumption. Around 14 countries of these sub-regions of Africa consume 85-95% of maize as their staple food rather than as animal feed. Maize provides basic diet to millions of people in Africa. The cereal is the cheapest source of calories among the cereal grains, making up about 65% of total food calories consumed by households in Africa. To meet this demand, maize is produced on 40% of the total crop area and it is mainly by smallholder farmers. Most of the maize is produced in rain-fed areas. It is also common to find maize being grown in those regions frequently hit by drought conditions in Africa.

Constraints affecting maize production include drought, low soil fertility, pests and diseases. Foliar (leaf) and stalk/ear rot diseases and stem-borers have traditionally caused great losses in maize production across the continent. Climate-smart agriculture could assist farmers adapt to changing weather conditions, increase climate resilience and improve farmer incomes.

Empirical evidence suggests that many farmers depend on informal seed systems with the commercial seed markets making up about 10% of the total seed planted by farmers. The reliance on informal seed systems, has a negative impact on productivity in the region attributed to

genetically weaker seed which is more susceptible to emerging biotic and abiotic stresses. However, smallholder farmers in Africa often shy away

from investing in high-yielding climate smart maize seed varieties due to limited access to viable output markets. In general, farmers have highlighted weak output market linkages. Maize marketing is usually controlled by brokers and middlemen who pay low prices during harvest times. Hence, there is little incentives for these farmers to invest in maize farming as a business or invest in climate smart-agriculture that could involve buying more expensive inputs.

Intervention

The TAAT Maize Compact initiated the move to strengthen the TAAT Regional Technology Delivery Infrastructure (RTDI) by engaging maize off-takers or Food Chain Millers (FCM) in Kenya to create demand for both maize seed and grain. Adopting its innovative approach of aggregating farmers into groups, Food Chain Millers (FCM) offer farm input credits to maize farmers. This includes improved climate smart maize variety seeds acquired through the Compact. They then purchase harvested grain from the farmers after harvest. Through this mechanism, the farmers pay off their creditors through the sales made to FCM and make a profit because they utilised proper seeds and other inputs that increased their yield per hectare.

Outcome and Impact

Through this initiative by the TMC, the FCMs have maintained a pool of over 2,400 smallholder farmers who supply them with maize grain annually. With formal contractual agreements with the farmers, FCMs were able to purchase about 4,320 MT of maize grain in 2019. They processed 3,600 MT and 720 MT of maize flour and animal feed, respectively. These products were then sold in the open market. This value chain development has led to higher incomes for multiple stakeholders including seed producers, farmers, grain processors, and other key players along the value chain. Through this partnership with the TMCs, farmers have the incentives to adopt climate smart maize hybrids in Kenya, particularly hybrid DroughtTEGO® (WE1101), with a promise of high productivity and access to grain markets.



A maize field in Western Kenya experiencing low yields

Low Resilience against Fall Armyworm Invasion in maize and other cereals crops

(Countries: Zambia and Zimbabwe)

What was the problem?

Maize is a key cereal crop in Africa which is central to livelihoods of approximately 300 million people. However, a myriad of biotic and non-biotic factors threaten maize production, including climate change, diseases and pests. One of the most damaging pests affecting maize in Africa is the fall armyworm. Fall armyworm feeds on and damages about 80 different crop species. However, when it comes to maize crops it is known to cause 50 to 100% grain yield loss. Such damages in areas that rely on maize as a staple crop poses a major threat to maize productivity and food security in Sub-Saharan Africa. Despite efforts by farmers to employ various control mechanisms, the effects of FAW continue to ravage farmers' fields.

Intervention

Efforts by researchers are yielding results, such as potent seed treatments. Scaling out use of these technologies is thus key to preventing the spread of the Fall Armyworm pest. With support from the African Development Bank, the TMC and the TAAT-FAWEC led by IITA, were able to jointly access Fortenza Duo (FD) chemical treatment. Fortenza Duo is a systemic treatment that offers protection to maize crops against FAW up to 4 weeks after germination, which is usually the most critical stage in maize growth. This technology minimizes the chemical sprays by farmers thereby reducing production cost. TMC and TAAT-FAWEC, in partnership with an existing government programme as well as selected seed companies, initiated the deployment of over 36,000 liters of Fortenza Duo seed treatment to seed companies in Southern Africa. The companies used 17,440 liters of the FD to treat over 3,007 tons of 40 climate smart maize varieties in Zambia and Zimbabwe. These seeds were deployed to more than 300,000 farmers in both countries.

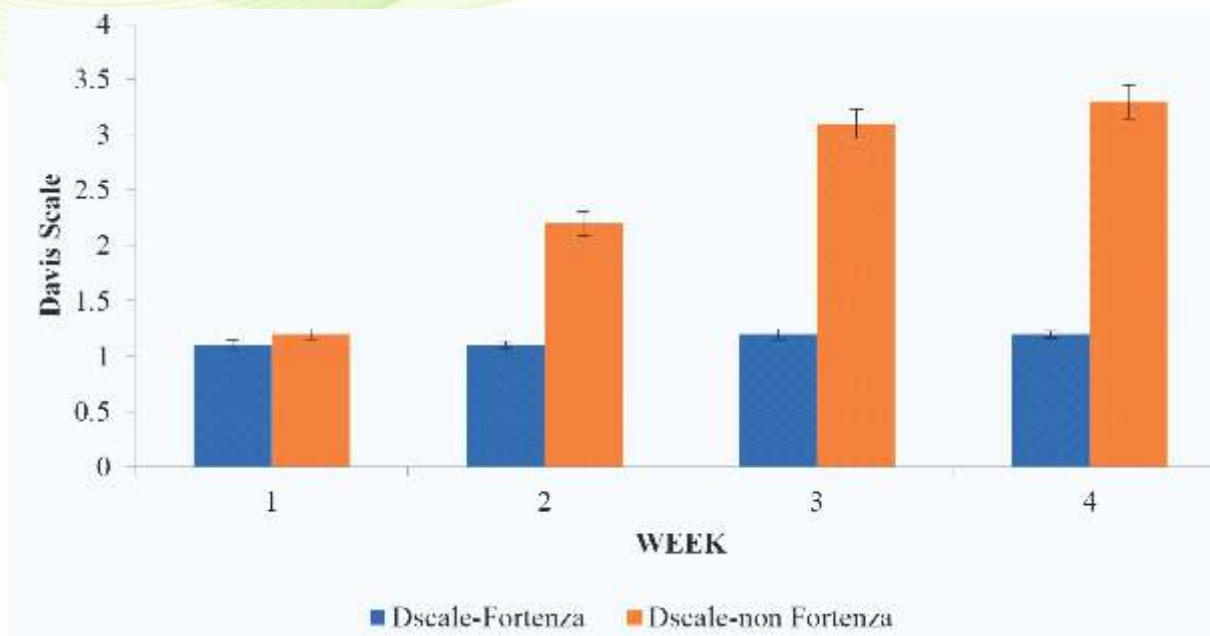


Basirio Mumbi, a happy farmer in Mpongwe district Zambia displaying his Fortenza Duo treated seed before planting

Outcome and Impact

Results from 4-weeks of continuous FD monitoring missions indicated that FD treated fields had good crop stand as compared to the non-FD treated fields. The fields showing positive results had insignificant to no FAW damaged foliar (Davis Scale 1 – Fig. 10), fewer number of FAW larvae, lower number of plants with fresh window panes and infected whorls.

Basirio Mumbi is one of the farmers who attested to the effectiveness of the FD treatment. He called on the government and seed stakeholders to ensure sustainable availability of the FD seed treatment to benefit more farmers saying, “My fields are better than the others which have Non-Fortenza Duo seed



Graph 10: Graph showing the D-scale units on Fortenza Duo and Non-Fortenza Duo fields (Scale: 1= Little or No visible damage and 4 = Whorl and furl leaves almost totally damaged)

The first 4 weeks of maize seedling are critical as they determine the eventual grain yields expected by a farmer. The FD-treated maize seed is protected for up to 4 weeks after germination, implying that with proper farm management, it provides better chances for the farmer to reap higher yields. The farmers that used the treated maize got a good crop stand, better ear formation and grain size. Hence, over 300,000 farmers got a good harvest despite the FAW devastating the untreated maize. A good harvest allows the farmers to sell their surplus production and maintain the remainder to feed their family.



Fall armyworm on a maize plant

Weak Spraying Service against Pests

(Country: Zambia)

What was the problem?

Fall armyworm invasion has contributed to huge losses in maize production among smallholder farmers in Africa. Research and farmers' indigenous knowledge have demonstrated that for effective control of the damages caused by fall armyworm, adoption of Integrated Pest Management strategies (IPM) strategies is key.

Intervention

It is against this background that the TMC in collaboration with Corteva Agriscience, a member of Crop life International Association, deployed "Delegate" insecticide to be used in the control of FAW 4 weeks after germination. During this time, the effectiveness of FD treatment is minimal. Ideally, only 2 sprays of delegate are needed after the fourth week to control FAW infestation up to harvest. However, in highly infested areas, the number of sprays can be increased to three. TMC tapped into the Crop life existing platform in over 80 countries, to enhance training of farmers and agricultural workers in the responsible and effective use of crop protection products. The Compact enhanced its work with youth groups affiliated to the National Union of

Farmers in Zambia, to expand coverage and reach of farmers with this toolkit. TMC in partnership with Corteva Agriscience recruited youths, who were trained in the provision of spraying and stewardship services among maize farms in Zambia. With support from the agricultural officers, the youths were able to spray the maize fields in two districts of Zambia, namely, Chongwe and Mpongwe, after the 4 weeks of FD had elapsed.

Initial presentation of the plants illustrated that fields with Fortenza Duo + Delegate had much less infestation of FAW than Fortenza Duo + Non-Delegate fields. Farmers were very receptive to this initiative and requested that the service be made available to help more farmers. The advantage in working with private sector Crop Life Programme is that it ensures access to quality products, stewardship package from the partner companies and training, and monitoring. The Project further connects the trained youths (Spraying Service Providers) with Agrovet outlets and farmer groups in the maize value chain. Apart from effectively helping smallholder farmers to control FAW damage on their maize plants, the initiative also exposed youths to a new business model. They can start crop spraying enterprises in the maize value chain and other crops to improve their livelihoods while transforming farming practices in their communities.

Low level of Hands-on, Practical Training

(Location: Lusaka, Zambia)

What was the problem?

Since the advent of fall armyworm in Africa in early 2016, several Training of Trainer (ToT) programs have been conducted. The goal is to build the capacity. These trainings have been conducted with the national program personnel involved in agricultural research and extension. They have also been conducted both at the national and regional levels. The training curricula have helped to build the capacity of trainees. During trainings by other partners, more time is allocated to PowerPoint presentations at the expense of hands-on practical field training. Unfortunately, some components of the training



TAAT Maize Affiliated Stewardship Service Provider (SSP) sprays maize crops with Delegate insecticide after 4 weeks of Fortenza Duo protection in Mpongwe, Zambia.

programs which are regarded to be basic and adequately explained in handouts are the ones which are instrumental to determining whether the participants understand the essence of the training or not.

Intervention

Mindful of the deficiencies in most FAW Training-of Trainers (ToT), TAAT-FAWEC organized a FAW ToT Programme at IITA's Southern Africa Research and Administration Hub (SARAH) Campus, Lusaka, Zambia. The ToT workshop taught participants how to identify FAW directly based on the morphological features as well as indirectly based on damage on maize crops. The training also educated farmers on how to identify other insect pests infesting maize alongside FAW, confounding its damage and provided field assessment in order to determine FAW incidences and damage levels. Participants were also trained on the calibration of spray equipment and managing of FAW using inexpensive resources

Outcome and Impact

Participants welcomed the on-field demonstrations of sprayer calibration using an actual standing crop at different phenological stages. Opportunities to discuss the merits of using mechanical control methods such as the application of sand to plant whorls vis-à-vis application of conventional chemical pesticides. The participants assessed FAW infestation and general crop health in a maize crop in which some plots were under sand-in-the-whorl treatment and others had Ampligo® (chlorantraniliprole + lambda cyhalothrin) sprayed every 2 weeks. Participants were particularly grateful to the compact for training them on how to accurately estimate the area of a field (or pasture) under infestation by FAW and other pests such as African armyworm. Participation and feedback were encouraging. One participant noted, *embarrassing to realize that all along we have been providing wild guess-estimates of field areas when the starting point is a simple pacing exercise on a piece of flat ground and then calculating the average length of one's stride when moving at a comfortable walking speed.*



One of the ToT participants demonstrating what was learnt at the programme

“It's embarrassing to realize that all along we have been providing wild guess estimates of field areas when the starting point is a simple pacing exercise on a piece of flat ground and then calculating the average length of one's stride when moving at a comfortable walking speed.”



Women rice parboilers using the new GEM parboiling technology at the Malanville Innovation Platform, Benin Republic

TAAT Rice Compact

***Boosting Africa's self-sufficiency
in rice production through
enhanced and scalable
deployment of impactful
technologies, innovations
and products in the rice
value chain.***

Introduction

As at 2015, rice consumption in African countries was estimated to be approximately 26 million (MT) of which 13 million MT, representing about one-third of what is traded on the world market, was imported to the continent. Rice consumption in Africa is projected to reach 34.9 million tons by 2025. The African Development Bank estimates that the rice sector has the potential to become an engine for economic growth across the continent. It is expected that the demand for rice will increase as result of population growth, increased per capita consumption, and a shifting preference towards 'premium' rice. The latter is linked to increased urbanization. Therefore, Africa will need to produce approximately 13 million additional tons of premium rice per year. Increasing rice production to meet this need is expected to improve the livelihood of at least 3 million producers and lead to economic gains of about US\$ 5.5 billion per year among African countries. However, in order to achieve this, Africa needs to develop holistic technology deployment mechanisms and infrastructures to support widespread distribution and commercial adoption of high-yielding climate-resilient rice varieties.

As part of its mandate in the program, the TAAT Rice Compact (TRC) contributes to the 'Feed Africa' initiative through deployment of rice technologies in the rice value chain. The compact seeks to achieve a 25% yield increase in rice production while creating 70,000 jobs. About 50% of those jobs will be women and the youth. This will also contribute to a 50% increase in annual household income and a further reduction in wood consumption in rice parboiling segment targeting the high-end markets.

Technologies being scaled up:

- Improved and climate smart rice varieties (including ARICAs, ORYLUX) and hybrids
- GEM rice parboiling technology
- ASI Thresher
- RiceAdvice
- Good Agricultural Practices.
- Small-scale irrigation and water management technologies (in collaboration with Water Enabler Compact)

Led by AfricaRice, TRC's focus countries are Benin, Cameroon, Cote d'Ivoire, Ghana, Madagascar, Nigeria, Uganda, Sierra Leone and Senegal as tier 1 countries. The tier 2 countries are Burkina Faso, Togo, Mali, Guinea, Kenya, Liberia, Niger, Tanzania and Zambia. TRC works with the TAAT Water Enabler Compact (TAAT-WEC). Led by the International Water Management Institute (IWMI), TAAT-WEC supports the Rice Compact by providing proven water management technologies that expand efficient and effective water use by farmers in a sustainable manner. TAAT-WEC also provides small-scale farmers with pathway to gaining access to low-cost irrigation and water management technologies. They promote appropriate technologies for the farmers' fields that increase crop yields and hence higher profitability.



hybrid rice farm in Senegal

Success Stories

Low Rice Productivity (Country: Nigeria)

What was the problem?

Nigeria is the leading consumer of rice in Africa. The country consumes 7 Million MT of rice per year representing 21% of total rice consumption in Africa whilst producing 4.9 Million MT of milled rice (6.5 Million MT of paddy) representing 19.7% of the total production on the continent and currently it has overtaken Egypt as the leading producer of rice. However, there is still a gap of 2.1 MT of rice that is covered by imports. This is largely

due to under investment in the rice value chain from farmer fields to the fork. There is little adoption of high-yielding, climate-resilient rice varieties, poor adoption of good agricultural practices and post-harvest packaging challenges. Rice in Nigeria is mainly produced by small-scale producers who usually sell 80% of total production, the rest is used at the household level. To increase Nigeria's

domestic rice production, the government adopted several measures. Some of these included outright ban on importation of rice and closure of all land borders. These measures increased the demand for domestically produced rice. Higher demand for higher quality rice has increased the quality of domestic parboiled rice. However, the domestic production supply has been below the demand, leading to higher prices and some rice shortage.

Intervention

Leveraging on the Innovation Platform (IP) established at Bukan-Sidi Lafia, Nasarawa state under the African Development Bank-sponsored project "Support to Agricultural Research for

Development of Strategic Crops" (SARD-SC), the TRC opted to use the existing infrastructure laid within the IP to introduce Grain Quality Enhancer Energy-efficient and Durable Material (GEM) rice parboiling in Nigeria. Through awareness campaigns, field days and workshops, the compact introduced GEM rice parboiling technology to value chain actors, farmers, millers, seed producers and extension workers. To be effective, the compact sought the buy-in of the local authorities. Hence, they engaged State Ministry of Agriculture, traditional rulers (Amir),



Justina Musa, a rice parboiler from Bukan-Sidi Lafia, in Nasarawa state, north-central Nigeria

farmer groups, traders, and women and youths, to promote quality GEM domestic parboiled milled rice. In addition, the TRC introduced the rice husk-fueled GEM parboiling system that can completely substitute firewood fuel with rice husk. This innovation saves on average, approximately US\$ 30 per ton compared to the cost of firewood to parboil the rice.

Outcome and Impact

In mid-2019 the Nasarawa state government (North-Central Nigeria) acquired a 12 MT integrated rice processing mill. It was then leased to the Bukan-Sidi Lafia rice IP at 80,000 Naira (US\$ 223) per month for 3 years. The IP in return floated shares of 500,000 naira (US\$ 1,389) raising 5 million naira among its membership.

Within a month, the IP generated over 19.7 million naira (US\$ 53,968.31) through service provision and sale of quality domestic parboiled rice. The IP has employed 16 women and 7 men. Using the rice husk-fueled GEM rice parboiling system by the IP in Nigeria for example, over 65 million Naira (US\$181,800) was generated within one year (2019) from selling 218.15 tonnes of quality domestic parboiled rice. Paulina Michael, a rice parboiler from Akwanga, Nasarawa state is happy with the noticeable transformation in her life and family. *“Truly, I have seen changes with this GEM rice parboiling technology. The process is much easier and less cumbersome than the old technology. At the end, I have better rice quality that everyone wants to buy. Before this technology was introduced, we milled the rice and did not even blow it to remove the chaff. We used to put it into the drum add water with the dirt. But now with the GEM technology, we wash our rice thoroughly to ensure that it is clean with no sand or stones and the market loves it”.*

Tabitha Illiya, a retired nurse who now parboils rice at the Bukan-Sidi Lafia mill added with satisfaction, *“Now my life has improved. I was able to get a loan of N 450,000 (US\$ 1,233) to buy a grinding mill and I have already paid back the loan. I can boldly say I have a grinding mill, employing up to five women.”*

According to Mr. Naphtali Jeremy Dako, Permanent Secretary at the Ministry of Agriculture and Water Resources in Nasarawa State, there is no doubt that the rice Innovation Platform and GEM parboiled rice have contributed greatly to increasing food security in the State. The government policies will now encourage rice producers, millers, and marketers along the value chain so that rice sector will be a key driver for job and wealth creation in Nasarawa state and in Nigeria as a whole.

Non-adoption of climate-smart rice varieties by smallholder rice farming (Country: Guinea)

What was the problem?

Farmers are using poor quality seeds and old varieties that are not climate-smart in Guinea. There is a higher frequency in droughts, erratic rainfall, and frequent flooding in the rice growing areas. Yet, the farmers are still reliant on the old



technologies and poor rice management practices.

Intervention

TAAT Rice Compact managed by Africa Rice Centre is working with the Africa-wide Rice Breeding Task Force (TF). This a key catalyst of the rice technology delivery infrastructure, that has developed rice varieties that are tolerant to key biotic and abiotic stresses. These varieties are;

- **NERICA L19sub1 (submergence/flood tolerant at vegetative stage)**
- **Aromatic ORYLUX 6 (Basmati group of rice), recognized for their excellent grain quality, taste, and early maturing**
- **hybrid ISRIZ 09 (AR051H) –released by ISRA in Senegal with excellent grain quality (long grain with firm texture) and good taste**

These varieties form part of the latest generation of rice varieties for Africa. These new mega varieties are suitable for rainfed lowland ecologies where there is limited or no water control and the irrigated ecology where water control is practiced. Yields of up to 7 tons per hectare have been obtained with the inbred varieties while the hybrid yields on average 9.9 t/h in the Senegal River Valley. The Japan Emergency Seed Project for Guinea in collaboration with TAAT Rice Compact produced over 10 tonnes of foundation seed of widely cultivated mangrove and lowland

rice varieties – Mbapeya (local landrace) and ROK5. These varieties are very old with low yields. Therefore, there was a need to increase the varietal portfolio in Senegal (especially with new mega climate-smart rice varieties in Guinea and beyond). TRC added over 1 ton of foundation seed of NERICA L19sub1 and WITA 4sub1 to the initial number. From the foundation seed of these new varieties, at least 400 tonnes of certified seeds are expected to be produced by farmer seed producers, with technical support from the Institute de Recherche Agronomique de Guinée (IRAG). The expected certified seed will be enough to cover 8000 ha and reach 32,000 smallholder rice farmers in Guinea. This intervention has the potential to reach 160,000 individuals.

Outcome and Impact

To illustrate the impact of this intervention we visited a smallholder farmer – Abou Camara of Koba in Guinea who has been involved in rice farming since 1998. During the intervention he received Mbapeya and ROK5 and the new climate-smart varieties NERICA L19sub1 and WITA 4sub1. During the monitoring and evaluation farm visit at crop maturity stage, he revealed that he has been receiving rice seeds from AfricaRice since 1998, including NERICA L19 in 2016. The NERICA L19 which he received in 2016 did not have the flood-

tolerant submergence gene. However, the new NERICA L19sub1 and WITA 4sub1 have the flood tolerant gene. Abou reported that these varieties were able to tolerate flooding when it occurred at the vegetative stage, for a period of 10-days. Both NERICA L19sub1 and WITA 4sub1 showed potential of good harvest despite the flooding in his farm. *“I have never experienced something like this in the past with rice varieties. I am proud of this scientific achievement”*, concluded Abou.

Low yields due to limited access to water (Country: Nigeria)

What was the problem?

Nigeria has high potential for rice production. However, the sector is plagued by low yields. Hence, the local supply of rice cannot meet the demand. The shortfall is then met by imports that drains the country's foreign exchange.

Intervention

Rice farmers in Nasarawa State, North-Central Nigeria, can now cultivate rice year-round, thanks to the introduction of modern water management interventions by the TAAT Water Enabler Compact (TAT-WEC). In partnership with the TRC, TAAT-WEC introduced modern water-efficient irrigation systems that work well for dry season cultivation farmers. This was at the Bukar-Sidi-Lafia Innovation Platform. The irrigation system consists of shallow tube wells, petrol pumps, and a pressurized Polyvinyl Chloride (PVC) pipe conveyance system. This facilitates easy lifting of ground water resources available year-round and distributes water to the fields with zero losses.

Outcome and Impact

The relatively low investment costs of the water efficient irrigation system allows the Nigeria's rice farmers to



Laying the pressurized PVC pipe distribution system in Nasarawa

intensify agriculture and significantly increase their income. With expanding knowledge of the technologies, farmers now cultivate rice as a second crop during the dry season. They are able to rotate the rice crop with more lucrative crops such as tomatoes and vegetables. Farmers in the region are delighted with TAAT-WEC's intervention which complements new high-yielding varieties that lead to increased crop yields. Prior to the introduction of this system, farmers were not able to cultivate anything in the dry season. The other technologies were very expensive and did not have good water management practices. The chairman of the Bukan-Sidi Rice Innovation Platform, Mr. Joshua Jonathan commended TAAT-WEC for the initiative in Nasarawa State. *"The gesture is a solution to the lingering water management challenges faced by dry season rice farmers in the state."*

Low Yields due Limited Access to Water (Countries: Burkina Faso and Mali)

What was the problem?

Traditionally, farmers irrigate vegetables and other crops by excavating wells by hand and lifting water using buckets. Limited access to water is the major reason accounting for low rice productivity in Burkina Faso and Mali. Therefore, adoption of water irrigation technologies can lead to increased productivity in rice thereby reducing imports.

The TAAT-WEC in collaboration with the TRC demonstrated efficient delivery systems utilizing PVC pipes and valves in the two countries. The technology reduces unnecessary water spillages and associated expenditures for fuel. This technology has already improved wheat production in Nigeria. Participating farmers now plan to expand their irrigated land during the dry season with rice and other crops that are suitable for lowland environment production.

Major outcome and impact

Rice Farmers in the lowland areas around Bobo Dioulasso in Burkina Faso and Sikasso in Mali can now extend their agricultural season to the dry season thanks to technologies brought by the TAAT-WEC. Rice farmers can now tap into shallow ground water aquifers using the tube wells and motor pumps brought by the compact. Like most of his colleagues, Ibrahim Issah, a rice farmer from Bobo Dioulasso is hopeful about the positive outcomes of the newly introduced tube wells. *"Every farmer will have access to water for irrigation. With the introduction of modern irrigation technologies, farmers can properly harness available groundwater to expand their production. We are very grateful to the new initiative" Issah observed.*

The major achievement is that farmers go from one season (rainy season) to two seasons. Therefore, they intensify rice production by 200%. There are opportunities for farmers to cultivate even up to three crops should they choose the right varieties and adopt the right cropping calendar. However, farmers instead of planting two rice crops per year, they prefer to rotate their production by growing irrigated vegetables in the dry season. This is a logical choice as these are higher value crops. The use of varieties recommended by AfricaRice and national partners and use of new technologies increases yields even if they choose to grow only one season of rice.



Rice farmers in Sikasso, Mali participate in the installation of tube wells

TAAT High Iron Beans Compact

“Intensifying High Iron Beans production by creating access to better quality seed and complementary productivity-enhancement technologies; enhancing business opportunities; and increasing investments along the bean value chain”



HIB varieties promoted by the TAAT HIB compact

Introduction

Common beans are a major and affordable source of protein, minerals (iron, zinc, calcium and potassium), fiber and vitamins that offer many health benefits. High Iron Beans (HIB) are biofortified to increase the iron and zinc content that help to reduce blood disorders such as anemia (especially in women of reproductive age), impaired physical and mental development (especially among children under 5 years), delayed maturation, poor appetite, poor reproductive health in men, and impaired immune function.

The TAAT High Iron Bean (HIB) Compact interventions build on the Pan Africa Bean Research Alliance (PABRA) model of the “Bean Corridor” as a market-driven transformation approach to scale. PABRA's model brings together a wide range of stakeholders (research, extension, donors, private sector, and farmers) at the country level. Collective innovation is catalyzed in the bean corridor through the establishment and facilitation of bean business platforms linking various actors in the HIB value chain. With this approach, the Compact contributes to: (i) enhanced HIB production and productivity (ii) business opportunities and increased investments along the bean value chain, (iii) increased incomes especially for women and youth, and (iv) enhanced nutrition and food security of target households.

The TAAT-HIB Compact (THC), through public-private partnership is giving bean farmers (including women and youth) access to better quality seed and complementary productivity-enhancement technologies. The bean corridor model provides structured markets for HIBs with private sector as a key player in terms of marketing and processing of value-added products. Ultimately, these efforts will result in improved food and nutrition security and enhanced incomes for HIB farmers and other value chain actors.

Bean technologies being deployed at scale

The focus of THC is disseminating biofortified and yield-enhanced bean varieties that are resilient to drought and root rot disease. They include both bush and climbing varieties promoted alongside Good Agricultural Practices (GAPs) to enhance productivity. The GAP technologies include seed dressers, organic and inorganic fertilizer use, cropping systems, bean threshers, solar bubble driers, and hermetic storage bags among others. Two processed products (precooked beans and bean flour) are also deployed in partnership with nutrition focal points within the PABRA network. HIB national technology delivery platforms (steering committees) oversee the wide deployment of these technologies across their respective countries.

THC is led by the Alliance of Bioversity International and CIAT. The HIB interventions target eight (8) countries: Burundi, DR Congo, Kenya, Malawi, Rwanda, Tanzania, Uganda and Zimbabwe.



HIB varieties

Success Stories

Low Bean Productivity, Malnutrition, and Poverty Country: Zimbabwe

What was the problem?

Over 92% of Zimbabwean rural households practice agriculture as their primary livelihood, with food crop production and casual labor being



Chimanimani Busy Lady women group displaying their HIB by-products during a TAAT MEL visit

the most important sources of income. However, about 70% of the local population depend on rain fed agriculture, leaving them to the vagaries of rainfall and temperature variations and natural disasters such as cyclone Idai that hit the country in 2019. As result of the unexpected variances in the climate, rural households continue to experience food insecurity with hunger and stunting widespread in many communities. Stunting slows down children's growth and brain development affecting a child's development. Stunting is a result of micronutrient deficiencies specifically iron and Vitamin A that causes anemia and reduced cognitive development. Farmers in Zimbabwe's Nyanga and Chimanimani Districts and some parts of Gokwe South were growing bean landraces using unimproved and non-biofortified varieties for subsistence and income generation. The yield and market value of these varieties is low leading to discouragement among farmers. A 2016 PABRA baseline study on the status of bean yield in Zimbabwe revealed a wide range of bean yields. Approximately 35% of the households producing greater than 1 t/ha, 17% producing 0.5 to 1 t/ha and 47% producing less than 0.5 t/ha across different agro-ecological zones within the country.

Intervention

To address the productivity gap as well as the gaps in nutritional diets, the THC introduced climate smart, high-yielding and micronutrient-rich bean varieties (rich in Iron and Zinc) into farming communities in the Manicaland Province, Mashonaland Central and Midlands Province of Zimbabwe. The Compact engaged 40 primary schools and 28 farmer groups (youth, women and mixed) consisting of 793 people, to produce HIB grain for sale and processing to value added products. Using the bean corridor model developed by PABRA, through resources provided by THC, farmer groups received start-up packs of 5 Kg per HIB variety (NUA45 and Sweet Violet) for multiplication and intensification.

THC deployed funds to catalyze development of the seed system for HIBs and focused on supporting and educating farmer groups involved in production, value addition, and school feeding. Through partnership agreements with DR & SS, LEAD Trust, Feed the Future and Alliance Bioversity-CIAT, THC funded the procurement and supply of agrochemical inputs delivered to 467 beneficiaries who were growing the new HIB varieties: NUA45, Sweet Violet and Cherry. The intervention by the HIB compact offered better opportunity for breeder seed production, mobilization of private sector. In return the private sector engage in HIB foundation and certified seed production. The THC provides capacity building on seed entrepreneurship, market opportunities linking seed companies with producers, and awareness creation campaigns on HIB in an effort to stimulate demand for high quality and nutritional seed.



The Sweet Violet HIB variety deployed in Zimbabwe

The Compact trained approximately 20,000 people in Zimbabwe during the first year of implementation. With the training received on GAPs, farmers are now able to use correct agronomic practices and fertilizer rates to improve soil fertility for increased production. At the household level, 65% of farmers have improved their knowledge and are able to

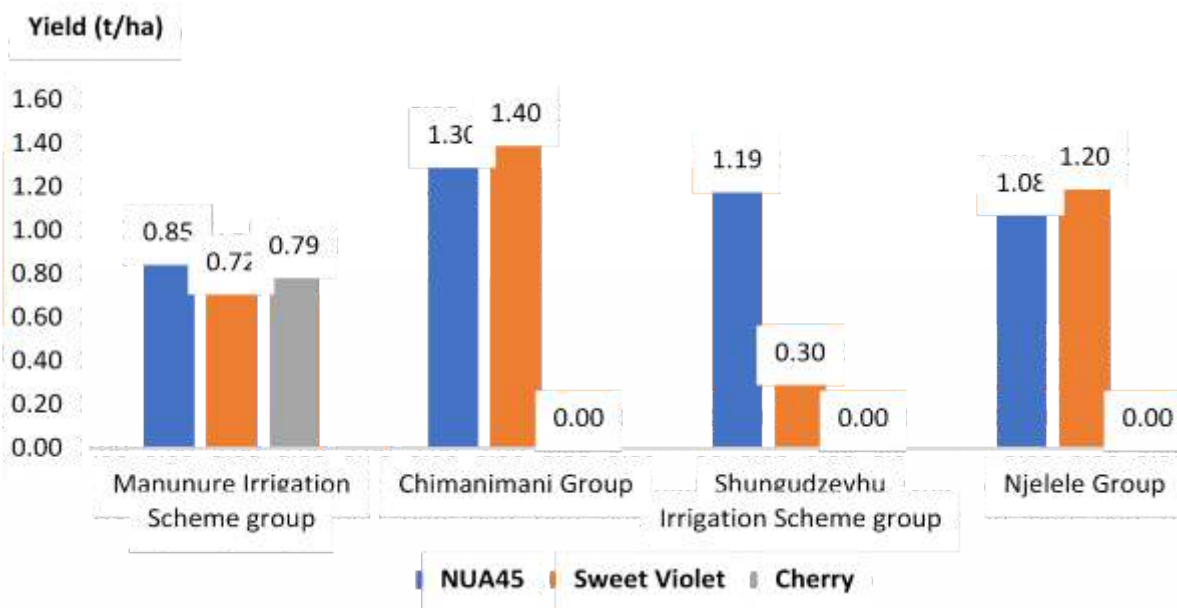


Chimanimani women groups celebrate the TAAT interventions while welcoming TAAT M&E Specialist and the HIB Compact's Technology Transfer Officer to their region

produce quality breeder seed with minimum supervision. Farmers are also able to carry out post-harvest activities such as sorting and grading of seeds before delivery to the warehouse, where records of the volume delivered by each farmer are maintained. As a result of the Compact's

intervention on GAPs, Zimbabwean farmers are now processing HIB grains into flour to cook meals for infants and feed their babies with HIB-NUA45 porridge flour. The Chimanimani Busy Lady women group with a membership of 10 women secured a stand to participate in the open provincial nutrition campaigns in November where mothers were exposed to HIB based nutritional foods for their babies. In Chimanimani District, 94 women have engaged in processing HIB-NUA45 into baby 4-star meals and hope to undertake more hygienic and sound processing methods for porridge flour. Women groups of Zimunda B, Hamamaoko and Busy Lady are now processing NUA45 into high value-added products such as juice, sausages, cakes, biscuits and baby porridge flour for sale.

An outcome case study conducted in Manunure, Chimanimani, Shungudzevhu and Njelele revealed that as a result of the TAAT HIB Compact interventions, farmers have increased productivity averaging 1.08 t/ha for NUA45, Sweet Violet 0.72 t/ha and Cherry 0.79 t/ha across the 4 groups compared to an original average yield on 0.6 t/ha. This is an increase of between 20% to 80%. This was despite the effects of Cyclone Idai, which destroyed a large proportion of the crops at germination stage in the lowland especially in Manunure.



Graph11: Yield (ton/ha) of NUA45, Sweet Violet and Cherry HIB varieties

The study also revealed that the HIB Compact has generated on average a RoI of \$8.35 for an average investment of \$5.61 per farmer. Women and youths are now engaged in profitable enterprises along HIB processing while men are engaged in seed production to get higher returns as described in previous sections.

Malnutrition (Country: Tanzania)

What was the problem?

Nutrition is one of the foundations of human health and development. Good nutrition plays an important role in people's health and well-being; conversely, poor nutrition can lead to anaemia, reduced immunity and impaired physical and mental development (World Health Organization [WHO] 2014). In Tanzania, malnutrition is one of the major causes of childhood illness and mortality. According to Tanzania Demographic and Health Survey (TDHS) of 2015-16, about three in five children aged 6-59 months and 45% of women aged 15-49 years are anemic.

The report also indicates that about 35% of children under the age of 5 are stunted (TDHS). Large proportions of school children suffer from malnutrition, adversely affecting their physical growth and cognitive ability to learn. Many school-age children in food insecure areas of the country remain out of school for extended periods of time, further negatively impacting their success in gaining good education and jeopardizing their future.

Achievements in technology scale up

The TAAT High iron Beans Compact adopted a school feeding approach as an entry point for introducing technologies that enhance nutrition and income of farming communities around schools in Tanzania. The Compact worked with 137 schools with 25 in Kagera, 10 in Iringa, 5 in Njombe, 5 in Mbeya, 10 in Songwe, 12 in Manyara, 14 in Kilimanjaro, 10 in Arusha, 7 in Karatu, and 40 in Musoma. They were provided with quality seed of JESCA, Selian 14 and Selian 15 varieties of HIB.

Of the 137 schools, 113 received 10 kg of seed each

and 24 received 20 kg of seed each. The three varieties are high-yielding and rich in iron and zinc. The schools were then guided to set up demonstration plots at their farms, where children studying agriculture gained practical lessons on GAPs to be able to apply to their farms at home. The school demonstrations were set up in close collaboration with local government authorities (agricultural extension and education departments) and Project Concern International (PCI). At the end of the season, field days were organized with a wide range of actors – teachers, parents/ farming communities, input suppliers (seed companies, agro-dealers), grain off-takers, and local government authorities. It is expected that the knowledge from the demonstrations plots will extend beyond the schools and into farming households.



Demonstration site at a primary school in Nyaga District, District, Kagera Region, Tanzania

Outcome and Impact

The school feeding approach to technology dissemination recorded high levels of participation in the field days because the schools are used as venues for various local events. This, in turn, sparked greater interest among governments who were looking for entry points for improving nutrition and enrolment in schools. By adopting high-yielding technology interventions, they get the benefits of good nutrition for the communities as well as enhancing farmers' income. The school feeding programs have created ripple effect in the wider business ecosystem by catalyzing private sector investments in provision of inputs and in marketing of good quality grain to support farmers planting HIB. The coverage of schools using biofortified beans is close to 400, which has resulted in a sharp increase in demand for seeds. For example, in Mara region, demand rose from 0.4 tons to 11 tons, while rural schools in Moshi, the demand for biofortified beans increased from 0.06 tons in 2018 to 4 tons.

TAAT Wheat Compact

Unleashing a wheat revolution in Africa by bridging yield gaps in traditional growing areas through better varieties, soil and water management, and taking heat tolerant and disease-resistant wheat technologies to a new frontier in irrigated environments in the Sahel

wheat field at Almukashfi Platform in El Gezira, Sudan

Introduction

Africa is the world's largest wheat importer at more than 40 million tons per year, at a cost of about US\$ 15 billion. This wheat import represents a third of the continent's total food import bill. Owing to stronger demand because of its uses in many food products, wheat is an imported commodity in all African countries. Yet wheat is grown on approximately 10 million hectares under rainfed and irrigated conditions across North Africa, the Sahel, the East Africa Highlands, and on the Southern Africa plateau, producing around 24 million tons per year. Wheat demand is expected to increase by an additional 8.7 million tons per year by 2025. Hence, without the right strategic sustainable interventions, wheat deficits will run to nearly 49 million tons per year. If nothing is done to stem this trend, 80% of all wheat consumed in Africa will be imported.

This situation can change substantially if proven and successful agricultural technologies are adopted and taken to scale. The TAAT Wheat Compact (TWC) is seeking greater self-sufficiency in wheat production and progressive reduction on imports. This will be achieved through guided use of improved varieties and management practices. The compact seeks to increase average wheat yields from 3 t/ha to over 6 t/ha allowing overall production to double over five years. This paves the path for over 7.7 million farmers to move into commercial wheat farming. TWC is already implementing a two-pronged approach aimed at stimulating a wheat revolution in Africa. The first approach is by bridging yield gaps in traditional growing areas of North Africa and the African highlands through the deployment of: (i) high yielding and climate smart varieties, (ii) improved soil and water management techniques, and (iii) heat-tolerant and disease-resistant wheat technologies. The second approach is deploying mechanization based on low-cost equipment and medium-scale irrigation systems that contribute to improving agricultural practices in wheat farming. National agricultural research and extension systems (NARES) are partnering with TWC in wheat expansion in terms of seed registration and bulking, extension advice, and capacity building of farmers. TWC's efforts are being linked to the private sector to

provide affordable and accessible farming inputs. As wheat is a processed commodity, millers and bakers have become critical links in TWC's value chain development drive. Wheat technologies being deployed at scale include:

- 1) Heat tolerant, disease, pest and stem-rust resistant varieties
- 2) Land preparation including raised beds and zero-tillage systems
- 3) Furrow and deficit irrigation, and sprinkler systems
- 4) Low-cost mechanized planting
- 5) Sustainable seed delivery systems

TWC is led by the International Centre for Agriculture in the Dry Areas (ICARDA) and its focus countries are Eritrea, Ethiopia, Kenya, Mauritania, Niger, Nigeria, Sudan, Tanzania and Zimbabwe. TWC works closely with the TAAT Water Enabler Compact led by IWMI, Soil Fertility Enabler Compact (TAAT-SFEC) led by IFDC and the TAAT-PEC led by AATF.



Governor of El-Gezira region appreciates the wheat quality at the TAAT Almukashfi Innovation Platform

Success Stories

Low wheat Productivity in Sudan (Country: Sudan)

What was the problem?

Wheat is one of the most important agricultural commodities in Sudan for food security in terms of quantity and calories consumed. It is grown on approximately 201,000 ha under irrigation with an



Harvesting wheat at the Al Mukashfi Platform in El-Gezira

average productivity of 2.5 t/ha. The annual wheat production stands at 513,000 MT, representing about 22 % of the total national requirement of 2 million MT. The ever-widening gap between local production and consumption led to a huge shortfall primarily covered through imports. This costs the Sudanese economy over 500 million dollars per year in foreign exchange. In 2018, farmers and other players in Sudanese agricultural sector were hit by a severe bread shortage that resulted in commodity price increases. The bread shortage was blamed on a lack of foreign currency which exacerbated the crisis after the government halted wheat import subsidies. Gezira State is the breadbasket of Sudan, producing about 60 percent of commercial wheat grain in the country. It is located between the two Nile Rivers, occupying about one million hectares and inhabited by close to 1.2 million people. For many years, production of certified wheat seeds in Sudan declined progressively.

Intervention

To tackle the wheat crisis, TWC in collaboration with partners such as Sudan's National Agricultural Research System and the private sector, released a number of high-yielding, heat-

tolerant wheat varieties namely Imam, Goumria, Zakia, Elnielain and Bohain each with production potential of 5 to 8 t/ha into the market. Over 1,260 hectares of basic seed is under production to further multiply to certified seeds for the next season ensuring wider accessibility of quality seed to farmers. In 2018/19, a total of approximately 29,965 MT of certified and high-quality seed was produced and disseminated, covering an estimated total area of 299,650 hectares. This area coverage is close to the entire wheat area in the country. The expected production of certified wheat seed in 2020 will be 76,000 MT. This will be enough to plant half a million hectares of wheat. The partnership established six Innovation Platforms sites, production and delivery of high-quality seeds, scaling up and adoption of proven wheat technologies and capacity strengthening of different

stakeholders along the wheat value chain in Sudan. TWC and its partners are rewriting the story of wheat in Sudan.

Outcome and Impact

Recent experiences to promote heat tolerant wheat varieties in Sudan through the African Development Bank-funded SARD-SC (Wheat) project revealed that technology-adopting-wheat farmers across project intervention sites increased their wheat productivity from 4 to 7 t/ha. When farmers conserve their traditional varieties they rarely exceed 2.5 t/ha. Adopting new technologies leads to increasing the yields by 100%. Abdelaziz Mahmood and Idriss Al-Hassan, both technology-adopting farmers under the TAAT Wheat program, expressed their happiness with the impressive performance of heat-tolerant wheat varieties. "We are expecting to realize yields of 4 to 6 t/ha this season, as compared to 2 t/ha we are used to before joining the TAAT program," Al-Hassan said. At Wadelneim village, a group of innovative farmers who adopted the heat-tolerant varieties (Zakia and Imam) shared their views with field day participants that they are expecting to achieve yields of 6-7 t/ha from their farms. They further indicated that the hands-on training that TAAT-organized at the farmer field school and proper

application of the recommended technology packages were the keys to their success.

Low Wheat Productivity in Ethiopia

What was the problem?

With an estimated production of 4.6 million MT of wheat per year, Ethiopia is Africa's largest wheat producer. However, domestic demand is estimated at 6.3 million MT. The increasing rise in income witnessed in Ethiopia in the last decade has fueled the rising demand for wheat. Demand for wheat in Ethiopia is growing at 5% per annum, while production is growing at a lower rate of 1 to 2% per annum. Wheat is mostly grown in the highlands with better rainfall, from which 4 million MT of wheat grain are harvested. Ethiopia currently imports 1.6 million MT of wheat, via the Djibouti Port some 700 km from Addis Ababa, to meet the shortfall. The gap in wheat supply is projected to double to 3 million MT in the next five years. Given the need to conserve scarce foreign exchange, provide employment to the youth, and remove the added cost to food consumers, the government of Ethiopia embarked on a wheat self-sufficiency campaign.

Intervention

TWC began to work with the Ethiopian government and seed companies to bulk up seeds of five heat-tolerant varieties released in Ethiopia through the African Development Bank-funded SARD-SC project. By the end of 2019, the TWC had established 20,000 hectares of irrigated wheat, and that was 10% of the target. This was in the lowlands of Ethiopia working with 28,000 smallholder farmers. The farmers used an existing irrigation scheme used for cotton and other crops that has now been adapted to wheat as a “winter season” crop. The Compact deployed excellent heat-tolerant wheat varieties in collaboration with the local partners consisting of wheat seed system specialists, agronomists, and breeders. This was made possible through a strong commitment of government to provide seeds and fertilizer to farmers. Hence, TWC was able to achieve rapid progress in Ethiopia.

outcome and Impact

TAAT continues to reinforce the opening of new frontiers in wheat production in Ethiopia. This is through scaling up of climate-resilient, high yielding wheat varieties in traditional rainfed highland areas and heat tolerant high yielding wheat varieties to expand wheat production in irrigated lowland areas. As part of the technology deployment, women and youth were engaged through the establishment of business-centers. The business centers were set up to promote rural entrepreneurship, and access to credit facilities for inputs (seed, fertilizers, and agro-chemicals) for both smallholder and large-scale farmers. The government of Ethiopia was convinced by the good performance of ICARDA's heat-tolerant wheat varieties in Ethiopia's lowland under the then bank-funded SARD-SC program. Hence, it has included wheat expansion as part of its policy and established a 200,000 Hectares of irrigated wheat fields in the hot and dry (300-400 mm of rainfall a year) Ethiopian lowlands around the Awash river. The Innovation platforms set up by SARD-SC and reinforced by TWC inspired the Government of Ethiopia to establish a high-level committee in the Agricultural, Finance, Trade and Industry, and Water and Irrigation Ministries, and expanded the wider adoption of new methodologies, significantly improving water resource management.



Elfnesh Bekele in her TAAT-supported wheat field in the Ethiopian lowlands

Approximately 21,000 hectares of wheat is now being cultivated under irrigation in three river basins on programs spearheaded by the Government of Ethiopia. Moreover, new partnerships with large-scale cotton farms were established and expectations are for a bumper crop harvest with yields expected to reach 6 t/ha. At an estimated average yield of 4 t/ha, a total wheat production of 840,000 MT is expected, which, at the projected conservative price of US\$ 250, can save Ethiopia about US\$ 210 million per year.



PVC Conveyance and distribution technology deployed by the TAAT-WEC in Kano, Nigeria

Low Wheat Productivity in Nigeria (Country: Nigeria)

What was the problem?

With a production of 60,000 MT annually, wheat remains the least cereal locally produce in Nigeria, although widely consumed. In 2013, the country's wheat consumption was estimated at 4.1 million tons creating a huge market potential in the wheat supply gap. By 2017, 5.4 million tonnes were imported, indicating an increasing local demand for the cereal. Wheat requires very well-drained soil, making it difficult to be grown in salty or acidic soil. The region of the country that supports wheat production includes Northern states such as Kaduna, Kano, Sokoto, Zamfara, Kebbi, Katsina, Yobe, Borno, Bauchi, Adamawa, Jigawa and Gombe. However, local wheat production in Nigeria is fraught with challenges. The variety of wheat cultivated in Nigeria is hard while the most popular types imported cannot grow in Nigeria as a result of the country's soil and climatic condition. Wheat farmers in Nigeria who irrigate use water from the tube wells using centrifugal pumps and then runs by gravity on soil surfaces to the crop field. This tedious traditional method takes a long time to irrigate big fields running the pumps for many hours increasing the cost of production with higher water conveyance losses.

Intervention

The TWC and TAAT-WEC worked together to deploy technologies comprising heat/drought-tolerant and stem rust-resistant wheat varieties

accompanied by water management techniques to farmers. The objective is to expand wheat production in Nigeria. TWC and TAAT-WEC also provided expertise to farmers in terms of land preparation including raised beds, furrow and deficit irrigation, sprinkler systems, and low-cost mechanized planting within conservation agriculture. Through farmer field days, TAAT-WEC trained farmers and extension workers in Kano State on proven technologies and innovations in irrigation and agricultural water management practices. These technologies are Impact Sprinklers, Gun Sprinklers, Weirs, Flumes, Spiles, Orifices and the PVC conveyance and distribution technology which saves time (hours) of irrigation and reduces the cost of production while at the same time increasing yields. Other TAAT-WEC activities included capacity building for innovation platform facilitators, extension agents, champion farmers and youths in the proper use of irrigation and water management technologies and implementation of good irrigation management practice.

Outcome and Impact

About 7,600 MT of heat-tolerant wheat varieties have been deployed as basic, certified and quality-declared seeds through the TWC. Over 500,000 hectares of wheat have been grown in Nigeria through reinforced support by the TWC. A number of Northern states like Kano, Jigawa, and Gombe are already growing wheat and are now producing wheat year-round under tropical rainfall with support of cutting-edge irrigation technologies. The Kano state government has pledged to assist wheat farmers in curtailing the waste of water, thereby increasing the production of wheat using technologies promoted by the TAAT program.

Achieving Food Security in the Sahel

“TAAT envisions a semi-arid region south of the Sahara with resilient and profitable crop and animal production that is not subject to episodic famine.”

-Sorghum and Millet Compact



Robust sorghum plant ready for harvest

Introduction

Africa's Semi-arid Zone occupies 5.5 million km and supports a population of 239 million. Poverty is widespread with 53% falling below the poverty line of \$1.25 per day. The natural vegetation across the Sahel and Sudanese Savanna is shrubby grassland. These lands are generally flat with over 16% converted to agriculture albeit subject to severe drought affecting the production of crops and livestock. This zone is extremely fragile and subject to desertification and catastrophe, however at the same time its people are extremely resilient and are ready for innovative labor-intensive solutions in land management.

Sorghum cultivation specifically is extremely important in the Sahel owing to its greater drought tolerance than maize, occupying 15.8 million ha. Yields are low (0.8 t/ha) owing to low planting density, insufficient access to improved varieties, widespread plant parasitism by striga, low adoption of fertilizers, inappropriate farming practices, declining soil fertility, lack of marketing and extreme weather events resulting in annual production of 13.2 MT per year. Demand for sorghum across Africa is expected to increase by 9.1 million MT by 2025.

Millet like Sorghum, is equally important to human welfare in the Sahel as it is the most important cereal grown in the drier portion of the Semi-arid zone, occupying 15.5 million hectares of rotationally grazed lands. Yields are also low (0.7 t/ha) owing to poor water management coupled with limited adoption of Integrated Soil Fertility Management (ISFM), resulting in an annual production of 10.2 million MT per year proving insufficient to feed the growing population.

Despite the research efforts that have led to the development of technologies to overcome productivity challenges, Sorghum and Millet productivity remains low due to insufficient efforts at disseminating successful crop interventions. Through the TAAT Sorghum and Millet Compact (TSMC), the African Development Bank envisions a comprehensive response that will assist sorghum farmers in investing an additional \$151/ha in improved seed, water harvesting and Integrated Soil Fertility Management, that will in turn increase average yields to 1.8 t/ha and steadily reduce the infestation of striga on these crops.

"Technologies being deployed at scale"

- 1) Dual-purpose varieties (feed and grain)
- 2) Mobile forage choppers
- 3) Utilization of crop residues
- 4) Fertilizer micro-dosing
- 5) Small-scale mechanization
- 6) Improved pearl millet varieties
- 7) Release of parasitoid Wasps and land reclamation

The Compact is led by the International Crop Research Institute for Semi-Arid Tropics (ICRISAT). The focus countries for the compact are Burkina Faso, Chad, Mali, Niger, Nigeria, Senegal and Sudan. The Compact works in partnership with the TAAT-WEC led by IWMI and the TAAT-SFEC led by IFDC.



A Sorghum farm in Bambe, Senegal

Success Stories

Low Sorghum and Pearl Millet Yields in Senegal (Country: Senegal)

What was the problem?

Sorghum and pearl millet are part of the main staple food crops in Senegal. However, yields of these crops are low due to various constraints including poor or lack of access to seeds of improved cultivars, fertilizer and other farm inputs, inappropriate agronomic practices, inherent poor soils, lack of commercialization and extreme weather events.

Intervention

To improve productivity, food and nutrition security as well as farmer livelihoods, TSMC



Amadou Diarra, a beneficiary of the TAAT's Sorghum and Millet Compact in his Tiandougou-coura Sorghum variety production field in Missirila, Beleko, Mali.

adopted a pathway to sustainable intensification and improved profitability of millet and sorghum by producing 1 MT of breeder seeds, 40 MT of foundation seeds and 70 MT of certified seeds in the country. This was achieved in collaboration with the Centre National de Recherches Agronomiques (CNRA), Bambey, Senegal.

Outcome and impact

Senegalese farmers are very appreciative of the 'Darou' variety (ISRA-S-622B) provided because it produces quality grains without tannin, quality fodder and sweet grain for human consumption. The TSMC in partnership with CNRA, developed this variety for large-scale dissemination in the Sudano-Sahelian zone where the rainfall is between 600 mm and 800 mm. In Senegal, this

zone includes Kaolack, Kaffrine and the North of Tambacounda regions. Following successful scale up of this variety, and subsequent introduction in Senegal, Senegalese farmers now prefer short-duration millet varieties such as GB 8735 (Origin: ICRISAT). The variety is bio-fortified with zinc and iron. It is the farmers' first choice because of its white and big grains which are suitable for processing and early maturing streak. In addition, GB 8735's good exertion of the head prevents millet head miner attacks.

Low Sorghum Productivity in Burkina Faso and Mali

What was the problem?

Sorghum is the main cereal crop grown in Burkina Faso, with more than 1.5 million hectares. Along with pearl millet, it is the staple diet of rural populations in the Sub-Saharan regions. Burkina Faso is the continent's third top producer of sorghum (after Nigeria and Sudan). Despite various interventions, its productivity remains low, with an average yield of approximately one ton per hectare. Many factors have

contributed to the decreased productivity, including demographic pressure, ecological degradation, loss of soil fertility, and water erosion. Other factors include the negative impact of the dry season on crop growth and yield, the negative effect of end-of-season drought, as well as the scarcity of organic amendment, improved seed and other farm inputs. Over half of the farming population grows sorghum and millet crops, which together account for 5-7% of all full-time jobs in the country. Sorghum and millet also contribute 5% to the GDP and account for about 15% of consumption shares (in monetary terms) in Mali. These crops are highly adapted to the low



Dramane Male admiring his panicle in Sorofing, Mali

rainfall and light soil types that prevail in the Sahel. Yet yields have remained very low, and output is significantly below its potential. As sorghum and millet remain strategic crops for food security in Mali, TSMC interventions in the country are needed more than ever to improve food and nutrition security and improve farmer livelihoods.

Intervention

During the 2019 rainy season, TSMC in collaboration with the TAAT-WEC selected Burkina Faso and Mali to host the demonstration of irrigation management of climate smart technologies. The technologies identified are Zai, Half-moons and Contour Lines soil and water conservation technologies. These were displayed in Burkina Faso using the farmer field school approach, while the contour lines technique (CLT) was presented to farmers in Mali using the demonstration plot approach. In both countries, abandoned bare lands, which traditional farmers believe are not suitable for cultivation, were used to demonstrate TAAT technology interventions. Kapelga, a sorghum variety (white grain and early maturing) was used in the district of Toma. It is a variety that is under promotion in the province and beyond by Federation des Professionnels Agricole du Burkina (FEPAB).

In the district of Boussouma (Burkina Faso), ICSV1049 a variety promoted in the Sanmentenga province was used. Both varieties were grown in half-hectare of half-moon and half-hectare of Zai. The half hectare planted with

the same varieties was used as control using the farmer's practice. The two sorghum varieties were selected based on the agro-ecological characteristics. Planting was done on the same day at each site. In Toma, the field was managed by FEPAB (25 farmers with 9 of them being women) and in Boussouma it was managed by 30 farmers of which 13 were women. Two field days were organized in each site during sprouting and maturity stages. The second day of the farmer field school presented an opportunity to harvest and help farmers with estimating yield outputs of the different technologies.

Outcome and impact

In Sorofing (Mali), one of the selected villages, the TAAT-WEC trained farmers on how to design the contour lines using the automatic reading method. Mr Dramane Male, a local farmer applied what he learned to the contour lines technique (CLT) on 2.0 hectares of Fadda. Despite the fact that he planted towards the end of season's drought, the plants remained green with good soil moisture which was a positive output. Dramane said that the CLT stopped the runoffs. *"If this were to be the traditional method in a similar rainy season, I would have lost all my crops because of drought,"* he added. He ensured that going forward, he will apply the CLT in all the areas of his fields with pronounced slopes. On a 0.5hectare plot, Yaya Male, another farmer, applied the CLT that resulted in the plants being well-developed with big stems and green leaves. A field day was organized at Foh (Mali) to showcase the performance of the demonstrated technology to farmers. About 10 research and development institutions including a private seed company and many farmers were represented at the event which was covered by Office de Radio diffusion-Télévision du Mali (ORTM), the country's national television station.

In addition to the proposed variety (Tiandougou Coura), the farmer used his own local variety to understand if the crop performance was linked to the varietal differences. The results were promising. The plot under CLT produced good plants with large panicles compared to the control (low plant stand due to runoffs). *"I usually abandon this particular field because of the runoffs,"* Pierre Diarra said. *"With this exposure to the CLT now, I promise to apply the CLT in all*

problematic soils for all crops,” Pierre added. Variety used on this site was Tiandougou Coura and some NPK fertilizer was broadcast on both treated and the control plots. The yield of treated plots was 1.7 t/ha whereas the yield of the control was 0.9 t/ha. This shows that the new technology almost doubled the yields compared to the control plot. Michel Traore, the Deputy Mayor who led the team of local authorities to the demonstrations, appreciated the technology deployed in his community. He then called for continuous support for taking the technology beyond his provinces. The Deputy Mayor promised to include the CLT technique in their local Development Plan (PDSEC) to ensure a sustainable pathway forward. At the Intervention site called Bla, the variety used was Hybrid Fada and for demonstration NPK was used as a micro-dose on both treated and the control plots. The yield of treated plots was 2.8 t/ha whereas that of the control was 2.0 t/ha. Hence, we find a yield increase of 40% when micro-dosing technology is utilized.

Two technologies were demonstrated in Burkina Faso. The Variety used was Kapelga with a potential yield of 1,300 kg/ha. Two technologies were demonstrated. These are Half-moons and the yield obtained was 1,625 kg/ha. The field that was treated with the Zai pits, the yield was 1,456 kg/ha. These were against a control plot yields of 0.95 t/ha. That is an increase of yields by 71% with the half-moon technology and Zai pits increased yields by 53%.

Lack of Access to Improved Varieties in Sudan (Country: Sudan)

What was the problem?

In South Darfur, Sudan, pearl millet is the most popular crop with 90 percent of farming households consider it to be one of their three major crops followed by groundnuts and sorghum. Millet and sorghum are the main staple food crops across the Darfur region while groundnuts are normally considered a cash crop. Although pearl millet is the most widely grown crop, less than 20% of farming households use improved varieties. In South Darfur, farming

households obtain their seed from multiple sources such as: the seed they had saved, local grain/seed markets, social networks, seed aid from the Government and other humanitarian and development partners, local seed banks and agro-input dealers. Access to improved seed capable of boosting crop yield constitutes a major problem to farmers here. The challenge is made worse by the gaping lack of access at the community level.

Intervention

In line with TSMC's commitment to boosting



Smile of satisfaction as technology-adopting farmer poses in her millet field in Mali

agricultural productivity and self-sufficiency in Sorghum and Millet by 2025, the compact identified the 25-member strong Al-Amel Agricultural Women Group in Sudan as a key partner driving a farmer field school and training initiative that provided knowledge sharing and outreach on improved crop seed production and good agricultural practices on varieties of Sorghum and Millet. TSMC realised that the farmer field school was a credible pathway to delivering agricultural technologies and inputs to farmers at local levels. Hence, the compact partnered with the Food and Agriculture Organization (FAO) and Arab Organization for Agricultural Development (AOAD) to deliver cutting-edge training services to the Al-Amel Agricultural Women Group. Other partners supporting this training campaign such as Nyala Research Station (NARES), worked with the Compact to provide foundation seeds.



Farmer field school with Al-Amel Agricultural Women group in South Darfur, Sudan

Improved varieties were introduced, including a medium-maturing variety of 120 days which has the benefit of being matched with the duration of rainy season in the area.

Outcome and impact

Fathia Mohamed Ahmed, the chairperson of the women-led group described the training through farmer field school as *“very important and useful for creating and developing personnel skills needed for better farming. The economic and social status of our members received a significant boost as they became wealth creators for*

their families and communities,” Fathia added. During the growing season, the women group received seed extension services from research and extension personnel. As a result of this effort, the women produced about 7 MT of high-quality declared seeds. The appreciative women all remarked that it was an important breakthrough for them to start their own businesses. Now their goal is to promote quality seeds to NGOs and farmers groups for further promotion and sale at premium prices.

Roots and Tubers for A Resilient Africa



happy women farmers pose with harvested cassava and OFSP tubers

Deploying technologies at scale to close yield gap and enhance livelihoods through Cassava and Orange-fleshed Sweet Potato





TAAT Cassava Compact

“Intensifying cassava production for industrial purposes by improving cassava yield from 10 to 20 t/ha; reducing production costs through mechanization and crop management; improving the efficiency of cassava processing; increasing market opportunities for smallholders; and catalyzing private-sector investments.”

IITA Cassava field

Introduction

Africa is the world's leading cassava producer. However, as millions of growers in Africa depend on it for their livelihoods, millions continue to live below the poverty line. Some of the reasons adduced for the non-lucrative state of cassava production are low productivity, low value addition, and the inability of farmers to access improved varieties and markets. Consequently, Africa's cassava productivity is less than 10 MT per hectare compared to Asia where productivity is more than 20 t/ha. Over 26 million hectares of cassava were planted worldwide in 2017, with about 76% in Africa. More than 291 million MT of cassava were produced worldwide with Africa accounting for over 60%. Cassava cultivation covers 13 million hectares in Africa yet yields remain well below the world average as a result of low adoption of available technologies and massive nutrient removal by this crop. Current annual production in Africa is 137 million MT per year with an additional 52 million MT required by 2025.

The Cassava crop is unfortunately widely regarded as a food for the poor rather than a crop for value-added food and industrial starch production. The TAAT Cassava Compact (TCC) aims to transform Cassava perception as low value crop by accelerating industrialized Cassava production and processing across Africa. This will contribute to the drive of achieving key poverty reduction and economic growth targets. A full spectrum of private sector partners is needed to support this effort including input manufacturers, agro-industrial processors, agribusiness development specialists, credit services, and insurers. Since 2018, TCC has begun addressing the limiting factors to cassava transformation

using a holistic and multi-stakeholder approach. This approach brings on board researchers, extension service providers, development practitioners, input dealers, information service providers, processors and farmers across the cassava value chain. Unlike previous dissemination efforts, TCC's strategy of technology delivery is driven by delivery and dissemination experts and backstopped by researchers drawn from national agricultural systems.

TCC is led by the IITA and targets the following countries: Benin, Burundi, Cameroon, Central African Republic, Congo DR, Nigeria, Rwanda, Sierra Leone, South Sudan, Tanzania, Togo, Uganda and Zambia. Enablers working in close partnership with the compact include the TAAT SFE C Enabler led by IFDC and the Empowering

- Cassava technologies deployed at scale by the Compact are:**
- 1) Improved fertilizer application**
 - 2) Improved varieties**
 - 3) Pest and disease management**
 - 4) Mechanization of production**
 - 5) Mechanical processing**
 - 6) Use of peels as quality animal feed**
 - 7) Rapid multiplication of clean planting materials**
 - 8) Mobile cassava processing unit**
 - 9) Cassava business connector**

Novel Agribusiness-Led Employment Compact (ENABLE TAAT) is led by IITA



Farmers loading cassava on to a Truck

Success Stories

Low Yields and inadequate nutrition (Country: Benin Republic)

What was the problem?

In the Republic of Benin, over half of the nearly 10 million population rely on subsistence farming for their livelihood with over 3.3 million people considered to be food insecure in the country. Since the mid-1980s, Benin has increased production of cassava. However, poor infrastructure, low yields and flooding, which can wipe out harvests and seed stocks, are persisting challenges that the farmers face. Cassava is still largely produced at a subsistent level in the country in spite of the crop's high growth potential to increase farmers' income and livelihoods as an industrial crop. There are plethora of post-harvest products that can be derived from cassava for industrial applications and export. Yet, the processing of cassava in Benin still remains artisanal and focused on traditional cassava products such as fufu, gari, and tapioca. These products have limited commercial transactions and are more for household consumption.

About 4000 local varieties of cassava are in 17 major cassava-growing countries in Africa, including Benin. Some improved varieties have been developed as well, with some of these being high-yielding and also nutrient-dense. However, many of these improved varieties are yet to be deployed in Benin. There is the yellow-fleshed cassava (Yellow Cassava) with nutritionally significant concentrations of carotenoids - a precursor of vitamin A. This yellow cassava is yet to become popular in the country. Farmers do not plant it for fear of glut on account of buyers' lack of interest

Intervention

To address this challenge, a behavioral change communication approach involving extensive sensitization campaigns in key villages was adopted by the TCC. Then planting materials of provitamin A cassava varieties were transferred from IITA Nigeria to Benin. The main partners were the Institut National des Recherches Agricoles du Bénin (INRAB),

BIORAVE, HarvestPlus and the Root and Tubers and Banana Program of the CGIAR. Through this effort, the compact was able to introduce technologies for rapid multiplication of planting materials of improved cassava varieties. This will contribute to the effort of addressing the nutritional deficiency and increase cassava yield up to an average of 25 to 44 t/ha.



Beninese root farmers rejoicing upon receipt of free cassava planting materials from TCC

The planting materials were multiplied to provide 200,000 cuttings, distributed freely to the first group of seed growers and root farmers in selected villages of Ouémé, Plateau, Zou, Couffo, and Atlantic departments of Benin.

Outcome and impact

Ezaie Etenou, a garri processor in Massi is already dreaming of a future with yellow cassava. *"This sensitization we had today is going to help us a lot. If we succeed in producing this new yellow cassava variety, it will greatly help in changing the whole community because it addresses malnutrition and food security at the same time"* she said.

Nazaire Donkpegan, a farmer is fascinated about the possibility of increased yields from yellow cassava. *"My impression of this awareness is that as a producer, I am used to growing white cassava variety which gives me little yields. I also sell the produce at a low price. But with this new yellow cassava variety, I get higher yields and can produce at a large scale for sale. Higher yields means that I get more income from cassava production"*, he added.

Post-Harvest Loss due to Poor Access to Processing Facilities (Country: Nigeria)

What was the problem?

Cassava commercialization is faced with a double-edged problem of expensive or very few raw materials available for cassava processing plants. These plants are usually located near cities (for access to electricity) while cassava farmers, often located in rural areas, lack access to the market to sell their roots, partly due to inaccessible roads. The rural sector lacks the necessary infrastructure (electricity, water, etc.) and skilled labor to attract private-sector investment in processing factories. Since cassava is very bulky, the cost of transporting cassava roots to city-based factories is very high even where all-season roads exist. Hence, most processing factories established in the cities are not competitive and are in a state of paralysis, operating below their capacity or are abandoned. Many private sector investments in processing factories have become moribund and bankrupt. Meanwhile, the rural sector lacks market access, jobs for the youth, and modern technologies that can make cassava farming profitable or attractive. Hence the rural areas are in a state of intractable poverty.

Intervention

TCC and its partner, the Federal Institution of Industrial Research Oshodi (FIRO) in Nigeria, is championing the use of Mobile Cassava Processing Plant model. This is an alternative investment approach for the private sector to avoid the problems associated with investments in expensive processing buildings, insufficient

electricity supply, inconsistent and inadequate supply of raw materials, and the high cost of transporting bulky fresh roots to city-based factories across Nigeria.

The specially constructed Mobile Cassava Processing Plant (MCP) consists of modern processing machinery and an electricity generator that is housed on a six-wheel machinery carrier equipped with a loader crane. The Mobile Cassava Processing Plant is carefully equipped with a specific set of machinery tailored to process targeted, shelf-stable, market-demanded cassava products. These are high-quality gari, fufu, flour or any other products. Both sides and the tailgate of the truck open flat to form a larger flatbed or platform for a cassava processing workspace. Depending on the product for which the machinery has been tailored, processing can be completed on the workspace combined with the ground-level workspace. Specific standard operating procedures are used for processing the product of choice.

Outcome and impact

Cassava farmers, especially the large-scale growers, who often face the challenge of selling all their outputs at maturity before the root quality begins to deteriorate, can seek the services of a mobile cassava processing plant. They can process the roots on the farm when the market price of the cassava product of choice is good and before the roots begin to decay. In addition, the Mobile Cassava Processing Plant can be used to make intermediate processed products. These are pressed cake from grated cassava roots, starch or fufu to be transported to a centrally located final processing factory for mechanical drying. This approach ensures that shelf-stable or non-perishable value-added products of 20–50% of the weight of initial raw material (fresh roots) are transported from the rural areas to distant markets, thereby reducing the cost of transportation and increasing the consistency of supply of the products at a competitive price and higher profitability to either the end-users such as textile mill, biscuit factories or to markets.



The specially constructed Mobile Cassava Processing Plant (MCP)

The mobile processing unit was operated in Nigeria by a private agricultural investment company to process and supply high-quality cassava cake to a starch factory. This arrangement showed a projected net value of \$79,303. That translates to 50% internal rate of return and 156% return on investment for a three-year period. This is with 70% loan financing of the total startup capital of \$49,386 at a 17% interest rate and a moratorium of 3 months. This technology has the potential to resolve many of the intractable challenges of the cassava processing enterprises in Nigeria. There are investors from the private sector, state Chambers of Commerce and commercial banks in Nigeria that in the process of acquiring Mobile Cassava Processing Plants.

Lack of Clean Planting Materials (Country: Location: Democratic Republic of Congo)

What was the problem?

The major challenge of cassava production in Central Africa, particularly the D.R Congo, is the availability of a sustainable seed system, an inherently low multiplication ratio of the crop as well as lack of clean planting materials due to pest and disease pandemics. Unlike maize, wheat, rice and other grain-legumes, commercial seed producers of certified seeds for cassava do not exist in this country posing a significant bottleneck to scaling up cassava technologies.

Intervention

TCC initiated two parallel and complementary paths to increase farmers' access to planting materials of virus-free modern cassava varieties. This is through Seed Bulking Farms in the Western areas of Congo, and the deployment of Semi Autotrophic Hydroponics (SAH) technology for the Eastern part of the country. The two were introduced as approaches to develop a sustainable seed system for cassava in the country. With the objective of delivering healthy, clean and adequate cassava planting materials to farmers, TCC obtained a license from SAHTECHNO through a project partner (GoSeed Ltd). This is to allow the deployment the Semi-Autotrophic Hydroponics (SAH) technology for



Technicians at the SAH Laboratory in Bukavu, DRC

the rapid propagation of cassava in DRC. The technical staff of IITA and INERA were trained on the new rapid multiplication technique. A Cassava Bulking Facility (CBF) where the new technique is applied to produce cassava plantlets, was jointly funded and established in Bukavu, Eastern Congo by IITA, in collaboration with the Integrated Agricultural Growth Program in the Great Lakes (PICAGL).

Cassava plantlets are transferable directly to the field to produce healthy cassava stems within three months of multiplication in the CBF. By 2019, 365,000 plantlets have been produced and transferred to the field in Congo. The current cassava bulking facility (60 M²) can produce more than 60,000 clean and healthy cassava plantlets per month and the annual production is 720,000 cassava plantlets that can produce up to 36 hectares of cassava stems during the first year of production. In the CBF, two approaches are used to produce cassava plantlets. A one-month plantlets growth-phase and three-month growth-phase, before field transfer.

outcome and impact

Two TAAT Cassava Compact partners have established seed farms in Western Congo. A total of 13.2 hectares have been established by Projet pour le Développement Intégral de la Rive Droite (PDIRD) at Tshopo and 5 hectares by Comité Local de Développement (CLD) de Nkolo. With the help of these projects two, thousand out-grower farmers were registered for 2020 multiplication activities and the 10 hectares of the seed-stock will plant 100 hectares of seed farm in 2020. The National Seed Service (SENASEM) inspects and certifies the seed farms.

Low Productivity (Country: Zambia)

What was the problem?

Many cassava varieties have been developed by researchers in Zambia. However, many of these varieties which are high yielding and resistant to diseases and pests, are yet to be adopted on a large scale in Zambia. One major challenge that comes with the development of new cassava varieties is the task of multiplying and disseminating to farmers on time before the onset of rainfall. Being a clonal crop, cassava multiplication is done using stems. This is a process that takes several years. This constraints in access to high-quality cassava seed in Zambia, results in cassava farmers not deriving the potential benefits from cassava. The main contributing factor to the reduced benefits is the use of low-quality planting materials which leads to poor harvests, hunger and poverty across many of the country's villages dependent on cassava.

Intervention

TCC established fifty-eight (58) seed bulking farms in partnership with the Zambia Agricultural Research Institute (ZARI) and Ministry of Agriculture Extension Services through the District Agricultural Coordinator (DACO) in several districts. Seed bulking sites were selected based on the existence of at least one cassava processing factory or aggregator in the area ensuring access to markets. Four of the seed farms are near the Chitambo cassava milling factory established under the African Development Bank funded Agricultural Productivity and Market Enhancement Project (APMEP). Community

mobilization was led by the DACOs and ZARI to identify and select beneficiary farmers who hosted the cassava farms in their respective communities. Other partners included aggregators and processing factories such as Premier Con Ltd and Total Land Care. Through the TCC partnership, five high-yielding released varieties (out of the seven released varieties in Zambia) were multiplied for deployment. Two to three varieties (out of the five) were multiplied per seed farm with yield potential being 20 to 30 mt/ha per variety.

TCC through GoSeed Ltd obtained a license from SAHTECHNO to use the SAH technology for the rapid propagation of cassava in Zambia. A representative each from ZARI and IITA-Zambia were trained in Ibadan, Nigeria on the new technology. Subsequently, the first Seed Bulking Facility (SBF) was established with co-funding from IITA-Zambia. The facility, located on the IITA campus in Lusaka, is being used to demonstrate the benefits of the SAH technology to other institutions and the private sector to spur investments in similar facilities across Zambia.

Outcome and impact

The scheme is already running. Each of the seed-bulking farm when certified, will be used to plant additional 174 hectares of land to multiply cassava seeds at 58 locations spread across the nation.

The Compact has developed Strategic alliance with the Seed Control and Certification Institute (SCCI) of Zambia. They will verify the health status of the cassava plants and certify the farms as seed stock. TCC is engaged in strategic alliances with the Citizens Economic Empowerment Commission (CEEC), through ZARI and also Chitambo cassava milling factory, through the ADB-Zambia. They will get planting materials from seed farms and the CBF to distribute to root growers near the cassava processing mills.

Lack of Clean Planting Materials (Country: Togo)

What was the problem?

The agricultural sector occupies an important place in the national economy of Togo, significantly contributing to the gross domestic

product. To this end, the cassava sub-sector has been identified as having a high growth potential and can contribute to job creation, improved incomes and the living conditions of farmers and other actors in the value chain. There are diverse products that can be derived from cassava for industrial application and export. Yet, the processing of cassava in Togo remains artisanal as traditional cassava products such as fufu, gari, starch, and tapioca have limited commercial transactions. Repeated efforts made by the processors to export gari and tapioca to Nigeria and France failed due to high costs and low quality of the products.

Intervention

The African Development Bank requested TCC to provide technical support to the Government in order to tackle these challenges. This is through introduction of new improved technologies, capacity building, and other forms of technical assistance. For the development of a Seed System in Togo, TCC initiated two parallel approaches to increasing farmers' access to planting materials of high nutrient-density and the facilitation of the establishment of an SBF in Lomé using the SAH technology. The establishment of two modern cassava processing factories was also initiated. Bakeries were trained on the technique for the use of high-quality cassava flour for making baked items. A web-based application developed by the Compact (Cassava Business Connector) was used to register and monitor farmers receiving cassava cuttings. These farmers will be linked to the modern processing facilities to supply roots.

Outcome and Impact

A unique co-financing approach was used by the Togolese government and the TCC in financing the cassava development activities in Togo. TCC

financed the cost of the experts who trained technical staff of ITRA in Nigeria, and training of bread bakers on the use of cassava for baked items. The Government of Togo funded the participation of the trainees. TCC obtained the license for the use of the SAH technology in Togo. The compact also provided some starting materials for the SAH technology and donated two sets of processing machinery to the government to establish two modern cassava processing factories. By 2019, the government of Togo through the Cellule Présidentielle d'Exécution et de Suivi des Projets (CPES), Ministry of Agriculture and the Institut Togolais pour la Recherche Agricole (ITRA) has spent approximately \$18,000 renovating and building a modern cassava processing center based on the design provided by the TCC. An additional

\$43,000 was spent on building the Cassava Bulking Facility (CBF) at ITRA with technical guidance from the TCC. Through the establishment of the Seed Farms, ITRA currently has a total of 564,767 cuttings capable of planting approximately 56 hectares of second stage cassava seed

farms with a density of 1 meter by 1 meter. ITRA is set to introduce GAPs on Cassava planting to about 500 farmers to increase farm-level productivity. The development of the cassava sub-sector in Togo is now emerging as a key component of an aggregated national effort at diversifying Togo's agricultural productivity. It will contribute to the generation of employment, food security and sustain incomes for the population. To achieve these objectives, the government identified IITA, the African Development Bank and the TCC as integral partners needed to continue moving forward to achieve the lofty objectives of the Presidential Initiative.



TAAT Orange-Fleshed Sweet Potato Compact

*Tackling Malnutrition
and Improving
Livelihoods through
Orange-fleshed
Sweet Potato*

*An African child savouring
a taste of OFSP*

Introduction

While Sweet potato came from the Americas to Africa in the 1500s, Africans believe it is indigenous to the continent. Its relative importance varies by sub-region in Africa. As at 2014, 24.2 million tons of sweetpotato are produced annually across the continent with over half (54%) being produced in East Africa, 21% in West Africa; 16% in Southern African and 9% in Central Africa. It is principally seen as a food security crop at the household level. Sweetpotato is vegetatively propagated and hence planting material (cuttings from vines) is easily shared among farmers. China is the world's largest sweet potato producing country, producing 71 million tons annually. The irony is that Africa has more land under sweetpotato production than China. Africa's total production stands at 24 million tons with an average yield of 6 tons per hectare, compared to 21 tons per hectare in China.

Orange-fleshed Sweetpotato (OFSP) is a rich plant-based source of beta-carotene, which the body converts into vitamin A. In Africa, most sweet potato varieties grown are high dry matter white and yellow fleshed varieties with little beta-carotene content. In 1995, researchers at International Potato Center (CIP) recognized the potential of OFSP varieties to address widespread vitamin A deficiency across the continent using an integrated agriculture-nutrition approach. With their partners, they confronted conventional wisdom concerning food-based approaches and institutional barriers, to build evidence and subsequently bred 80 OFSP varieties adapted to farmer needs and consumer preferences in Africa.

TAAT Orange-Fleshed Sweet Potato Compact (TOFSP) is working with stakeholders to increase the average yield per hectare of sweetpotato in general and scale up the deployment of new high yielding OFSP varieties. The compact is leading efforts at strengthening sector-wide human and institutional capacity to integrate OFSP into African food systems and markets for increased incomes. The compact pursues the attainment of its mandate through increased adoption of Beta Carotene-rich OFSP among smallholder and large scale farmers and improving their productivity. This leads to improved income at the household

level through sale of roots. The Compact is also increasing value of the roots through promotion and capacity building for OFSP-based products processing along the value chain. This then provides a market for the surplus roots for the smallholder farmer while creating commercial OFSP farmers geared for the market. Since OFSP is biofortified, there is a need to raise awareness of its nutritional benefits. It can be cooked, roasted or processed into many products that currently use wheat. OFSP technologies deployed at scale by the compact are:

- 1) Seed systems development
- 2) Vines multiplication and conservation
- 3) Nutrition trainings for food diversity based on biofortified foods
- 4) Good Agronomic Practices (GAP)
- 5) Better harvesting technologies
- 6) Post harvesting technologies
- 7) Linkages to the market
- 8) Processing at household and industrial technologies
- 9) Product development and marketing

TOFSP is led by the International Potato Centre (CIP). The target countries for the compact are Mozambique, Madagascar, DR Congo, Kenya, Ghana, Nigeria, Rwanda and Malawi. The Compact works in close partnership with the TAAT-WEC led by IWMI and the TAAT-SFEC led by IFDC.

The TRIPLE S technology



Success Stories

Lack of OFSP Planting Material (Country: Ghana)

What was the problem?

One of the biggest hurdles in sweet potato production in Africa is getting enough quantities of planting materials at the onset of rainfall. This is because unlike cereals and pulses the seed has to be kept in the nursery in the dry period growing until it is needed for planting. After harvesting the vines are good for only 48 hours and then they get destroyed. Also carrying the vines from one location to another requires proper management to avoid overheating and getting destroyed in the trucks. In areas with extended dry seasons, traditional conservation methods such as conserving roots by burying them in the field are popular yet ineffective. Most traditional methods lead to the build-up of pests (such as weevils) and diseases. When the roots are stored using traditional methods, they risk rotting or being destroyed by pests like weevils, rats, mice and other wild animals. These in turn affect the quality and quantity of the planting material generated and thus negatively impact later the outputs because of the use of poor-quality planting materials or late planting.

Intervention

In tackling this challenge, TOFSP, in partnership with the “Triple S” scaling project in Ghana funded by the RTB Scaling Fund, deployed the Triple S technology to conserve roots and generate quality planting material after a long dry season that was experienced in Northern Ghana. TRIPLE S stands for Storage, Sand and Sprouting technology. The technology allows farmers to store sweet potato roots through the dry season in a container of sand. As the rainy season nears, these preserved roots can then be planted in seedbeds and watered to sprout healthy planting material ready for sowing at the optimal time. This simple and affordable system has proven to be effective and is now being scaled to farmers in Ghana. The compact partnered with Damongo Agricultural

College. This is one of the five colleges in the country that train agricultural extension agents, offering both certificate and diploma courses with over 224 students. The college piloted the training of this technology to its students. This partnership is in recognition of the fact that Agricultural Extension Agents (AEA) who work closely with farmers, are best suited for knowledge dissemination on good agricultural practices and new technologies. Damongo Agricultural College was granted permission by Ministry of Food and Agriculture (MoFA), to conduct the trainings. One hundred and twenty-six students and 8 tutors

were involved in the training that was delivered through printed material, instructional videos, and hands-on demonstration of the innovation.

Outcome and impact

According to Richard Dantey, a tutor at the Agricultural College, the successful demonstration of

the TRIPLE S technology forced the college to develop courses directly addressing OFSP and the Triple-S innovation. The course covers the following: roots and tubers crops, post-harvest and storage technology, farm-led nutrition, and practical cookery. Through the enhanced curriculum, the students now have a full understanding of the technology and have identified income generating opportunities they can engage in, such as producing vines for sale to farmers and roots for sale to processing plants.

Richard Annobil the Director of Human Resources and Capacity Building at Ghana's Ministry of Agriculture, was one of the participants in the learning journey. He has become an advocate for OFSP and Triple-S at the national level. He has proposed the adaptation and dissemination of course materials to the other agricultural colleges, as well as five farming training institutes in Ghana. This will help in the sustainable integration of OFSP and Triple-S into the national education system. He promised to support the TAAT OFSP Compact and Damongo Agricultural College to



participate in the national revision of curricula for agricultural training. This will ensure that the Triple S technology and other topics surrounding roots crops and nutrition are incorporated into the curriculum, getting OFSP and Triple-S into the national agricultural training curricula is key to encouraging self-scaling of this technology without additional financial support from projects or programs.

Low Production of Quality OFSP Vines *Location: Blantyre, Malawi*

What was the problem?

Malawi's cuisine is quite dependent on root crops, with typical meals consisting of potato, sweetpotato, and cassava. With ranging weather conditions, the availability of sufficient and premium sweetpotato vines at the onset of the rainy season is essential to producers in order to guarantee good yields. The situation is particularly difficult because sweetpotato vine production takes place during the dry and hot months preceding the rainy period. Producers are required to water their plants. The task is commonly done by hand using watering cans and tapping water from streams and hand-dug wells. This is a laborious back breaking task shunned by women and the youth. Hence, most vine multipliers can only plant small areas that can easily be irrigated by using their current technologies. Often plants receive insufficient water compared to their demands and water stress leads to diseased seeds because they are weak leading to lower production and quality of vines.

Intervention

In collaboration with TAAT Water Enabler Compact, TOFSP provided selected Malawian farmers with new varieties, good agronomic practices and recommendations in combination with appropriate irrigation technologies. Demonstration sites were set up around Blantyre in southern Malawi. Irrigation equipment was procured with the support of local irrigation pipe producers, Pipeco Ltd. It was observed that local production of the pipes significantly reduces the cost to farmers as the sustainable High-Density Polyethylene (HDPE) pipes were priced equally to that of the PVC

pipes. These pipes would be sourced within a short time within the country at the same time backup support was guaranteed. Surface water was then pumped into a water-efficient conveyance system and distributed to the field using two different technologies: gun sprinklers and rain hoses. Rain hoses lead to a more homogeneous water distribution within the farmer's field with less impact from wind. Because of this technology women and youths showed keen interest to go into OFSP vine multiplication.

Outcome and impact

After the one-day joint field demonstration led by CIP, IWMI, Ministry of Agriculture and equipment suppliers, the farmers were impressed by the achievements and requested the expansion of TAAT intervention across all parts of Malawi where sweetpotato is grown. They also reacted enthusiastically and began to reflect on other crops they could cultivate to make optimal use of the new irrigation infrastructure. Three cropping cycles per year are possible and cultivated areas can now be expanded. It is believed that this is a potentially profitable technology that can take farming in Malawi to new levels. The users of the technology reported that they managed to double their production of OFSP vines. They got



OFSP vine producers in Malawi receive on-the-job training in installation of irrigation equipment

better quality vines produced on time for the season which could be sold at a higher price, hence increasing their incomes (Table 3.) This trend is expected to improve even further with the successive years with more experience by the farmers and encouragement for the increased demand.

Table 3. OFSP vine yields and revenues before and after using TAAT irrigation equipment.

| Multiplier | Sex | District | EPA | Village | Seed Buyer | Seed Sold (Bundles/kg) | Unit Price (MK) | Total Sales (MK) | Seed Sold (Bundles/kg) | Unit Price (MK) | Total Sales (MK) |
|----------------|-----|----------|---------|---------|------------|------------------------|-----------------|------------------|------------------------|-----------------|------------------|
| | | | | | | 2018-2019 | 2018-2019 | 2019-2020 | 2019-2020 | 2019-2020 | |
| Glenda Gomani | F | Blantyre | Soche | Bangwe | CIP | 1545 | 500 | 772,500 | 2805 | 700 | 1,963,500 |
| Maxwell Nkhoma | M | Zomba | Thondwe | Chibibi | CIP | 4601 | 500 | 2,300,500 | 2913 | 700 | 2,039,100 |
| Stanley Mlako | M | Zomba | Thondwe | Chibibi | CIP | - | - | - | 3197 | 700 | 2,237,900 |



OFSP vines being watered with rain hoses; a low-cost water solution for efficient water distribution.

Expanding Fish and Livestock Production in Africa

***TAAT Aquaculture Compact: Achieving Self-Sufficiency
in Inland fish Production in Africa***



Raised Pond Technology

Introduction

Fish farming is the principal form of aquaculture and involves raising fish in tanks, net enclosures (cages), or ponds. Aquaculture accounts for more than 43% of global fish supply but only 2% in Africa, mainly from Egypt and Nigeria. With fish in high demand globally, a great opportunity exists for the production of tilapia and catfish across the continent. Increased production of farmed fish by 2 million MT/y in Africa can increase fish consumption and greatly reduce current imports. However, to completely replace projected imports, the production of an additional 5 million fish by 2025 is required. This is a task not insurmountable with proper planning and investment.

Through the TAAT Aquaculture compact (TAC), the African Development Bank seeks to disseminate and upscale aquaculture technologies. This will be by increasing aquaculture value chain actors' productivity, increasing fish protein consumption and enhancing sustainability across the value chain. To achieve these, the compact aspires to create an enabling environment for technology adoption, facilitate effective delivery of technologies to aquaculture value chain actors, and raise aquaculture production and productivity through identification and deployment of appropriate technologies. TAC seeks to create and improve access to improved fish seeds for 80% of fish farmers across twelve countries. This will lead to achieving 20% increase in aquaculture production and 10 to 30% reduction in importation of fish. The increase will also improve household nutrition and employment creation for youth in the value chain. Aquaculture technologies deployed at scale include:

- 1) **Fast-growing, disease-resistant quality fish seeds and improved fish rearing technologies for tilapia (*Oreochromis niloticus*), catfish (*Clarias gariepinus*) and hybrids of *Heterobranchus* species and *Clarias* species**
- 2) **High-quality low cost fish feed using locally available raw materials**
- 3) **Improved post-harvest technologies and fish product development (value addition)**

TAC is led by the Worldfish Centre. The targeted countries for the compact are Benin, Burundi, Cameroon, Cote d'Ivoire, DR Congo, Ghana, Kenya, Malawi, Nigeria, Tanzania, Togo and Zambia. The Compact is working in close partnership with the TAAT-WEC led by IWMI, ENABLE TAAT led by IITA and the Capacity Development and Technology Outreach Enabler Compact TAAT-CDTO led by FARA.



Tilapia (Oreochromis niloticus)

Success Stories

Low Fish Productivity (Country: Zambia)

What was the problem?

Fish farms producing fresh tilapia and processed fish in Zambia are faced with many challenges ranging from indiscriminate theft, predators, lack of access to modern technologies, and poor management practices. Despite investments such as installation of solar plants for water pumping and running of aerators, renovation of ponds, and construction of cold rooms for fish storage to maintain fish freshness, the challenge of enhancing production and profitability still remain.

Intervention

TAC identified Better Management Practices (BMPs) and value addition technologies as requisite interventions capable of turning around the low productivity. The compact selected Mpeni farms in Lusaka as a demonstration center and extended its training services to farmers. The farm also received a facility upgrade with a solar tent fish drying technology. Many fish farmers including women and youths were trained on the use of modern technologies in fish farming as well as better management practices in preservation, storage and value addition. Through this effort, Mpeni farms now serve as a central location for training of women and youth in fish value addition and product developed from fish. These are fish fillets, sausages, mince fish, fish cakes and fish powder as an inclusion in baby food and pregnant women for the provision of essential amino acids. This technology is now being disseminated to other women in the country as a source of increased income and nutrition in the community.

Outcome and impact

According to Mrs. Joyce Tembo who benefited from the farmer outreach, “value addition overcomes the problem of rapid fish spoilage and is more profitable than selling fresh fish”. The technologies have transformed the community in several ways. These include providing a cheap source of protein for thousands of people and by providing them with the necessary knowledge to improve their fish productivity and storage.

Employment opportunities have been created in the community leading to the mobilization of resources for the impoverished. The TAC intervention has encouraged youths and women to come for contracts and training at Mpeni Farms. This leads to a more balanced resourceful and active community. Women in the community are now wholesalers of fish, who sell to retailers. Fish processing has now become a lucrative business in the community as women now order fish on a large scale to resell to others. After the interventions the yields increased by 60%, sales increased from USD2,000 to USD3,000. This is a 60% increase. At the moment, the farm is able to produce 1.2 tons of smoked and dried fish and 100 kg of fish sausage.

Increasing fish demand amidst rising land values (Country: Kenya)

What was the problem?

The oldest form of fish production is the utilization of existing water bodies. Here the yields are generally low (20-50 kg/ha/year) and the possibilities for human intervention are rather moderate. Non-availability of existing water bodies or land constitutes a great hindrance to those interested in going into fish farming in Africa. There is an increasing demand for aquaculture products in the face of mounting economic and environmental constraints. However, some constraints are curtailing the growth of aquaculture production. These

Fish sausage made by technology-adopting fish farmer in Zambia



constraints include rising land values and increasing pond rental costs that require greater economic return from fish farms, limited water availability, declining water quality issues, and increasing food safety concerns.

Intervention

In response to the lack of water bodies and land cost, the compact has introduced the raised pond technology. The compact organized multiple trainings to transfer knowledge on available technologies. These are; in-Pond Raceway System (IPRS) which reduces the period of production from eight months to five months; Raised Pond System (RPS) which gives women and youths who do not own land in Kenya and are not near a water body, the opportunity to start fish farming. It also works to increase the accessibility of high-quality feed. The Compact has introduced technologies that ensure the production of quality fast growing fingerlings. Raised Pond System uses less space, is easy to manage, and is movable, enabling a farmer to move with them from one locality to another.

Outcome and impact

Mr Wachira, a participant at one of the many trainings organized by one of the beneficiaries of



TAC's trainings, heard of the technologies available for fish production for the first time and took a keen interest in raised-pond technology. With resources given to him from his local church, Mr. Wachira got some space and started a fish growing venture. With this level of support, Wachira then contacted Mr. James (who is a beneficiary of the TAAT ToT training) to construct the raised ponds for him. Six raised ponds measuring 3 M x 2 M x 1 M were constructed and

stocked with 500 tilapia fingerlings. This led to increased production and a positive impact on food security in his community with knock-on effects on nearby communities. Other community members have learned from this experience and are now owners of fish businesses themselves. These technologies have been able to reach many prospective fish farmers through step-down training from TAC beneficiaries. Wachira is specifically thankful to TAAT for the new technologies since he can now do fish farming without owning much land. For instance, in Vihiga County-Kenya, Tigoi Fish farm is owned and managed and by a woman (Zinath Deen). It was established in 2012. After working with TAC it has increased its annual production from 120,000 to 360,000 mono sex tilapia fingerlings in hapas. The Increase in yield of 240,000 fingerlings is valued at USD 33,000. The annual income has increased from USD 16,649 to USD 49,440. That is an increase of 197% in revenue. The farm has also strengthened skills of over 38 fish farmers including youth and women.

Poor fish Productivity (Country: Zambia)

What was the problem?

Absence of adequately trained personnel to undertake production programs is one of the main constraints hindering the advancement of the aquaculture sector in Africa. Qualified employees are mainly enrolled in research or administrative work and are not part of the field outreach programs in fish farming. In Zambia for example, fish farmers experience serious challenges ranging from lack of knowledge and experience in modern technologies to low productivity. Exacerbating this challenge is the near-non availability of quality mono-sex tilapia fingerlings. The majority of extension services and production activities are carried out by fishery specialists who may not have the required practical knowledge in proper fish farming production. Other challenges confronting the aquaculture sector in Zambia are; stunted fish seeds, high levels of mortality, poor aquatic health management, high cost of fish feed with over 60 to 70% of farming costs entailing fish feed,

high level of post-harvest losses and low value addition.



Royd Mukonda and some his trainees in fish farming

Intervention

To address this myriad of challenges, the TAC in collaboration with the WorldFish Centre, organized a demonstration of aquaculture technologies and best management practices for extension workers, fish farmers and aquaculture value chain actors from 10 African countries including Zambia. Among those facilitated to participate in the training was Royd Mukonda, a university graduate of aquaculture who runs Mukasa Agrosolutions in Kabwe, Zambia. The TAAT training was timely for Royd as he was having challenges in breeding catfish and tilapia as well as accessing water quality parameters which are not found in Zambia. He was able to interact with experts in tilapia breeding from WorldFish and also bought the necessary equipment to use for production. He got the concept of mono-sex tilapia fingerlings production, value addition and production of low-cost feed using local raw materials from the information he received. To address the problem of non-availability of quality mono-sex tilapia fingerling, the TAAT Aquaculture Compact supported the young fish farmer with improved 300 brood stock to help him achieve massive mono-sex fingerling production.

Outcome and impact

Royd implemented the technology for mass fingerling production while using his farm as a demonstration center for conducting extensive trainings. Over 515 fish farmers in Zambia have been trained in quality fingerling production. The

trainees are now fish farmers and have been supported with fingerlings and technical support giving them the desire to invest more and achieve results with their farming activities. Royd's engagement with TAC has contributed massively to increased technical expertise in breeding and general management of aquaculture enterprises in Zambia. He now provides employment to 3 university graduates who are working on full-time basis plus 3 non-skilled permanent workers. The aquaculture compact enabled Mukasa farm to increase technical skills in production of mono-sex tilapia fingerlings. This enabled the farm to increase production per month from 250,000 to an average of 500,000 tilapia fingerlings from 3,200 brooders. That is an increase of 100%. Thereby increasing the availability of quality tilapia fingerlings in Zambia. The outcome was increased annual income from US \$ 61,000 to US \$ 183,000. That is an increase of 200% in revenue. It has also increased the customers data base and generated more employment. The success of the farm has attracted more than 200 new entrepreneurs and private investors. And the model farm has passed on skills to over 500 fish farmers including youth and women. The sex reversal rate success has improved from 70% to 98%.

In addition, Mukasa Farm is now the center for quality fingerlings, demonstration and training center for TAAT, and a partner with the Zambian Ministry of fisheries and Livestock.



Catfish (Clarias gariepinus)

Achieving Better Lives through Livestock

TAAT Livestock Compact facilitates, better access to technology scaling techniques, micro-finance and markets for livestock farmers, including women and youth with a view to achieving nutrition and improved



Abaynesh Demisse poses with her Holstein Friesian crossbreed heifer

Introduction

Livestock supports the livelihood of about 1.3 billion people in developing countries and contributes up to 30% of the agriculture GDP of countries in Africa, mainly through the provision of meat, milk, eggs, wool, hides and skins. Demand for livestock products in Africa is increasing, rapidly fueled by the growing population, urbanization and improved incomes leading to shifts in diets towards high value commodities such as meat and milk. Livestock is a source of readily convertible cash and acts as a household insurance against crop failures. The objective of the TAAT Livestock Compact (TLC) is to increase the productivity and profitability of small animal value chains through scaling-up innovations in livestock genetics, improved feed, better health, good production systems, linkages to the marketing and a conducive policy environment.

TLC's work cuts across value chains in the small ruminants and poultry sectors by scaling a selected number of proven technologies for more efficient, gender inclusive and sustainable sheep, goats and poultry production. The compact's delivery model uses best practices and approaches with carefully selected and existing partnerships between ILRI, ICARDA and CIAT, and strategic public and private sectors to make these technologies available, accessible, attractive and profitable for livestock farmers and other value chain actors.



Ensete Ventricosum recipe for sheep fattening in Doyogena, Ethiopia

Technologies being deployed at scale *Poultry value chain:*

- 1) Improved poultry genetics
- 2) Introduction of brooder enterprises to deliver 21 to 30-day old chicks to reduce mortality risks at smallholder production level
- 3) Promoting widespread use of effective Thermostable Newcastle disease vaccine
- 4) Production of high-quality cassava peels mash for livestock feed

Small ruminant value chain:

- 1) Promoting thermostable vaccine for Peste des Petits Ruminants (PPR)
- 2) Promoting improved forages, feed supplements and better use of crop residues for fattening
- 3) Strengthening business models for fattening enterprises and improving small ruminants' genetics through community breeding schemes

TLC is led by the International Livestock Research Institute (ILRI). The Compact's activities are being implemented in Ethiopia, Mali and Nigeria with prospects for extending activities into Kenya, Zambia, Mozambique, Cameroon and other countries that may be interested in accessing African Development Bank loans. The Compact works in partnership with the TAAT-WEC led by IWMI and ENABLE TAAT led by IITA.

Success Stories

Soil degradation and environmental pollution from cassava waste peels (Country: Nigeria)

What was the problem?

Approximately 98% of Nigeria's cassava peels annually are wasted due to constraints in peel drying and concerns about safety of use from a health standpoint, particularly hydrocyanide and mycotoxins related food poisoning. For example, cyanide from cassava waste peels significantly reduces soil microbial population, increases soil acidity and heavy metal content around processing sites. Drying peels during the rainy season takes two to three days. Consequently, peels are left to rot in heaps or set on fire polluting the nearby air, soil and groundwater and wasting a potential livestock feed resource. For every ton of cassava processed, 10 to 15%, that is approximately 125 kg/tons, are lost in form of wet peels, which are poorly utilized or dumped as waste or burnt. Thousands of women spend 5 to 10 hours a day in various cassava processing centers, peeling cassava and earning less than US \$ 2.5 a day. This huge cassava peels waste can be converted to useful livestock feed and additional farmer income. The High-Quality Cassava Peels Mash (HQCP) technology solves this problem of waste and environmental pollution and contributes to increased income. Processed peels also contribute to import substitution from replacing imported grains in concentrate feeds. Animal feeds is the most expensive livestock production cost, hence any saving in this cost will enhance income for producers. With livestock production expected to more than double in the next 40 years, transforming cassava peels into high-quality feed holds a huge income potential for African economies struggling to meet rapidly rising demand for animal-source products.

Intervention

Working with the stakeholders, e.g. ILRI, Synergos Nigeria Ltd, Business Innovation facility (BIF), The Compact promoted the HQCP technology jointly developed by the CGIAR Research Program on Roots, Tubers and Bananas (RTB), IITA, ILRI and CIP. Synergos Nigeria established prototype HQCP factories in partnership with ILRI and the

International Fund for Agricultural Development (IFAD) in Benue and Kogi States. The HQCP wet cake, fine and coarse mash are the key market products serving as ingredients in animal feed. Up to 25% maize in poultry feed can be replaced with HQCP fine mash. To gain commercial acceptance for the product, the partners conducted independent evaluation of the quality of cassava peels mash on broiler and layer chickens and beef cattle. Layer and broiler birds were fed with the HQCP mash at a replacement rate of 60 kg/ton. These birds performed similarly on feed intake, conversion efficiency, egg production and growth rate while achieving 10 to 12% lower feed costs



Cassava peels

compared with control birds on maize-based diet. Rams fed 591 gm/day coarse cassava peels and cassava leaves attained average weight gain of 66.5 gm. Pigs receiving 30% HQCP mash diet achieved feed conversion ratio of 5.97 from feeding approximately 200 to 250 grams per day of HQCP as supplement. Market linkages support for the HQCP flagship product (fine mash) led to identifying Premium Fish Feed limited, at Ikorodu in Lagos state, South-West Nigeria. Premium Feed incorporates up to 60% of HQCP into the fish mash to produce excellent quality, 100% floating, non-leaching fish feed. According to Premium feeds, fish fed with the fine mash feed achieved a feed conversion ratio (FCR) of 1:1, compared with 1: 0.5 on conventional feed. Premium feeds currently have a production capacity of 6,000 kg of feed daily with ample room for further expansion. The company off-takes up to 6 tons of

HQCP fine mash weekly. ATT Farms Makurdi, Benue State, is a livestock farm rearing pigs, chicken, fish and turkey. The farm buys HQCP from Oracle farms for livestock feeding. The pigs are, fed an average of 50 kg coarse mash weekly while the turkey birds are fed on the fine mash. Another initiative of the TLC was the training of Certified Master Trainers by BIF and Synergos, for quality assurance and more organized HQCP mash production.

Outcome and impact

To date, 120 entrepreneurs and 20 certified trainers have been trained at the ILRI HQCP model center at IITA, Ibadan on understanding the benefits of using cassava peels for feed. Synergos and ILRI are leading efforts to establish three additional cassava peels processing facilities in Kogi, Benue and Ogun states of

one year. Up to 15 to 20% reduction in feed costs are attainable by using HQCP mash.

Bolstered by the opportunity that the processing of cassava peels offers for poverty alleviation and women empowerment, the Benue and Kogi state governments have supported entrepreneurs to establish 10,000 hectares of cassava farm. In an effort to create more awareness of the HQCP mash technology, the Oyo State government in collaboration with the ILRI and the Raw Materials Research and Development Council (RMRDC), Nigeria, convened a stakeholders forum tagged "Waste to Wealth: Cassava Peels Utilisation". In addition, five Nigerian states including Abuja have been mapped with potentials to process cassava peels to HQCP.

Youth Unemployment (Country: Ethiopia)

What was the problem?

Youth constitute a significant portion of the Ethiopian population. Out of 108,386,391 people, 71% of this number fall under the 25 to 30 age group while two-third of the population are under 25 years old and more than half are women. However, urban youth unemployment stands at 22% compared to 17% for all other age groups. There is a high unemployment rate in rural areas where most of the youth live. The rural youth derive their livelihood from traditional farming with very limited land access. Access to land is guaranteed either through inheritance upon death, as gift, or as informal rental markets, leaving young farmers without land inheritance at a disadvantage. With 80% of population residing in rural areas, there are opportunities for the youth to get involved in livestock fattening and dairy production as a means of earning a living. The challenge remains that agricultural technology and best practices are not widely available or adopted across rural areas in Ethiopia. In most parts of Ethiopia, lack of training and knowledge prevent youths and women from playing pivotal entrepreneurship roles in the broader livestock value chain.

Intervention

The Compact partnered with the ICARDA to disseminate improved sheep fattening



Abaynesh Demisse feeding her rams

Nigeria. The partnership contributes to improving the economic wellbeing of rural women, enhancing value-addition of cassava peels in livestock and fish feeds and reducing the menace of environmental degradation. The TLC is supporting women cooperatives to own the HQCP processing machines so that they can reap the full benefits of the technology. The HQCP technology has the potential to add around 15 million tons of quality feed to the livestock sector when taken to scale. The economic potential to the feed industry in Africa hovers around 2 billion dollars a year. From the installed capacity of the four new small and medium cassava processors, it is estimated that approximately 10 tons/day of HQCP mash will be produced. This translates to approximately 117,000 or 0.11 million USD in

technologies in Bonga, Doyogena in the Southern Nations, Nationalities and Peoples region (SNNPR) and Menz in Amhara region. The partnership successfully provided resources, technical and business trainings to youths. The TLC's sheep fattening intervention created youth and women sheep fattening groups which were not existing before the intervention. To kick start interventions, the Compact provided one free ram to each youth and women group, while each youth provided another ram. The youths were trained on aspects of sheep fattening such as feeding, housing, and health. Other materials provided included, plastic feeding and watering containers for the animals. The project trained NARES trainers, on sheep fattening and entrepreneurship business training.

Outcome and impact

In Doyogena, Ms. Abaynesh Demisse, a youth beneficiary aged 22 years, said that the deployment of sheep fattening technology by the TLC and partners has enabled her (and her family) to increase their livestock and overall asset ladders. Ms. Abaynesh who started the sheep fattening business with two rams (including one free Ram through TLC), is on her 5th sheep fattening cycle. She currently owns a Holstein Friesian crossbreed heifer worth 9,000 ETB (USD 279) and 4 sheep. She has also upgraded her father's house structure and has created shelter for her livestock in her homestead. In Bonga, Mr. Ashebir qualified as a beneficiary on a sharecrop basis to acquire a sheep and benefit from the start-up package. He is currently on his 4th sheep fattening cycle and owns an ox worth 12,000 ETB (USD372) and 4 rams. The improvement in livelihoods was observed for 150 women through the feed technology program deployed by the TLC. The technology intervention included using the false banana recipes known as *Ensete ventricosum* as feed for the sheep.

Through TLC's intervention among other things, women have become trailblazers in processing Ensete plants into useful material relevant as feed for animals and food for human consumption. The newly introduced modern sheep fattening techniques have increased income and shifted consumption patterns. The cost of buying a young ram was approximately 2,600 ETB (USD80.7) in 2018, while fattened rams, were sold at approximately 6,000 ETB (US \$ 186) by the end of 2019. This is an increased income of over 230% for families within the intervention sites of the Compact. Accounting for inflation and production costs at approximately 30 ETB per animal/day for 90 days of fattening amounts to approximately USD84.3 leaving a net profit of USD101.6 per animal. Over a period of one year the youths earned approximately USD440,000 from selling



One of the TAAT beneficiaries, Mr Ashebir feeding his rams

approximately 4,000 rams. In addition to improved living standards, some of the youths have been able to use the income from sheep fattening for higher education, and other family support projects.

Loss of Soil Fertility due to Erosion (Country: Ethiopia)

What was the problem?

Millions of smallholder farmers in Southern Ethiopia confront three major issues which



a soil degraded site on the Ethiopian highlands

rotate around the need to intensify and diversify their farm production. These include limited land sizes in the face of exponential population growth, the need to preserve the environment through good agricultural practices in order to maintain its productive capacity for current and future generations and managing the threat of soil erosion as one of the major factors leading to land degradation, severe loss of soil fertility and decline in agricultural production.

Intervention

In partnership with Inter Aide, the TLC leveraged an innovative approach that comprises combining fodder production with soil and water conservation. This involves planting fodder on contour bounds and in unproductive places of the farm. This single practice allows farmers to address the problems of erosion, reduce the



Combining fodder production with soil and water conservation

loss of fertility and fodder scarcity. These measures contribute to generating new sources of income as well as food, to reduce the burden on women who collect fodder for livestock. It was also necessary to control open grazing. The initial challenge of access to planting materials was solved by training farmers on how to multiply vegetative materials by the families in farm-based micro-nurseries. The combination of grass and legume forages integrated on the SWC structures, as well as on underutilized land helped to address the crucial livestock feeding problems without competing with traditional food crops space. The involvement of traditional social organizations called "Iddirs" helped stimulate community ownership, to ensure consistent implementation at the scale of micro watersheds, and to address the critical issue of animal open-grazing control.

Outcome and impact

The TAAT Livestock Compact has identified, organized and engaged 27 villages in Soil Water Conservation Structures Forage Development (SWCS-FD) work, mobilizing and engaging 30 *Iddirs* in the process. About 1,822 households in the watershed are benefiting directly from the SWCS-FD work with a potential to reach 1,000 HH per each *woreda*. By the end of 2019, 89 peer educators were trained with each providing technical support to 25 farmers in the construction of anti-erosive structures. They also



Degema and Birke, beneficiaries of the TAAT- Inter aide integrated fodder production project in Ethiopia

organized peer education learning visits to older project sites for farmers and community leaders to learn and make sound decision about adopting the technology. Eight hundred and seventy-four (874) family backyard nurseries of an average size of 50 M² have been established with zero open grazing recording, while 70% of farmers have been trained to set up vegetative structures and multiply forage planting materials on terraces. About 100 carpenters received technical training on fabrication of feeding troughs for improved livestock feeding. TAAT Livestock plans to support the Regional government of Oromia, Ethiopia, to secure their investment in poultry by delivering approximately 400,000 of *thermo-tolerant* Newcastle disease (ND) vaccine to about 85,000 households, 70% of these are youths of which women constitute about 40%. Through the partnership with Inter-Aide, the TLC has succeeded in improving fodder-soil conservation by introducing water retention ditches for successful implementation and effective erosion control.

Efforts to mitigate soil erosion for improved fodder yields are expected to spill over to the areas focused on sheep fattening. Approximately 60 Km² equivalent to

6,000 hectares of vegetated Soil and Water Conservation structures were constructed to rehabilitate degraded farmlands. Forage yield conservatively estimated at 15,000 tons Dry Matter per hectare (2.5 tons/ha) was produced from the rehabilitated lands. This quantity of fodder will feed approximately 7,350 Cattle or approximately 73,000 sheep and goats for 4 months during a typical dry Season.



Transporting livestock feed

Conclusion

The TAAT Programme recognizes that success in transforming agriculture to reach the Comprehensive African Agricultural Development Program's (CAADP) goals will come from interventions at a very large scale that require partnerships between research institutes, public institutions, farmers' support organizations and the private sector with the combined support of national programs. In Year 2 of implementation, TAAT continued on its pathway to transforming African agriculture by delivering technology solutions to smallholders as well as large scale farmers through its nine commodity compacts organized around rice, maize, cassava, wheat, sorghum and millet, orange-fleshed sweetpotato, high iron beans, small ruminants, and aquaculture. The Compacts are supported by six enabler compacts providing support services in soil fertility management, water management, capacity building and technology outreach, advocating a supportive seed technology policy, mobilizing the youth into agribusiness, and organizing a response to the fall armyworm invasion.

Accelerated use of proven technologies is at the heart of TAAT's ambition to improve productivity and efficiency in African agriculture. This is through a bundle of technologies that include advances in crop improvements through new and better varieties of crops and better genetics in breeds of animals coming out of research institutions and the accompanying technology toolkits that enable them to be fully deployed. This achievement requires that the program coordination and implementation structures mobilize proven technologies and bring them to their intended beneficiaries.

Building on the foundation laid down these past two years of TAAT operations as well as the lessons learned, it is imperative that TAAT meets and even surpasses its overall goal to ensure that 40 million smallholder farmers across Africa can effectively access productivity-enhancing technologies and services by 2025. There is no doubt that the progress to reach the stated goal will be accelerated by Phase II of TAAT. Phase II will build seamlessly on the investments and infrastructure set out by TAAT I.

In 2020 and beyond, TAAT will accelerate achievements to scale by reaching further down the value chain to support the development of efficient supply chains that increase returns to farmers and offer guarantees of quality produce to upstream investors in processing capacity and value-addition. TAAT has identified a suite of policies requiring regional harmonization and enforcement. TAAT will therefore intensify the support to policy-based regional activities. It will also support the bank's funding to countries based on analytics for impact. TAAT compacts are committed and tooled to offer expertise to individual countries or regional projects to ensure that the projects are implemented utilizing the best possible bundle of technologies and practices. That way TAAT will assist the bank in ensuring that the stated goal of improving the African Agricultural Productivity is achieved through the value chain selected under the Feed Africa Strategy. TAAT is committed in assisting the design of projects that are sustainable and profitable to enhance agricultural transformation across the continent.

The TAAT seed system support is already benefitting over 6 million farmers. TAAT will continue to deepen the expansion of these seed systems, partnering with private seed firms and SMEs to

ensure sustainability at scale. Where there are no seed systems, TAAT works with partners to support their development as viable businesses. Phase II of TAAT will allow partners to invest more in supply chain infrastructure. These are agro-dealer networks and agripreneurs and SMEs supporting the value chain, and better use of technology tools for trainings, managements and analytics. In the last two years of operations, TAAT has identified some policy bottlenecks limiting faster agricultural development, harmonized regional agricultural systems viz seamless seed systems, movement of varieties across borders, and value chains development. TAAT with the partners, will continue to engage individual countries and regional bodies to remove these bottlenecks.

TAAT is a strong engine already contributing towards agricultural transformation on the continent. However, comprehensive transformation can only be achieved by continuing with priority value chains through strategic public-private partnerships. We will also work to provide mechanisms that improve market systems that attract more farmers and provide the necessary incentives that lower production, processing, and marketing costs. This will be achieved through collaborations with public and private sector as well as other multilateral donors and development agencies working in the same sector.

TAAT Consolidated Statements Of Sources & Application Of Funds (US \$)

Year End 31 December 2019

| | 2019 | 2018 | | |
|--|-------------------|------------------|-------------|-------------|
| <i>Source of Funds :</i> | | | | |
| AFDB | 15,416,842 | 6,300,114 | | |
| Other Donors: | | | | |
| Bill and Melinda Gates Foundation (BMGF) | 1,220,822 | 1,139,762 | | |
| TOTAL FUNDING FOR THE YEAR | 16,637,664 | 7,439,876 | | |
| | ADB/ADF | | BMGF | |
| <i>Application of Funds:</i> | 2019 | 2018 | 2019 | 2018 |
| Component 1: Creation of Enabling Environment for Technology Adoption | | | | |
| Works | | | | |
| Goods | 1,168 | 8,248 | | |
| Services | 285,204 | 566,824 | | |
| Personnel | | | | |
| Recurrent | 45,327 | 81,921 | | |
| SUBTOTAL | 331,698 | 656,993 | | |
| Component 2: Regional Technologies Delivery Infrastructure (RTDI) | | | | |
| Works | | | | |
| Goods | 20,136 | 125,959 | | |
| Services | 1,002,210 | 1,055,234 | | |

| | | | | |
|--|-------------------|------------------|----------------|------------------|
| Personnel | | 30,197 | | |
| Recurrent | 175,897 | 150,142 | | |
| SUBTOTAL | 1,198,242 | 1,361,531 | | |
| Component 3: Deployment of Appropriate Technology (DAT) | | | | |
| Works | | | | |
| Goods | 5,586,633 | 152,962 | | |
| Services | 4,309,642 | 1,224,788 | | |
| Personnel | | 44,839 | | |
| Recurrent | 474,672 | 219,503 | | |
| SUBTOTAL | 10,370,947 | 1,642,092 | | |
| Component 4: Project Management | | | | |
| Works | | | | |
| Goods | 81,249 | 134,392 | | 52,451 |
| Services | 973,380 | 572,618 | 86,595 | 263,030 |
| Personnel | 3,079,156 | 1,539,230 | 221,547 | 955,860 |
| Recurrent | 706,485 | 251,123 | 2,351 | 18,330 |
| SUBTOTAL | 4,840,270 | 2,497,364 | 310,492 | 1,289,671 |
| TOTAL FUNDS APPLIED | 16,741,158 | 6,157,980 | 310,492 | 1,289,671 |

Who's who in TAAT in 2019

PROGRAM STEERING COMMITTEE

Members:

Mr. Gaston Cossi DOSSOHOUI
 Dr. Mary A. MGONJA
 Dr. Dunstan S.C. SPENCER
 Dr. James Ambrose AGONA
 Dr. Stella Ama ENNIN
 Dr. Sophia E.N. MLOTE
 Prof. Abdourahmane SANGARE
 Dr. Abdou TENKOUANO
 Dr. Noe WOIN
 Ms. Maria Z. ZALOUMIS

Chairperson
 Vice-Chairperson
 Vice-Chairperson
 Member
 Member
 Member
 Member
 Member
 Member

Ex officio members (non-voting)

Dr. Kenton DASHIELL
 Dr. Ramadjita TABO
 Dr. Mpoko BOKANGA

Representing the Executing Agency
 Representing the Implementing Agencies
 Secretary of the PSC, Head of TAAT Clearinghouse

CLEARINGHOUSE (CH) STAFF

Mpoko BOKANGA
 Oluwatoyin ADETUNJI
 Boris ADOUGAN
 Fidelia BABADJIDE
 Rollande HOUNSINO
 Mary IGBINNOSA
 Welissa MULEI
 Atayi OPALUWAH
 Ayoko VIAS
 Paul WOOMER
 Rachel ZOZO

Head of Clearinghouse
 Value Chain Specialist
 Driver/Messenger
 Executive Assistant
 Senior Accountant
 Partnership Engagement Expert
 Technical Assistant
 Communication Specialist
 Program Officer
 Technical Adviser
 Monitoring & Evaluation Specialist

PROGRAM MANAGEMENT UNIT (PMU) STAFF

Chrysantus AKEM
 Adeola ADEEKO
 Kikelomo ADEKOYA
 Ebenezer ADENEKAN
 Tarhyel AYUBA
 Monsuru BAKARE
 Seyi FASHOKUN
 Sabra LEWIS
 Becca OLAMUYIWA

Program Coordinator
 Procurement Officer (through April 2019)
 Accounting Officer
 Executive Assistant
 Driver
 Procurement Specialist
 Program Accountant
 Program Administrator
 Accounting Officer

TECHNOLOGY DELIVERY COMPACTS

Rice Compact

Sidi SANYANG

Compact Coordinator

| | |
|---|---|
| Maize Compact | |
| Jonga MUNYARADZI | Compact Coordinator |
| Sorghum & Millet Compact | |
| Dougbedji FATONDJI | Compact Coordinator |
| Wheat Compact | |
| Solomon Assefa GIZAW | Compact Coordinator |
| High Iron Beans Compact | |
| Josey Kamanda | Compact Coordinator |
| Cassava Compact | |
| Adebayo ABASS | Compact Coordinator |
| Orange-Fleshed Sweet Potato Compact | |
| Kirimi SINDI | Compact Coordinator (through November 2019) |
| Livestock Compact | |
| Samuel Adeniyi ADEDIRAN | Compact Coordinator |
| Aquaculture Compact | |
| Bernadette FREGENE | Compact Coordinator |
| Fall Armyworm Compact | |
| Peter CHINWADA | Compact Coordinator |
| Enable-TAAT Compact | |
| Evelyn OHANWUSI | Compact Coordinator |
| Soil Fertility Compact | |
| Jean Ekwe DOSSA | Interim Compact Coordinator |
| Water Management Compact | |
| Sander ZWART | Compact Coordinator |
| Capacity Development & Technology Outreach Compact | |
| Krishan BHEENICK | Compact Coordinator |
| Policy Support Compact | |
| Francis NANG'AYO | Compact Coordinator |



Presenting the Mobile Cassava Processing Machine at the National Cassava Investment Forum in Abuja

MOBILE CASSAVA
PROCESSING CAPACITY

24

TONNES OF FRESH
CASSAVA ROOTS INTO
CASSAVA CAKE/DAY



HUMAN PROCESSING
CAPACITY (WOMEN) - GAARI



50kg
PER DAY

MOBILE CASSAVA
PROCESSING CAPACITY - GAARI



250kg
PER DAY



AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE
DE DEVELOPEMENT



Technologies for African
Agricultural Transformation

For more information, please contact:

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