SAHEL QUARTERLY
Nourishing Africa

CRITICAL TRENDS IN AGRICULTURE AND FOOD IN AFRICA FOR THE NEXT DECADE

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EDITORS' NOTE

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With great excitement, I present the twenty-sixth issue of the Sahel Quarterly focused on the Critical Trends in Agriculture and Food in Africa for the Next Decade.

Within the year 2020, Africa recorded unprecedented disruptions in our health, economic, political, financial, and governance ecosystems. With 2020 ending on the heels of the Corona pandemic, Africa is predicted to fall into the worse recession yet. This year also revealed the fragility of the agriculture landscape and the urgent need for increased efforts to build resilience and strengthen the food ecosystem. Moreover, climate change and the depletion of natural resources have reduced agricultural productivity and increased risks for most farmers on the continent despite having more than 65% of the world's uncultivated arable land[1].

Despite these challenges, the continent is also faced with unique opportunities to thrive. The agriculture sector is well-positioned to contribute to attaining all seventeen Sustainable Development Goals (SDGs), given the sector's potential to contribute to food security, poverty alleviation, good health and wellbeing, water and energy use, climate action, and decent work and economic growth. Emerging trends demonstrate the various possibilities for driving growth. From the growing number of agri-tech start-ups to the dramatic increases in the penetration of mobile technology across the continent, reliance on big data, and the growing demand for equality and inclusion at all levels, it is evident that the continent is at a tipping point.

This Quarterly presents practical solutions by exploring ten critical trends in the agriculture and food landscapes that should be prioritised for stakeholder action in the next decade. These trends were carefully and strategically selected based on their early evidence of impact, and potential to transform the sector and create real change. By sharing these ten critical trends, this Quarterly highlights strategic pressure points to tackle poverty, achieve zero hunger, and attain sustainable development on the continent. It is, therefore, my hope that this Quarterly will inform, educate, sensitise and mobilise the required urgent action to address challenges and drive sustainable growth on the continent in the next decade.

1. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Brochure_Feed_Africa_-En.pdf

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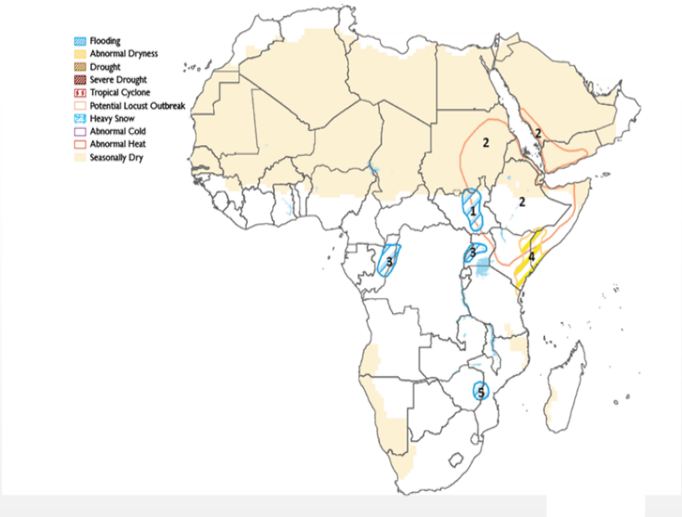
SCALING CLIMATE-SMART AGRICULTURE

BY BOMI FAGBEMI

Africa is the most vulnerable continent to the effects of climate change. Nineteen of the past 20 years have been hotter than any previous year on record. In 2020, River Nile and its tributaries have continually overflowed. Heavy rainfall has also led to flooding in parts of Uganda, the Republic of the Congo, Zimbabwe, and Nigeria. On the other hand, short rains in East Africa have led to moisture deficits in Kenya and Somalia[3]. Desertification, rising sea levels, and other issues currently plague the continent and are projected to worsen over the next few years. Effects such as these disproportionately impact smallholder farmer families who make up ≥70% of food production across the continent. By the end of the century, the continent may lose two of its staple foods; it is estimated that over 30% of areas producing maize and over 60% of the area where beans are grown would no longer support the crops[4].



Africa Weather Hazards. Source: FFEWSNETINOAA

By 2030, the focus should be ensuring that agriculture has become part of the solution, by developing and implementing sustainable, environmentally friendly solutions to intensify production to feed Africa's growing population while protecting the environment and reducing the carbon footprint from agriculture across the continent.

Adaptation

Climate change adaptation means modifying production methods to increase efficiency and resiliency. These approaches often build on existing **indigenous practices and knowledge.** Agricultural technologies that are addressing climate change fall under the following broad categories:

- Soil management: includes interventions focus on enhancing soil health.
- Crop management: includes innovations to ensure crop resistance to the impact of climate changes such as the development of more resilient varieties.
- Livestock management: includes improved or modified livestock management practices such as improved grazing management, improved pasture and agroforestry species, breeding for heat tolerance, etc.
- Water management: includes improved water management practices through the capture and retention of rainfall and improved irrigation.

Within these broad categories, specific developments are expected to play a significant role in building climate change adaptation:

Resistant Crop Varieties

In sub-Saharan Africa, the Drought Tolerant Maize for Africa initiative released over 200 drought-tolerant maize varieties between 2007 and 2015. These generate 25-30% yields superior to currently available commercial maize varieties under stress and optimal growing conditions. According to CGIAR, $150 million of additional funding is required to scale drought-tolerant maize in the next ten years. This is a wakeup call for national governments to commit to investing in agricultural research to promote long term productivity and resilience.

Agroforestry

Agroforestry integrates trees and crops in an intentionally designed system. In an agroforestry system, every plant is selected for a particular purpose such that plants will not compete but collaborate. This diversity of crops and trees allows the area to be productive[5] throughout the year so that

2. https://gain.nd.edu/our-work/country-index/
3. https://reliefweb.int/report/world/global-weather-hazards-summary-november-13-19-2020
4. Ramirez-Villegas J, Thornton PK (2015) Climate change impacts on African crop production, CCAFS Working Paper no. 119. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen Available at: www.ccafs.cgiar.org
5. Programme & Concept Note. http://www.fao.org/3/I9096EN/i9096en.pdf

farmers can earn income in all seasons. Cocoa plants, for example, thrive in the shade of trees. In Indonesia, oil palm plantations have been shown to benefit from intercropping. Every form of mixed (cocoa +oil palm) systems reduces the carbon footprint of cultivating crop on its own. These mixed systems are also less sensitive to price uncertainty and act as a buffer for each crop's production risks[6].

Irrigation systems

Agriculture is the largest user of the world's freshwater resources, using 70% of the available supply, and over 95% of farming in sub-Saharan Africa is rainfed[7]. So, as climate change increases the uncertainty around rainfall patterns and creates moisture deficits across the continent, it is imperative to implement low-cost solutions to increase smallholder resilience. In Benin and Togo, low-cost irrigation systems designed and developed by farmer groups involving bunds, drainage canals, and irrigation infrastructure can help farmers diversify their crops and income, and enhance climate resilience. In Morocco, a system combining trees and shrubs using contour ridges proved successful in collecting runoff in areas with rainfall of less than 200 mm[8].

Alternative farming

The use of alternative soilless farming systems such as hydroponics, aeroponics, and vertical farming can extend growing seasons and supply fresh produce year-round while eliminating the challenges of transport costs and greenhouse emissions. This increased efficiency in production and allocation can reduce agricultural waste from large hectares of crop farms. By 2030, aquaculture is likely to be responsible for the more significant part of global fish production, and the further development of methods like aquaponics can see the farming of fish species in landlocked regions where they are non-native[9]. Aquaponics allows the simultaneous cultivation of fish and produce. The plants act as a biofilter, cleaning the water and using the fish waste as a nutrient for growth. In areas prone to drought and at risk of desertification, recirculating systems such as these are a boon, as less water is needed than traditional farming, and seasonal effects do not limit production. In the Egyptian desert, Bustan Aquaponics is cultivating produce and fish simultaneously. Produce from commercial aquaponics systems is usually sold to niche markets to maximise profits. In Guinea, AquaFarms Africa has trained women and youth to launch their own AquaFarms franchises to boost the local economy and promote agriculture[10]. This might lead to wide-scale adoption and encourage greater self-sufficiency among smallholders.

Mitigation

According to the UN Environment Program, Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy-efficient, and changing management practices or consumer behaviour[11]. Agriculture can also contribute to providing solutions that will reduce greenhouse gas emissions in the medium to long term. Two far-reaching solutions are highlighted below.

Waste-to-energy

Farms have the potential to become an integral part of energy infrastructure. In Africa, waste-to-energy/ bioconversion/biogas can provide sustainable, low-cost electricity and gas generation. This could lead to the development of mini-grids, where agricultural activity helps to provide power to farming communities. Circular economies/ systems remove the inefficiencies in our value chains and emulate the closed-loop circular systems of natural ecosystems, thereby eliminating carbon emissions into the atmosphere. Waste 2 Watt (W2W) is an example of a program in the rural off-grid community of Rije in Northern Nigeria. W2W focused on converting agricultural and communal waste into electricity and cooking gas using a biogas digester. Given the proliferation of similar initiatives across the continent, by 2030, it is likely that waste will be treated more and more like a resource, with increased competition over its value, collection, and utilisation, at local, regional, and international levels.

Alternative protein sources

Changing consumer behaviour and increasing demand for non-animal protein is expected to lead to less deforestation for grazing and a reduction in farmland dedicated to the production of livestock feed. For example, insect protein has the potential to make a huge difference as an alternative source of protein. Insects can be grown with extraordinarily little water, much less land, and subsequently a lower environmental impact than livestock and traditional feed products like soybean and maize. For example, Black Soldier Fly Larvae can convert large amounts of organic waste to animal feed and fertiliser. Companies like Agriprotein and Ynsect have made strides in this regard. Over the next decade, insect protein will appear much more commonly in products meant for human consumption; it is estimated that this industry will be worth $8 billion by 2030[12].

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6. https://www.frontiersin.org/articles/10.3389/fsufs.2019.00122/full
7. http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/facts-and-figures/all-facts-wwdr3/fact2-agricultural-use; https://www.iwmi.cgiar.org/issues/rainfed-agriculture/summary/
8. Climate change adaptation in agriculture: practices and technologies: https://cgspace.cgiar.org/bitstream/handle/10568/71051/SBSTA44-Agricultural-practices-technologies.pdf
9. http://www.fao.org/3/i3640e/i3640e.pdf
10. Welcome | AquaFarmsAfrica. https://www.aquafarmsafrica.com/
11. https://www.unenvironment.org/explore-topics/climate-change/what-we-do/mitigation#:~:text=Climate%20Change%20Mitigation%20refers%20to,management%20practices%20or%20consumer%20behavior.
12. https://www.investmentbank.barclays.com/our-insights/insect-protein-bitten-by-the-bug.html

Another example is synthetic proteins, which will begin to replace traditional meat products over the next decade. Food -as-software models are becoming popular in the developed world. This allows individuals to engineer food at a molecular level and upload to databases that are accessible by food engineers anywhere in the world – in the same way that software developers release APIs. Such models ensure that there is a continuously, iterating, decentralised model of an alternative food production system that aims to mitigate the effects of climate change[13].

Reversing Climate Change?

To truly have sustainable agriculture, we may have to go beyond mitigating and adapting to climate change. Ultimately, the African continent will have to make concerted efforts to reverse the effects of climate change. Carbon sequestration through regenerative agriculture has been touted as having the potential to reverse the negative effects of climate change. Regenerative agriculture comprises of planting cover crops, etc. to improve soil health. As such, regenerative agriculture seeks to remove carbon dioxide out of the air by storing it as organic carbon in soils. There are currently conflicting reports over the extent of the benefits, and more research into this and other methods to remove carbon dioxide directly from the atmosphere is needed[14]. *More about regenerative agriculture is discussed in Article 9 of this publication*.

Stakeholders must take responsibility for scaling climate-smart agriculture over the next decade

As highlighted by the many examples above, it is worth noting that most of the recommendations and technologies regarding climate-sensitive agriculture already exist, however, a lack of incentives has hindered broad adoption. Also, most African countries have so far shown a placid response to climate change, with some governments directly opposing the idea itself.

To foster a climate-smart transformation of agriculture, a recent panel of experts highlighted four key areas of action[15].

- First, farming and rural livelihoods need to be rerouted to new trajectories that both reduce emissions and are climate-resilient. CSA cannot be accomplished through a single "silver bullet". Instead, a set of interventions is needed for a climate-smart transformation of agricultural systems that includes climate-smart crop/livestock technologies (e.g. varieties and management practices); delivery of site-specific climate information, agro-advisory and extension services; provision of insurance products and financial services that build resilience; enhanced institutional support structures that support resilience-building; and key policy reforms that enable transformation.
- Second, farms and value chains need to be de-risked to cope with increasing extreme weather events. This can both protect livelihoods and attract investment from private financing sources.
- Third, emissions need to be reduced from agriculture, while still ensuring sufficient nutritious food is produced for a growing African population, particularly in urban areas.
- Fourth, a realignment of policies, finance, support to social movements is needed, with innovation to facilitate action in the above action areas.

These key areas of activity require urgent stakeholder engagement.

Policymakers have the biggest role to play. They can influence the effects of climate change over the next few decades across different levels of society. Italy became the first country to make the study of climate change and sustainability in schools mandatory. Strategies such as these do not require infrastructural change but can create an outsized level of societal change. Worthy of emulation is another example from the Philippines. The country has implemented a new law requiring each student from all educational levels to plant ten trees before graduation. It is estimated that a single generation will plant 525 billion trees as a result of this reforestation policy.

Agro-processing companies need to prioritise reframing waste and unsustainable practices as production inefficiencies to be avoided. This is important to stop the over-theorising surrounding the extent to which climate-smart practices can mitigate climate change but instead focus on pilot testing so that there are more practical use cases to draw from. Sustainability and profit ought to go hand in hand: Coca-Cola's deal to use Climeworks's direct air capture technology (taking carbon dioxide directly from the atmosphere) to carbonate its beverages is an example of how food and agro-processing companies can form partnerships across value chains to integrate technology.

Funding institutions and development organisations must focus on funding innovative companies that are helping to make agricultural systems more resilient. While implementing sustainable practices may bear a high initial cost and investment, they tend to pay back the cost over time. Linking farm subsidies to sustainable agriculture practices can create a significant financial incentive for farmers to explore eco-friendly agricultural methods – this can be achieved through multi-stakeholder partnerships

13. https://www.cranfield.ac.uk/press/news-2020/lab-grown-food-made-from-air-but-is-there-appetite-for-synthetic-protein; https://geneticliteracyproject.org/2020/06/08/next-food-revolution-will-synthetic-proteins-eliminate-animals-as-food/; https://www.frontiersin.org/articles/10.3389/fsufs.2020.577723/full
14. https://www.wri.org/blog/2020/08/insider-further-explanation-potential-contribution-soil-carbon-sequestration-working
15. ttps://cgspace.cgiar.org/bitstream/handle/10568/108489/Actions%20to%20Transform%20Food%20Systems%20Under%20Climate%20Change.pdf

including funding institutions, the government, and the private sector. Lastly, international development partners can contribute by encouraging the adoption of climate-sensitive practices in relevant projects funded by their organisations.

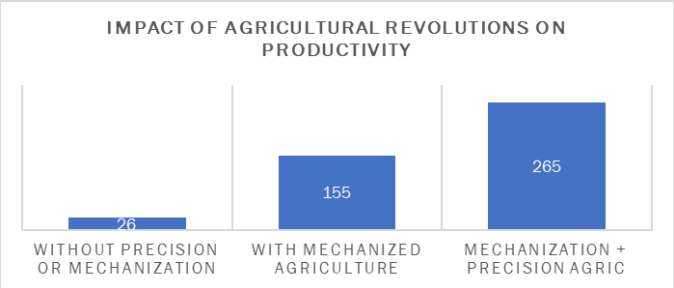
Further read: Sahel has published a robust quarterly on Climate Change and Agriculture. To download and read: https://sahelconsult.com/climate-change-and-agriculture-in-africa/

OPTIMISING RESOURCES THROUGH PRECISION AGRICULTURE

BY ABISOLA OLADELE

Precision farming is fast gaining popularity and traction across the globe. In fact, the third wave (3rdW) of modern agricultural revolutions is greatly dependent on the advancement of precision agriculture. The combination of Global Positioning System (GPS), Internet of Things (IoT) and mobile mapping has provided agriculturists with a new capability of gathering information for implementing decision-based precision agriculture. Food producers can now make nutrients available when crops need them, match the amount and type of fertiliser to crop needs, and place nutrients where crops can use them.

It is exciting to know that with field sensor systems on farmers' phones, farmers can now capture visual observations of crop growth, diseases, pests, weeds and other anomalies while taking a walk on their farms. Even more exciting is the fact that such anomalies can be corrected in real-time leveraging precision agriculture technology to apply needed plant nutrients, irrigation, and pest control. With precision farming, each farmer will feed 265 people on a land that once fed only 26 people[16]. This potential impact on food security in Africa is enormous.



Source: Emerging Trends in Precision Agriculture: Reshaping Nigeria's Conventional Farming Practices, 2020

Precision Agriculture in Africa

The African continent is yet to fully scratch the initial surface for the adoption and optimisation of precision agriculture as there is yet little statistical evidence of the use of precision agriculture technology on the continent. However, it is important to note that the initial barrier of entry into farming technology that has plagued the continent for many years has dropped significantly, as cloud computing, computing systems, connectivity, open-source software, and other digital tools have become increasingly available[17]. Agri-food entrepreneurs across the continent can now deliver solutions – and in fact, are now delivering solutions to small-sized farms

at cost models that farmers can afford.

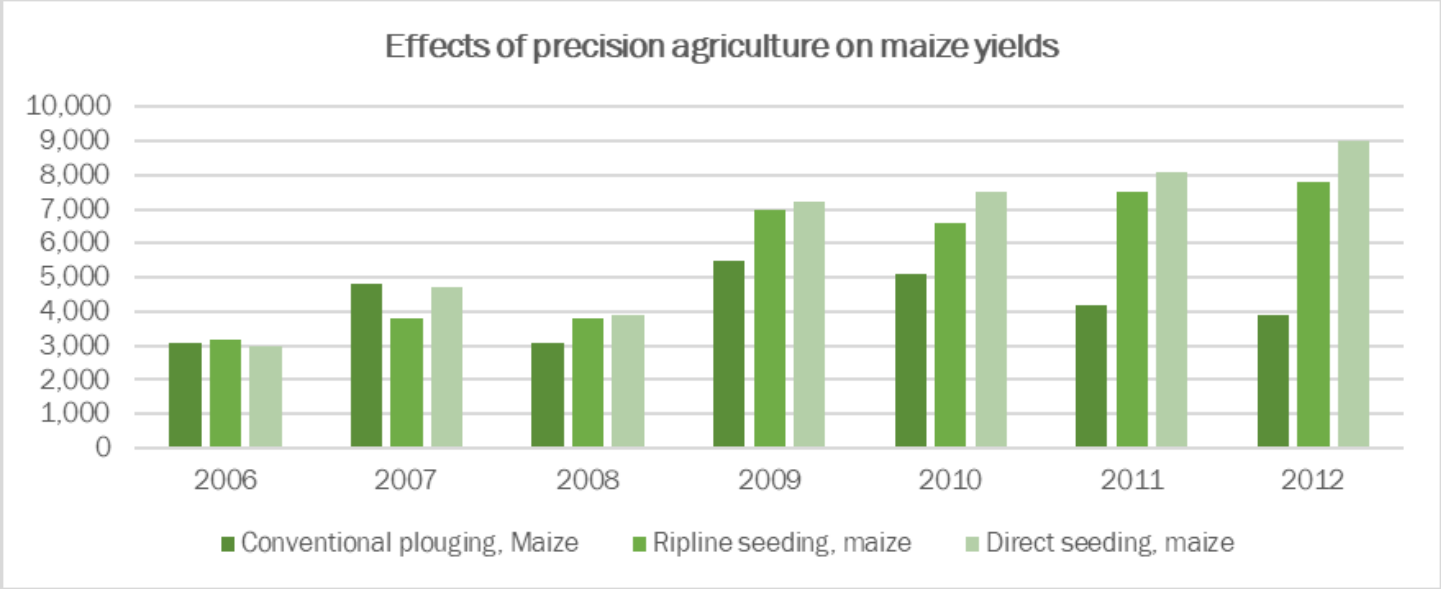
In Nigeria, Zenvus, a precision farming startup, measures and analyses soil data like temperature, nutrients, and vegetative health to help farmers apply the right amount of fertiliser and optimally irrigate their farms. In Kenya, UjuziKilimo, a tech startup, uses big data and analytic capabilities to transform farmers into a knowledge-based community, to improve productivity through precision insights. SunCulture, also a Kenyan tech startup sells drip irrigation kits that use solar energy to pump water from any source, making irrigation affordable[18].

Precision agriculture has also been deployed in several other contexts. Presentations made at the West African Forum on Precision Agriculture (WAFPA) in February 2020 indicates that fertiliser deep placement technology introduced in irrigated rice production systems in Burkina Faso and Senegal has led to significant effects on yield and reduction of Nitrogen losses in the soil. The private sector, research institutes, and universities use drone technology for land use classification, crop canopy and density mapping in Burkina Faso, Ghana, Cote d'Ivoire, Nigeria, and Senegal. Another example is the Chameleon and Wetting Front Detector Sensors developed by the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia which have enabled small scale farmers in Mozambique, Tanzania, and Zimbabwe to cut down irrigation frequency fifty times and double productivity[19].

16. OFABNIGERIA, Emerging Trends in Precision Agriculture: Reshaping Nigeria's Conventional Farming Practices, 2020
17. How digital technology is changing farming in Africa. https://www.ippmedia.com/en/features/how-digital-technology-changing-farming-africa
18. Further read: Sahel has published a quarterly on Technology in Agriculture which features more companies. Read and download at: https://sahelconsult.com/agricultural-technology/
19. https://www.apni.net/2020/06/29/highlights-from-the-west-african-forum-on-precision-agriculture/

Visualising the Possibilities

The emergence of sector-wide PA initiatives across the continent lay a solid foundation and hope for what is possible with precision agriculture. Precision agriculture tools and practices have a significant role in reducing world food deficits in developed and developing countries. The use of precision agriculture practices provides better and more accurate management of farm operations, contributes to climate change mitigation among other benefits, resulting in an overall increase in productivity and profitability of the farming systems. Specifically, for Africa, precision agriculture innovation is determined to have tremendous potential to change agricultural production in both short and long terms positively. For example, depending on different pesticide types, it has been shown that the use of UAV to spray pesticides can save about 80% of operating time, 90% of water consumption and 50% of pesticide use[20]. In Southern Africa, the use of precision agriculture practices including animal traction ripline and direct seeding (involves the use of ripper tines and direct planters for opening planting furrows and placing seed and basal fertiliser in the furrows during sowing) has contributed to increased maize yields over time under smallholder farming conditions[21].



Source: Conservation Agriculture in Southern Africa: Advances in Knowledge. Renewable Agriculture and Food Systems

20. Overview of Precision Agriculture with Focus on Rice Farming, 2019. Chia-Yu Lin et al. Available at https://www.fftc.org.tw/upload/files/activities/20190926114217/PROCEEDING_BOOK_FFTC_2019.pdf

21. Thierfelder, C., Rusinamhodzi, L., Ngwira, A. R., Mupangwa, W., Nyagumbo, I., Kassie, G. T., et al. (2014). Conservation Agriculture in Southern Africa: Advances in Knowledge. Renewable Agriculture and Food Systems, 30, 328–348.

The table below shows groundbreaking achievements possible with the optimisation and scaling of precision agriculture on the continent across five critical use cases for both crops and livestock.

Use cases	What can we achieve with Precision Agriculture?	What are the expected results and implications?
Plant Health	• The application of Internet of Things to precision farming can make accurate measurements of NPK (Nitrogen, Phosphorus and Potassium) in liquid manures possible, which has been notoriously difficult before now.	• Precision Agriculture can slash the use of mineral fertilisers by ≈30% and result in up to 60% savings in agro-chemicals[22].
Yield Mapping	• Aerial photography can be used to predict future yields based on the current level of field biomass. • Aggregated images can create contour maps which helps to track the direction of where water flows, develop yield maps of areas, and regulate variable-rate seeding.	• Verifiable yield data are valuable for decision making. Data collected over several years with different weather conditions can address problem areas and improve yields.
Farm Operations	• The use of precision irrigation system based on the plant's need ensures efficient use of water. • Efficient use of agricultural inputs in doses required by plants • Animals can be equipped with internal and external sensors to determine health and fitness, sense physical injuries and identify optimal breeding times.	• Farmers have been shown to benefit from variable fertiliser applications[23]. • When farming becomes profitable, farmers can invest in high-value nutritious crops, thereby, increasing nutrition and food security. High-quality crops are also maintained because fertiliser application and use of agrochemicals are applied as required[24].
Soil Mapping	• Soil maps contain information on critical agronomic factors such as the soil depth exploitable by crop roots, the soil moisture storage capacity and the soil's inherent nutrient content.	• Up to 40% loss in soil productivity via soil degradation can be prevented by the availability and use of adequate soil mapping data[25].
Climate Change Mitigation	• Precision agriculture practices with high-tech equipment and site-specific applications help to better target inputs to the fields' spatial and temporal needs, which can result in lower greenhouse gas emissions.	• By adopting precision agriculture, in 25% of farms, greenhouse gas emissions and water use could be reduced by 10% and 20%, respectively by 2030[26].

What is stopping Africa from optimising precision agriculture technology on a par with the rest of the world?

The implementation of precision agriculture has so far been mainly focused on technologies that reduce water use and input costs. Soil testing for precision nutrient management remains few and far between, and unmanned aerial vehicle (UAV) imageries using drones are yet to be deployed in scalable operations on smallholder farms compared with commercial farms. Given the huge potential of precision agriculture in Africa to improve food security through land, water, and nutrient use efficiency, there are still barriers to adopting and optimising the technology across the African continent. Specific constraints to the adoption of precision agriculture in Africa include:

- High cost of the equipment and tools needed for implementation
- Prerequisite level of knowledge and skill of farmers to operate some equipment and interpret the data generated
- Inadequate mobile and internet infrastructure hamper adoption in rural areas where a majority of smallholder farmers are located

22. Rider, T. W., Vogel, J. W., Dille, J. A., Dhuyvetter, K. C., & Kastens, T. L. (2006). An economic evaluation of site-specific herbicide application. Precision Agriculture, 7(6), 379–392.
23. Jacobs et al., Farmers perceptions of precision agriculture and the role of agricultural extension: a case study of crop farming in the schweizer-reneke region, south Africa 2018
24. Bonang et al., Precision Agriculture and Food Security in Africa 2018
25. https://agfundernews.com/why-precision-agriculture-is-essential-in-combating-climate-change.html
26. https://www.researchgate.net/publication/326368583_Mapping_soil_degradation_using_remote_sensing_data_and_ancillary_data_South-East_Moravia_Czech_Republic

- Epileptic electrical power supply hinders use and operation of many precision agriculture tools

For Africa to be on par with the rest of the world in the use and optimisation of precision agriculture, these constraints must be urgently addressed as stakeholders' collaborative effort.

The Role of Stakeholders

With combined stakeholder efforts and diligent application of precision technologies based on the needs and specific socioeconomic conditions of a country, precision agriculture can work as a tool to optimise the use of resources and reduce the gap in food production and technology in Africa.

Agricultural research institutions across the continent must work more closely to develop technology transfer initiatives to ensure grassroots adoption and use of precision agriculture technology. These institutions must also work with policymakers to convince them of the value of what they do and advocate for policies that help farmers use the best available technologies and management strategies to increase crop yields. Also, to spur the adoption of precision farming methods, researchers must ensure that pilot demonstration projects must be conducted at various growers' locations by involving farmers in all project stages. These pilot demonstrations must engage farmers in an attempt to address their needs, clearly communicate the technology's operational implementation, and emphasise the costs and savings involved. The technology design must be simple and effective to encourage quick learning and practical use by all classes of farmers.

The role of agricultural input suppliers, professional societies, extension advisors, and consultants in the spread of these technologies cannot be over emphasised. Professional associations of agronomy and other related fields must provide training guidance in the use of these technologies. Extension service providers must be professionally trained and incentivised to 'preach the gospel' widely. Agricultural cooperatives are also crucial in the dissemination of precision farming technologies to small farmers.

Public agencies must consider supplying free data such as remotely sensed imagery to the Universities and Research institutes involved in precision farming research. Changes in agricultural policies are also critical to drive the adoption of precision farming. Thus, there must be environmental reform policies that inhibit the overuse of agrochemicals, for example, which encourages farmers to seek alternative options in precision farming.

Innovative agritechs serve as drivers of the precision agriculture revolution across Africa. Existing interventions from young entrepreneurs already serve as case studies for further research and development. These agritechs must diligently collect data on the use and impact of their initiatives, act as an information conduit to disseminate best practices, and conduct advocacy toward increasing adoption and scaling impact.

HARNESSING MOBILE TECHNOLOGY FOR AGRICULTURAL SERVICE

BY UYAIETIENO OKONNAH AND RAHMAT EYINFUNJOWO

The mobile market in Sub-Saharan Africa is projected to reach half a billion mobile subscribers in 2021[27]. With a unique mobile subscriber base of about 100 million in Nigeria alone, mobile technology is fast becoming the primary tool for enhancing connectivity and communication through the generation, dissemination, and consumption of digital contents and services. This rapid spread of mobile phones offers unique opportunities to improve service delivery for small scale farmers. If properly harnessed, mobile technologies possess significant potential in extending the reach of services to rural populations by facilitating communication that is not restricted by volume, time, medium, and distance to solve these challenges for small-scale farmers and ensure a more efficient food ecosystem in general.

The Case of Mobile Innovation in the Agriculture Sector in Kenya

Over the past decade, Kenya has recorded a growing number of agricultural services deployed through mobile phones (m-services). Kenya's mobile payment system M-Pesa is one of the most successful mobile payment systems in the developing world. As of 2015, M-Pesa accounted for 77% of mobile money customers and has been credited for helping to familiarize the Kenyan population with the use of their mobile phone for non-call related services where 89% of mobile users are sending SMS compared to 50% in South Africa, 26% in Nigeria and 20% in Ghana[i].

Agricultural m-services offered to Kenyan farmers include access to information and learning, insurance and financial services, inputs, and marketing services. Most of these services are offered by the private sector, including companies like M-Farm, mFarmer, iCow, Sokopepe, and Arinifu. Already, price information obtained by farmers via mobile technology from service providers like Farmerline has encouraged farmers to change their cropping patterns. A survey of iCow users found that 42% of farmers thought their income had increased[ii]. Kenyan farmers are also able to sell their produce through the internet and SMS-supported selling platforms such as Farmers Market, Mkulima Young and Sokopepe. Other providers like ifarm360 also provide crowdfunding platform that helps farmers receive funding from individual investors.

This growing trend of the application of mobile technology in Kenya and M-Pesa's growth point to the vast opportunities derivable from harnessing mobile technologies in the agriculture sector.

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i World Bank (2012) Information & communications technologies – IC4D 2012: maximizing mobile. World Bank, Washington, DC.

ii iCow (2010) iCow impact study results. iCow. http://icow.co.ke/blog/item/15-icow-impact-studyresults.html

27. https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/09/GSMA_MobileEconomy2020_SSA_Eng.pdf

Potential Opportunities for the Next Decade

While mobile technology is already changing the agri-food sector dynamics in sub-Saharan Africa, the process has not been systematic. Many of the mobile technology services currently available across the continent, including in Kenya, are yet to reach the full potential of what is possible. Smartphone penetration and 4G networks are still limited in many rural areas. Most mobile applications for agriculture are currently focused on using low-tech mobile phones, and most delivery technologies include primary media such as SMS or voice services[28]. Predominant m-services include those offering early notification or general information on-farm management practices, crop prices and weather forecasts. Only a few services make use of smartphones or tablets. Overall, mobile phones in agricultural service delivery are still at an infant stage in terms of scale and sustainability.

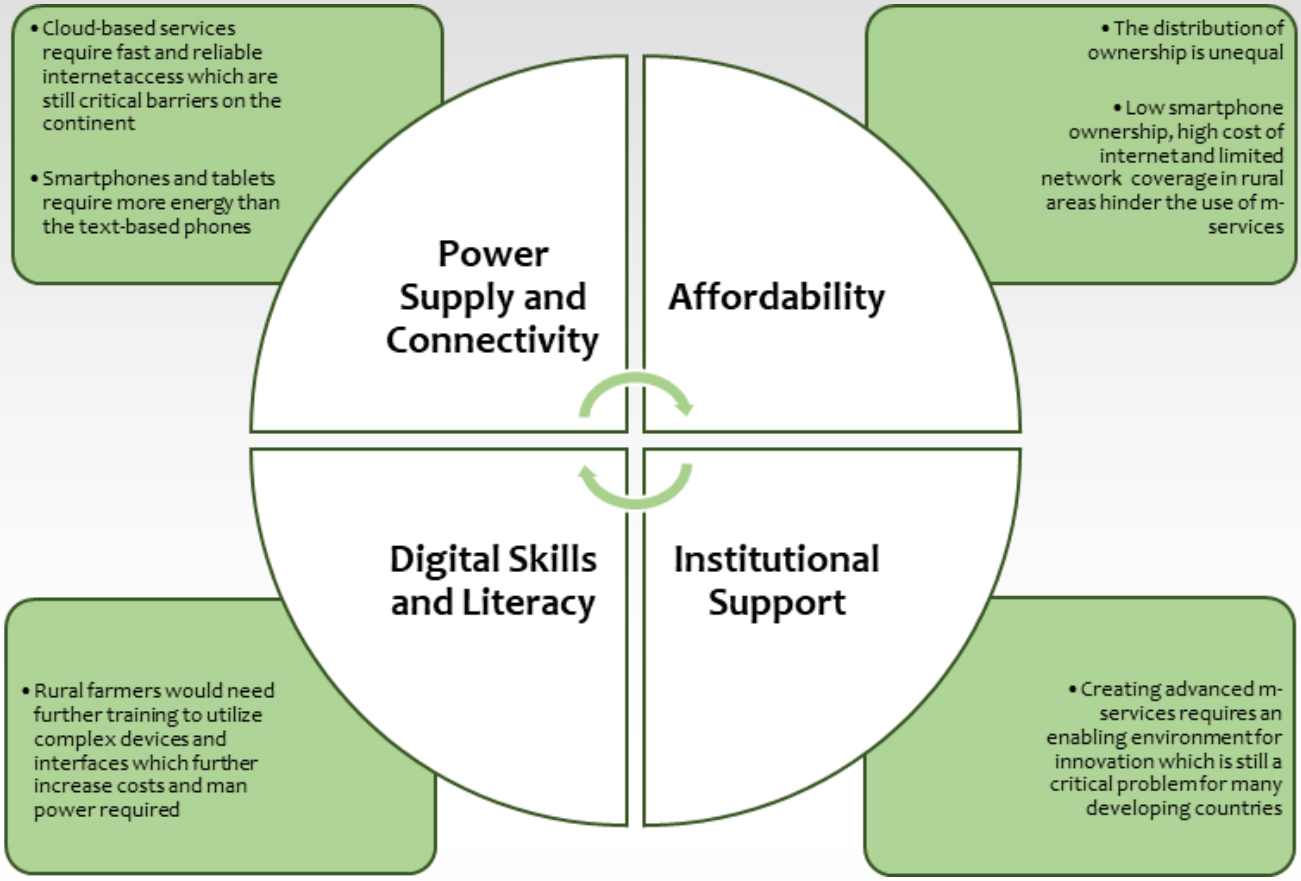
Harnessing mobile services for agricultural service delivery can scale several aspects of agricultural transformation on the continent. Access to m-services technology can offer significant advantages to smallholder farmers and other small businesses in the sector by providing links to services and information, allowing users to leverage available data, and access support services such as funding, training, insurance, and new markets. However, colossal quantum leaps are required to employ m-services to several other use cases in the agriculture sector.

What quantum leap is required	Area of application	Opportunities
Learning management systems	Extension services and learning	A combination of advanced mobile technology and high-speed internet can allow service providers to facilitate interactive digital extension sessions with farmers. The same can be employed to disseminate a diverse range of media including video, audio, images, or longer text to users.
Cloud-based services	Big data	Cloud-based services can facilitate the sourcing, storage and analysis of big data and mobile devices can be used to disseminate the analysed data. Such analysed data could then be used to monitor trends such as crop disease outbreaks, market prices, or weather forecasts.
Web-based services	Financial services	Web-based banking and insurance services can enable farmers to make payments and access insurance services on their mobile devices.
Internet of Things (IoT)	Supply chain management	Mobile devices can be applied to supply chain management using IoT to collect and activate tracking of the produce throughout the distribution
	Precision agriculture	The use of IoT to deploy precision agriculture already offer a glimpse of the potential of m-services to monitor farms remotely and implement farm management practices, thereby exponentially boosting agricultural productivity.

28. Hatt T, Wills A, Harris M (2013) Scaling mobile for development: a developing world opportunity. GSM Association, London

The Barriers and Drivers of Change in the Next Decade

The uptake and utility of more advanced m-services largely depends on several factors including power supply and connectivity, accessibility and affordability, digital skills and literacy and institutional support.



"Mobile phones may help to increase income, improve the efficiency of markets, reduce transaction costs, and offer a great opportunity for innovative interventions, especially in service delivery, but to realise the full potential of enhanced communication of market information, also requires additional investments (in roads, education, financial services, and so forth)"[29].

Harnessing mobile technology for agricultural service delivery would require an ecosystem approach that involves the collaboration of all value chain actors in the sector, including the private sector, government and other local and international agencies. As such, some specific priorities for the next decade are outlined as follows:

There is a need for investment in developing multidisciplinary digital skills and knowledge to prevent the marginalisation of people without digital competencies. While education and supporting services must be improved to support the adoption of digital technologies, there is even a more critical need for institutions of learning to revisit their curricula to incorporate digital subjects and increase the availability of digital technologies in classrooms.

There is also a need for governments to support the local innovation ecosystem. A key factor driving the rapid growth of Kenyan technology start-ups is the innovation environment led by the emergence of innovation hubs such as iHub, m: lab, and iBizAfrica. These hubs offer access to funding, networks, infrastructure, and mentorship to entrepreneurs leveraging innovation and technology. Therefore, it is critical for the government to establish policies and frameworks that support these growing ecosystems and create an enabling environment for competitive m-services.

29. Anytime, Anywhere: Mobile Devices and Services and Their Impact on Agriculture and Rural Development. https://elibrary.worldbank.org/doi/10.1596/978-1-4648-1002-2_Module3

The challenge of limited battery power can be surmounted by adding battery power externally using a second exchangeable battery or portable 'power banks. Another solution lies with cost-effective solar-based chargers which are gaining popularity in off-grid areas. The intervention of the private sector, supported by African governments, is required to provide these alternative power solutions.

To tackle the challenge of affordability and accessibility, local and international development agencies need to incorporate mobile technology services as compulsory components of their programs and development efforts. The provision of smartphones to smallholder farmers for data collection and farm record-keeping would go a long way in increasing smartphone ownership and adopting new m-services.

Finally, the growing 'new generation' farmers have a key role to play in supporting adoption, dissemination and development of new mobile technologies across the continent. These entrepreneurs comprise mostly of youth who have specialised skills and are more disposed to innovative thinking given their tertiary education and exposure. These entrepreneurs must be at the forefront of adopting mobile technology services, conducting advocacy, providing creative feedback, and fostering collaboration and engagement to use mobile technology services.

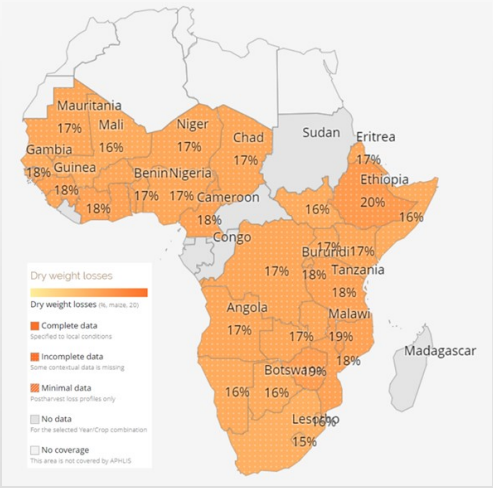
DRIVING A CIRCULAR ECONOMY TO REDUCE FOOD WASTE AND LOSS

BY RAHMAT EYINFUNJOWO

In Sub-Saharan Africa, post-harvest food losses are estimated to be worth $4 billion per year – enough to feed at least 48 million people[30]. The FAO (2011) estimates that roughly 37% (or 120–170 kg per year per capita) of the physical mass of all food produced is lost or wasted in Sub Saharan Africa, In the same vein, the post-harvest losses of food cereals are estimated at 25% of the total crop harvested. For maize alone, a major staple crop in most countries, the post-harvest loss is estimated between 15–20% across the continent as represented in Figure 3. Vegetables with a shorter shelf life such as tomatoes are lost to the extent of 40 –50% annually[31]. In East Africa, economic losses in the dairy sector due to spoilage and waste could average as much as US$90 million/year[32].

For a continent where there is more than 20% prevalence of malnutrition and acute food insecurity and where 30% of children under five years in Africa are stunted[33], the sheer number of existing post-harvest loss estimates is alarming.

By 2030, the SDG Target 12.3 aims to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses. The Inaugural Biennial Review Report (BRR) released by the African Union Commission in January 2018 shows that Africa is not on track towards reaching this goal, in fact, the continent scored zero in 2017, against a target of 10% towards the 2025 mark[34]. With just nine years to go, the African continent is sorely behind toward reaching this target by 2030.



Post-Harvest Loss of Maize in Africa, 2019.
Source: https://www.aphlis.net/en/page/10/maps

Why Circularity is Important to Reduce Food Loss and Waste

There are many technologies and practices in existence to address post-harvest loss. However, smallholder farmers often have not adopted improved post-harvest methods due to lack of awareness, inadequate knowledge, or high costs of implementing these practices. Also, systemic challenges related to infrastructure and lack of standardisation in agricultural best practices limit any successful loss reduction on the continent. While wide adoption of post-harvest technologies and practices would significantly support food security on the continent, many challenges remain, and losses continue to be high.

There is a need for a paradigm shift in combating food loss and waste on the continent. This is where circularity comes in. A circular economy aims to reduce resource consumption and emissions to the environment by closing the loop of materials and substances in the food supply and demand chain. Driving a circular food system would engage practices and technology that minimise the use of limited resources, promote regenerative agriculture, thwart the leakage of nutrients including Nitrogen, Phosphorus and Carbon from the food system, and promote the reuse and recycling of inevitable resource losses[35].

It is worthy to note that circularity in African agriculture is not an entirely new concept. Various studies have traced existing circularity practices among rural farmers but at a lower scale. These practices are mostly driven by the application of indigenous knowledge by the farmer as well as efforts of local development projects by international communities or NGOs. Such practices include mulching, planting of cover crops, mixed farming, use of organic manure, and converting farm residue to animal feed. This section will focus on circularity as

30. World Bank et al. (2011); https://www.unenvironment.org/thinkeatsave/get-informed/worldwide-food-waste
31. GEMS3&4 Programs, 2016/2017
32. FAO, 2004; Worldwide food waste | ThinkEatSave. https://www.unenvironment.org/thinkeatsave/get-informed/worldwide-food-waste
33. https://www.worldhunger.org/africa-hunger-poverty-facts-2018/; https://data.unicef.org/resources/joint-child-malnutrition-estimates-interactive-dashboard/ http://www.fao.org/3/a-i7967e.pdf; and https://www.worldhunger.org/africa-hunger-poverty-facts
34. Inaugural Biennial Review Report (BRR)
35. Jurgilevich et al., 2016. Transition towards circular economy in the food system. Sustainability 8(1): 69

Other aspects related to optimising agricultural resources and regenerative agriculture are discussed in Articles 2 and 9 of this publication, respectively.

The Case of Songhai Center in Porto-Novo, the Republic of Benin [i, ii, iii, iv]

Songhai Center located in Porto-Novo in the Republic of Benin provides an interesting model hinged on circular food production systems. The center has two components:

- The development of a functional, competitive and efficient agricultural system (parent farm).
- The incubation of agro-entrepreneurs and promotion of services to increase their productivity, thereby creating a snowball effect through the formation of a critical mass of young agricultural entrepreneurs and the creation of a framework conducive to the successful development of producers across the African continent.

Founded by Dominican Priest, Father Godfrez Nzamuja in 1985, the Songhaï Center Porto-Novo covers 60 acres, which includes crop fields, classrooms, laboratories, processing and meat smoking facilities, warehouses, fishponds, animal and poultry units, cold storage units, machinery/ equipment shop, bakery, internet café, restaurants, a store, dormitories, and guest house. More than 200 people work at the center across various areas, including education, production, machinery/ equipment manufacturing, processing, and marketing. The center engages in the production of vegetable crops, annual crops, perennial crops, livestock farming, and fish farming produces all kinds of grain, vegetables, fruits, meat and fish for local markets and sell its produce under the Songhaï brand in domestic markets.

Songhai Center has developed a fully integrated production system based on a Zero Emission Research Initiative (ZERI) principle. The waste from one part of the farm operations is used to enhance another part of production. For example, food waste from the restaurant is used as feed for the fish, animals and poultry. Moringa trees are grown for shade which also produce leaves that are used as feed for animals. Wastewater from the center flows into lagoons where the natural process of plant purification occurs. Manure from the animal and poultry units are composted to produce natural fertilizer. The farm also uses a biogas to power generators for the machinery which process vegetables and fruits. Residue from soybean processing is used for feed. As a way of preserving the natural environment, no chemicals are used in any part of the production cycle. Materials from the livestock production are the main sources of organic nutrients for the soil.

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i Songhaï Centers as Models for Promoting Sustainable Agriculture by Michelle L. Eley, John Paul Owens and Younouss Adjibi

ii Songhai Center Model: The Future for Africa's Food Security

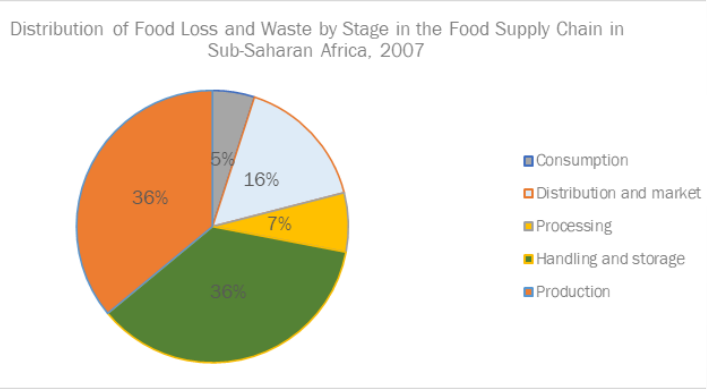
iii Gaston Agossou, Gualbert Gbehounou, Godfrey Nzamujo, Anne Sophie Poisot, Allison Marie Loconto, et al. The Songhai Model of Integrated Production. Innovative markets for sustainable agriculture: Exploring how innovations in market institutions encourage sustainable agriculture in developing countries, Food and Agriculture Organization of the United Nations., 2016.

iv https://hal.inrae.fr/hal-02795914/document

Taking a Supply Chain Approach

The integrated farming system, organic orientation, and zero waste approach of the Songhai model have put forward best practices in circularity worthy of emulation and scaling to other African countries. The Songhai model clearly relays the salient message that examining the African agri-food system from the 'circular economy' perspective can reveal opportunities at all stages, from primary production to distribution and consumption. A first step toward designing tailored interventions required to drive circularity in agriculture is to understand the extent of food waste and loss at all stages of production.

Unlike other parts of the world, food waste occurs mainly in the early stages of the food value chain in Africa. Consumers in sub-Saharan Africa, South and Southeastern Asia throw away only 6-11 kg in a year as against 95-115 kg in a year in Europe and North America[36]. For Africa, more losses and wastes are recorded at the production and handling and storage stages; averaging 72% in total. This data point represents boundless opportunities for circularity innovations at each stage of the food supply chain.



Source: WRI analysis based on FAO 2011.

African governments, businesses, consumers, and other stakeholders must prioritise circularity to effectively reduce food loss and waste at all levels of the agricultural supply chain. Deploying circularity in the African agriculture sector is a practical approach with huge potentials to exponentially increase food production efficiency, increase yields, improve the quality of food produced, and positively benefit the environment. Driving a circular economy would require a series of interconnected changes at each level of the value chain, including institutional, organizational, technological, and behavioural changes. Three critical actions encompassing these various changes are highlighted- below.

Repurpose

This involves food keeping food waste in the human food supply chain by directing them to other uses. To reduce food loss and waste at production and processing, food and beverage companies, households, and farmers can partner with development organisations, NGOs and local charities to redistribute food that would otherwise be wasted. This ensures that healthy, nutritious food also reaches populations that are unable to afford them. Private sector actors along the transportation and distribution must sensitise their teams to identify food loss and waste along distribution chains and determine the best approaches to repurpose the identified potential food waste.

Recycle

This involves diverting food deemed unfit for human consumption to other diverse uses such as animal feed, biofuel, or soul improvers/fertilisers. At the production level, farmers must make concerted efforts as shown by Songhai Farms' case to integrate practices that minimise waste and ensure that resources are recycled into the system. At the processing, distribution and storage level, value chain actors must engage actors from other industries such as the energy and manufacturing sectors to explore opportunities for developing innovative solutions that convert waste to alternative uses. We also see an example of this with Zuka in South Africa. Zuka uses vermicomposting biotechnology to produce affordable alternatives to liquid fertilisers, made from recycled fruit and vegetable waste. The company partners with municipalities and the epartments of Agriculture, Public Works and Social Development in South Africa to employ people to collect waste, and produce and package the products[37].

Reuse

This involves designing products and business models that promote restoration, re-manufacturing, or repairing, thereby, reducing transportation, packaging, and food waste. Food companies are challenged to develop and launch new products derivable from ingredients discarded from food manufacturing processes. For example, spent grain from breweries containing 15–26% protein and 35–60% fibre on dry basis[38] can be used to make flour for the confectionary industry, thereby creating more food products for human consumption. Chefs, food bloggers, and consumers play a role in developing innovative new recipes that would make use of spent food products and household food waste to create healthy, nutritious foods.

36. World Bank et al. (2011); https://www.unenvironment.org/thinkeatsave/get-informed/worldwide-food-waste
37. https://www.b2bcentral.co.za/effective-food-waste-management/
38. Ikram S, Huang L, Zhang H, Wang J, Yin M. Composition and nutrient value proposition of brewers spent grain. J Food Sci. 2017;82:2232–42.

CREATING SHORTER AGRI-FOOD VALUE CHAINS

BY ISMAEL ADENIJI

Almost 70% of the world population will be residing in urban settlements by 2050[39]. This poses great concern for agri-food businesses since most food trades, especially in Africa, occur at the local farming communities. This singular projection is an urgent call for a rapid transformation in the logistic activities involved in food production and distribution, primarily related to raw materials procurement and product distribution to the final consumers. In 2019, a Food and Land Use Coalition report also agreed that shorter value chain is one of the key drivers of agricultural operation in the next decade[40]. The shorter agri-food value chain provides a viable alternative to the conventional, longer globalised value chain model. It affords several benefits for the agri-food service providers and the final consumers. Already, spurred by the realisation that the main objective of any value chain model is to ensure operational efficiency, and render the most value to their customers at the least possible cost, many agri-food firms in Africa are rethinking their operational model by leveraging blockchain technology for the development of a shorter value chain scenario for their business operations to ensure productivity and profitability.

Unstable financial policies across regions, absence of unified trading policies amongst regional blocks, political tension in most countries, COVID-19 pandemic and other transnational concerns make it necessary to consider shorter supply chain for sustainable agri-food business. This article will make a case for shorter value chain by highlighting emerging issues in the agri-food industry, the importance of a shorter value chain, and the enablers to achieve shorter value chains on the continent over the next decade.

Why Shorter Value Chains?

Take the case of the fertiliser value chain in Tanzania. Interviews with local fertiliser importers and distributors in Tanzania has shown that import and distribution mark-ups can add nearly 40 – 45% to the fertiliser price. At each stage of movement along the distribution chain, the value chain actor adds a cost – freight and insurance costs are added at landing; port charges, storage and baggage costs are added at the port; the importers add their margins before it gets to the wholesaler; the wholesalers add their margin before it gets to the community agrodealers who then add another margin before the fertiliser gets to the farmers[41].

The long process described above is typical of many value chain activities in the African agriculture sector. In many cases, there are several levels of wholesalers and retailers, resulting in increased prices before the goods get to the final consumers. This results in increased food prices, degrading products, food loss and waste, and inefficient use of resources. Given several disruptions across the continent including the COVID-19 pandemic and existing political, economic, and social issues, there is an urgent need for inputs, extension services, credits, etc. to reach farmers without superfluous delays and for food to reach consumers in the shortest time possible. Shorter supply chain that leverages innovation and technology is going to be a game changer in this era of much unpredictability in the general business environment, worldwide.

An exciting possibility that comes with shorter value chains is the possibility to prevent food wastage across all value chain activities on the continent. The turnaround time for raw materials conversion in a short value chain scenario is lesser than what is obtainable in the longer conventional model. For example, the broad adoption of e-commerce for agricultural produce will eliminate the need to transport produce from farm to markets on long, perilous roads, reduce logistics costs, and ensure that only fresh produce reaches the consumers directly from the farm. The adoption of ICT at national ports will eradicate the usual bureaucracy associated with clearing of imported goods which typically contributes to spoilage of foods and other perishables even before entering or leaving the country.

Again, our lifestyles demand the incorporation of healthier diets which is more feasible by promoting healthier societies. With shorter supply chains, foods can reach consumers in their natural form, thereby enhancing the quality of available nutrients consumed.

39. https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
40. Food and Land Use Coalition (2019). Growing Better: Ten Critical Transitions to Transform Food and Land Use (pg. 11). www.foodandlandusecoalition.org
41. https://www.mckinsey.com/industries/agriculture/our-insights/winning-in-africas-agricultural-market

Emerging Trends in Agri-Food Industries

This decade has seen the emergence of trends in the agri-food supply-demand chain across the globe and specifically within Africa.

Food Fraud; *Codex Alimentux*: The international food standards regulatory body made a report in 2019 about the increasing rate of food fraud along the global food supply chain, and its tendency to become a global network of organized crime against humanity[42]. For stakeholders in Africa, this is most worrisome as most of the practices that tampered with the integrity of food are being recorded on the continent. Recent commentaries on food dilution, counterfeiting, concealment, mislabelling, adulteration, and several other forms of practices that tamper with the integrity of foods are alarming. There have been reports of powdered milk being diluted with cornflour or cassava, and powdered chilli pepper being diluted with Sudan Red and ground kola nut. These criminal activities have huge implications on the health of consumers and pose an immediate threat to the mission of achieving zero hunger on the continent.

Different Types of Food Fraud
Source: Food Fraud, What Does it Mean?[43]

Ethical Sourcing of Agri-Food Materials

There has been an increasing interest by consumers for sustainably and responsibly produced food. Consumers are now asking critical questions. They want to know that the water used for their carrot cultivation was responsibly managed. They want to know if their Amaranthus was grown organically or with mineral fertilizer. They want to know that their salads' packaging materials are biodegradable. They want to be sure that their frozen foods are shipped under hygienic conditions. They want to be assured that their chocolate and tea are not cultivated under child labour. They want to be sure that farm and processing operations are gender compliant and inclusive. They want to be reassured that farmers are paid fair prices for their produce. Given these and many more growing consumer concerns, food service providers need to institute a supply chain framework that ensures materials are responsibly and sustainably procured and produced if they wish to remain in business in the next decade.

Traceability

Due to the need to be assured that the foods they consumed are ethically sourced, traceability has also become a great concern. Large international organisations are being charged to take responsibility for the source of their raw materials and clearly indicate this on their packaging labels. Albeit slowly and in minute number, food aggregators, processors, food preparers, and other value chain actors on the continent – especially those destined for international markets – have now incorporated some elements of traceability on their products to assure their consumers.

42. http://www.fao.org/fao-who-codexalimentarius/committees/codex-regions/cceuro/about/food-fraud/en/
43. https://ec.europa.eu/food/safety/food-fraud/what-does-it-mean_en

This effort has portrayed such products in good light, especially in international markets, thereby providing higher profits and increased foreign exchange for such companies and their countries of origin, respectively. One such company is AACE Food Processing and Distribution Limited, a proudly Nigerian indigenous food processing and distribution company that has instituted a traceability system for its raw materials sourcing from smallholder farmers across the region. AACE Foods implements a batch number model that enables its line of spice and condiments to be traced to the individual farmers, fields, and farmer cooperatives where the raw materials are sourced.

AACE Foods Products showing unique batch number

Adoption of ICT for Innovative Agribusiness Models

ICT has been on the increase since the beginning of the new millennium. Penetration of technology and other ICT solutions has led to an improvement in the efficiency of agricultural operations. All through the agricultural value chain, several ICT platforms have been invented to cater for farmers and other stakeholders needs. iProcure and Ujuzikilimo are Kenyan-based platforms that provide solutions for agricultural raw materials procurement and other supply chain activities using big data and analytics. AgroSpace, a replica of Nigeria's Novus Agro, provides price update of farming commodities in Cameroon. Metajua is another ICT platform operating both on the mobile and web interface to improves agricultural operations efficiency. It enables all stakeholders to access necessary information all on the same platform. For instance, it allows the field level officers to timely send data to their offsite managers who will then process the data, provide necessary feedback, set prices, authorise transactions, and communicate to their subscribers all on the web interface. It also provides inventory, monitoring and evaluation solutions to companies[44].

Change in Consumer Behaviours

The way consumers shop and get their goods delivered to them has changed in the last years. There is a large shift in the behaviour of generation Y and Z consumers from the generation before them. They are more open to online shopping and doorstep delivery, aided by the proliferation of mobile e-commerce applications. With an increasing demand for high-quality food at a relatively low price and a rising number of e-commerce platforms, the traditional food suppliers must consider developing new business models to accommodate this reality if they intend to be in business over the next decade.

Critical Enablers for Shorter Agri-Food Supply Chains for the Next Decade

The Role of Agricultural Cooperatives and Societies: Formation of self-help groups and cooperatives by local producers has proven to be a potent tool to develop the local food system and shorten the agri-food supply chain. With the effective administration of cooperative structures, co-operators will have a better opportunity to market their goods to urban buyers at reduced cost with less hassle. Cooperative affords the opportunity to develop the capacity of local producers on improved agronomic practices and business of farming, organise them for financial inclusion and cheaper procurement of inputs, advocate for fair prices, and ensure that they are compliant with global standards. Produce aggregators, agricultural service providers, processors, exporters, and development projects are critical to developing credible cooperatives across their various value chain activities.

The Role of the Regulatory Bodies: Regulatory agencies must ensure the institutionalisation of efficient digital platforms that will ease the process of obtaining necessary documentation and certification at various levels. Quarantine services across the continent must step-up their operational framework to eliminate delays and inefficiencies. The custom services and shipping authorities must become more efficient and embrace digitalisation of their activities to ensure fast business transactions across borders.

The Role of Financing Institutions: Commercial banks, micro-finance banks and other financing institutions must support agro-dealers to improve their service to farmers by offering them favourable loan terms and access to programs with financial and technical training, and other incentives. Such financial empowerment will enable them to purchase inputs in large quantities and gain applicable volume discounts while the knowledge empowerment will allow them to improve their service delivery models. This improves the farmers' capacity to adopt new technologies and build efficient production and distribution chains.

They must also engage in policy dialogue and advocacy to ensure they get needed supports from necessary and important people that can influence required change in the supply chain activities across countries in the continent. This continent-wide collaboration is especially needed, given the newly signed African Continental Free Trade Agreement (AfCFTA). Most importantly, private sector actors need to be agents of change themselves. More service providers need to adopt technology to deliver services to farmers in a way that contracts the supply chain.

The Role of Technology Providers: To realise shorter supply chains, technology providers need to enormously support the initiative by developing tailored, innovative solutions that will

44. https://metajua.com/how-it-works/

innovative solutions that will be easily and readily adopted. Adoption of innovative solutions means they will not only be affordable but straightforward and sustainable. Such solutions must be easy to use by a layman with a lesser reliance on internet connectivity, given that most of Africa's rural communities where foods are produced are not connected to strong internet broadband.

The Role of the Consumer: Consumers who hope for continuous accessibility to ethically sourced food products must support the development of a shorter supply chain by taking it upon themselves to patronise and support and promote these ethically sourced products. This will encourage the producers to do more, stay in business, and increase their turnover and revenue.

Further read: Article by Ndidi Nwuneli – Private Sector Solutions to Urban Food Insecurity | Center for Strategic and International Studies (csis.org)

ADVANCING GENDER EQUITY AND INCLUSION

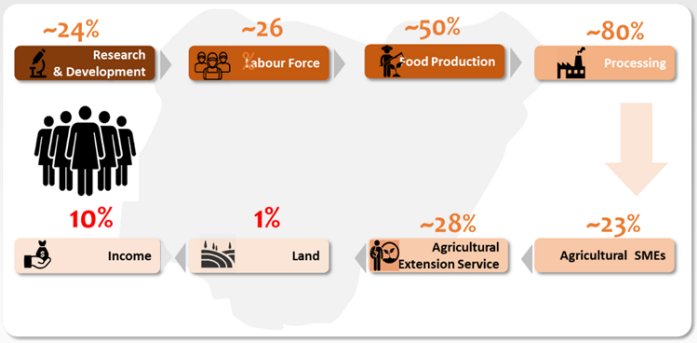
BY JUMMAI BAPPAH

"Women in agriculture are not operating on a level footing with men, and so, the policy thrust should be one of EQUITY first, and then EQUAL Opportunity next". Equity First, Equality Next: Towards closing the opportunity gap for women in agriculture in Nigeria, Oxfam 2017 "

The African agriculture sector is often replete with stakeholder irony, where the groups that are supposedly the most important tend to be the ones marginalised. Women and the youth combined form the majority of the population of nations. Yet, for many years, development projects have been designed with little or no consideration and involvement of women stakeholders. Women are critical value chain actors in agriculture. They engage mostly in post-harvest activities, including drying, bagging, storing, cleaning, and processing food. They are also involved in the trading of farm produce, especially within their local communities. Every day, women in agriculture – especially in rural farming households – make important decisions on how much food to store, consume at home, or sell. Despite this, women engagement in more profitable ventures such as commercial processing and large-scale farming is limited. This is due to several factors, including limited financial and technical capacity, societal restrictions, and culture.

Take the case of Nigeria where women are less often found in the field of developmental research in agriculture on the continent, constituting only 24% of those in research fields, of which only 14% hold managerial positions. The same low participation is observed across other value chain activities in the country. In Kenya, only a mere 0.5% of women have access to financial services, and only around 6% own land[45]. Similarly, studies in South Africa have shown that women receive less than 10% of available credit and 7% of extension services[46]. Broadly, women constitute 60–80% of smallholder farmers, producing up to 80% of foodstuff for household consumption, yet, make up only about a fifth of landholders in sub-Saharan Africa[47].

FIDA/Federation of Women Lawyers Kenya. Women's land and property rights in Kenya: Promoting gender equality. Washington DC: Kenya and International Women's Human Rights Clinic at Georgetown University Law Center; 2009



Women Participation in Agricultural Activities in Nigeria. Sources: https://www.asti.cgiar.org/pdf/ifpridp00957.pdf; http://sahelcp.com/the-role-of-women-in-nigerian-agriculture/

Emerging Trends in Women Inclusion

It is becoming more recognised that reducing gender inequality will contribute immensely to agricultural growth and the attainment of food and nutritional security. With only nine years left to achieve the sustainable development goal of zero hunger on the continent, it is now even more pertinent than ever before to increase women's participation in the sector for improved outcomes.

Interventions in agriculture now benefit from hindsight and are forging forward with ambitious inclusion strategies and bold steps in leveraging technology to do this. In Nigeria, Sahel Consulting Agriculture and Nutrition Limited is using radio, mobile phones and community extension agents to reach women dairy farmers with the support they require to increase their incomes. In Kenya, the Alliance for a Green Revolution in Africa uses the same means to reach women crop farmers with the information they need to increase their yields. The Bill and Melinda Gates Foundation provided women farmers in the Mbeya region of Tanzania with training to improve their coffee quality and quantity, helping to increase their income. The digital trading platform, Avenews-GT has been facilitating the access of women farmers to agriculture. markets.

45. FIDA/Federation of Women Lawyers Kenya. Women's land and property rights in Kenya: Promoting gender equality. Washington DC: Kenya and International Women's Human Rights Clinic at Georgetown University Law Center; 2009

46. https://www.bizcommunity.com/Article/196/358/194178.html

47. https://www.asti.cgiar.org/pdf/ifpridp00957.pdf

The Food and Agriculture Organization (FAO) is working with the countries in southern Africa on getting young women and men into agriculture focusing on the provision of inputs, loans, and training as incentives for the youth.

What Are the Expectations for the Future?

To get closer to achieving zero hunger and attaining food security, women's inclusion is essential for the next decade. Giving women access to the same resources and education as men would be hugely catalytic and transformational in many ways, the biggest of which include increased food production, job creation, and rise in income, evidenced by existing statistics.

- Providing women with the extension services that they need, would help them grow more food, not just for household consumption but also for earning extra income. The extra income would enable women to keep large populations out of hunger as women tend to spend more of their earnings on their families, eventually enhancing the overall wellbeing of nations. Earning extra income would also enable women to spend more on health care, nutrition, and education for their children. This will ensure that women have access to the nutritious food they need for their families, resulting in lower maternal and child mortality. These are investments that could produce long-term, positive results for the families and their communities[48].
- Providing women support to earn more income has yielded positive results on the continent as shown in reports by the Food and Agriculture organisation[49] as well as the World Bank. Siting examples from Malawi and Rwanda, the reports assert that children from female-headed households were healthier than children from male-headed households. This includes male-headed households that had higher incomes than the female-headed ones.
- Increasing women's ownership of land and access to other agricultural assets would enable women to invest in these resources, thereby generating increased output and income.
- Improving women's access to innovation and technology would enable them to leverage new opportunities in the landscape and increase the use and impact of these technologies. Given their role in post-harvest activities, women can also help reduce food loss and waste if they are adequately informed, trained, and equipped on post-harvest management practices and technologies.

Target Stakeholder Activity Required to Include Women

It is an onus on the public and private sector partners to build on the last decade's successes. Failure to do these would reverse the gains made over the years – not just for women but also for young smallholder farmers. To ensure equity and inclusion, urgent stakeholder actions are required against the next decade.

Funding organisations must dedicate more funds to women-owned enterprises to incentivise existing and prospective business owners. Governments at all levels and the private sector must also prioritise investment in areas that encourage innovation and competition among young women and men.

New development projects must incorporate gender components that seek to promote women participation and contribution. Baseline studies must seek to understand gender roles within the local communities and value chain and how women will be affected by the program's proposed outcomes.

Policymakers must review and discontinue existing policies that handicap women from having equal access to resources, including assets, labour, and land. Clear policies should be designed and upheld on incentivising local financial providers to prioritise credit to women, increase access to education for girls and women, and generally promote gender equity and equality. Policymakers should also make use of gender-disaggregated data for all policy decisions and implementation.

A public-private partnership will be the primary vehicle for developing the approaches for more equitable inclusion of women and the youth into agriculture. Agritech companies must ensure that agricultural technologies should be tailored for use by all ages and gender, particularly in rural areas. Similarly, these companies should prioritise linking women and young farmers to ready markets for their products.

Negative gender stereotypes surrounding women's participation in agriculture must be addressed through extension services, including building the self-esteem of young women to be the farmers and agribusiness owners they want to be. Finally, women already in agriculture need to be provided with the required extension services, the appropriate technology and access to finance, business development services and markets.

48. FAO, The State of Food Security and Nutrition in the World, 2020
49. www.fao.org/e-agriculture/news/future-africa's-agriculture-rests-youth The future of farming is female - FurtherAfrica

EMBRACING PROTECTIVE FOODS

BY MUHAMMAD MOMOH AND WILSON AKUMUO

There is an increasing global switch towards more protective foods like fruits, vegetables, whole grains, legumes, nuts, and predominantly plant-based diets. Particularly in the current face of the Covid-19 pandemic, certain nutrient-dense foods (protective foods) have gained public recognition and increased consumption for their anti-viral properties, immune system-boosting and disease-preventing properties. There has been a drastic reduction in the consumption of ultra-processed foods high in saturated fats, salt, and sugar. This is a long-overdue development, given the recurrent trend of a high global burden of malnutrition especially with regards to childhood and adult overweight and obesity as well as diet-related non-communicable diseases like diabetes and hypertension amongst several others.

Many factors like economic stratification have shaped most people's consumption patterns as higher-income earners are more likely to spend their money on healthy diets than the lower class. This trend threatens – albeit in a good way – the current production of high-quantity, affordable foods that are of low nutritional value and based on a limited number of crops. Developed countries plagued by diet-related noncommunicable diseases (DR-NCDs) are taking steps to minimize unhealthy dietary intake and promote health. For example, in England, the government is working with food industries to reduce the sugar, salt, and calorie contents of commonly consumed manufactured foods[50]. Companies like Nestlé have taken the initiative to reduce the risks of DR-NCDs by strategically cutting down the sugar, salt and fat contents in their products and achieving significant gains in that regard[51].

The Shift to Protective Foods in Africa

In Africa, the shift to protective, healthy diets is also gaining prominence if not as swift as in the developed world. Indeed, the movement for improved diets is only beginning to creep into African societies, especially in urban centres. Urbanization in Africa has brought about the transition of dietary consumption from nutrient-dense diets to more convenient calorie-dense diets. As is associated with developed countries within the top wealth quintiles and a concurrent increase in overweight and other DR-NCDs, this transition has crept into a developing Africa characterized by low socio-economic status and high under-nutrition prevalence. Nutrition transition in an African context contributes to the double burden of malnutrition where poor populations suffer from overweight and undernutrition at the same time. Nonetheless, Africa still presents a unique opportunity to renew or develop new food systems that support the production and consumption of nutrient-dense "protective foods". There is significant potential for improved diets to overturn the current food demand for quantity over quality. With the public understanding of the health and environmental benefits of better diets, the rate of consumer demand for improved diets is likely to increase.

Several efforts are currently channelled towards achieving not only food self-sufficiency but a well-nourished African continent. Take the case of Africa Improved Foods (AIF), in Rwanda that is developing nutritious food products for various categories of people on the continent. AIF is a public-private partnership involving DSM, Government of Rwanda, IFC, CDC Group and FMO. AIF provides a scalable and sustainable solution to malnutrition via local production of highly nutritious foods. AIF seeks to reduce poverty, create jobs and address stunting and malnutrition through partnerships with non-profit institutions, such as the World Food Programme (WFP) and Governments. The company also seeks to make affordable commercial products for the mass market. Through AIF's long-term contracts to serve WFP & Rwanda's government, enough nutritious foods are being produced for >1 million children daily. AIF implements a Value Chain approach to develop local maize and soy farming to a much higher standard[52]. AIF's factory generates jobs, increases the demand for regionally sourced packaging, equipment and services, and increases the value of Rwanda's exports.

On the development front, the Global Alliance for Improved Nutrition (GAIN) is leveraging its Marketplace Innovation Accelerator to support SMEs in Kenya, Mozambique, and Tanzania to develop nutritious foods for low-income consumers. In Nigeria, where a high percentage of children are undernourished, and the majority of the population are below the poverty line, various organisations such as the International Potato Centre (CIP) and Harvest Plus have introduced agricultural nutrition-sensitive programmes to

50. https://publichealthmatters.blog.gov.uk/2018/03/06/why-we-are-working-to-reduce-calorie-intake/
51. https://www.nestle.com/csv/impact/tastier-healthier/sugar-salt-fat
52. https://africaimprovedfoods.com/

improve the availability and consumption of nutrient-dense/ fortified food crops. These organisations have developed bio-fortified food crops by adding nutritional value to commonly consumed African staple crops such as potatoes, maize, and cowpea. Although aimed to improve nutrient availability and reduce micronutrient deficiencies, these actions have also improved smallholder farmers' livelihood.

Role of Stakeholders in Promoting the Production and Distribution of Accessible and Affordable Protective Foods in Africa

Lawrence Haddad, the Executive Director for GAIN during a panel discussion at the Alliance for a Green Revolution for Africa held in Ghana, stated that building new food systems will not be easy. Still, with commitment, Africa can achieve this milestone in the coming years[53]. Developing the value chain for nutrient-dense "protective foods" in Africa demands significant inputs from several stakeholders including government, private sector, donor agencies, research institutions and academia. Multi-sectoral commitments and multi-level involvement in enhancing food systems are essential ways that sustainable development can be achieved in promoting food security in Africa.

The **government** must provide stakeholder platforms that map the nutrition and agriculture sensitive engagements of relevant public and private sectors in the respective countries. This will help facilitate a national plan of action to identify gaps in on-going interventions, ensure that the interventions are sustainable and impactful, identify opportunities for scale-up of activities promoting the consumption and production of nutrient-dense foods, and improve the availability and accessibility of these "protective foods". African governments should take 'health and nutrition' as a part of their agriculture agenda and agricultural policies developed should be tied to improving the production and consumption of nutrient-dense protective foods. The government can also work with donor agencies and development partners to enhance the African value chain infrastructure for nutrient-dense food crops that are usually wasted or underutilized. When smart and affordable technology is made available for SMEs involved in food production, and farmers supported to produce sufficient nutrient-dense crops, nutrient-dense foods can be available for all. Another role the government can play to promote accessibility to protective foods is introducing mitigating laws, high taxes and import duties on unhealthy foods and food products. When production cost for unhealthy and convenience foods are high, the African populace will be forced to switch to a more affordable healthy alternative.

The private sector comprising of UN organizations, donor agencies, civil society organizations and private organizations like Sahel Consulting can share relevant food system and value chain data while also amplifying existing private-sector efforts to increase the production of nutrient-dense foods across African countries. Private sector bodies should also work with relevant government agencies to implement contextually relevant, evidence-based interventions to improve agriculture and dietary practices. Furthermore, civil society organizations can intensify efforts on sensitization and awareness campaigns and, advocacy for the transition to healthy diets to solve public health and environmental problems. To achieve this, civil societies could initiate platforms for community engagement, thereby creating a space to share ideas across social groups and sectors to support low-income communities to advocate for better food production, trade and consumption.

Research institutions and Academia are not left out of this drive towards embracing the consumption of protective foods. While the need for funds to support the food system and value chain improvement research cannot be overemphasized, it is also paramount that more attention is directed towards conducting this research in the first place. The severity and scale of malnutrition are already known; we should now develop strategic and data-backed ingenious ways to solve the persistent burden of malnutrition. Therefore, research should focus on how stakeholders can achieve maximum impacts in improving the production, availability, and consumption of nutrient-dense protective foods.

Also, **SMEs** are significant actors linking farmers to consumers. However, these SMEs suffer a huge funding gap that limits their ability to develop their food products' nutritional value to acceptable standards. **Government, private sectors and financial institutions** must invest in SMEs to improve their managerial skills and capacity to enhance value chain outputs.

In conclusion, over the next decade, as African countries continue to develop, coupled with the increase in income and globalization, food habits and diets in Africa will be more influenced by modern retailers like supermarkets, restaurants and kiosks. While other stakeholders' roles have been discussed, **food industries and the individuals** of the African population also have to put in the conscious effort to change dietary habits. Sensitization and advocacy are essential to penetrate people's mindsets and facilitate a positive behaviour change towards increasing demand, production, distribution, and consumption of healthy, nutrient-dense foods.

53. http://www.ipsnews.net/2019/10/nutrition-best-investment-developing-africa/

LEVERAGING BIG DATA IN AGRICULTURE

BY CHIZOBA EZEA

Big Data is a large and complex set of data that requires specific analytical methods to draw information and make quality decisions by its users[54] Applying this to agriculture, farmers, especially in developed countries, currently use a large set of climatic and soil data to increase productivity and reduce risk toward ameliorating the problem of climate change and guide farming decisions. This has a hugely significant impact on the reduction of the food security challenges faced by the continent. However, despite the vast potentials embedded in the use of big data, its use in the African agricultural sector is currently underexploited and limited to adopting smart agricultural practices such as the use of drones to identify fertile lands and precise irrigation systems for conserving water resources. A lot more can be done, especially over the next decade.

Current Status of Big Data Application in African Agricultural Sector

Many agritech companies have improved sustainable food production practices in Africa by leveraging Big Data. For instance, Acquahmeyer Company in Ghana has reduced the use of pesticides by 50% through the use of drones to facilitate the precise application of pesticides and monitoring of crop health[55]. Furthermore, in East Africa, Big data has been used by corporations such as UAP Insurance and Syngenta Foundation for Sustainable Agriculture (SFSA) to increase access to farm credit. SFSA created an agricultural insurance platform named Kilimo Salama for smallholder farmers who make up 75% of the population, thereby increasing the prospects of achieving food security and economic development. The satellites and weather stations, which the insurance companies installed, collected data over the years, increasing farmers' profit by 20%[56].

Another example of Big Data utilization in sub-Saharan Africa includes the mAgric Initiative, which has improved smallholder farmers' lives, especially in Kenya as funded by Bill and Melinda Gates Foundation and the Rockefeller Institute. Farmforce, a cloud-based mobile application that provides a platform for exporters to access production data of smallholder farmers in East Africa. This project has improved these smallholder farmers' export capacity, as is the case of Fairfruit, one of the companies that signed up for the project and eliminated the hurdles faced by smallholder farmers due to export quality control.

The above cases of Big Data application show that the rate of BD adoption will significantly increase in the coming years as the positive effects of its application are evident.

Solving Food System Problems with Big Data Application

Farmers and every actor in the food supply chain 'house' various forms of data that can be used to improve decision-making processes. With technological advancement, now facilitated by the use of BD in the food system, there is a unique opportunity for solving food security challenges at every level of activity and involving every value chain actor. There are different instances where BD has shown lots of potential in addressing these food system challenges.

54. Wolfert, S., Ge, L., Verdouw, C. and Bogaardt, M., 2017. Big Data in Smart Farming – A review. Agricultural Systems, 153, pp.69-80

55. Africa M.E. 2020. Agricultural Data Is Becoming Big Business In Africa - Africa M.E.. [online] Available at: <http://africa-me.com/agricultural-data/> [Accessed 22 December 2020]

56. Protopop, I. and Shanoyan, A., 2016. Big Data and Smallholder Farmers: Big Data Applications in the Agri-Food Supply Chain in Developing Countries. International Food and Agribusiness Management Review Special Issue, 19(A)

Food System Challenge	Big Data Application (Case Study)
Increasing food production	• Use of mobile app to detect Cassava Brown Streak disease in Nairobi has reduced crop loss and increase cassava yield and farmers' profit[57]. • Sweden-based Ignitia used in Cote d'Ivoire, Ghana, Mali, Niger, Nigeria, and Senegal uses weather forecasting models to guide farmers at optimum times for different farm operations, which has increased yield.
Reducing environmental impact of food production	• The use of Monsanto's Integrated Field Systems (IFS) by farmers in North America reduces the use of herbicide by mapping out soil conditions, weed status, and positions in farms[58].
Identifying consumer preference	• An analytical tool called Heartbeat uses data extracted from social media trend in Canada to produce information for food producers and retailers on consumer food preference[59].
Reducing food waste	• Valorization of Rice straw supply chain has been researched and proposed by researchers using BD analytics, which indicate the state and value of different parts of a crop. This would significantly reduce the amount of waste in

Deploying Big Data in the Agricultural Sector in Africa

Deploying big data in Africa's agricultural sector will naturally come with several obstacles despite the advantages that BD will have on the sector's development. Principal among these challenges include:

- **Poor data quality:** A significant challenge for agricultural development in most African countries is the enactment of policies based on insufficient dataset. Although the importance of quality data is increasing in Africa, there is still a large room for improvement, impeding the smooth deployment of Big Data into the continent as its relevance will depend on the quality of available data.
- **Technical capacity:** A significant percentage of rural farmers in Africa do not have formal education, and this could slow down the acceptance rate and in turn, deployment of BD in the sector.
- **Infrastructure:** A major part of the application of Big Data analytics is the infrastructure (hardware)[61]. To fully deploy BD in Africa, high-quality infrastructure which are generally not readily available to most African countries will pose a huge obstacle.

The Drivers and Levers

In two decades, the rate of internet users has increased in Africa, and this has caused a dramatic growth in the amount of data collected and mined. Leveraging the increasing internet usage across the continent will facilitate the deployment process and aid data access to rural farmers. Despite the obstacles that the deploying process may face, the opportunity it presents far outweighs that. To ensure a successful transformation of the food system using BD, all stakeholders have relevant roles to play along the food chain.

Government of the different African nations must prioritize IT within the agricultural sectors, setting up policies that would encourage local and international agritech companies to create novel ways of utilizing BD for agricultural development. Agritech companies should focus on strategies that would speed up the adoption rate amongst rural farmers who make up a significant percentage of the farming population. On the other hand, farmers must have to drop their conservative attitude and embrace technological changes that are evolving within the sector. This must be aided through aggressive door-to-door extension services that will seek to demonstrate the use and impact of big data. Such extension services would require funds that the African government and donor organizations can deploy to this use. Innovation hubs across the continent must enjoin the entrepreneur networks that they support to leverage and incorporate big data in their various interventions.

With each stakeholder playing their role, huge strides can be achieved in organizing data in the sector and putting this to good use to achieve agricultural transformation, increase food production, attain food self-sufficiency, and achieve the Sustainable Development Goals by 2030 on the continent.

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57. SciDevNet, 2020. Boost Smallholder Phone Access For Better Crop Yields - Sub-Saharan Africa. [online] Sub-Saharan Africa. Available at: <https://www.scidev.net/sub-saharan-africa/news/boost-smallholder-phone-access-for-better-crop-yields/> [Accessed 23 December 2020]

58. Bronson, K. and Knezevic, I., 2016. Big Data in food and agriculture. Big Data & Society, 3(1), p.205395171664817

69. Bronson, K. and Knezevic, I., 2016. Big Data in food and agriculture. Big Data & Society, 3(1), p.205395171664817

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61. OTAVA. 2020. The Importance Of Infrastructure To Big Data Analytics | OTAVA. [online] Available at: <https://www.otava.com/blog/the-importance-of-infrastructure-to-big-data-analytics/> [Accessed 23 December 2020]

PROMOTING SUSTAINABLE AND REGENERATIVE AGRICULTURE

BY TOBI EJALONIBU

At the current rates of soil destruction, including decarbonisation, erosion, desertification, and chemical pollution, in the next 50 years, the world will suffer a qualitatively degraded food supply owing to inadequate arable topsoil to feed ourselves. Thus, the need for alternative means of agriculture; a method of agriculture that tends to give back to the ecosystem and maintains its purity while taking from it. Many organisations and researchers are promoting and encouraging regenerative agriculture (RA) as a way to, not just grow food, but improve the ecosystem progressively.

Regenerative agriculture is a farming principle and practices that seek to rehabilitate and enhance the farm's entire ecosystem by placing a heavy premium on soil health and paying attention to water management, fertiliser usage, and more. It is a method that "improves the resources it uses, rather than destroying or depleting them". Regenerative agriculture can produce high-quality, nutrient-dense food while simultaneously improving the land, leading to increased farm products that contribute significantly to food security and a balanced ecosystem. RA addresses constant diverse vegetative cover on the surface, reducing runoff and encouraging infiltration.

What is Achievable with Regenerative Agriculture in Africa

Only a few African countries have adopted the system of regenerative agriculture. An example is South Africa. A variable climate and financial pressure forced quick changes in the South African farming system such that regenerative farming models are increasingly being adopted for cropping, dairy, and beef operations. Rebuilding the structure of soils that have been generally crushed by heavy tillage for decades, became the first step taken by South African farmers trying the RA concept. The farmers have further taken a zero-till approach, and the use of multi-species cover crops as regenerative strategies. Climate change, ethical motivations, and family succession concerns are reasons for adopting principles RA in South Africa[62]. Similarly, in Kenya, Farm Africa launched a regenerative agriculture project to increase production and incomes, and boost the resilience of 10,000 farmers in Embu County in Kenya by 2021 through reformative agricultural practices that will improve soil health and food security in the face of climate change. The project will develop a technical curriculum on good agricultural practices for regenerative agriculture and business management and deliver the training course to 100 private village-based advisors (VBAs) and six ward agricultural officers, who in turn, will train the 10,000 farmers[63].

Regenerative agriculture will help restore and improve the soil's health, which is a vitally important outcome given that soil stores more carbon than the world's biomass and atmosphere combined. Conservational tillage will enable African farmers to regenerate the soil, compared to traditional tillage which dramatically erodes soil and releases large amounts of carbon dioxide. By adopting low or no-till practices, farmers minimise physical disturbance of the soil and over time increase levels of organic matter, creating a healthier, more resilient environment for plants to thrive and keeping more and more carbon where it belongs. By increasing plant diversity, farmers help create the rich, varied and nutrient-dense soil that will lead to more productive yields and income, thereby improving their livelihoods.

Regenerative agriculture will transform the agricultural system resulting from an increase in yield production. It will also yield environmental, health, and social outcomes given its propensity to revive the ecosystems, amplify biodiversity and improve variety in our diets. These positive impacts will cascade across industries and create new paths to more prosperous, robust, resilient, self-sufficient, and sustainable food system for Africa. Summarily, regenerative agriculture presents farmers and stakeholders with an approach that holds promise for increased profits, diverse revenue streams, stable markets, and an increment in the livelihood of successful farm transfer to the next generation.

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62. https://www.resilience.org/stories/2019-09-17/regenerative-agriculture-is-trending-in-south-africa/
63. https://www.farmafrica.org/kenya/regenerative-agriculture-

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Stakeholders' Roles in Promoting Regenerative Agriculture in Africa

Stakeholders across the continent must collaborate to establish practices that will create enabling and resilient supply chains, reinstate the health of agricultural lands, and empower farmers and businesses to thrive while employing regenerative agriculture.

Changing government policy is critical for the wide-spread transition to regenerative agriculture. In Nigeria, for example, no policy addresses the practice of RA as attention is currently not given to this type of agricultural production system. This has made it challenging for farmers to adopt the system, as there is low awareness of regenerative agriculture practices and benefits. African governments must ensure that there is an established system in the ministries of agriculture that will see to the design, implementation, and dissemination of localised regenerative agriculture systems. The government should also ensure broader policy planning for farming activities to create and adopt ecosystem regeneration at the community level. Another critical action needed from the government is to configuring food production and value chains' economics to reward regenerative practices as they come onboard. The government should also consider developing a policy where the education sector and research institutes must include regenerative agricultural systems into their curriculum to ensure that students are well-grounded on its practice and benefits.

There is a need to research how the goals and sustained impacts of a regenerative agriculture system will differ from the current agriculture system. Researchers should endeavour to provide insights that will articulate the purposes of the current system and provide a vision and foresight about what and how the regenerative agriculture system should be designed and what it can achieve[64].

Private sector stakeholders such as producers, service providers, development organisations, consultants etc. are also critical to the increased adoption and practice of regenerative agriculture. These stakeholders must strategically partner with others in the industry to promote the system through training and capacity building, information sharing, practical demonstrations, and analysis on the adaptability of various regenerative practices.

Farmers' mindsets also need to change from the 'belief' that adopting regenerative techniques would lead to drops in yield or profitability. There is a need for proof that regenerative agriculture can and will improve business resilience, agricultural productivity, and financial performance across the value chain. Farmers and stakeholders need confidence that regenerative agriculture will financially benefit them, based on positive results within relevant regions and markets. This means that there is the need to develop a business plan and pilot case study, which should be clear and concise and based on facts, showing farmers the possibilities and opportunities in transitioning to regenerative practices. The community should also be encouraged to show commitment to farmers and promote those who embrace regenerative practices. Extension workers are critical to train farmers on the fundamental techniques involved in regenerative agriculture such as conversational tillage, diversity, rotation and cover crops, etc.

Another critical area for action revolves around the shifting of the market structures towards regeneration. The current economic system rewards short-term financial gain, which focuses on economies of scale to maximize yield and largely commoditize farm produce. To secure the future of the self-sufficient agriculture industry, the goals of the economic system need to shift towards long-term resilience for farmers, livelihoods, and communities, ensuring a fairer distribution of value and risk between stakeholders and the regeneration of land and resources[65]. Investment into regional farmer-led initiatives and partnerships will help fuel and encourage regenerative agriculture movement by providing platforms for farmers to participate proactively with the industry and government, and with each other, through farmer-trusted knowledge exchange. This will help share best practices, shape the policy and build a resilient agricultural system.

64. https://www.futuredirections.org.au/publication/growing-our-future-how-regenerative-agriculture-can-achieve-economies-of-scale/

65. Growing Our Future – How Regenerative Agriculture Can .... https://www.futuredirections.org.au/publication/growing-our-future-how-regenerative-agriculture-can-achieve-economies-of-scale/

CONSOLIDATING STAKEHOLDER EFFORTS IN THE INDUSTRY

BY RAHMAT EYINFUNJOWO

The African agriculture sector is notorious for its fragmented nature. A McKinsey study presents a simple case study. In analyzing major agricultural-input chains in eight countries, it was found that "inputs changed hands at least three times before they reached the farmer; moving from national importers to regional distributors and then to agro-dealers before finally reaching the farmers. Of nearly 1,000 agro-dealers surveyed, 68% purchased from local distributors, and only 23% purchased directly from manufacturers. The report further showed that on average, this fragmented supply chain led to a 20% – 50% markup over import price across major agricultural inputs, with about one-third to one-half of that captured as margin by the distributors and retailers in the chain"[67]. Ultimately, the resultant high costs of agricultural inputs are transferred to the costs of food and have a ripple effect on the ability of the average African consumer to afford high quality, nutritious foods.

An important point to note is that each critical trend identified for the next decade – shorter value chains, big data, precision agriculture, mobile technology, gender inclusion, circular economy, climate-smart agriculture, protective foods, regenerative agriculture – requires the combined efforts industry stakeholders. Feeding Africa's 1.5 billion people by 2030 and 2.4 billion by 2050 requires a shared vision among the industry's different stakeholders. The year 2020, ending on the heels of the COVID-19 pandemic amidst other disturbances significantly affecting the African food ecosystem has presented vital lessons on the need for collaboration. Estimates have shown that the COVID-19 crisis could plunge 40 million people into extreme poverty in Africa[68]. Already, some African countries are experiencing an economic downturn, with expectations of continent-wide recession following closely[69].

Amidst the burgeoning African population, rising food demand, worsening poverty indices, and approaching recession, stakeholders need to combine efforts to implement new solutions. Conventional approaches to solving food systems problems are no longer acceptable. The silos need to be broken; unity of stakeholders in purpose, design, and implementation of solutions will drive better results and lead the continent toward sustainable growth much faster.

Leveraging digitalisation, big data, innovation, and technology, stakeholders can co-create sustainable solutions. The 50 million smallholder farmers who make up 90% of food production in Africa; the ≈400 private sector agritech companies who market and handle 80% of Africa's food consumption; the local, national and international governments of the 54 countries in Africa; the 15 CGIAR Research Centers and national research centres across the continent; and the several international development agencies, NGOs, and multilateral organizations operating in the agri-food sector on the continent can now truly come together to build a more efficient food ecosystem. Existing multi-stakeholder initiatives on the continent are showing us what is possible.

Examples and successes of multi-stakeholder initiatives across the continent

Grow Africa is one of such multi-stakeholder initiatives. Founded in 2011 by the African Union, the New Partnership for Africa's Development (NEPAD) and the World Economic Forum, Grow Africa has specific goals to increase private-sector investments in agriculture and enable countries to realize the potential of their agricultural sectors. Grow Africa aims to achieve these goals by facilitating collaboration between governments, international and domestic agriculture companies, and smallholder farmers to reduce the risk and cost of agricultural investments and improve the return speed to all stakeholders. The partnership platform comprises over 200 companies and governments of 12 countries (Benin, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Senegal, and Tanzania)[70].

The **New Alliance for Food Security and Nutrition** was established in May 2012 as a partnership between G8 nations, African countries (Benin, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Malawi, Mozambique, Nigeria, Senegal, Tanzania) and some private sector actors. The initiative aims to lift 50 million people out of poverty in Africa by 2022, achieve sustained, inclusive, agriculture-led growth, reaffirm continued donor commitment to reducing poverty and hunger, and leverage the potential of responsible private investment to 3 support development goals. Since 2012, more than 200 African and

66. Quoted from the article: Winning in Africa's Agricultural Market, 2019
67. Mahler, Lakner, AGUILAR, et al., 2020
68. https://www.worldbank.org/en/news/press-release/2020/10/08/world-bank-confirms-economic-downturn-in-sub-saharan-africa-outlines-key-polices-needed-for-recovery
69. https://www.econstor.eu/bitstream/10419/204641/1/16631831 98.pdf

international companies have signed letters of Intent to invest $10 billion in African agriculture, $1.8 billion of which has been realized. Also, private investments have reached 8.2 million smallholders and created more than 21,000 jobs in 2014, over half of which were for women; and development partners have disbursed 85% of expected funding to date[70].

Similarly, the **Advancing Local Dairy Development in Nigeria (ALDDN)**, a five-year program in Nigeria is catalyzing the emergence of a vibrant local dairy sector in an inclusive way that improves the livelihoods, productivity, nutrition, and empowerment of smallholder women dairy farmers and the communities in which they live. Funded by the Bill and Melinda Gates Foundation and led by Sahel Consulting, ALDDN is being implemented through a multi-stakeholder partnership with private sector companies, relevant federal ministries (including agriculture, health, women affairs, and water resources) in the various states. ALDDN aims to reach at least 210,000 beneficiaries in five states in the country.

Another example is **Nourishing Africa**, a digital knowledge and membership platform focused on supporting African agriculture and food entrepreneurs to scale their businesses through the provision of critical resources, tools, and opportunities, including funding, capacity building, data, networking, e-learning, local and global nominations, and mentoring. Through its platform, Nourishing Africa supports more than 700 agri-food SMEs from 34 countries in all five regions across the continent, providing them with unique opportunities to connect with other entrepreneurs, industry experts, mentors, funders, and technical support providers. To deliver on its mandate of ensuring that Africa nourishes itself and becomes a net exporter of food by 2050, Nourishing Africa partners with a range of international and local stakeholders including the Mastercard Foundation, the United States African Development Agency (USADF), Generation Africa, Inclusive Business Action Network (iBAN), FW Media, Invest in Africa and others.

Africa Improved Foods (AIF) established in 2017 by Kenyan Amar Ali produces fortified foods for the East African market. The company is a joint-venture and a public-private partnership aimed at tackling malnutrition in East Africa by producing and making available nutritious, high quality foods to those that need it most. To do this, AIF partners with the government of Rwanda to produce and distribute nutritious porridge to two groups who are most at-risk from malnutrition and from the lowest income segments in the country – pregnant and lactating women and infants between 6-24 months. In just two years of establishment, AIF exceeded supply targets for the World Food Programme and the government of Rwanda. It has also launched five new commercial products in three countries and works with 24,000 smallholder farmers in Rwanda. The company projects that their post-harvest work with farmers will further reduce total aflatoxin rejections to roughly 10% in the coming years. AIF recognized that to solve malnutrition and stunting in Rwanda truly; it needed to work closely with the Ministry of Health, the Ministry of Agriculture, and other stakeholders in the landscape.

Stakeholder consolidation is rife with its own challenges. However, these challenges are surmountable.

It is important to note that achieving consolidation of stakeholder efforts in the sector will come with its challenges. Bringing multiple stakeholders to work on a single cause at the same time can be complicated and chaotic. There will be challenges of conflicting interests, different modes of execution, varying organizational values and culture, geographical location, etc. However, these are reconcilable differences that can be addressed with tact and the shared commitment of driving growth in the sector.

First, it is crucial to recognize that there are success stories from high impact past and active ongoing multi-stakeholder initiatives and companies across the continent like that of AIF. These initiatives provide useful insights on challenges, lessons learned, and best practices for stakeholders to design and plan private-public business models and multi-stakeholder projects. Therefore, existing multi-stakeholder partnerships must document relevant information to be used as a guide for others.

Secondly, identifying relevant resources can ease the planning, design, and implementation of multi-stakeholder initiatives. Some of such resources include the World Bank's toolkit that provides practical guidance to strengthen the results and effectiveness of multi-stakeholder development[71], the Global Development Incubator's report on 'making multi-stakeholder initiatives work',[72] and Harvard Kennedy School's publication on the same subject[73]. The resources will provide useful frameworks to build structured collaboration between multiple actors from different organizations, backgrounds, locations, and even sub-sectors, who often may have varying interests but shared goals.

What needs to be done

Collaborate, not compete

More stakeholders need to realize that no singular action or actor can tackle poverty alone. There is a need for collective action and strategic collaboration at a systems level, drawing on different actors' strengths to deliver on the collective good. To truly achieve consolidation, stakeholders must, therefore imbibe the mindset of collaboration instead of competition.

Draw learnings from existing multi-stakeholder partnerships in the landscape

Stakeholders must realize that there are existing similar forms across the continent for every new initiative, project, or

70. https://www.growafrica.com/projects
71. Designing a Multi-Stakeholder Results Framework: A Toolkit to Guide Participatory Diagnostics and Planning for Stronger Results and Effectiveness
72. More than the sum of its parts: Making Multi-stakeholder Initiatives Work
73. Multi-stakeholder Initiatives: Lessons from agriculture. Harvard Corporate Responsibility Initiative, 2017

business idea. These initiatives must be adequately mapped, identified, and engaged for possibilities of collaboration and sharing of learnings.

Support private sector actors

Governments and development partners must also support platforms such as Nourishing Africa to connect value chain actors from farm to fork in the industry. Such platforms are instrumental in engaging and supporting small and medium-sized businesses across the nooks and cranny of the continent and by so doing, reach the millions of smallholder farmers and consumers that these SMEs serve.

Conclusively, the current and future changes in the food ecosystem open exciting possibilities for stakeholders to accelerate the agri-food sector's development through the promotion of a centralized ecosystem that will solve problems from different stakeholder perspectives and thereby lead the continent into a decade of agricultural and economic excellence.

INSIGHTS FROM THOUGHT LEADERS

COMPILED BY ADEMOLA ADELU

The Sahel and Nourishing Africa teams engaged with global thought leaders who provided critical insights on various critical trends that will drive the growth of Africa's agriculture sector in the next decade.

On food loss and waste, and driving a circular economy

"I think we have all it takes to run a circular economy in Africa. It is said that 60% of uncultivable arable land is in Africa and Africa will be the global food basket in the next few years. Looking at our history as Africans, we have not been able to take advantage of the first three industrial revolutions that shook the world, which is one of the reasons for our status. Thankfully, Africans are now at the fore in terms of emerging technologies, which points out that it is achievable if we want to go into a circular economy. When we have a strong post-harvest management system in place, we can talk about a circular economy in the sense that everything produced on the farm is being utilized. If you take commodities like coconut, for example, the husk can be used as bioenergy. Also, if you take the feed industry as a case study, waste from maize and soybean can be used to feed insect and as concentrates."

Dr Daniel Asare-Kyei, CEO, Esoko, Ghana

Source: Podcast session with Nourishing Africa

On advancing gender equity and inclusion

"In essence, there has been a group of women who are in the value chain, but most times, they get ignored... One of the viable ways in which the Rockefeller Foundation is currently trying to improve the food environment is through the idea of Smart Market of the Future, where we have conceived a market powered by solar for illumination and to power cold storage, and agro-processing facilities. We do these to reduce drudgery and encourage more women inclusion in the ecosystem. To achieve zero hunger, similar efforts must be geared towards unlocking economic empowerment for women."

Betty Kibara, Director, Food Initiative, the Rockefeller Foundation.

Source: Sahel@10 Conference

"If we can close the gender gap taking Nigeria as a case study, we can have an additional gain of $9.3 billion or 2.3% of annual GDP per year – or 22.9 billion or 5.8% GDP per year, if we factor in another spillover. In view of this, if we focus on agricultural policy, programmes strategies, and closing the gender gaps, the entire African economy will achieve zero hunger goal."

Vicki Wilde, Senior Program Officer, Agricultural Development, Bill and Melinda Gates Foundation

Source: Sahel@10 Conference

On leveraging Big Data in agriculture

"Currently, most countries in Africa do not track data; as such, the data management system in Africa suffers a huge setback... We recently launched a 'Food Systems Dashboard' whereby we have tried to put together food systems data across several countries, and data is used to generate a macro picture of the food systems across the world regarding undernourishment, nutrition, and environmental metrics of food systems. However, the lacking component is the local picture which warrants the need for African countries to replicate this. There is a need to make data open access. We need a range of stakeholders to generate new data, and one viable way to achieve this is by supporting African scholars by ensuring that they can collect reliable data, own it, and publish globally. We also need to explore a community-based data collection approach giving these researchers a voice to be able to publish their data collected at the local level."

Dr Jessica Fanzo, Bloomberg Distinguished Professor, John Hopkins University

Source: Sahel@10 Conference

On climate-smart agriculture

"To accomplish Climate-smart agriculture (CSA), African governments must mainstream CSA into their public investment. However, the public sector cannot accomplish this ambitious goal alone. The governments and public sector institutions are needed for providing the policy and enabling environment that supports CSA, including climate-informed agricultural extension, infrastructure for weather information, safety net programs, and other investments in public infrastructure. Research organizations are needed to provide scientific evidence for climate-smart technologies, information, and finance, which public and private stakeholders can utilize. Civil society is key for supporting producers' organizations and filling in key gaps where market failures prevent the private sector from providing climate-smart services. Private sector agribusinesses are key, providing the business models to deliver CSA technologies, disseminating information and providing financial services to producers and value chain actors. Finally, leveraging private finance to support CSA in Africa is critical. There is a great opportunity for CSA to reduce investment risk and help catalyze innovative finance included from blended public-private financing models, impact investors and commercial financiers."

Dr Evan Girvetz, Principal Scientist and Global Program Leader, Africa Region for Climate Action, Alliance of Biodiversity International and CIAT

Source: Direct interview

On protective foods

"In Africa, SMEs in the nutritious food space need technical assistance in developing investment propositions to be able to navigate the financial systems. GAIN is currently working with other organizations on the establishment of a program for keeping the food market active and efficient, getting credit to SMEs in the nutritious food space, and keeping food system workers healthy."

Dr Lawrence Haddad, Executive Director, Global Alliance for Improved Nutrition (GAIN)

Source: Sahel@10 Conference

"We need to leverage technology to improve the nutritional content of foods… We need a paradigm shift from consuming major types of unhealthy carbohydrates to legumes and protective foods that will help protect against several diet-related diseases. African SMEs must create sustainable, innovative business models that could create more nutritious foods and incentives to scale. With technology coinciding with the backdrop in the nutritious food sector, in a few years, we look forward not only to food self-sufficiency but a well-nourished food sector in Africa."

Dr Rajiv Shah, President, the Rockefeller Foundation

Source: Sahel@10 Conference

On consolidation of stakeholder efforts in the industry

"There has been a government-enabled private sector-driven agricultural transformation in Africa. The governments' role is to intensify efforts on creating an enabling environment for private sectors to integrate more viable components of the agrifood value chain. Agriculture is Africa's number one comparative advantage, and transforming the sector will provide more sustainable employment opportunities in the sector. With the size of the food market estimated at over 1 trillion dollars by 2030, Africa's future millionaires and billionaires would come from agriculture. Continuous efforts must be geared towards ensuring a strong collaboration between the public and private sector."

Dr Akinwumi Adesina, President, African Development Bank (AfDB)

Source: Sahel@10 Conference

"According to the Agriculture Status Report produced last year by AGRA, Africa's private sector handles about 80% of food production in the sector. This implies that, without these SMEs, we will starve."

Dr Agnes Kalibata, President, Alliance for a Green Revolution in Africa (AGRA)

"If we are going to change this narrative, there is a need to focus more on the SMEs in the landscape."

Dr Lawrence Haddad, Executive Director, Global Alliance for Improved Nutrition (GAIN)

Source: Sahel@10 Conference

"Going forward, we need different food systems around the world to address the myriad of issues plaguing the food sector in their respective context."

Dr Rajiv Shah, President, the Rockefeller Foundation

Source: Sahel@10 Conference

SAHEL CELEBRATES TEN YEARS OF IMPACT

Over the past ten years, Sahel Consulting Agriculture and Nutrition Limited and Sahel Capital Agribusiness Managers Limited ("Sahel") led by Ndidi Nwuneli and Mezuo Nwuneli respectively have worked to transform Africa's agriculture and nutrition landscape by providing strategic advice, policy interventions, and ecosystem solutions across multiple value chains, and investment growth capital to food and agricultural companies in West Africa.

Sahel held a virtual conference on Tuesday 24th November 2020 to celebrate its 10th anniversary tagged **"Zero Hunger: Africa's Private Sector Driving Innovation & Growth".** Notable amongst the keynote speakers include Dr. Akinwumi Adesina, President of the African Development Bank; Dr. Rajiv. J. Shah, President of the Rockefeller Foundation; Dr. Agnes Kalibata, President of the Alliance for a Green Revolution in Africa (AGRA); and Dr. Lawrence Haddad, Executive Director of the Global Alliance for Improved Nutrition (GAIN). During the conference, Dr. Cosmas Maduka, Chairman of Coscharis Farms also shared key insights and lessons from his entrepreneurial journey.

The official host of the session, Mr. Frank Aigbogun, Publisher and CEO, BusinessDay Media opened the conference alongside Ndidi Nwuneli, Managing Partner at Sahel Consulting who gave the welcome address and set the tone for the conference. She described entrepreneurs as the lifeblood of the agriculture sector. She reiterated that it would take the engagement of stakeholders across the food ecosystem including policymakers, entrepreneurs, youth, and farmers to achieve the Sustainable Development Goal (SDG) 2 – Zero Hunger by 2030.

Dr. Akinwumi Adesina commended the co-founders for their passion, hard work, and commitment to transforming the agriculture landscape. He highlighted the need for Africa to capitalize on the market opportunities by producing more food efficiently and sustainably through agro-industrialization, and in a manner that supports both the farmers and the private sector. Dr. Adesina described a working agricultural sector as one which is private sector-led, but government enabled. He urged that the youth must be encouraged to see agriculture as a business to be driven by their innovation and business acumen.

During his remarks, Dr. Rajiv Shah emphasized the need for a focus on nutrition and sustainability, rather than just increasing food production. He discussed the importance of energy in achieving development goals, as well as the efforts of the Rockefeller Foundation to end energy poverty in the world and gave examples from countries such as Nigeria and India. He also urged the conference participants to rethink existing food systems and to create innovative new businesses within the food and agricultural sector.

In her remarks, Dr. Agnes Kalibata described African entrepreneurs as dynamic, vibrant and data-driven; focused on transforming Africa's agriculture and nutrition landscape. She further encouraged all stakeholders not to relent on their commitments to double down on the efforts of the government and private sector to increase food production. She stated that Africa's private sector handles 80% of food consumed on the continent and 48% of food consumed in urban areas; and urged the conference participants to support and celebrate the successes of these businesses, and especially women-owned businesses.

The keynote addresses were followed by two sets of three-panel discussions which ran concurrently and focused on "leveraging technology", "the impact of big data", "agriculture development", "economic transformation", "women in agriculture", and "building ecosystems of support".

During the session "Leveraging Technology & Innovation to Leapfrog", Dr. Angel Adelaja-Kuye (Senior Special Adviser on Agriculture to the Ogun State Governor), Dr. Maneshree Jugmohan-Naidu (Director of Biotechnology at the South African Department of Science and Innovation), Mark Nelson (Managing Director at Context Global Network), and Prof. Olugbenga Ogunmoyela (Lead Consultant, Glylabs Consulting) were the key discussants. The panelists emphasized the need to leverage technology to leapfrog, driving productivity improvements and dramatically reducing post-harvest losses. The panelists reinforced the importance of private-public partnerships to support the emergence of strong value chains.

In the second panel session, "The Impact of Big Data on Food Ecosystems", Dr. Daniel Asare-Kyei (CEO, Esoko), Dr. Jessica Fanzo (Bloomberg Distinguished Professor, John Hopkins University), and Dr. Simon Winter (Executive Director, Syngenta Foundation) discussed the need for data use and tracking in the agricultural space. They emphasized that data must be made affordable and accessible to smallholder farmers. Dr Winter amplified how accurate data has enabled various stakeholders to make optimal decisions within the sector. He shared the example of the Seed Trial App, developed by Syngenta, which provides seed regulators and seed production companies with the information necessary to understand the commercial viability of investing in specific seed varieties. In closing, the panelists highlighted the need for data banks across the continent to ensure accurate data is not only collected but also accessible and affordable to all.

In a separate session, Christopher Brett, the Lead Agribusiness Specialist at the World Bank gave a presentation focused on how agriculture development could drive economic transformation across Africa. During his presentation, he discussed the hidden costs of the global food and agricultural system, which he estimated at $12 trillion, and the importance of building a food system that is holistic – ensuring healthy people, a healthy planet, and a healthy economy. He highlighted the rapid growth of the world's population and the challenge of feeding more people with fewer resources. After his presentation, he was interviewed by Mezuo Nwuneli, Managing Partner of Sahel Capital, and their discussion addressed issues ranging from food supply chains to agricultural policy, and subsequently to the African Continental Free Trade Area (AfCFTA).

The fourth panel was focused on the critical role women play in the agricultural sector. The session featured Carla Denizard (Regional Leader for West Africa, World Vision International), Elohor Mercy Diebiru-Ojo (Assistant specialist, Cassava Seed Systems, IITA), Betty Kibaara (Director, Food Initiative, Rockefeller Foundation), and Vicki Wilde (Senior Program Officer, Agricultural Development, Bill and Melinda Gates Foundation). Their discussions highlighted the importance of gender-inclusive community sensitization to increase the participation of women in the sector. They discussed practical ways in which girls could access the right information, skills, tools and resources to change their trajectory and future participation in the sector. Vicki Wilde emphasized the Bill and Melinda Gates Foundation's effort to increase women participation within the sector such that they are able to make economic decisions that transform the sector. Carla Denizard concluded by saying that the food security of Africa and the world rests on women's activities across the various value chains.

The fifth panel focused on "Africa's Rebirth: The Role of Agriculture In Economic Transformation". The session was moderated by Shachi Gurumayum (Director, Agrimayum GmbH). It featured Sami Khan (Director Strategy, Food and Agribusiness, CDC Group), Uche Orji (CEO, Nigeria Sovereign Investment Authority), Atsuko Toda (Director, Agriculture Finance & Rural Development, the African Development Bank), and Kees Verbeek (Chief Representative Officer, Rabobank Kenya). They highlighted the efforts of institutional investors working to address the challenge of access to finance for Africa's agricultural sector, particularly for Small and Medium-Sized Enterprises (SMEs). The panelists also discussed the need to provide risk-sharing facilities for financial institutions in Nigeria and across

Africa to de-risk the agricultural financing value chain and institutionalize agricultural lending.

They also reinforced the need for creating strategic and innovative partnerships among institutional investors to unlock economic opportunities within the sector.

The final panel was focused on "Building Ecosystem Of Support For Africa's SMEs". The session included Olagoke Balogun (CEO, So Fresh Nigeria), C.D. Glin (President and CEO, U.S. African Development Foundation), Lesego Serolong Holzapfel (Founder/CEO, Bokamosa Impact Investments), Chidinma Lawanson (Country Manager Nigeria, Mastercard Foundation), and Sunday Silungwe (Co-Founder and Director of Marketing, Good Nature Agro). During their discussion, they highlighted the need for a support system for SMEs to ensure their survival and the effect of fragmented value chains on the business processes thereby, forcing businesses to depend on the open market and smallholder farmers for supply. They reinforced the critical role of Nourishing Africa in helping SMEs overcome a myriad of challenges and enabling them to scale.

Dr. Lawrence Haddad, Executive Director of Global Alliance for Improved Nutrition, in the final keynote address, gave thoughtful insights on how SMEs could scale to achieving sustainable businesses. He explained that small and medium enterprises need to be investor-ready and fully aware of the finance mechanism available to them. He underscored that the future of Africa's food system must develop and scale new models to avoid many of the challenges faced in Europe and other western countries.

As part of the vote of thanks, Mezuo Nwuneli, Managing Partner, Sahel Capital, acknowledged and thanked the Sahel team, partners, clients, investors who have supported the company over the past ten years. He expressed excitement about the future of the Sahel Group working collaboratively with key stakeholders to transform the ecosystem, to ensure the achievement of Zero Hunger in Africa by 2030!

SAHEL AND CODARAN HOLD VIRTUAL DAIRY CONFERENCE ON CATALYZING LOCAL DAIRY DEVELOPMENT IN NIGERIA

The Nigerian Dairy Sector has evolved tremendously over the years. Though successes have been recorded within the dairy value chain, challenges still abound. These challenges hamper productivity across the value chain and this translates to an inadequate supply of dairy products in the market from the local industry. Consequently, Nigeria depends heavily on imports to meet the huge demand for dairy products.

To examine these challenges and chart a way forward for the dairy industry, Sahel Consulting through the Advancing Local Dairy Development in Nigeria (ALDDN) program, partnered with the Commercial Dairy Ranchers Association of Nigeria (CODARAN) to host the 2020 Dairy Conference on Thursday, November 12. The Conference had as theme: "Catalyzing Local Dairy Development in Nigeria: Lessons from Local and International Models" and brought together local and international experts and industry practitioners who proposed best practices that Nigeria can adopt to develop its dairy industry.

In their welcome remarks, Mrs. Ndidi Nwuneli, Co-founder and Managing Partner at Sahel Consulting Nigeria and Alhaji Muhammadu Abubakar, President of CODARAN and Managing Director of L&Z Integrated Farms Nigeria introduced ALDDN and CODARAN, respectively and tasked participants to take advantage of the wealth of experience of the conference speakers and panelists to enhance the productivity of their businesses to enable Nigeria to achieve self-sufficiency in dairy production.

The first-panel session, moderated by Dr. Hafsat Ali Grema, the Productivity Improvement Manager at Sahel Consulting Nigeria, focused on achieving self-sufficiency in the Nigerian Dairy Sector, drawing lessons from international sustainable models. The discussants on the panel were Dr. Annabelle Daburon, a Livestock Value Chain Advisor at the Chez Wageningen University in the Netherlands, and Dr. Asaah Ndambi, a Senior International Animal Production Specialist from the same university in the Netherlands. Others were Dr. Charles Odhong, a Livestock Production System Specialist at the University of Nairobi, Kenya, and Mr. Rob La Grange, a Dairy Expert at Western Dairy, Australia.

These experts unanimously recommended that the Nigerian Dairy Industry players should embark on innovations that are smallholder farmers oriented. Being the mainstay of any vibrant dairy industry, focusing on the smallholder farmers have enormous benefits. Initiatives like building resilience among the farmers and fostering gender inclusivity by increasing the number of women in the sector are key to improving yield. This increment would have far-reaching benefits on local economies, leading to improved livelihoods. They proposed market-focused extension service models that would create the required nexus between farming practices and market requirements.

The second-panel session focused on the critical role a sound policy environment plays in the development of an economy. Moderated by Ndidi Nwuneli, Managing Partner at Sahel Consulting Nigeria, the session featured Mr. Steve Hossen, a rural consultant in Western Australia, Mrs. Amina Ahmed Habib, Deputy Director and the Dairy Team Lead at the Central Bank of Nigeria, and Mr. Rajesh Gupta, the Head, Cooperative Services Group, National Dairy Development Board of India.

In his discourse, Mr. Hossen highlighted several policy initiatives that have worked in Australia, including a subtle subsidy regime that provides farmers the latitude to produce, and a financing system that allows farmers to borrow up to $5m to invest in their businesses. He advised against excessive protectionism and suggested a gradual increase in tariffs on imports and encouraging backward integration as ways of growing the local dairy industry.

The Indian example shared by Mr. Rajesh Gupta was inspiring. According to Mr. Gupta, India has over 100 million farmers engaged in dairy production. He discussed expansively the role of cooperatives in the development of the dairy sector in India. From financing to capacity building, the cooperatives make communication, provision of extension services, and government-backed growth initiatives effective.

Mr. Gupta noted that the Indian Dairy Industry has also benefitted immensely from the activities of the main industry association – the National Dairy Development Board (NDDB) of India. This is a model CODARAN is working to replicate in the Nigerian Dairy Industry.

From the CBN's perspective, Mrs. Amina Habib observed that Nigeria has made interventions in the macro, median and micro levels of policy formulation and implementation. Investment in research institutions, the creation of policy frameworks for agricultural activities, and single-digit interest loans to farmers are some of such interventions.

The third-panel discussion followed thereafter, focusing on available opportunities for profitable investments in the dairy sector through strategic partnerships. On the panel were: Alhaji Muhammadu D. Abubakar, President of the CODARAN and Managing Director of L&Z Integrated Farms Nigeria, Mr. Laoye Jaiyeola, Director General, Nigerian Economic Summit Group (NESG). Others were Dr. Manzo Maigari Director-General, Nigerian Agribusiness Group, and Dr. R.S Khanna, Chairman, Kwality Group, India. Fisayo Kayode, Livestock Coordinator, ALDDN, moderated the session.

The panelists drew extensively from their reservoirs of knowledge and experience to advise potential investors on how to strategically position for profitable engagements in the industry. They identified profitable opportunities in ranching, crossbreeding for high yield through Artificial Insemination (AI), feed and fodder production, animal disease control, extension services, milk collection, aggregation, bulking, and processing, among others.

Furthermore, they proposed partnerships through think-tanks like the NESG and advocacy through industry associations like CODARAN to create platforms for dialogue, engagement with policymakers, knowledge, and experience-sharing to confront industry-wide challenges.

The Dairy Conference had three masterclasses, namely: Making Dairy Business Profitable, Commercial Feed and Fodder Production as a Source of Income and Dairy Health Management. Facilitating the sessions were: Alex Gitonga, Senior Partner and Value Chain Consultant at Tanolope Consultancy, Kenya, Dr. Tunde Amole, Country Representative, International Livestock Research Institute (ILRI), Nigeria and Dr. Chris Van Dijk, Chief Executive Officer of South Africa's Milk Producers Organisation, respectively. Participants benefitted from the knowledge shared by these experts.

Giving the closing remarks, Mr. Dianabasi Akpainyang, Executive Director at CODARAN charged participants to commit to implementing the key takeaways from the Conference which include farmers-oriented innovation, a business-friendly policy environment, and regular stakeholder engagement to catalyze the development of the Nigerian Dairy Industry.

SAHEL ENGAGES SCHOOLS IN LAGOS AND ABUJA, DONATES COVID-19 PREVENTIVE ITEMS AND WRITING MATERIALS

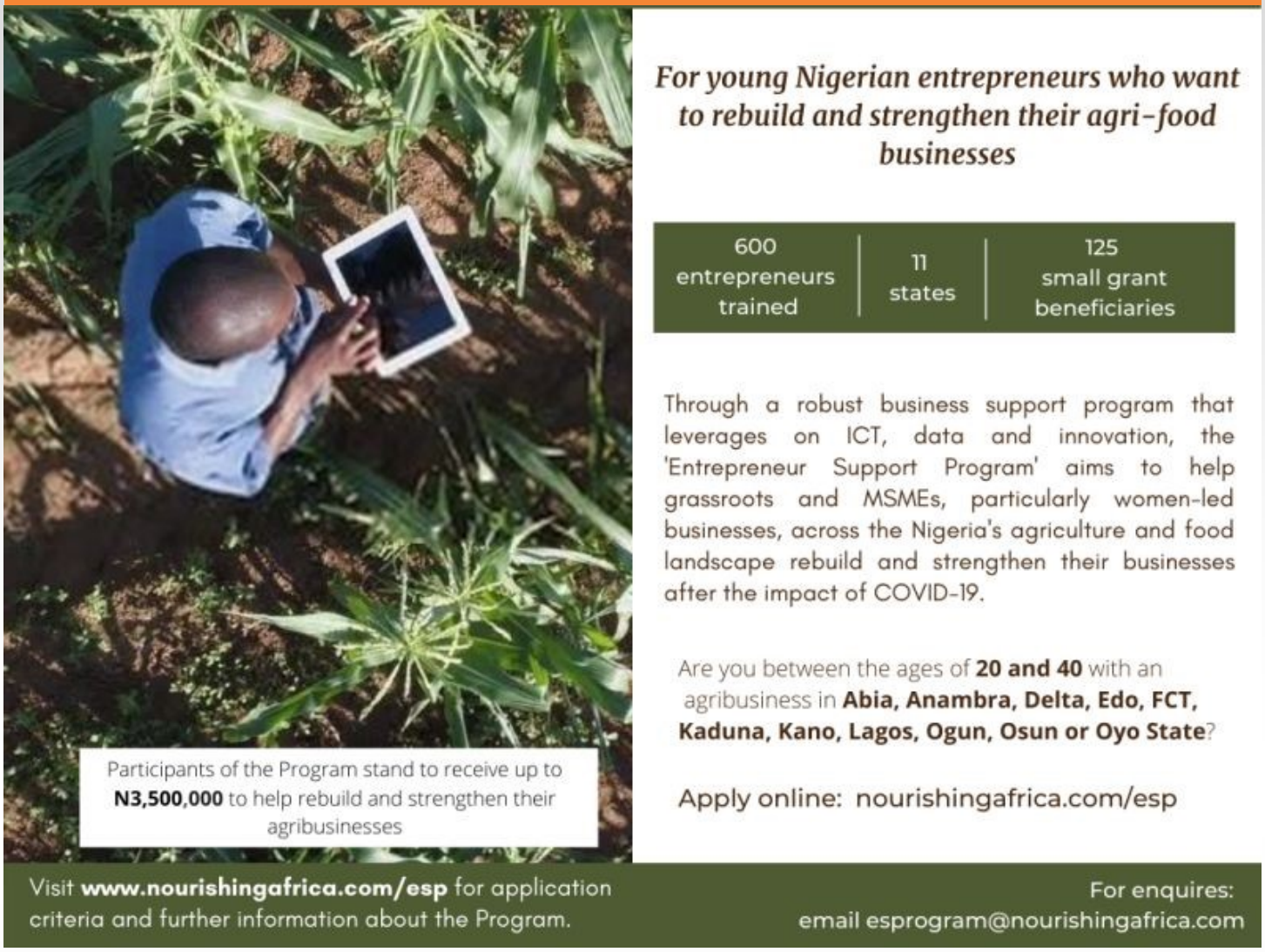
As part of its Corporate Shared Value (CSV) Programme, Sahel Capital Agribusiness Managers Limited and Sahel Consulting Agriculture and Nutrition Limited ("Sahel") provided Covid-19 preventive items and writing materials to students in three schools – Ikota Primary School, Lekki, Lagos; Ilasan Primary School, Jakande, Lagos; and Government Secondary School, Jabi in the Federal Capital Territory. Items donated include leg-operated handwash stations, wall-mounted automatic dispensers, liquid soap, liquid hand sanitiser, nose covers, exercise books, and recycled pencils.

Following six months of the closure of schools in Nigeria due to the COVID-19 pandemic, schools across the country recently re-opened their doors upon the ease of lockdown by order of the country's Federal Government. This intervention by Sahel was a prompt response to ensure that students continue to learn in a safe and conducive environment. Specifically, the production and distribution of recycled pencils using waste papers and books enable Sahel to contribute to a circular economy, reducing paper waste and land pollution.

The donation was well received by students and staff of the schools who expressed their joy at the gesture. The contactless handwash stations were placed strategically at the schools' entrances to enable students and staff to wash their hands upon entry into the school premises. Simultaneously, the automatic dispensers were mounted along the classroom corridors, thereby ensuring that the school community can sanitize their hands at different periods in the day.

Sahel remains committed to creating sustainable value by implementing humanitarian projects that cut across three intervention areas – education, health, and the environment. In partnership with the schools, this intervention reinforces this commitment and combines all three Sahel CSV intervention areas on education, health, and environment. Sahel will continue to engage its community and provide strategic support in these areas to foster shared growth and prosperity.

NOURISHING AFRICA LAUNCHES ENTREPRENEUR SUPPORT PROGRAM



Nourishing Africa has partnered with the Mastercard Foundation and the United States African Development Foundation (USADF) to launch the Entrepreneurs Support Program. The program is designed to support MSMEs across Nigerian agriculture and food landscapes to rebuild and strengthen their businesses.

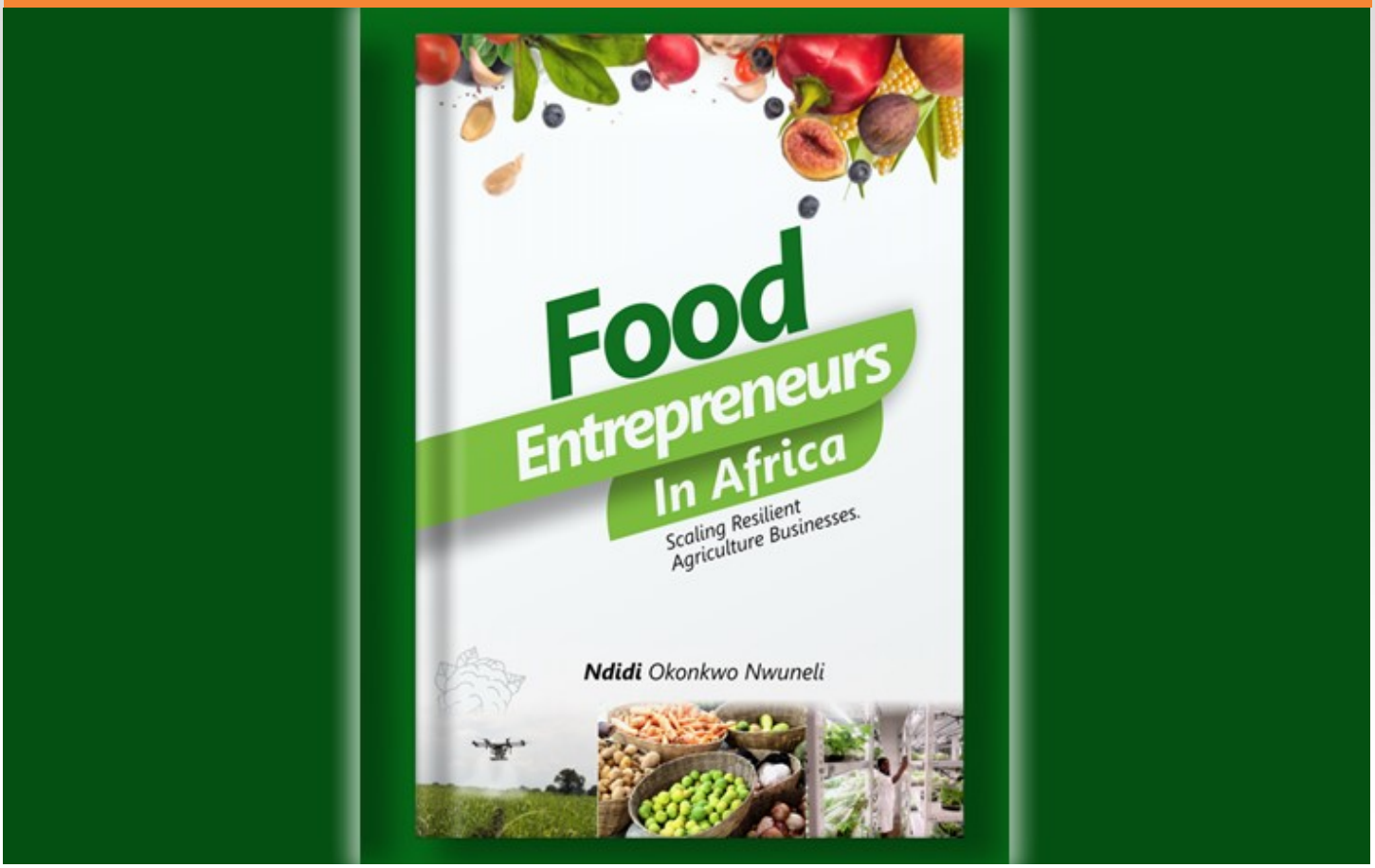
Leveraging on ICT, Telecommunication, Data, and Innovation, Nourishing Africa has developed a 4-step program aimed at directly supporting these MSMEs with training, financing, and support for the stabilizing and scaling of resilient businesses that can withstand future shocks.

The program targets micro and small-scale enterprises run by young people between the ages of 20 and 40, engaged in critical food, cash crops, and livestock value chains from the provision of inputs, primary production, processing, logistics and storage, and distribution in 11 states in Nigeria: Abia Anambra, Delta, Edo, FCT, Kaduna, Kano, Lagos, Ogun, Osun, and Oyo states. Agri-food businesses who qualify can apply at **https://hub.nourishingafrica.com/esp**

As part of the Program, Nourishing Africa aims to partner with organizations, cooperatives, and associations with agrifood members. Through these engagements, we will identify and incorporate grassroots and MSME agripreneurs from the 11 focus states. Entrepreneur support organizations or agri-food cooperatives and associations in the 11 focus states who would like to partner with us on the Entrepreneur Support Program are encouraged to email us at **esprogram@nourishingafrica.com**.

The Program Kickstarts on **18 January 2021**. All applications must be submitted by **10 January 2021**.

NDIDI NWUNELI WRITES BOOK ON FOOD ENTREPRENEURS IN AFRICA



Ndidi Nwuneli, Managing Partner at Sahel Consulting Agriculture and Nutrition Limited, has written a book on Food Entrepreneurs in Africa: Scaling Resilient Agriculture Businesses. The book is set to launch in the first quarter of 2021.

External Reviews

"Africa's demographic dynamics are rightly cited as one of the megatrends which will shape the Continent's path and trajectory. Ndidi's book throws that much needed focus on what that means for Africa's agriculture, farmers and entrepreneurs. No one could have done it better. Ndidi brings to the fore the critical importance of African ownership and the centrality of those responsible for over three quarters of what Africa consumes: the local entrepreneur. Ndidi's life long-commitment and rigorous study of the issues pertinent is all evident in this timely publication"

Dr. Donald Kaberuka, 7th President African Development Bank

"Food Entrepreneurs In Africa is a unique book that sets forth the requirements to be a successful African change maker at each level of the vertical food chain from seed to the kitchen table. Ndidi Okonkwo Nwuneli emphasizes that change makers be more creative in responding to the health, economic, and environmental needs of both producers and consumers. To my knowledge, I know of no other book that has done this for Africa. This book will be useful to entrepreneurs, public policy makers, educators, and to all those who want to improve this much needed and too long neglected important part of the global food system."

Professor Ray Goldberg, Emeritus George M. Moffett Professor of Agriculture and Business, Harvard Business School

"This book, through the voices of active entrepreneurs, distills the building blocks necessary to fortify courage for the brave few who will dare to rise to the challenge of feeding Africa, and the world. Through eight chapters, readers are carried along on a journey of discovery; parsing the challenges, motivations and value proposition for embarking on agribusiness entrepreneurship. This should be the first reference material for anyone, in the public or private sector, willing to contribute to Africa's prosperity in agribusiness. I am proud to recommend this book to governments, entrepreneurs and students of agribusiness. Mrs. Ndidi Okonkwo Nwuneli continues to demonstrate her leadership in fostering agriculture transformation in Africa."

Dr. Debisi Araba, Managing Director, African Green Revolution Forum (AGRF)

"Food Entrepreneurs in Africa is a must-read for anyone who cares about building a more inclusive, fair and sustainable world, both within food and agriculture and beyond. Ndidi Okonkwo Nwuneli is an exceptional entrepreneur and story-teller. She offers a rare combination of hard won, on-the-ground practical experience, intellectual and analytical rigor and a deep-seated passion and personal commitment for driving transformational change. She knows first-hand how difficult it is to implement, let alone scale new financing and business models, new technologies and new mindsets – both at the firm-level and more systemically. She also understands the enormous positive potential when such change can be achieved. This book is both a practical guide for action and how to overcome obstacles as well as an inspiring vision and reflection on what is possible."

Jane Nelson, Director of the Corporate Responsibility Initiative at Harvard Kennedy School, and a nonresident senior fellow at the Brookings Institution.

"Ndidi Nwuneli describes extensively in this book the need for scalable entrepreneurship in the agri-food industry in Africa. This is critical to make Africa self-supporting in its own food-production and more independent regarding food import and aid programs.

By developing knowledge and experience, Africa can become more resilient with respect to the adverse climate impact, natural disasters like locusts or infection diseases. This book is very welcomed and enhances the entrepreneurial spirit in Africa."

Feike Sijbesma, Honorary Chairman Royal DSM, Africa Improved Foods, Global Climate Adaptation Centers.

SAHEL CONSULTING SPEAKS

Fidelity SME Forum

Temi Adegoroye spoke on "Leveraging Technology to Unlock Nigeria's Agribusiness Potentials" at the Fidelity SME Forum on 10th November 2020.

Scaling in Practice Webinar

Ndidi Nwuneli spoke on the 'Ingredients for Scaling' at the Scaling in Practice webinar hosted by CGIAR on 10th November 2020.

Seed Connect Digital Series

Falaq Tidjani spoke on "Youth Involvement in the Seed Sector, Creating Employment and Investments in Our Food Systems" at the Seed Connect Digital Series on 20th November 2020.

Temi Adegoroye spoke on "Tackling Counterfeit Seeds and the Deployment of Sub-Standard Quality Seeds in Our Seeds Systems" at the Seed connect Digital Series on 20th November 2020.

Harvard Business School Food, Agriculture & Water Conference

Ndidi Nwuneli delivered the keynote speech on "Building a Resilient, Sustainable, and Nourishing Global Food System" at the Harvard Business School Food, Agriculture & Water Conference on 20th November 2020.

Pioneers of Change Summit

Ndidi Nwuneli moderated the 'Pioneers of Change Summit' convened by the World Economic Forum on 20th November 2020.

The Redeemed Christian Church of God (RCCG) Economic Summit

Temi Adegorogye spoke on "Starting and Sustaining A Business (Micro Small Medium Enterprises)" at the RCCG Economic Summit on 21st November 2020.

26th Nigerian Economic Summit

Ndidi Nwuneli spoke on "Securing Food Security" at the 26th Nigerian Economic Summit hosted by the Nigerian Economic Summit group on 23rd November 2020.

Virtual Bold Actions for Food as a Force for Good 2020 Summit

Ndidi Nwuneli spoke on the 'Panel Discussion Action Track 1' at the Virtual Food as a Force for Good Summit hosted by Global Alliance for Improved Nutrition (GAIN) and the World Economic Forum on 23rd November 2020.

Standard Bank of Africa Chairman's Scholarship Conference 2020

Ndidi Nwuneli spoke at the Standard Bank of Africa Chairman's Scholarship Conference on 2nd December 2020.

Art of Technology Lagos State Conference

Ndidi Nwuneli spoke on 'Smart Data for Better Living: A Venture Capitalist Approach' at the Art of Technology (AOT) Lagos State Conference on 4th December 2020.

National Association of Securities Professionals: 31st Annual Pension and Financial Services Conference

Ndidi Nwuneli spoke on 'Smart Cities' at the 31st Annual Pension and Financial Services Conference organized by the National Association of Securities Professionals (NASP) on 4th December 2020.

SAHEL CAPITAL SPEAKS

African Philanthropy Forum Conference

Mezuo Nwuneli spoke on the panel session "Food Security: Can Africa Feed Itself and Feed the World?" at the African Philanthropy Forum conference hosted by the African Philanthropy Forum on 29th October 2020.

OYO-ILE Investors Forum

Olumide Lawson spoke on "Repositioning Oyo State for Post-covid-19 Economy Recovery and Sustainable Growth" at the OYO -ILE Investors Forum on 7th November 2020.

Fidelity SME Forum

Deji Adebusoye spoke on "Leveraging Technology to Unlock Nigeria's Agribusiness Potentials" at the Fidelity SME Forum Hosted by Fidelity Bank on 10th November 2020.

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Agrowth Conference 2020

Olumide Lawson spoke on "Achieving Sustainability in Agriculture" at the Agrowth conference 2020 on 11th November 2020.

ScaleUp Lab Agribusiness Accelerator Programme

Olumide Lawson served as a judge on the ScaleUp Lab Agribusiness Accelerator Programme sponsored by Fate Foundation concluded on 12th November 2020.

Investment Food Forum

Mezuo Nwuneli interviewed Dr Cosmas Maduka, Chairman of Coscharis Farms Ltd showcasing work done to build large scale integrated rice farm and mill in eastern Nigeria at the Investment Food Forum hosted by the African Agri Council on 18th November 2020.

Agrofood And Plastprintpack Africa Trade Fair and Conference

Olumide Lawson spoke on "Financing the agriculture value chain" at the Agrofood And Plastprintpack Africa Trade Fair And Conference hosted by AHK Nigeria on 25th November 2020.

NOURISHING AFRICA SPEAKS

LEAP Africa - SIPA

Ify Umunna moderated a breakout session on "Technology as an Enabler to Scale Agriculture & Food Security in Africa" during LEAP Africa's SIPA conference on 2nd October 2020.

The GreenRise World Food Day 2020 Symposium

Rahmat Eyinfunjowo spoke on "The Future of Agri-Food Tech and Food Security" during the GreenRise World Food Day 2020 Symposium organized by GreenRise Innovation Hub on 16th October 2020.

Sahel@10 Virtual Conference

Ify Umunna moderated a panel on "Building Ecosystems of Support for Africa's SMEs" during Sahel's Virtual Conference on 24th November 2020

Agrofood & Plastprintpack Africa 2020 Conference

Rahmat Eyinfunjowo moderated a panel on "The digital transformation of agriculture in Nigeria" during the Agrofood & Plastprintpack Africa 2020 Conference on 25th November 2020

African Philanthropy Forum - 2020 Conference

Ify Umunna moderated a panel on "Repositioning Farmers to Mitigate and Adapt to Climate Change" during African Philanthropy Forum's 2020 Conference on 29th October 2020

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