

# ICT Update

a current awareness bulletin for ACP agriculture

Issue 89  
December 2018



**4/6** SACAU and EAFF harness the power of aggregated farmers' needs through farmer organisations for lobby and e-extension services

**14** Joost van der Woerd of EARS describes how drought insurance based on satellite data is helping Ugandan farmers

**18** In East Africa, CLIMARK leverages the data revolution to increase pastoralists' resilience and adaptive capacity.



## Contents

- 2 **Can access to data really transform agriculture for smallholders?**  
*Yanick Bakker, Jasmien Bronckaers, Fatma Ben Rejeb and Chris Addison*
- 4 **Farmer registration and development – the SACA experience in Lesotho and eSwatini**  
*Fhumulani Mashau*
- 6 **Aggregating farmers for markets and agricultural support services**  
*Norbert Tuyishime*
- 8 **Value addition through digitalization for Ugandan coffee farmers**  
*David Muwonge*
- 10 **Harnessing datafication for improved market access by farmers' organisations: a case of Cameroon**  
*Marc Ghislain Bappa Se and Nestor Ngouambe*
- 12 **Data-driven smallholder tea production in Uganda**  
*Hamlus Owoyesiga*
- 14 **Satellite data for agricultural index insurance**  
*Joost van der Woerd*
- 16 **On-the-spot, easy and affordable soil testing for Kenyan smallholder farmers**  
*Christy van Beek, Susanne Coolen, Berten de Leede, Teun Fiers and Angelique van Helvoort*
- 18 **Enhancing pastoralists' resilience in livestock Value Chains in East Africa**  
*Racho Godana, Frankline Agolla and John Mwikya*
- 20 **Resources**

## ICT Update



ICT Update is a bimonthly printed bulletin with an accompanying web magazine (<http://ictupdate.cta.int>) and e-mail newsletter.

**Editorial manager:** Chris Addison

**Production coordinator:** Yanick Bakker

**Editor:** Yanick Bakker

**Layout:** Steers McGillan Eves Design Ltd

**French translation:** ISO Translation & Publishing

**Cover photo:** Adobe Stock

**Publisher:** Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA), Wageningen, The Netherlands  
With thanks to FAO for distributing ICT Update through e-Agriculture ([www.e-agriculture.org](http://www.e-agriculture.org))

**Copyright:** ©2018 CTA, Wageningen, the Netherlands

<http://ictupdate.cta.int>



This license applies only to the ICT Update issue 89, January 2018.

# Can access to data really transform agriculture for smallholders?

Yanick Bakker, Jasmien Bronckaers, Fatma Ben Rejeb and Chris Addison

In order to feed 9 billion people by 2050, sustainable agricultural growth is needed, supporting an agricultural sector which produces enough food, which is inclusive and resilient, and which makes optimal use of innovation and digital solutions. Smallholder and family farmers must play a key role in achieving this. About 80% of the world's food supply is produced by small-scale and family farmers, yet their full production potential is hardly reached. To strengthen resilience and productivity of these smallholder farmers, they need an enabling environment that supports their access to critical resources such as finance, markets, inputs, information and technical solutions. This issue of ICT Update uncovers the power of organised smallholder farmers. Through a series of case studies, we explore how farmers' organisations can make use of farmer data to enable access to resources, thereby strengthening the resilience, voice, or livelihoods of smallholder farmers.

The Pan African Farmers Organisation (PAFO) has been working with CTA and AgriCord in the Data4Ag project to identify how data can be used by their organisations to improve the livelihoods of their members. Working with

*This issue of ICT Update uncovers the power of organised smallholder farmers.*

10 farmers' organisations across Africa, they have been investigating how managing farmer profile data can change agribusinesses. Some of these test cases are seeing the benefits: highest crop returns for 15 years; new countries as markets for produce; improved logistics; policy influence and access to credit. However, the story varies by crop and

location and there are clear challenges with connectivity, limited economic benefits and complexity in data management.

AgriCord, a global alliance of agri-agencies, finds that digitalisation for agriculture breaks paradigms. “We see that through digitalisation, there is much more access and there are many more possibilities, also for women to participate in the economy”, says Stefaan Bonte, Strategic Partnership Facilitator at AgriCord. Through mobile applications, many women are able to access innovations in an autonomous way, challenging the paradigm that innovation is less accessible to women. PAFO has similar findings; through applications and e-extension, digitalisation empowers women with access to mobile phones to market their produce and access finance, where they were previously dependent on their male peers. This allows women to become decision-makers, and move from subsistence producers to economic actors, hence giving them more power over their own lives.

For digitalisation in agriculture to truly benefit smallholder farmers, interventions are needed in multiple areas. In this issue we examine how the foundation of farmers profile data plays a role in four areas of agricultural operation: Production, Markets, Finance and Organisation.

### Organisation

Digitalisation is not only a technical issue; in many cases it's a socio-political one. On the one hand, data becomes available to farmers which enables them to make informed-decisions, on the other hand, data becomes available *about* farmers, making visible the challenges farmers face and enabling targeted solutions. Accurate knowledge on the members of an association or agribusiness ensures more efficient operations in the organisation and better representation of the groups' interests, as you can read in the stories of SACAU and EAFF on pages 4 and 6.

### Markets

On page 8, NUCAFE, the Ugandan National Union of coffee farmers' association, tells their story of how profiling and mapping has helped expand their market and secure higher revenues for their coffee. New markets open up when the farmer-owned businesses or associations can proof product origin, through opportunities for certification and transparency.

### Finance

Inputs in agriculture and investment in sustainability depend on finance, which for smallholders has been limited if not non-existent. In the projects presented, farm profiles are now used to access credit and engage banks. For Igara Tea Growers Factory, page 12, farmer profiles have supported the set-up of a SACCO, in which digital farm profiles act as collateral and reduce the financial risk involved in lending to their members. On page 14, you read how EARS uses aggregated data to provide smallholders with affordable drought insurance.

### Production

Farmer data generated on-farm or off-farm can inform services to farmers that allow targeted production information, be it alerts on risks (weather and pests) or extension information such as crop husbandry. In Kenya, CLIMARK, page 18, shows us how weather data increases resilience of pastoralist communities and AgroCares and Agroterra, page 16, discusses preliminary findings on soil scanner services for smallholder farmers.



A recent workshop organised by PAFO, AgriCord and CTA with partners from Central, West, East, Southern and North Africa, on capacity development for African farmers' organisations through improved policies, technologies and capabilities, showed that data is crucial to enable access to finance for smallholder farmers. Access to finance enhances farmer resilience as it enables them, for example, to adopt more sustainable coping strategies. As such, access to finance can help stabilise agribusinesses and catalyse further investments, as farmers become more eligible for loans. Collection and verification of data that can unlock access to finance, however, requires investment. Key is to work out the cost of registration versus the benefit of returns. As Dr. Mizzi, Head of Unit Rural Development, Food Security, Nutrition, Europeaid, European Commission, put it: “In agriculture the first investors are farmers themselves”. We thus need to let digitalisation work for farmers, with a special focus on inclusion for women and youth in agribusiness development. Drawing from the lessons learned during the workshop, PAFO, CTA and AgriCord will continue to work on three key areas: (1) policy dialogue, (2) digitalisation and data-drive services, and (3) markets and agribusiness development. ●

Above: Igara profilers in a tea field

### About the authors

**Yanick Bakker**, a young expert on rural sociology, has worked with the ICT4Ag team at CTA. [Yanick.bakker@gmail.com](mailto:Yanick.bakker@gmail.com)

**Jasmien Bronckaers** is International Partnership Manager at TRIAS, a Belgium-based international NGO that works on social inclusion and entrepreneurship and is part of the Agricord network. [jasmien.bronckaers@trias.ngo](mailto:jasmien.bronckaers@trias.ngo)

**Fatma Ben Rejeb** is CEO of PAFO, an Africa-wide network of farmers' organisations. [ceo@pafo-africa.org](mailto:ceo@pafo-africa.org)

**Chris Addison** leads the Data4Ag project for CTA which includes the PAFO/CTA/Agricord work with farmers organisations. [addison@cta.int](mailto:addison@cta.int)

# Farmer registration and development – the SACAU experience in Lesotho and eSwatini

Fhumulani Mashau

Dispersed smallholder farmers in Sub-Saharan Africa are at risk of social and economic exclusion. Digital innovation and an enabling policy environment can help smallholders to transition out of poverty. The **Southern African Confederation of Agricultural Unions (SACAU)** considers farmers' organisations to be the key to drive this change.

**F**armers' organisations can act as representative bodies to leverage services and mobilise resources to support farmers. However, verifiable membership data is necessary to enhance their credibility and legitimacy, to mobilise negotiating power and to work on evidence-based advocacy to give a voice to small-scale farmers.

*The accumulation of membership data by farmers' organisations can improve delivery of services to farmers.*

## Farmer data – a powerful resource

Concerned about the paucity of farmers' organisations' membership data, SACAU supported by AgriCord and CTA, has been working on a project to register farmers for its member organisations in the kingdoms of Lesotho and

eSwatini. Launched in 2016, this project has led to the development of an Electronic Membership Data Management System for the Swaziland National Agricultural Union (SNAU) and Lesotho National Farmers Union (LENAFU).

Through the creation of this data infrastructure, SACAU aims to improve service delivery by farmers' organisations, such as improved access to extension services, markets or financing, to improve farmers' incomes. Furthermore, the collected farmer data can be monetised through trade with other economic players such as seed, fertiliser, agricultural input and processing firms. Data can therefore serve as an additional revenue source for farmers' organisations and their members. By demonstrating these benefits, increasing numbers of farmers are encouraged to register. As the farmers' organisations accumulate more members and farmers' data, they strengthen their position as advocates for farmers in their respective regions.

A no mean feat, this project was made possible by over 50 field facilitators who took to the field to register the farmers in their localities. Armed with smart phones, the facilitators registered over 52,000 farmers for LENAFU and 23,000 for SNAU. Data such as the age, location, gender and farming activities were compiled in the digital platform. With the project nearly complete, this data can be translated into information and narratives for a multiplicity of purposes.

Both LENAFU and SNAU were set-up with the objective to promote an enabling (policy) environment through



advocacy and to represent the interests of their members. Their databases allow them to work with their governments on subsidy programmes for the benefit of their members. The Government of the Kingdom of eSwatini has, for example, requested SNAU to assist in the registration of farmers under a government input subsidy programme.

### Advocacy and collaboration

Data collection is, however, not an end in itself; it does not automatically improve the work of farmers' organisations or farmers' standard of living. What is important is sensitivity to the socio-political nature of data. To give power to farmer data, farmers' organisations need to meet governance.

There are two areas where farmers' organisations and governments can mutually benefit from profiling.

Firstly, since few African countries possess reliable public sector institutional statistical capacity, farmers' organisations and governments should explore joint ventures for data collection. This is hardly contentious as African governments committed themselves to allocating at least 10% of their national budgets to agriculture and rural development within five years after the 2003 African Union Heads of State and Government Summit. This commitment, which many governments are yet to meet, can neither be fulfilled, nor can the interventions make the necessary impact without reliable statistical data. Farmers' data could be used either as a source of information or as a verification mechanism complementing official data collection processes.

Secondly, since advocacy is ultimately a political vocation, data collection by farmers' organisations should inform advocacy campaigns for the implementation or review of existing government policy commitments and policy change. Whereas farmers' organisations and governments may not always agree, their interests are best served by forging co-operative relations.

*"This project and the publicity it generated has positioned SNAU as a partner organisation of choice for various stakeholders including government for initiatives involving farmers in the country. It has also improved the standing of SNAU as a repository of farmers' data in the country"*

- Mr Nqobizwe Dlamini, SNAU Project Coordinator.

An enabling policy environment for rural development should also translate into physical services. In developing countries, data collection is time consuming and costly. In Lesotho and eSwatini, project facilitators had to contend with intermittent mobile network coverage, inadequate energy sources, and poor road accessibility.

The construction of physical and digital infrastructures that link urban areas – which are often the locus of trade – to rural communities is key to ensure inclusion of peripheral farmers.

### Bridging between producers and policy-makers

The accumulation of membership data by farmers' organisations can improve delivery of services to farmers to enhance their income, and provides these organisations with the evidence and legitimacy to advocate farmers' needs. As such, farmers' organisations become trust centres that bridge between farmers, policy-makers and value chain actors.

To upscale data collection through farmers' organisations, an integrated approach is needed whereby public, private and development partners collaborate. The development sector should continue to strengthen the strategic capacities of farmers' organisations, including in digital and business development and support farmer registration to enhance the provision of services to farmers. Farmers' organisations should continue to mobilise farmers and aggregate needs and supply to strengthen the position of smallholder farmers. At the same time, investments are needed by the public sector in ICTs, (digital) infrastructure, institutions and public services, and agricultural policies.

In Lesotho and eSwatini, the two national farmers unions are now poised to improve their policy-making and membership service processes, and to better engage in targeted advocacy programmes that should contribute to improved standards of living for their members. Yet work remains to be done. With the continuation of their registration efforts, additional information will be collected and added to the platform to enhance reliability, gain greater clarity on the sector and region and support planning and policy intervention measures. ●

### About the author



**Fhumulani Mashau** is Projects Officer at the Southern African Confederation of Agricultural Unions (SACAU) based in South Africa. She has 16 years' experience in the agriculture sector and has held positions in the public, private and development sectors. [fmashau@sacau.org](mailto:fmashau@sacau.org)



# Aggregating farmers for markets and agricultural support services

Norbert Tuyishime

Agriculture is back at the top of Africa's development agenda, enjoying the support of governments and attracting heavy investments from private sectors. Many of smallholder farmers across Africa that are central to the agricultural transformation taking shape on the continent, however, struggle to benefit from these developments due to their dispersed, small-scale and unorganized nature. Aggregation of smallholder farmers' needs may provide the solution, says **Norbert Tuyishime** of the Eastern Africa Farmers Federation (EAFF).



In East Africa, the agriculture sector is dominated by smallholder farming (averaging 0.2–3 ha), with 60% of farmers making less than 1.5 Euro per day. Fertilizer use among these farmers is low; about 1.7 kg/acre against 60 kg/acre globally. The agricultural sector is mainly rain-fed and entirely dependent on bimodal rainfall, making it vulnerable for frequent drought-related crop failure. Under pressure to deliver even more food for rapidly growing and urbanised populations, generate and sustain employment, incomes and livelihoods, smallholder farmers who do not aggregate around input and output markets or other agricultural services, such as extension, credit, transport, mechanisation or warehousing, fall short of realising their potential for agricultural commercialisation.

## Aggregation for collective access

EAFF recognises that smallholder farmers are highly dispersed and often lack collective action to strengthen their position in agricultural markets. Agriculture is a high-risk sector which makes working with individual farmers difficult for many value chain actors. Aggregation of smallholder farmers through farmers' organisations is needed to create an enabling environment for farmers to thrive. Aggregation can support efficient agro-service and extension delivery, technology adaptation and mechanisation in agriculture, input procurement at favourable prices and competitiveness in output markets. In addition, data on farming is needed to inform decision-making on investment and innovation with regard to technology, financing, value addition, policy and advisory services. Apart from farmer profiles providing general bio data, EAFF recognises an overall lack of historic data on farm activities, which would allow banks to credit score farmers and advance loans.

Since 2013, EAFF has shifted its focus from lobbying and advocacy to strengthening the role of farmers in profitable value chains enabled by strong entrepreneurship. EAFF thereby focusses on knowledge, institutional development, policy, partnerships and youth. With the digital revolution taking place in the agriculture sector, where big data applications are (re-)shaping power relations among value chain actors, EAFF embraces use of technology as the transformational tool to help achieve the objectives of this new strategy. In this framework, EAFF launched the e-Granary project in Kenya in 2016 in partnership with PAFO, AgriCord and CTA.

e-Granary is a mobile-based platform aimed at increasing access to markets and e-extension services. The platform provides 4-in-1 services; it aggregates farmers for input and output markets and financial and extension services, in the maize, rice, beans, green gram, black-eyed bean and soya value chains. To access the platform, farmers need to be members of a farmers' organisation and register their bio data, crop and harvesting data. The platform is gradually evolving in an ecosystem that serves stakeholders through various connected services.

- For farmers, it enables sales at best prices, access to certified inputs, affordable tailor-made financial solutions, and access to timely e-extension on agronomic advice, post-harvest management and financial literacy.
- For financial institutions, it allows access to bankable and de-risked smallholders to market various financial products, such as insurance as a bundled product with a loan.
- For buyers, it allows access to better quality traceable produce in a large marketplace at competitive price without the exorbitant premium



The core services provided through e-Granary are; group purchase of agriculture inputs, learning groups, micro-finance and micro-insurance, policy and advocacy, coordination of contract farming with millers and buyers, coordination of post-harvest services, coordination of farm equipment leasing and crop management e-extension and tools.

By end 2018, 103,000 farmers had registered in the platform, a significant increase compared to the 39,000 and 5,000 registered farmers in 2017 and 2016 respectively. The platform has already trained over 3,000 trainers of trainers on structured trade, agronomy, financial literacy and extension, and targets to reach 20,000 smallholder farmers by 2018 through voice and text messages at different stages of crop season. In 2017, e-Granary assisted 3,627 farmers to access loans in the form of certified inputs (seeds and fertilizers) worth 136,036 Euro. Collectively, e-Granary farmers have sold 316 MT of maize and soybean worth 77,141 Euro.

### Taking aggregated farmer services to scale

Aggregation of farmer needs and data are key enabling factors to strengthen the position of smallholder farmers in agricultural markets. For farmers to enhance their position, they need access to finance for inputs. Where financing is not easily accessible, farmers recycle seeds, use less fertilizer and rarely use necessary chemicals to protect their crops, and increase production. The most effective business model for smallholder farming financing is non-cash input loans, such as seeds, fertilizers and insurance. The e-Granary experience has shown that uptake of insurance increases when bundled with input loans. E-extension provides farmers with timely information so that they are able to anticipate risks and minimise losses.

Farmers across the region are eager to participate in the e-Granary due to their concerns for climate change

vulnerability and access to markets and certified inputs. In 2019, the platform intends to register 340,000 farmers, of which 150,000 will receive e-extension services. Objective is to turn 10% of e-Granary member farmers into active users of loans worth 879,000 Euro with the volume

*e-Granary is a mobile-based platform aimed at increasing access to markets and e-extension services.*

and value of sales reaching 1,000 MT and over 1,3 million Euro respectively. EAFF will launch e-Granary in Uganda, Rwanda and in Tanzania in the near future.

A strong concern for upscaling is, however, limited technical capacities of smallholder farmers in structured trade and use of agricultural digital solutions. A lot of capacity building is needed on collective marketing, contractual farming, finance management and use of digital solutions in agriculture to enable smallholder farmers to truly benefit from the digital transformation in agriculture in Africa. ●

### About the author



**Norbert Tuyishime** works at EAFF as Program officer in charge of Agribusiness and Trade with a broad rural development experience of plus 5 years in East Africa. [norbert.tuyishime@gmail.com](mailto:norbert.tuyishime@gmail.com)

# Value addition through digitalization for Ugandan coffee farmers

David Muwonge

A digital farmer profiling initiative, which enables coffee to be traced back to its roots, is paying off for smallholder farmers in Uganda. NUCAFE's **David Muwonge** describes how coffee produced under the scheme is fetching far higher prices, revealing the strong potential of geo-referencing as a marketing tool to guarantee authenticity and origin.

**T**he design of a geospatial database is helping Ugandan coffee farmers to provide traceable products, ensuring access to new markets and higher prices. With support from CTA, the National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE) has generated farmer profiles and maps of coffee farms as part of a targeted marketing strategy. NUCAFE represents 210 coffee farmers and farmers' organisations - totalling 205,120 farming families - by advocating in their favour, facilitating their access to services and resources and by promoting farmers' access to local and international markets. Seeing how proof of origin influences market prices for coffee, NUCAFE is investing in technology that will secure product traceability.

Before its collaboration with CTA, NUCAFE set up an Excel database with basic member information, based on manually uploaded questionnaires. Realising the limited capacity of this database, NUCAFE and CTA collaborated to

develop a spatial data management system. Between June 2017 and April 2018, farmers were profiled using a tablet-based questionnaire that captures the coffee farm family details, production information and GPS location of the household and farm. With data privacy consent, the data was transferred to the NUCAFE servers, using ONA, and processed using QGIS and ArcGIS geographical information systems software to generate maps of farm locations and individual coffee farms field maps. To obtain higher resolution images of the individual farms, to be used for traceability and delivery of agricultural advisory services, the GPS coordinates are used to produce flight plans for drones.



In the second phase of the project, this improved database will help to generate added value by effectively providing each batch of coffee with a 'passport' in the form of a QR-code, which proves its authenticity and origin. This passport includes information about the farmer who grew the beans, the farmer group, geographical farm location, the product itself, date of delivery to the warehouse, and details of the coffee's subsequent journey along the supply chain.

## Traceability pays off

Within six months after its launch, the initiative has already produced promising results. International buyers from Italy and South Korea have offered higher prices for coffee



AGRIBUSINESS ENTERPRISE DEVELOPMENT IN UGANDA







**The benefits to the coffee farming household:**

1. Have farm map.
2. Optimise land utilisation, good agricultural practices and crop health.
3. Better information technology tools to guide youth involvement.
4. The farmer becomes more bankable to various financial institutions and insurance.
5. Market access.

An Enumerator will collect household and demographic information and also canvass coffee farms/ plantations in order to capture GPS points of the farms which will enable the drone to capture farm images.

Your data and privacy will be safe guarded as per the NUCAFE Data Privacy Guidelines.





produced by the profiled farmers, paying 3.51 Euro per kg instead of the less than 2.16 Euro generally paid for untraceable coffee of similar quality. The premium increase of 24% on the basic price is directly related to product traceability, which ensures consumers that coffee farmers truly benefit from their purchase and that coffee beans carry specific geological and geospatial quality markers. For a typical Arabica coffee farm of 0.4 hectares producing an average 600 kg each year, that translates into an additional annual income of 850 Euro.

*“We have benefited from the additional income we get from our coffee being traceable and certified by being able to take our children to school and working on the community health centre,”* says Mr Gibezi Yunus a farmer from Bufumbo Organic Cooperative Association.

NUCAFE member Bufumbo Organic Coffee Farmers Association has been quick to use the database to its advantage. It used data about its farmers and their coffee farms from the NUCAFE spatial database, for a critical external audit for organic and UTZ (an international standard for fair, sustainable and transparent production) certification. The association was able to obtain both certificates, and subsequently sold 19.8 MT of organic/UTZ certified coffee to an Italian buyer for roasting, and a further 160 MT to other buyers. Following this success, other farmers are motivated to change their practices to obtain certificates and coffee farmers’ associations are expressing interest to use the database for certification. As there are additional compliance costs and a conversion period associated with organic certification, NUCAFE sensitises its members on the requirements and supports them in securing resources from internal and external sources for the process.

At a practical level, the geo-referenced data has enabled extension workers, businesses and hub managers working with the coffee farmers’ associations to improve logistics planning. Having a detailed overview of the territory and location of farmers makes it easier for them to schedule coffee bean collection, effective agricultural advisory support, and supplementary services. Awareness raising on the value of drought insurance, training in climate-smart agriculture, and positioning of strategically located wet processing machines in Mabira Coffee Farmers Association are among the services delivered by NUCAFE.

### Upscaling digital profiling

Buoyed by its early success with the digital database, NUCAFE has received more than 1,2 million Euros from the European Union to help establish geographical indications for coffee in six member cooperatives in the Rwenzori region during the next four years (2018 to 2022). Targeting 20,000 coffee farmer households, many located in the remote area of the Rwenzori Mountains, the initiative seeks to obtain organic, fair trade and geographical indicator certification, using GIS-based tools. The ultimate goal is to secure improved livelihoods, job creation and poverty alleviation for coffee farming families.

Growing awareness of the potential benefits of being profiled is starting to attract new members to NUCAFE. Furthermore, the state-run Uganda Coffee Development Authority (UCDA) wants to use the same profiling methodology for all Ugandan coffee farmers to facilitate service provision and distribution of inputs, and to upgrade speciality branding of Ugandan coffee on the international market. ●



#### About the author



**David Muwonge**, a smallholder farmer himself, is Deputy Executive Director at NUCAFE. [david.muwonge@nucafe.org](mailto:david.muwonge@nucafe.org)

Above: Bags of NUCAFE coffee stored for export to international markets

# Harnessing datafication for improved market access by farmers' organisations: a case of Cameroon

Marc Ghislain BAPPA SE and Nestor NGOUAMBE

**Marc Ghislain Bappa Se and Nestor Ngouambe** discuss opportunities for farmers' organisations to harness data-driven agriculture to facilitate market access for smallholder farmers in Cameroon. Taking the PIDMA project as an example, they argue that supporting farmers' organisations' capacity to capitalise on data is crucial for farmers to efficiently and effectively tap into the 'data value chain' sphere.

Information and Communication Technologies (ICTs) are increasingly used to generate efficiency gains for farmers. There is an exponential increase in information and data associated with new applications, tools, actors, and business models for data-driven agriculture. Open data is, however, still a relatively new concept, and there remains a vast, untapped potential for data-driven innovation<sup>1</sup>. Data for agriculture is expected to enhance agricultural productivity and resilience, reduce risks and make agri-food market chains more efficient and accessible<sup>2</sup>.

Farmers' organisations are considered key in enhancing farmers' access to wider markets. The benefits of formal farmers' organisation are most evident in high-value commodity value chains and long market chains. These chains, associated with high transaction costs, are less accessible for individual smallholder farmers, whereas a collective approach enables farmers to share and reduce costs and risks, access information and comply with supply requirements<sup>3,4</sup>.

## Harnessing the value chain data ecosystem

Beyond technological innovation, data for and from farmers has become a growth area, driving projects on big data, blockchain technology, precision agriculture, farmer profiling and e-extension all over Africa. On farm

management level, commercial farmers record and monitor empirical business data throughout agribusiness processes, such as inputs purchasing, feeding, seeding and fertilization, and metadata ('data about data', such as time, location, standards used, etc.). Such data is needed to monitor performance and make management-decisions to improve production. The flow between raw data, data analysis and decision-making forms the 'data value chain'. At market level, data sharing among value chain actors not only supports traceability, productivity, monetary flows and transactions, but also creates opportunities to access new markets in new territories.

In Cameroon, most individual small-scale farmers and farmers' associations are not yet harnessing data to increase their market access. Thus, it is critical to demonstrate the opportunities and potential that hide behind the use of data to ease farmer business operations and management, for improved productivity and profitability.

In this framework, the Agricultural Investment and Market Development Project (PIDMA) recently developed a new approach to enhance farmers' organisations acquisition and use of data to improve market accessibility. PIDMA is a joint initiative of the Cameroon Government and World Bank, aimed at improving the productivity and competitiveness of maize, cassava and sorghum value chains and at scaling up production to meet the raw material demands of local agro industries. This ag-finance project invests in all value chain segments and strengthen the functional relationships between production, processing and marketing. The project aims to move from subsistence agriculture characterised by low productivity to commercial agriculture equipped with competitive value chains<sup>5</sup>.

PIDMA does this by providing technical support and advisory services to farmers' organisations. Leveraging on Global Positioning System (GPS) technology, a technical advisor trains cooperative members for each agro-ecological zone of Cameroon, on how to generate data on their profiled farmlands, on pest and disease incidence and severity, on crop capacity and other agronomic data. These data serve to assess productivity rate, quantity of agricultural inputs needed to maximise produce and control pests, quantity of seeds required to compensate crop loss and expand farm production, and to monitor financial investment and farm management. Following a market-oriented approach, PIDMA publishes collected data on Facebook and in local newsletter, enabling agribusiness partners to link with farmers. This approach is paying off for farmers in the cassava and sorghum value chains.

## Cashing on cassava and sorghum

Cassava, among the top five high-value food crops in Cameroon. Embedding many business opportunities, cassava is a delicacy in many cultural dishes and farmers' organisation are increasingly venturing into this value chain. Sorghum production in the far northern region of Cameroon, one of its most important production areas, peaked at 411,499 T in 2014<sup>6</sup> and should reach 2 million T by 2020<sup>7</sup>.

Three cassava cooperatives, representing 150 farmers, based in Cameroon's centre region have signed a contract with Food Processing Professional Co-operative Society Limited (FOPRO-COOP Ltd), a local business cooperative specialised in processing primary cassava produce into flour and garri. Through this collaboration, 300 T of primary produce have already been sold at 50Fr per kg. FOPRO-COOP also offers the cooperatives mechanised ploughing services,

free cassava seed tubers and technical capacity building.

In Northern Cameroon, a local cooperative has signed a formal agreement with Guinness-Cameroon to deliver around 100 T of sorghum per year, thanks to the data generated under the PIDMA project. The cooperative produces and cleans the sorghum and Guinness processes it to beer. This agreement allows Guinness-Cameroon to apply a 20% discount on all sorghum-based products made in Cameroon such as harp, and has increased the unit price of sorghum with about 25% within this contract.

Support smart data use, for a more controlled market By harnessing agribusiness data, farmers' organisations can professionalise their business operations, enhance their credibility and capitalise market opportunities. However, for smallholders to benefit from data-driven agriculture, tools and applications need to be designed for their specific situations and capacities. They – and the organisations that support them – need to grow their capacities to become smart data users and managers; measures are needed to ensure that farmer-generated data is not exploited or misused; and smallholders, usually the least powerful actors of a value chain, must grasp every opportunity to be included in the collective data flows within agri-food systems. ●

About the authors



**Marc Ghislain Bappa Se**, is a young professional in ICT4Ag,

specialized in outreach communication with keen interest on youth entrepreneurship, knowledge management for agriculture, farmers' organisations and extension services. semarc27@gmail.com

**Nestor Ngouambe**, an agricultural economist, has supervised projects on the use of mobile phones for extension services and agricultural videos for capacity building of farmers. He has published several books and articles on agribusiness, food nutrition and ICT4Ag. ngouambe@gmail.com

References

- <sup>1</sup> <https://bit.ly/2Gc3Nsy>
- <sup>2</sup> <https://bit.ly/2ErkONH>
- <sup>3</sup> <http://edepot.wur.nl/58356>
- <sup>4</sup> <https://bit.ly/2QSzdZb>
- <sup>5</sup> <https://bit.ly/2LaRifB>
- <sup>6</sup> <https://bit.ly/2UyYKFE>
- <sup>7</sup> <https://bit.ly/2QO2cgg>

Infographic

## DATA4AG

Can access to data really transform agriculture for smallholders?

Detailed and up-to-date farmer profiles allow for targeted extension and product services that help optimise production and minimise risks

- AgroCares' soil scanners allow farmer cooperatives to provide farmers with services and advice to optimise fertiliser use for sustainable yield increase
- Weather data-based extension is helping pastoralist communities in East Africa become more resilient, thanks to the CLIMARK project

PRODUCTION

Product traceability throughout the value chain and geographic indicators enable smallholder farmers to access new markets and premium prices

- In Uganda, NUCAFE's coffee farmers have obtained UTZ and organic certification, which results in premium prices
- PIDMA is a Cameroon-based project that takes a market-oriented approach to enhance farmers' organisations use of data to improve market accessibility

FARMER PROFILES

Accurate knowledge of farmers' organisation members legitimises advocacy and enables aggregated services and better representation

- SACAU recognises the power of farmer data and considers farmers' organisations as 'trust centres' that act as a bridge between farmers and policy-makers
- Registration of farmers helps EAFF to aggregate farmers' needs to provide them with better services

ORGANISATION

Records of transactions based on farmer profiles and historic farm data help de-risk farmers and make them more eligible for financing

- Igara Tea Growers Factory has used its member database to set up a SACCO through which registered tea farmers obtain loans and inputs on credit
- Using satellite data crop analysis, EARS has developed a drought insurance index, making drought insurance for smallholder farmers feasible and affordable

FINANCE

Actionable and accurate, bio, geospatial and productivity data can unlock opportunities for smallholder farmers. Farmer data can inform decision-making to optimise production, support organisations to give voice to farmers, unlock marketing opportunities and make farmers more bankable

# Data-driven smallholder tea production in Uganda

Hamlus Owoyesiga

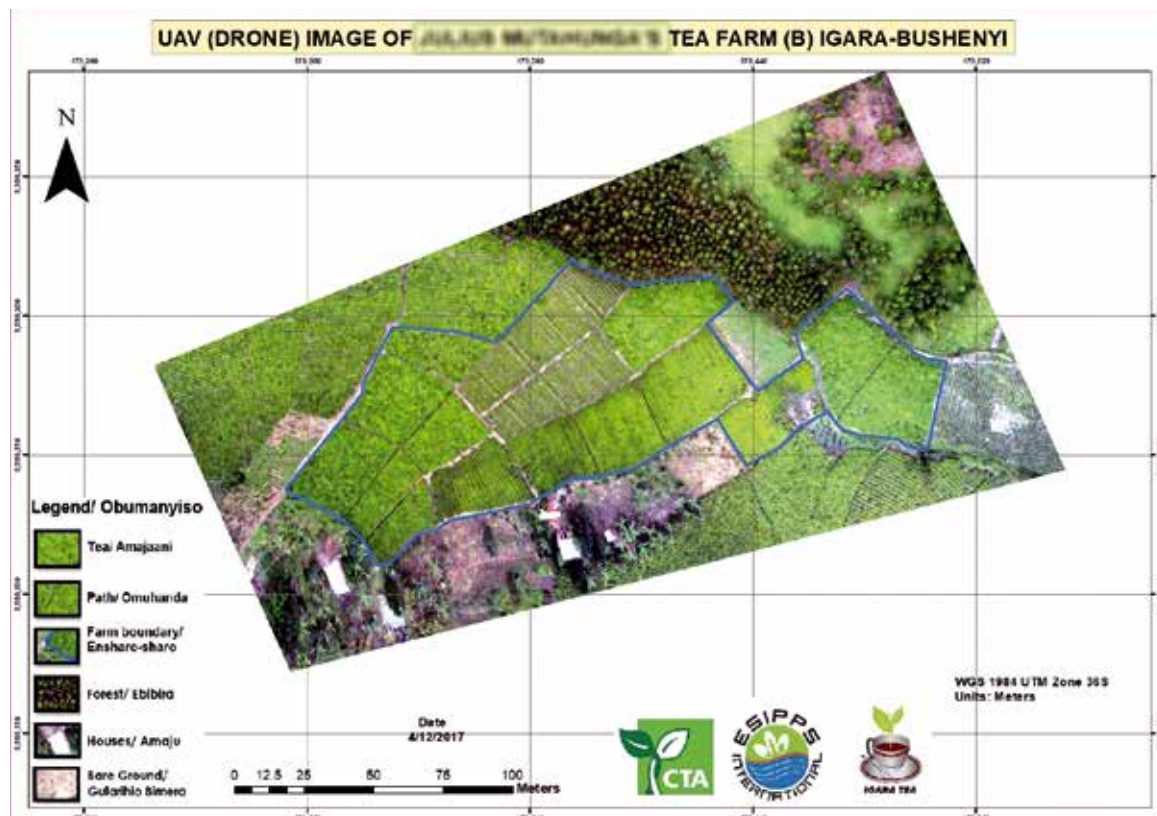
A spatial data management system to profile tea farmers and map tea plots among members of the **Igara Tea Growers Factory (IGTF)** in Uganda has led to increased access to financial services for producers, and higher repayment rates for input loans. An immediate impact has been increased productivity and a dramatic fall-off in the practice of side-selling – so much so that other tea companies are now considering adopting the model.

IGTF grows, processes and packages eight grades of tea for export and local consumption. The IGTF agribusiness is owned by 7,321 smallholder farmers, about 20% of which are women. The majority of these tea farmers are small-scale farmers with less than 10 acres under tea production, along with a number of medium-

sized farms and estates. IGTF owns and operates two tea-processing factories (Igara Tea Factory and Buhweju Tea Factory) and is the largest smallholder tea factory company in Uganda, contributing about 10% of Uganda's tea production. Despite IGTF's leading position among tea factories in the country, it has experienced challenges with business operations.

Until early 2017, IGTF was storing shareholders' information on one database but individual data sets were incomplete, not necessarily verified and lacked crucial geo-referencing. In other words, IGTF did not know where its individual members were located on the territory or how large the tea gardens were. At the time, IGTF provided members with small loans and inputs, such as fertilisers and agrochemicals on credit, based on the quantity of tealeaf delivered the season before, and not on the actual farm size. Lacking a clearly identified location of the single tea gardens offered the opportunity for unscrupulous farmers to file multiple requests for input credit and loans for the same farm. Due to low repayment rates and insufficient rigour in financial administration, IGTF registered a loss of 289,000 Euro in 2015.

To address this issue, IGTF and CTA, in partnership with consulting company the Environmental Surveys, Information, Planning and Policy systems organisation (ESIPPS), launched a project in the summer of 2017 to build on a spatial data management system. The digital profiling of tea farmers, completed in early 2018, involved compiling geo-referenced information about tea farmers and their land using GPS-enabled tablets. Extension officers then uploaded the data onto a dedicated online platform (ONA / ODK), and subsequently onto the IGTF's QGIS database. The system now in place offers a fully functioning data collection platform and a Geographic Information System



where all data are stored and spatially analysed. The profile database is linked to a financial and accounting system, allowing IGTF to build track records of transactions with member farmers. The system can thus serve as a basis for fertilizer distribution and tracking, with data on amount of fertilizer distributed, costs, dates of distribution and due dates for payments.

### Lower interest rates, higher repayment rates

An additional important outcome of the project is it has stimulated IGTF to launch a Savings and Credit Cooperative (SACCO) in Butare Kyamuhunga in February 2018. Profiled IGTF farmers can become shareholders of the co-saving initiative, which uses its financial capital to distribute loans to its members, enabling small-scale tea farmers to access finance in a sustainable manner. The prospect of access to savings and credit proves to be an incentive for farmers to participate in the digital profiling exercise, since only profiled farmers have access to loans via the SACCO. As of mid-2018, 4,500 IGTF members and their tea gardens have been profiled – 32% more than the target set in the project design.

The SACCO is well on course to take over the supply of inputs on credit and loans to farmers, previously handled by IGTF. For the tea farmers, the benefits are tangible. The SACCO operates a more favourable application procedure and charges lower interest rates than the previous system. More importantly, since the risks of supplying loans to small-scale farmers are considerably reduced through the introduction of a database that monitors farmer produce and tracks delivery to the factory, producers have easier access to credit. For example, they can apply for soft loans for farm inputs, or financial services through banks, with the SACCO acting as broker and the profiling database serving as collateral.

As of November 2018, 1,737 farmers (24% of IGTF's members), 35% of which were women, had joined the SACCO and obtained credit. The average value of loans issued since the opening of the SACCO was 351,569 Euro per month, with a repayment rate of 98%. The loans enable farmers to sustain their businesses in a competitive way, improving production using better inputs.

*"I am happy I can get my payment for my leaf from a bank that is owned by IGTF. Each time I need fees for my children I come for short loan from the SACCO."* Mrs Jolly Nshumbusha, IGTF farmer and SACCO Member.

### Transparency pays dividends

The project has included the pilot testing of drone technology. A total of 42 farms were surveyed using a drone equipped with a multispectral sensor. Data captured were processed and visualised in the form of crop diagnostic geo-referenced maps, which show the health status and plant density of the crop, and its location. The maps combined with farm profiles were submitted as 'enhanced dossiers' to lending institutions to support the creditworthiness of applicants. Already, the Stanbic Bank, a subsidiary of Standard Bank Group, has expressed interest in adopting and upscaling the concept. After acquiring a professional drone equipped with a multispectral sensor, IGTF now plans to upscale drone-based services to its members.

The farmer profiling has also helped to solve the issue of fraud. Fresh tealeaf is in high demand from competing processing plants in the western Ankole Corridor, where most tea cultivation is concentrated. IGTF has faced difficulties in ensuring that its members deliver products



exclusively to its own factories and that they used input credit and loans obtained from the agribusiness to cultivate tea destined for IGTF. The advent of geo-referenced profiles and spatial data analysis has allowed management to

*"...I am happy I can get my payment for my leaf from a bank that is owned by IGTF. Each time I need fees for my children I come for short loan from the SACCO."* Mrs Jolly Nshumbusha, IGTF farmer and SACCO Member.

identify fraudulent credit applications. Thanks to greater trust and loyalty and reduced side-selling to competing factories, the quantity of fresh leaf delivered to IGTF factories peaked to the highest level recorded in 15 years, during the second quarter of 2018. This trend has been evident since the start of the profiling process. In turn, the higher production levels have resulted in more timely payments to farmers, increased efficiency in extension service delivery, and greater business profitability for the farmer-owned company.

Such has been the scale of the impact that there are moves to extend the model further afield. IGTF management has shared results of the system with competing tea factories, which have expressed a willingness to adopt digital profiling in their own companies. IGTF has now submitted a project proposal to CTA to upscale the system. Through extension of the spatial database, companies that were once competitors can become partners, using digital technology to increase productivity, support farmer access to crucial inputs and enhance agribusiness efficiency. ●

#### About the author



**Hamulus Owoyesiga** works for IGTF as Head of ICT. He is also a UAV Pilot passionate for GIS, ICT and Data for Agribusiness.

howoyesiga.igara@ugatea.com

# Satellite data for agricultural index insurance

Joost van der Woerd

How can we ensure that drought is no longer an outright disaster to smallholder farmers in Africa, but instead a manageable risk? With low-cost satellite-based index insurance products that monitor climatic conditions in near real-time and automatically trigger a pay-out when conditions are below normal. This helps farmers secure necessary credit for inputs, recover faster from bad seasons and sustainably improve their livelihoods.

Thousands of satellites are orbiting our planet and constantly measuring the earth's surface and atmosphere with a wide range of sensors. Satellites have been around for a good while, but in recent years new applications are being developed and combined with other technologies at an unprecedented rate. For example, it is now possible for African farmers to receive satellite data-based farming advice and early warning

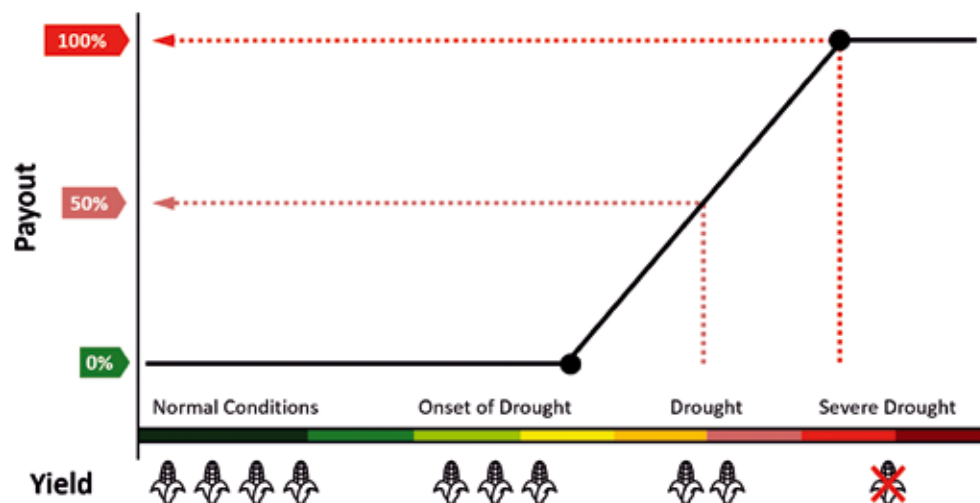
messages in combination with insurance, via SMS and paid for with mobile money on legacy phones.

## Capturing drought-induced yield loss from space

Capitalising on this technological revolution, EARS, a satellite remote sensing company based in Delft, The Netherlands, uses satellite data to provide micro insurance for smallholder farmers. EARS is specialised in using meteorological satellites for continuous monitoring of climatic conditions of the African continent and around the globe. With hourly observations available since 1982, EARS has built a large database of daily climatic parameters including cloudiness, global and net radiation, rainfall, and actual and potential evapotranspiration.

These parameters are very relevant to agricultural production and can be used, amongst other applications, to develop agricultural index insurance products. Index insurance is a low-cost alternative to 'traditional'

Fig 1. Qualitative representation of drought vs. insurance pay-out



indemnity-based insurance. Index insurance is particularly suited to developing countries that lack mature agricultural insurance markets. With index insurance, the crop is not directly insured, as it is with indemnity-based insurance, but instead a proxy is used that is closely related to yield loss. This eliminates the need for local insurance experts and expensive loss assessment exercises, required for indemnity-based insurance.

In Uganda, this proxy is evapotranspiration. Evapotranspiration, the loss of water from soil and plants through evaporation and transpiration, is an indicator for crop growth. Drought affects the ability of plants to capture CO<sub>2</sub> and release H<sub>2</sub>O. As such, by measuring evapotranspiration levels in insured areas, drought-related crop yield loss can be estimated. If in a given area the seasonal evapotranspiration falls below a certain threshold insured farmers in this area are automatically and rapidly compensated, without the need to put forward a claim to the insurance companies.

To develop index insurance products, EARS' long historical data series is used to create risk profiles of every location in Uganda at a 3 km resolution. These are then used to price the insurance products. This is done at a sub-county level to help farmers obtain insurance without the need for detailed location data about their farms, but based on the sub-county they live in. Near real-time satellite reception ensures continuous monitoring of conditions and rapid loss assessment after the end of the growing season. When the drought index indicates the insured area falls below the index threshold, crops loss is imminent and insurance is paid out.

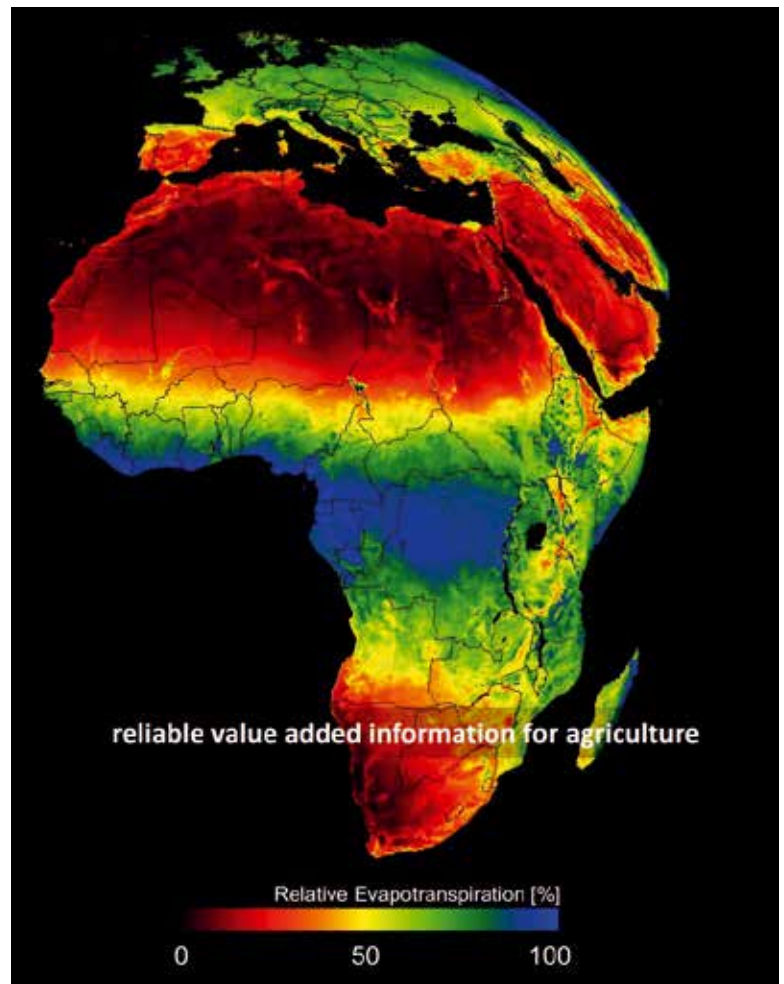
### From aggregated data to bundled services

However, insurance is only part of the solution. It is necessary to support smallholder farmers in stabilising their financial situation to increase their investment and production capacity and professionalise their business. For this reason EARS has joined the MUIIS initiative in 2015.

The MUIIS project design is based on the need for timely, accurate and actionable information regarding crop management and climate risks to inform smallholders' management decisions. The MUIIS platform offers subscribers a bundle of services: actionable agronomic advice via SMS to help farmers maximise production in a good year, and a safety net in the form of insurance that comes into effect in case of a bad year. MUIIS uses mobile money to transact with its clients, to collect the subscription fees that include the insurance premium prior to the season, and to disburse pay-outs at the end of the season to subscribers that experience drought-related losses.

The project is executed by an international consortium of organisations. Local partners with farmer networks, outreach capacity and essential agronomic expertise are supported by a local state of the art fintech-firm. Several complementary satellite and weather data providers from Europa and the United States, including EARS, provide satellite data derived weather and agronomic information as input to the MUIIS platform to be distributed to subscribers via SMS during the growing seasons.

The MUIIS project is one of the 23 projects of Geo data for Agriculture and Water (G4AW), a program run by the Netherlands Space Office (NSO) – the Dutch national space agency. With programs such as MUIIS, G4AW focuses on making food security more sustainable in developing countries by using satellite data. "Its goal is to reach thousands of people with that data, and the new technological applications that are possible with it.



*When the drought index indicates the insured area falls below the index threshold, crops loss is imminent and insurance is paid out.*

It's really about scaling up," says Ruud Grim - the coordinator of G4AW. The program was recently referred to by Minister Kaag of Foreign Trade and Development Cooperation as a successful example of collaboration between the Dutch government, Dutch companies and local partners to create lasting impact. ●

Above: Relative evapotranspiration

*Note that, with permission, this content is partly based on an article by [duurzaamnieuws.nl](https://www.duurzaamnieuws.nl) that focused on EARS technology for index insurance and G4AW. <https://www.duurzaamnieuws.nl/hoe-satellietdata-helpen-verduurzamen/>*

### About the author



**Joost van der Woerd**, project manager at EARS Earth Environment BV, is a dedicated remote sensing specialist with years of experience using satellite data for climate and agriculture related applications. [joost@ears.nl](mailto:joost@ears.nl)

# On-the-spot, easy and affordable soil testing for Kenyan smallholder farmers

Christy van Beek, Susanne Coolen, Bert de Leede, Teun Fiers and Angelique van Helvoort

Below: Use of the soil scanner at a cooperative in Kenya

Africa is facing an escalating soil fertility crisis and without immediate interventions, the continent continues to lose over 3,5 billion Euros per year worth of nutrients. To increase productivity whilst decreasing soil fertility decline, balanced fertilization is essential. Farmer cooperatives using soil scanners to provide real-time fertilizer recommendations to farmers may be part of the solution. **AgroCares** and **Agriterra** present their findings from a soil sensor services pilot for farmer cooperatives in Kenya.

In 2017, AgroCares launched a Near InfraRed (NIR) soil scanner in Kenya, which gives farmers real-time information on the nutrient status of their soil. An app translates the soil data on the spot into fertilizer recommendations for the selected crops. November 2018, AgroCares and Agriterra executed a joint evaluation on the use of the soil scanner at cooperative and farmer level, to identify success factors, possible bottlenecks and the added value of innovative soil testing services for farmers. The results seem promising: farmers have reported higher fertilizer efficiency, increased yields and, in general, willingness to pay for scans.



## Soil scanner services through farmer cooperatives

In Africa, many farmers lack on-site soil and crop information and base their fertilizer selection on intuition or on tacit knowledge and advice from local agro dealers, without knowing the actual nutrient status of their soils. This can result in a mismatch between applied nutrients and required nutrients for productive soils. More so, applying non-limiting nutrients results in economic losses and environmental degradation. What is needed, is real-time information on the nutrient status of soils for informed decision-making on fertilisation. Worldwide, only about 5% of the farmers have access to reliable soil testing information. Conventional soil test laboratories are expensive and testing is done off field, advice is often complex and delivered with delay. But recent technological innovations in IT, sensor technology and machine learning, have opened up new possibilities.

AgroCares, a Dutch agro-tech company, works through a network of service providers who offer soil testing services to their networks of farmers. Since its release in 2017, 200 soil scanners were sold to various organisations, including input suppliers, agro dealers, NGOs and farmer cooperatives and unions in Kenya. The service providers buy the scanner for 3,000 Euro and a license for a specific application, for example the 'advisor application' of 1,800 Euro per year, with unlimited use of the database. The cooperatives offer soil testing as a service to their members and charge approximately 5 to 8 Euros per report.

## Booking success with the right business model

For their evaluation, AgroCares and Agriterra conducted interviews with board members, managers, extension officers, input shop officers and farmers linked to three Kenyan primary cooperatives and one cooperative union:

- Meru Central Coffee Cooperative Union: 98,000 active members, 5 scanners, 5 operators, 1,876 clicks in 13 months
- Tarakwo Dairy Cooperative Society: 3,000 active members, 1 scanner, 192 clicks in 20 months
- Olkalou Dairy Ltd.: 6,000 active members, 2 scanners, 2 operators, 118 clicks in 18 months
- Tulaga Farmers Cooperative Society: 1,878 active members, 1 scanner, 2 operators, 26 clicks in 2 months

Farmers interviewed indicated positive experiences with the scan, but it takes at least six months of investing to get these results. Cooperatives can achieve a breakeven point within one year. Soil testing gives members of organisations superior value: the costs of the scan are compensated by (1) reduced input expenses due increased efficiency and (2) increased yields and higher return of investment.

The evaluation further showed that the main implementation challenges were 'non-technical'. Farmers may have limited or no availability to recommended inputs and for the cooperatives, logistics of collecting soil samples and communicating fertilizer recommendation can be challenging. Furthermore, a majority of farmers has no knowledge about the importance of soil testing and extension officers have insufficient knowledge to provide tailored advice to farmers based on a scan. It is not easy to find motivated promoter farmers and to retain qualified operators. Finally, some cooperatives have indicated they don't feel ownership and involvement over a soil scanner purchased with donor support.

A critical success factor for the implementation of soil scanner services, are the management and board of a





cooperative. They need to be aware of the business potential and value for cooperatives and farmers and prepare a professional soil testing services business approach, supported by a SMART business and operational plan. The evaluation shows this is not always the case. After-sales support for technical challenges, coaching of operators and providing promotion materials are also important. The evaluation team therefore developed two tools to support a sound introduction of soil testing services at cooperatives-level: a *pricing mechanism calculation model* for cooperatives to know real costs, price setting, break-even point and profit; and a *services model* distinguishing four phases spread over two years to systematically reach out to the innovators and early adopters.

**The way forward**

The soil scanner is a disruptive innovation and changes the way soil testing used to be done. Consequently, bringing an innovation to scale needs time and continuous support. Critical to the success is the position of the service providers, in this case the farmer cooperatives. They are well placed institutions to offer soil testing as they have an extension

SoilCares, part of AgroCares, has developed a portable handheld soil Scanner using Near InfraRed (NIR) spectroscopy. How it works: a spectral image is sent to the application on the smartphone via Bluetooth. Subsequently, the smartphone application connects to AgroCares' global calibration database to convert the spectral image into the required soil data. How this data is interpreted and reported depends on the selected application. There are applications for monitoring (only data presentation), liming recommendation and several fertilizer recommendation applications. The most used application is the 'Advisor application', which translates the soil data within 10 minutes into direct fertilizer recommendations for farmers for the selected crops. This application is used by 37 organisations in Kenya, 20% of which are farmer cooperatives, operating 97 scanners. The sensors can make about 30 soil samples per day.

system in place and know their members. On-the-spot soil testing benefits the farmer as well as the cooperative's business. It is fast, affordable and productive, but to make it efficient, it is recommended that a cooperative has at least 1000-1500 members and sees the soil testing service as a business. Cooperatives should have their own input supply shop (or a good network) and have a check off payment system. They can even make soil testing compulsory for their members as a condition to supply to the cooperative (this works for example for coffee) or to have access to inputs. The next step for the scanner is to integrate soil test information in platforms for data analysis, e.g. by financial institutions or governmental bodies. AgroCares and Agriterra will continue their partnership and work on the two models and implementation of the scanner in other African countries. ●

**About the authors**

- Christy van Beek** is Chief Agronomist at AgroCares and Director of SoilCares Foundation. [christy.vanbeek@agrocared.com](mailto:christy.vanbeek@agrocared.com)
- Susanne Coolen** works marketing advisor at Agriterra, an international organisation that professionalizes farmer cooperatives worldwide. [coolen@agriterra.org](mailto:coolen@agriterra.org)
- Berten de Leede** is an experienced Business Advisor for Agriterra (focus on Africa), an international organisation that professionalizes farmer cooperatives worldwide. [deleede@agriterra.org](mailto:deleede@agriterra.org)
- Teun Fiers** supports the work of AgroCares as intern agronomist at AgroCares in Nairobi.
- Angelique van Helvoort** is Manager Marketing and Communication at AgroCares.

Above left: Interview with a farmer  
Above right: Evaluation in the field

# Enhancing pastoralists' resilience in livestock Value Chains in East Africa

Racho Godana, Frankline Agolla and John Mwikya

Below: Massai children carrying goats in the rain

The remote arid and semi-arid Lands of Northern Kenya are dominated by pastoralist livestock production and are constantly threatened by prolonged droughts. Destocking, restocking and moving their herd to grazing areas are a key coping strategy for herders. Yet in times of stress, herders often find themselves selling stock at low prices. The challenge of accessing information serves as a key constraint for pastoralist communities to make informed decisions and manage risks.

A significant portion of the livestock farmers in East Africa and the greater horn of Africa are at risk due to the vicious never-ending drought, caused by climate change and climate variability. Droughts cause livestock health depletion and mortality,

sell-off of livestock and reduced water and forage availability. The traditional adaptive capacity and resilience of pastoral communities are no longer tenable due to increased population pressure in combination with changing land tenure regulations. Perennial conflicts among pastoralists due to insufficient valuable resources such as water and greater incidences of diseases continue to strain livestock value chains. The pastoralists' main assets are their livestock and any form of threat to this key asset always turns out catastrophic.

It is against this backdrop that CTA (Technical Centre for Agricultural and Rural Co-operations), in partnership with Amfratech Ltd, East Africa's leasing Technology and Consulting Service Provider, and aWhere Inc., a US-based data collection and analysis company for Agricultural Intelligence, have set-up the CLIMARK (Climate Livestock and Markets) project.

The objective of the CLIMARK project is to increase pastoralists' resilience by enhancing adaptive capacity. One of its strategies is to deploy a blended weather information management system, consisting of a functional, easy-to-use Agri-weather mobile-based application (Mobile-APP) and dashboard. During the pilot phase, running between December 2018 and March 2019, 200 pastoralists from Marsabit and Isiolo Counties will receive free actionable weather advisories via SMS on a weekly basis. The service will also be available to other stakeholders within this region through the dashboard and mobile application.

In order to carry out an effective Drought early warning system, the quantitative measure developed by Wayne Palmer (1960) was used in CLIMARK project. The Palmer drought index is superior to other drought indices in many respects because it accounts not only for precipitation totals, but also for temperature, evapotranspiration, soil runoff and soil recharge. The CLIMARK Project Agri-climatology team used the following indices for the purpose of convergence of evidence and determined the advisories based on a World Meteorological Organization (WMO) classification:

- Cumulative rainfall which entails rainfall during the growing period and comparing it with the cumulative normal rainfall.
- Standard precipitation index for any location based on the long-term precipitation record for a desired period.
- Drought index which gives a measure of the effectiveness of actual rainfall in comparison to expected rainfall on crop and pasture performance.
- Moisture Availability index which is a measure of the ratio of rainfall to evapotranspiration (ETO).

## Data for resilience

The CLIMARK project addresses multiple significant information challenges across the East African livestock value chain with a primary focus on the lack of available localised and real-time ag-meteorological-driven information on forage and pasture conditions. The absence of such information affects decision making of the pastoralist community in regards to grazing (where and when and how many animals), resulting in cascading impacts on the other links in the value chain. For example, unplanned movement of animals to meet short-term cattle needs can result in long-term economic losses through unfavourable animal prices. Accessibility to vital agri-weather information enhances awareness of weather



patterns in the short term and enables pro-active actionable recommendations to safeguard pastoralist livelihoods in the long term.

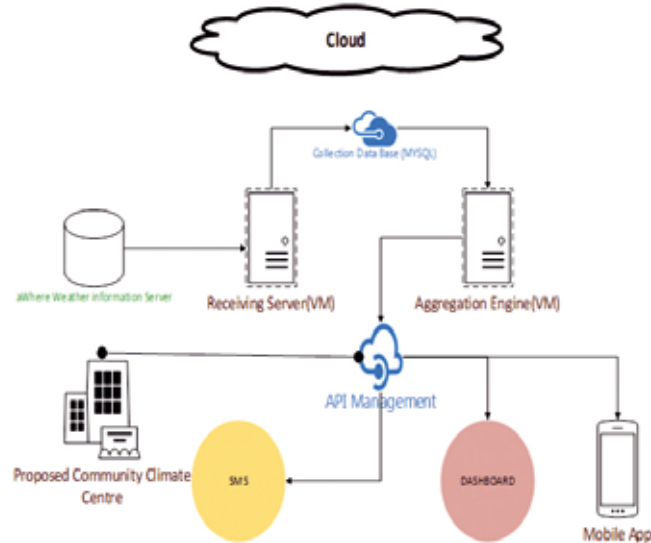
Amfratech has designed a cloud-based blended weather information service, which incorporates a weather dashboard, Mobile Application, and Short Message Service (SMS) subscription service for the Marsabit and Isiolo Counties in Kenya as an initial pilot phase between December 2018 and March 2019. In this design, Amfratech receives near-real-time agri-weather information from aWhere Inc. through Application Programming Interface (API) integration. This information is then analysed by experienced Agri-Climatologists and coded into a granular actionable format for the pastoralists to access via mobile phone and a computer-based web dashboard. The role of the Agri-Climatologists is to develop weather-based indicators with a view to issue early drought warning and ensure that this information reaches the stakeholders including pastoralists, County government, Insurance agencies, NGOs among others for early response. The drought early warning system is developed based on weather as primary indicator, followed by pasture, market prices and human health indicators. This agrometeorological early warning system entails acquisition of weather data (temperature, precipitation, potential evapotranspiration (PET), humidity and wind), crop/pasture information, market information and anthropometric data. The actionable messages targeting pastoralists include logistical advisories on times to deliver hay and water, need to destock, avoidance of resource-related conflicts between communities and best times to buy livestock insurance.

**Cloud-Based Weather Information System**

Based on feedback from the pilot, the weather system will be further developed. The CLIMARK team is in engagement with The Kenya National Drought Management Authority (NDMA) on this pilot and possible upscaling to other counties in Kenya. The NDMA is the agency of the Government of Kenya mandated to establish mechanisms which ensure that drought does not result in emergencies and that the impacts of climate change are sufficiently mitigated.

This service has the potential of reaching over 20 million pastoralists when rolled out to other countries in the horn of Africa that are faced with similar climate challenges, such

**Fig 1. CLIMARK Cloud-Based Weather Information System Architecture**



*The CLIMARK project addresses multiple significant information challenges across the East African livestock value chain.*

as Ethiopia, Somalia and Djibouti. The weather data from aWhere can further be customised for actionable crop advisory services to farmers, in order to achieve steady crop production and further appreciate the power of agricultural intelligence.

The blended weather information management system is part of a mix of strategies the CLIMARK project employs to enhance pastoralist resilience. The project, for example, also focuses on scaling up livestock insurance and activities to boost livestock markets, trade and enterprises for women and youth. ●

The weather dashboard can be accessed via web on [www.climark.org](http://www.climark.org) and targets the stakeholders within the CLIMARK region with sufficient access to internet. These stakeholders include the National Drought Management Authority (NDMA), Marsabit and Isiolo county Governments, Insurance Service Providers and Non-Government Organisations, who are key policy drivers in championing resilience interventions within the target population.

The stakeholders can also access the same agri-weather information via the Mobile Application “MyAnga”, which is available in Google Play for android devices. “MyAnga” is a Swahili language connotation for “My Weather” and therefore resonates well with the pilot target group.

The local herders can also access the weather information through the SMS service using a short code to receive weekly granular agri-weather information for their locality in English, Swahili and their preferred local language (Borana/Gabra, Samburu and Rendille).

**About the authors**



**Racho Godana** is co-director & co-founder of Amfratech Ltd. He is a Senior ICT & Engineering Specialist with vast experience in Project Management and Process Improvement. [racho.godana@amfratech.com](mailto:racho.godana@amfratech.com)  
**Frankline Agolla** is co-director & co-founder Amfratech Ltd. He is a Senior Project Leader with vast experience in Engineering & ICT. [frankline.agolla@amfratech.com](mailto:frankline.agolla@amfratech.com)  
**John Mwikya** is consultant Agri-climatologist and former deputy director of Kenya Meteorological Department.

# Resources



## Digital and Data-Driven Agriculture

What is needed for smallholder farmers to become smart data managers and users? This White Paper, a co-publication of GODAN, GFAR and CTA, contributes towards the discussion on the opportunities and risks involved with smallholder data. Through a series of recommendations, it sets out to ensure that in the data revolution for agriculture 'no one is left behind'.  
<https://f1000research.com/documents/7-525>

## Data for smallholder farmer financing

The main challenge for financing smallholder farmers lies in compiling adequate data on risks. Due to significant data gaps, most smallholder farmers lack financial profiles which inhibits credit flows to farmers. In this publication, AGRA argues that Farm Management Systems can catalyse financial inclusion for smallholders farmers by bridging the (data) gap between financial institutions and the agricultural sector.  
<https://bit.ly/2Q5Ankt>

## Livestock insurance for drought resilience

ARID-Kenya and its partners have published a report showcasing its ICT solution for increased productivity and resilience to climate change among pastoralists communities in Kenya. The Index-based livestock insurance (IBLI) is a programme for market-mediated, index-based insurance products to protect livestock keepers from drought-related asset losses. Read how this programme uses satellite data to create statistical models of livestock mortality, which inform insurance pay-outs.  
<https://cgspace.cgiar.org/handle/10568/97904>

## Farmer Profiling: Making data work for smallholder farmers

This CTA working paper presents preliminary findings and field data on the use of farm data by farmer organisations. Stéphane Boyera, Chris Addison and Chipo Msengezi discuss the role of farmer cooperatives in Africa's data for agriculture revolution. They argue that farmer cooperatives should take a step-by-step approach, building on their member profiling first to enable effective information flows that support the provision of value-added services.  
<https://cgspace.cgiar.org/handle/10568/89763>

## Policy Brief: Data, ICTs and agriculture

In a series of policy briefs CTA highlights the Centre's key intervention areas. This brief outlines the potential for enhanced data use across value chains: <https://cgspace.cgiar.org/handle/10568/89762>  
 This policy brief makes the case for smallholder empowerment to use ICTs and leverage on the data revolution: <https://cgspace.cgiar.org/handle/10568/89795>

## Governance issues for open data in agriculture and nutrition

Jeremy de Beer, Professor of Law at the University of Ottawa, discusses issues with ownership rights to data for agriculture and nutrition. Open and equitable data is not only a legal challenge, but a social and political one. De Beer proposes four governance strategies to address these challenges, enabling inclusive sharing of open data to benefit food-related development objectives.  
<https://bit.ly/2ztXDCY>

## Dossier: Farm Data

Discover Spore Magazine's dossier on Farm Data. Read for example the interview with André Laperrière, Executive Director of the GODAN Secretariat, on awareness raising about the potential of agricultural data. Find fact and figures on how data serves smallholder farmers. And more information of the Data4Ag project, providing insights in the value of data for smallholder farmers and the risks.  
<https://bit.ly/2K7pMgO>

## CTA resources on Data4Ag

Eager to follow contemporary developments and opinion pieces on data for agriculture and rural development? Don't miss this dedicated library on CGspace that compiles knowledge products of the CTA, AgriCord and PAFO Data4Ag project.  
<https://bit.ly/2Rii17r>

## Webinar series on Data for Agriculture

Find a series of webinar recordings, organised by GFAR, CTA and GODAN in the context of GFAR's work on farmers' rights to data, with discussions on the following topics: (1) Data-driven agriculture, (2) Key data for farmers, (3) Market adoption and use of data by smallholders, (4) Data-driven services for farmer-led businesses, and (5) Data and agri-food, or have a look at any of the 25 other recommended resources on the website.  
<https://bit.ly/2r97aGc>

## Global data ecosystem for agriculture and food

For agriculture to benefit from (open) data, global digital infrastructures must be built. This paper, commissioned by Syngenta and GODAN, discusses the challenges of making the global data ecosystem a reality with the objective to build on a global consensus of what this infrastructure could look like and what is needed to support it – both socially and technically.  
<https://bit.ly/2QoDFYR>

## Digital Farmer Profiles: Report, blog post, infographic, webinar

Read here the leading report on Digital Farmer Profiles by Grameen Foundations and USAID: <https://bit.ly/2BPpHzJ>  
 In this blog post, Steve Hollingworth, President and CEO of Grameen Foundations shares his vision on the digital revolution and its implication for agriculture: <https://bit.ly/2E4ECWJ>  
 In his blog, Hollingworth describes the 2018 landscape assessment on farmer profiles, entitled 'Data-driven agriculture, the future of smallholder farmer data management and use'. Find the infographic with the key areas of research here: <https://bit.ly/2re7Z0x>  
 For a discussion with USAID on main findings of the report and the importance of farmer profiles, also have a look at this webinar: <https://bit.ly/2rkv4ih>