

African Farming

and Food Processing

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Keep Phytophthora

Canker at bay in cocoa plants

Field research unit

Boosts fresh produce automation

Poultry processing:

Innovative software solutions



Case IH unveils multi-purpose tractor. p38

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Case IH launches multi-purpose tractor and self-propelled sprayer



Image Credit: Adobe Stock



Phytophthora stem cankers are excised using sharp tools to expose clean, disease-free wood before applying cuprous oxide canker paint. p16



Case IH demonstrates 2000 Series Early Riser planter at Annual Farmers Day in South Africa. p36

African Farming and Food Processing

Editor: Ebin Gheevarghese E-mail: ebin.gheevarghese@alaincharles.com

Editorial and Design team: Prashant AP, Hiriyti Bairu, Miriam Brtkova, Manojkumar K Praveen CP, Rahul Puthenveedu, Rhonita Patnaik, Samantha Payne, Deblina Roy and Louise Waters

Managing Editor: Georgia Lewis

Publisher: Nick Fordham

Sales Director: Michael Ferridge

Magazine Manager: Richard Rozelaar

Tel: +44 207 834 7676

Email: richard.rozelaar@alaincharles.com

Country	Representative	Telephone	Fax	Email
India	Satyanarayan Naidu	+91 98 33055655		satyanarayan.naidu@alaincharles.com
Nigeria	Bola Olowo	+234 8034349299		bola.olowo@alaincharles.com
South Africa	Sally Young	+27 824 906 961	+27 46 624 5931	sally.young@alaincharles.com
UAE	Graham Brown	+971 4 4489260	+971 4 4489261	graham.brown@alaincharles.com
USA	Michael Tomashefsky	+1 203 226 2882	+1 203 226 7447	michael.tomashefsky@alaincharles.com

Head Office:

Alain Charles Publishing Ltd
University House
11-13 Lower Grosvenor Place
London SW1W 0EX, United Kingdom
Telephone: +44 (0) 20 7834 7676
Fax: +44 (0) 20 7973 0076
E-mail: post@alaincharles.com

Production: Srinidhi Chikkars, Nelly Mendes, Infant Prakash and Rakshith Shivakumar
Email: production@alaincharles.com

Subscriptions: circulation@alaincharles.com

Chairman: Derek Fordham

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Middle East Regional Office:

Alain Charles Middle East FZ-LLC
Office L2-112, Loft Office 2,
Entrance B, PO Box 502207
Dubai Media City, UAE
Telephone: +971 4 448 9260
Fax: +971 4 448 9261
E-mail: post@alaincharles.com

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Farming Calendar 2018-19

OCTOBER

10-13	6th Addis AgroFood & Pack www.addis-agrofood.com/	Addis Ababa
22-25	IAOM MEA Conference & Expo www.iaom-mea.com	Nairobi

NOVEMBER

8-10	Agriworks Expo Stellenbosch www.agriworks.co.za	Stellenbosch
20-21	African Farming's Agroinvestment Summit www.agroinvestmentsummit.com	Abuja
27-28	African Agri Investment Indaba www.agri-indaba.com	Cape Town

FEBRUARY 2019

15-17	AgroTecno East Africa www.mxmexhibitions.com/agrotecno	Nairobi
15-17	Agro & Poultry East Africa 2019 www.mxmexhibitions.com/agropoultry_kenya	Nairobi
20-23	Sudan Poultry Expo www.expoteam.info/eng/events.php	Khartoum

MAY 2019

14-17	Nampo Harvest Day www.grainsa.co.za/pages/nampo	Bothaville
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JUNE-JULY 2019

28 -7	House & Garden Show www.housegardenshow.co.za	Durban
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Readers should verify dates and location with sponsoring organisations, as this information is sometimes subject to change.

Agroinvestment Summit set to kick off in November

AFTER THE SUCCESS of African Farming's debut Agroinvestment Summit in the UK, the second edition of the event is all set to be held from 20-21 November 2018 in Abuja, Nigeria. According to the industry experts, on an annual basis more than US\$10bn is committed across Africa in agricultural development, food, beverage products and services. As the market and investment opportunities for the Nigerian agriculture and food markets is increasingly dynamic due to the population growth, urbanisation, income growth and higher output services, the event will discuss some of the recent challenges and opportunities the sector is facing the present day.

Endorsed by the Federal Ministry of Industry, Trade and Investment and the Federal Ministry of Agriculture and Rural Development (FMARD), African Farming's Agroinvestment Summit has been designed to embrace a wide range of stakeholders like government officials, importers, distributors, agribusiness owners, C-level executives from food companies, trade union members and manufacturers and suppliers of agricultural equipment, machinery and services.

The summit will create a cohesive platform for trade and investment opportunities, attracting major investors and buyers from around the globe. The major focal points of the summit are: Achievement of integrated finance for African agricultural development via cross border partnerships amongst financial institutions; Harnessing processing and packaging opportunity via public-private partnerships for agro-development; How tariffs will affect future trading and agro food relationships in Nigeria with special focus on the attraction of foreign direct investments/partnerships.

The summit will hold deliberations on deployment of agro-machinery in Nigeria and technology via OEM partnership, funding for agro-development and value addition, harnessing, processing and packaging via PPP partnerships for sufficiency and exports, local assembly investment, challenges and opportunities in Nigeria and cross-border trading.

Marel Poultry develops LineLink transfer systems for modern poultry processing plants

MAREL POULTRY HAS developed LineLink transfer systems for contemporary poultry processing plants, particularly suitable for capacities up to 15,000 bph. LineLink DE transfers products from the defeathering line to the evisceration line, while LineLink EC transfers products from the evisceration line to the chilling line. Each product and all information collected on it is transferred. LineLink automatic inline transfer helps optimise product hygiene and ensures full traceability.

Transfer units mark crucial phases in a processing plant, where different types of shackles are needed for different departments. When speeds are accelerated to 15,000 bph, processors should be able to rely on flawless transfers with fast, hygienic and careful handling, without damage to the product, and no empty shackles downstream.

First, incoming products are placed into the system's units. A large part of the carousel's circumference is used for positioning products carefully. Then they are conveyed round the system's carousel to the point where they are guided into the new shackle. Products are then positioned for downstream operations. Both lines run at the same speed. Products are transferred



The fast operational pace of Marel Poultry's 15,000 bph lines brings about a significant increase in performance and yield

on a one-to-one basis, preventing empty shackles and a higher line speed downstream. Line forces are synchronised electronically by the Stork Active Tension Control system. ATC compensates automatically for differing chain stretch on the two lines. Both lines always run at precisely the same number of shackles per minute and accurate coupling can be achieved.

LineLink transfers products and data. Each individual product transfer is accompanied by transfer of the associated weight and quality information, gathered by assessment systems

such as SmartWeigher and IRIS. These data can be used for production order planning and downstream processes. In the defeathering department, this information can be an aid to veterinary inspection with selective unloading. Moreover, the information collected on each product ensures traceability through the entire process.

Combining LineLink with Innova PDS software, processors can monitor and evaluate the transfer performance real-time from a central point. This adds to a more detailed traceability.

Image Credit: Marel Poultry

AgDevCo welcomes funding from Britain

AS ANNOUNCED AS part of British Prime Minister Theresa May's visit to Africa, the UK Department for International Development will provide a further US\$72.2m to support AgDevCo's mission to create jobs, improve food security and boost prosperity in Africa. The funds will allow AgDevCo to invest more in the eight countries where it is already active and expand into new countries including Kenya and Côte d'Ivoire.

AgDevCo is a specialist impact investor which invests in responsible and sustainable agribusinesses and delivers benefits for smallholder farmers. It is already one of the most active investors in African agriculture having invested in more than 55 early-stage farming and agro-processing companies to date, in the process supporting some 7,500 jobs and linking over 425,000 smallholder farmers to reliable markets.

AgDevCo backs socially responsible companies like East Africa Fruits in Tanzania, led by a young Tanzanian entrepreneur, which sells horticulture products into regional markets; Jacoma Estates in Malawi, founded by a group of British investors, which is pioneering a world-class macadamia export industry incorporating commercial and smallholder farmers; and Equity for Africa, an innovative equipment leasing business which is expanding in East Africa.

By recycling capital recovered from successful investments and attracting additional private investment, AgDevCo ensures that funding from UK Aid goes further in helping to deliver the Sustainable Development Goals. AgDevCo's chairman and founder Keith Palmer said: "Responsible commercial agriculture has a major role to play in creating more jobs, increasing trade and reducing poverty in Africa. We welcome the announcement of the new funding by DFID, which will allow us to build further on the successes achieved by AgDevCo so far".

AIF wins award for sustainable consumption



DSM's Nelleke Barning receives prize money on behalf of AIF

Image Credit: AIF

THE SWISS GREEN Economy Symposium (SGES) this year presented its first SDG Award to Africa Improved Foods (AIF). AIF Rwanda is a joint venture between the government of Rwanda and a consortium of Royal DSM, Dutch development bank (FMO), DFID Impact Acceleration Facility managed by CDC Group plc and International Finance Corporation (IFC), the private sector arm of the World Bank Group. It is the leading manufacturer of high quality and nutritious complementary foods in Rwanda. DSM as the initiator and main shareholder contributes to creating a more sustainable food industry. This is also a goal of Bühler, which supplied the factory, the process technology, and the know-how to Africa Improved Foods.

AIF applies a new approach to fight malnutrition in Africa, promoting local production by directly buying farmers' yields of maize and soy against cash at competitive prices. AIF mainly continues to produce porridge flours (with added milk, vitamins and minerals) targeting vulnerable population segments.

Grain care, our commitment





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IAOM MEA 22 - 25 Oct., Nairobi, Kenya Stand 45	SIMA SPSA 08 - 11 Oct., Alger, Algeria Stand 48	AAPA 07 - 10 Oct., Valparaiso, Chile Stand 54	AGROSALON 09 - 12 Oct., Moscow, Russia H13 stand 04.55	INDAGRA 31 Oct. - 4 Nov., Bucharest, Romania Stand 131
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Research aims to boost rice output in Africa

GUY KIRK, PROFESSOR of soil systems at Cranfield University, is leading a US\$31mn research project to overcome a soil health problem affecting rice production in sub-Saharan Africa. The study will examine the traits that allow indigenous African rice varieties to tolerate the toxicity, with the aim of incorporating these traits into more high-yielding varieties through plant breeding. Announcing the funding for the project as part of its Sustainable Agriculture for Sub-Saharan Africa programme, Professor Sir Mark Walport, chief executive of UK Research and Innovation, said: "Stresses such as drought, and the restriction of vital resources including nutrients and water are among the challenges affecting the development of sustainable agriculture in Sub-Saharan Africa."

Small-scale horticulture project transforming lives

KENYA HAS ONE of the most dynamic and innovative economies in sub-Saharan Africa. A decade after going through a food crisis and in the aftermath of the drought in 2016-2017, the country aims to achieve self-sufficiency in food products such as maize, tomato, cabbage, rice, beans, milk and meat. This ambition of the Kenyan government has received support from the African Development Bank, which sees food security as a catalyst for the growth and development of the country's productive sectors. Since launching its 'Vision 2030' long-term development strategy in June 2008, which places special emphasis on agricultural development, the Kenyan government has been working assiduously with the African Development Bank Group to combat food insecurity, especially in rural communities.

AfDB and Purdue University to hold conference on technologies for African farmers

THE AFRICAN DEVELOPMENT Bank (AfDB) and Purdue University are organising the Scale Up Conference on Agricultural Innovations from 25-27 September to address how to shift agricultural innovations from research institutions into the developing world, particularly Africa.

The Scale Up Conference will bring together hundreds of individuals and organisations engaged in the introduction, diffusion, and adoption of agricultural innovations that have the potential to reach millions.

Bank president Akinwumi Adesina will be the keynote speaker at the conference. Together with bank vice president for Agriculture, Human and Social Development, Jennifer Blanke, Adesina will meet with university management and other stakeholders on partnership opportunities, including the Technologies for African Agricultural Transformation (TAAT) initiative, being steered by the Bank. TAAT is a knowledge- and innovation-based response to the recognised need for scaling up proven technologies across Africa.

"This will be the first multi-day conference on this topic that includes presentations, panel discussions, case studies, and breakout group discussions to help conference participants develop a thorough understanding of how to scale up agricultural innovations to reach millions," said Indrajeet Chaubey, associate dean and director of international programmes for the College of Agriculture at Purdue University.

Dozens of speakers who have implemented scale up processes in agricultural landscapes will participate.

"In the College of Agriculture we work to develop solutions to real world problems while also finding methods to realistically deliver and grow these technologies," said Karen Plaut, the dean of the College of Agriculture. "The Scale Up Conference is about taking those technologies and applying them in the developing world."



Image Credit: Adobe Stock

Purdue University's College of Agriculture has led and managed large agricultural research and development projects.

Participants are expected to gain an understanding of successful, sustainable large-scale implementation.

For more than 60 years, Purdue University's College of Agriculture has led and managed large agricultural research and development projects. In addition to a long history of significant agricultural innovations, the university has produced three World Food Prize laureates.

The African Development Bank Group is a leading finance institution in Africa with a mandate to spur sustainable economic development and social progress in the continent, thereby contributing to poverty reduction. The African Development Bank's authorised capital of around \$US100 bn, is subscribed to by 80 member countries made up of 54 African countries and 26 non-African countries.

African Development Bank boosts Cameroon livestock and fish farming with US\$98.9mn loan

THE AFRICAN DEVELOPMENT Bank Group has extended a loan of US\$98.9mn to Cameroon to support livestock and fish production in the central African country in line with the Bank's strategies to create jobs and raise household incomes.

The loan, approved by the bank's board, will support the modernisation of beef, pork and fish production, with significant improvements to food and nutrition in the country. Both the bank and the government of Cameroon are implementing strategic policies aimed at improving food and

nutritional security, reducing poverty and improving production infrastructure in rural areas. The bank's High 5s strategy includes policies to feed Africa, industrialise the continent and improve the quality of life of its people.

The project will specifically target raising standards and competitiveness in such vital livestock value chains as genetics improvement, feeding, slaughter, processing, conservation and transportation. For fish production, the focus will be on rearing, conservation, storage, and processing. While

the project has a national scope, the Cameroon government has identified three main target areas – the north-west for production, and central and coastal for consumption. The impact of the cross-cutting actions involved will, however, be felt in the other regions of the country as well. Major beneficiaries of the project will be stockbreeders and their cooperatives who constitute 45 per cent of the pastoral sector labour force; fish farmers, input producers and sellers, traders, women wholesale fishmongers and processing operators.

Africa-to-Africa Investment Report launched

OPPORTUNITIES FOR INVESTMENT in Africa outweigh the obstacles, according to a report on leading African companies covered in the African Development Bank's Africa-to-Africa (A2A) Investment Report. It is the first report on inter-African trade published by the bank.

The report unearths the realities African companies face when investing in the continent, emerging trends in A2A investment and steps African policymakers can take to accelerate intra-African investment.

Africa-to-Africa Investment Report: A First Look, finds that more African companies are investing in Africa. These companies have confidence in the continent's long-term growth potential; they are at the cutting edge of their industries, and are capitalising on their knowledge of local markets to generate higher returns and impact. In line with the bank's High 5s for transforming Africa and the African Union's Agenda 2063, the A2A Report aims to take the conversation on investing in the continent a step further. It shows what African multinationals are doing to drive investments in Africa, how they are expanding their African footprint, and gives insights into how to scale up investments more widely.

"As global foreign direct investment to Africa falls, intra-African investments are picking up pace," said Akinwumi A Adesina, president of the African Development Bank Group. "Africa's big companies are increasingly on the move and expanding their African footprint. It is through more investments that the continent can build inclusive, sustainable growth and development. We have made this our collective commitment in the High 5s".

Highlights from the report's intra-African investment stories include the importance of clear long-term visions, getting up-to-date investment facts, building local partnerships to deliver on the ground and tapping into talent in the local labour force.

AfDB backs Ghana's renewable energy sector

THE AFRICAN DEVELOPMENT Bank has approved a US\$1.5mn grant from its Sustainable Energy Fund for Africa, to assist Ghana's renewable energy investment drive. The grant will support the Ghanaian government's efforts to overcome technical, financial, regulatory and institutional barriers to scaling-up renewable energy investments in the country.

The project, which is part of the bank-led Climate Investment Fund and the Scaling-up Renewable Energy Programme Investment Plan for Ghana, will complement the Bank's effort in the Ghana Energy Development and Access Programme. The SEFA grant will fund two broad components: the technical/commercial/regulatory and feasibility studies, aimed at providing detailed renewable energy resource studies, grid integration studies and regulatory texts, and resources and public sector skills and capacity development. In a bid to create an enabling investment climate for renewable energy, the Ghanaian government put in place several policy and regulatory measures, including the Renewable Energy Act 2011.



Image Credit: Adobe Stock

The assistance is fully aligned with the Bank's New Deal on Energy for Africa.

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In a modern processing line, consistency, transparency, and traceability are vital. Poultry processors know how important these are in their journey towards operational excellence.

Performance software for optimal poultry processing from Meyn

THE NEW VERSION of Meyn Connect M1.1 enables available data to be turned into valuable information, which can be monitored in real time and combined into integrated reports. Processors can now invest their time in analysing data, instead of gathering it.

Meyn Connect M1.1 helps to optimise the whole production line, delivering consistency and transparency throughout the process so users have the right information at their fingertips at any time.

Meyn Connect M1.1 is a complete solution, including hardware and software applications. It gathers data from equipment and presents it intuitively, with easy integration into poultry plant business applications.

Information relates to order data (quality, number, and yield); to operation; and to equipment (status and availability). Every poultry operator has specific needs, and requires a solution that meets those needs without turning them into a costly customised IT project. Meyn Connect M1.1 can be installed in a variety of configurations to meet those requirements. Modules such as Distribution Manager and Flock Scheduler mean that information is always available to manage production and to ensure more efficient processing.

Every poultry operator has specific needs, and requires a solution that meets those needs without turning them into a costly customised IT project.

Benefits:

- Connects equipment to business software
- Easy access to available data
- Process monitoring
- Product traceability
- Reporting
- Intuitive dashboards

Meyn Connect M1.1 allows data to be collected from different areas of the processing lines, which is then made available via the so-called 'Poultrybus' to



Image Credit: Adobe Stock

dedicated modules - each providing value to your process and operational tasks.

Most poultry processing lines use multiple product sensors for bird counting, weighing and grading. The sensors measure process values such as temperatures, speed and power consumption — and these values are usually individually available on screen but are not always easy to compare.

Meyn Connect M1.1 collects data for easier analysis. For example, weighing data from the process is displayed in one condensed dashboard, making it easy to compare and recognise trends and exceptions.

There are modules available to integrate most sensors, with values shown in dashboards or reports. Managers gain a direct overview and can 'connect the dots'. Processing overviews of counter and weight values indicate clearly if and where possible production losses are occurring. Continuous development will support future integration of other sensors and equipment.

"The site has transparent overviews and easy access to consistent information throughout the whole process. Condensed dashboards give a quick overview where to improve efficiency in production or process, says Andre Petersen, product manager, plant automation and logistics.

Meyn Connect M1.1 Core platform

Meyn Connect M1.1 is built on a robust network with dedicated modules to ensure open access with highly reliable data security and availability. The active network concept ensures information integrity and storage of data. Data is easily exchanged between the Meyn equipment and applications, via a bus structure (Poultrybus) which is based on the proven OPC-UA standard. The platform includes a helpdesk monitor, allowing the helpdesk to support remotely and to identify the source of issues quickly. Several options are available to integrate with other systems and exchange information.

Meyn Connect M1.1 Tracking Manager module

The Tracking manager module adds track and trace functionality, in order to monitor flocks and individual birds through the process. All information, such as disease or defect, welfare, quality, and weight, is linked to the individual bird by the Tracking manager module, and made available for traceability.

Meyn Connect M1.1 Flock Scheduler module

This module enables daily planning for flocks and the arrival of trucks, with the flexibility to match last-minute changes. When processing a flock starts, the Flock

Scheduler module automatically ensures the distribution of correct flock identification throughout the processing line. With the Flock Scheduler interface, it is possible to automatically download daily planning from business planning systems.

The Distribution Manager module routes products efficiently through processing lines, based on individual bird weight and bird quality data.

Meyn Connect M1.1 Distribution Manager module

The Distribution Manager module routes products efficiently through processing lines, based on individual bird weight and bird quality data. The end destination (drop stations, packing lines or other downstream processes) can be set according to production orders. Data to manage the routing is collected from the Meyn Line weigher and Meyn Grading system. Throughout the process, dedicated weighing and grading options are available.



Most poultry processing lines use multiple product sensors for bird counting, weighing and grading.

Meyn Connect M1.1 Footpad Inspection System (FIS) module

This module captures all of the classification data generated by the FIS. All classifications of lesions are captured per flock. This means all data is captured in one system, with no need for manually typing

flock details into the FIS, thereby reducing double entry of information. The information is used for animal welfare feedback, while during processing the quality classifications per hock or foot can be used for directing hocks into the appropriate line for further processing. ¹²

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A BIOBASED CHEMICALS SUPPLIER for Feed Production

Animal African trypanosomiasis is one of the biggest constraints to livestock production and a threat to food security in Sub-Saharan Africa. A study by HR Holt, R Selby, C Mumba, GB Napier and J Guitian.

AAT vulnerability in cattle-owning communities of Sub-Saharan Africa



The production losses in cattle due to trypanosome infections have been estimated to be up to 20 per cent across a range of parameters.

Image Credit: Adobe Stock

IN ORDER TO optimise the allocation of resources for Animal African trypanosomiasis (AAT) control, decision makers need to target geographic areas where control programmes are most likely to be successful and sustainable and select control methods that will maximise the benefits obtained from resources invested.

The overall approach to classifying cattle-owning communities in terms of AAT vulnerability was based on the selection of variables collected through field surveys in five Sub-Saharan Africa countries followed by a formal Multiple Correspondence Analysis (MCA) to identify factors explaining the variations between areas. To categorise the communities in terms of AAT vulnerability profiles, Hierarchical Cluster Analysis (HCA) was performed.

Three clusters of community vulnerability profiles were identified based on farmers' beliefs with respect to trypanosomiasis control within the five countries studied. Cluster 1 communities, mainly identified in Cameroon, reported constant AAT burden, had large trypanosensitive (average herd size = 57) communal grazing cattle

Understanding how cattle-owners are affected by AAT and their efforts to manage the disease is critical to the design of suitable locally-adapted control programmes.

herds. Livestock (cattle and small ruminants) were reportedly the primary source of income in the majority of these cattle-owning households (87.0 per cent). Cluster 2 communities identified mainly in Burkina Faso and Zambia, with some Ethiopian communities had moderate herd sizes (average = 16) and some trypanotolerant breeds (31.7 per cent) practicing communal grazing. In these communities there were some concerns regarding the development of trypanocide resistance. Crops were the primary income source while communities in this cluster incurred some financial losses due to diminished draft power. The third cluster contained mainly Ugandan and Ethiopian communities which were mixed farmers with smaller herd sizes (average = 8). The costs spent diagnosing and treating AAT were moderate here.

Livestock under threat

Tsetse (*Glossina* spp.) and animal African trypanosomiasis (AAT) are an important constraint to livestock production and a threat to food security in Sub-Saharan Africa. The production losses in cattle due to trypanosome infections have been estimated to be up to 20 per cent across a range of parameters, including mortality, calving rate, draft power, meat and milk production. A high tsetse-trypanosome burden constrains the use of land for livestock production, with farmers in these areas often being more reliant on crop farming. However, trypanosomiasis also compromises crop

African Farming's

2nd Edition

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production by reducing the availability of draft animals to plough fields and provide manure for fertiliser.

The impact of AAT can be reduced by trypanocide application and the introduction of trypanotolerant cattle breeds. There is no vaccine available for the disease, and reduction in transmission rates is largely reliant on control of the tsetse vector by methods such as insecticide treatment of cattle (ITC), the use of traps or targets, ground or aerial insecticide spraying, or reducing the risk of exposure through changes in livestock management. The process of privatisation of veterinary services in many Sub-Saharan African countries means that farmers and community animal health workers (CAHW) with limited training are often responsible for the treatment of the disease. Traditionally, farmer-based control of AAT has relied heavily on the individual use of chemotherapy and chemoprophylaxis, while methods requiring collective action have often been neglected. Trypanosome species, however are becoming increasingly resistant to these common-place treatments.

Plan of action

In recognition of the need for co-ordinated actions against AAT, the Pan-African tsetse and trypanosome eradication campaign (PATTEC), funded by the African Development Bank, was established in the year 2000 and has set tsetse elimination as its goal. Although this goal presents a huge challenge that would require extensive resources and there is debate as to whether it is feasible, the last decade has seen renewed interest in the research and development of control options.

Governments, charities and philanthropists have made funding available for this purpose, despite this, the reality is that many of the communities afflicted by AAT have insufficient resources available for its control and are not always reached by control programmes. In addition, macro-level decision making may ignore important heterogeneities between communities.

A series of interviews were conducted with cattle owners in different agro-ecological zones across five countries in Sub-Saharan Africa, namely Burkina Faso, Cameroon, Ethiopia, Uganda and Zambia. Data collected on cattle was mainly on owners' knowledge and perceptions of AAT. The study sites provided a large variation in environment, AAT eco-epidemiology, cattle management and socio-economic impact of AAT.

The overall approach to classifying communities in terms of AAT vulnerability was based on the selection of key variables collected through field surveys followed by a formal Multiple Correspondence Analysis (MCA) to identify factors explaining the variation between areas. Hierarchical Cluster Analysis (HCA) was

then performed in order to categorise communities into groups describing their AAT vulnerability profile.

Field surveys

A series of surveys were conducted in 17 study areas in five countries in Sub-Saharan African during 2013; Burkina Faso, Cameroon, Ethiopia, Uganda and Zambia. A previous review of tsetse density and trypanosome prevalence studies was the basis for the geographic focus of the study, identifying the selected countries as moderate to high risk AAT areas. The countries were selected to cover a range of eco-regions and AAT epidemiology, in addition the ease of conducting fieldwork in the selected countries was taken into account. Within the countries, study areas were classified in terms of environment, including ecoregion and available information on AAT risk. A brief description of the study areas is given below and in Table 1.

Burkina Faso

The main income in these study areas comes from rain fed agriculture with cattle utilised for draft power. Livestock rearing in extensive systems is also common; however trypanosomiasis is a constraint to livestock production in the area. AAT is endemic, and cattle owners report it as the most important disease in tsetse challenged areas.

Resistance to trypanocides is thought to be widespread, particularly isometamidium resistant *T. congolense*, and the first reports of trypanocide resistance came from these study areas. The Léraba study area is crossed by 32,000 cattle per year from the North of Burkina Faso and Mali en route to markets in Côte d'Ivoire. In addition, during the dry season there is transhumance of Fulani cattle into the areas due to the availability of water points. Cattle entering the area may be highly susceptible to AAT.

Cameroon

The study was conducted in the Adamawa plateau which is the most important cattle rearing region in Cameroon. Here, white and red Fulani cattle are reared extensively, with a system of communal herding and Gudali (Sahelian Zebu) cattle are also important in the region. There is risk of AAT infection in at least two-thirds of the territory where 90 per cent of the cattle are found and the disease is one of the biggest limitations to the development of the cattle sector in Cameroon.

In 1995, at the end of the tsetse eradication campaign initiated by the government-founded 'Mission spéciale pour l'éradication des glossines' (MSEG), the Faro et Déo division of the Adamawa plateau was divided into three zones: tsetse infested, tsetse cleared

and a buffer zone between the two zones where all the cattle are treated with pyrethroids at regular intervals. In 2010, a report from the Cameroonian government estimated that in tsetse infested zones, milk and meat sales were reduced by 50 per cent.

Ethiopia

Tsetse infest around 220,000 km² of fertile land in south and southwestern parts of Ethiopia. AAT is thought to be the most important livestock disease in terms of economic development and influence on settlements. AAT has also been reported as an important disease in other species especially in equines and goats. The surveys were conducted in the Jimma zone of the Oromia region which

Countries	Study areas	HH's	Trypanosome cattle (%)	Trypanosome species	Tsetse species
Burkina Faso	Ioba & Sissili	123	4.3 % to 10 %	<i>T. vivax</i> , <i>T. congolense</i> and <i>T. brucei</i>	<i>G. pallidipes gambiensis</i> , <i>G. tachinoides</i> & <i>G. morsitans submorsitans</i>
	KénéDougou	61			
	Léraba	41			
Cameroon	North Faro & Faro et Deo	131	35.1 %	<i>T. congolense</i> , <i>T. brucei</i> & <i>T. vivax</i> .	<i>G. m. submorsitans</i> , <i>G. fuscipes fuscipes</i> & <i>G. tachinoides</i>
	South Faro	91	4.3 %		
	Mayo Rey	77	9.86 %		
Ethiopia	Ngoma & Setema	45	8.6 %-20.4 %	<i>T. congolense</i> , <i>T. brucei</i> & <i>T. vivax</i> .	<i>G. m. submorsitans</i> , <i>G. fuscipes fuscipes</i> & <i>G. tachinoides</i>
	Goro & Cheha	36			
	Limmu Seka (East)	34			
	Limmu Seka (West)	36			
Uganda	Tororo	139	15.3 %	<i>T. vivax</i> , <i>T. congolense</i> & <i>T. brucei. rhodesiense</i>	<i>G. f. fuscipes</i> , <i>G. pallidipes</i> & <i>G. morsitans</i>
	Buyende & Pallisa	78	27.5 %-35.7 %		
	Kumi & Ngora	83	29.0 %		
	Busia & Iganga	74			
Zambia	Lundazi - plateau	99		<i>T. vivax</i> , <i>T. congolense</i> & <i>T. brucei</i>	<i>G. m. submorsitans</i> , <i>G. pallidipes</i> , <i>G. breval papis</i> , <i>G. f. fuscipes</i> & <i>G. tachinoides</i>
	Lundazi - valley	57	17.8 %		
	Mambwe	54	28.4 %		

is known for its large cattle numbers and the economy is also heavily reliant on crop production. In this region, cattle farmers attribute reductions in draft power and meat and milk offtake, increased calving intervals and mortalities and impacts on breeds kept and cattle management to AAT.

Uganda

In Uganda the 'tsetse belt' runs from the highlands in southwestern Uganda across Lake Kyoga to north-eastern Uganda and at least 70 per cent of the entire country is thought to be infested with tsetse flies. *T. vivax* is the most prevalent species of trypanosome in Ugandan cattle and *T. congolense* and *T. brucei rhodesiense* infections also occur. Following increases in human density, changes in land use, and a reduction in the wildlife population, Ugandan cattle are now considered the primary host of *T. b. rhodesiense*. *T. b. rhodesiense* causes human African trypanosomiasis (HAT) or 'sleeping sickness' which is fatal if left untreated. The distribution of *T. b. rhodesiense* in Uganda has increased dramatically in the past 10 years; this is attributed to the restocking of infected cattle into naïve areas following military conflict in the late 1990's. More than 50 per cent of reported *T. b. rhodesiense* cases in the whole of Africa between 2000 and 2009 were from Uganda. The study was conducted in the Southeast region of Uganda.

Zambia

The Luangwa valley runs through the Eastern Province of Zambia, with 3.84 mn ha of national park (46.9 per cent) and 0.41mn ha dedicated game management area the valley is an ecological niche for trypanosomes allowing vector-host interaction due to favourable conditions for tsetse in terms of vegetation, climate and abundance of wildlife hosts. The study was conducted in Lundazi and Mambwe districts in the Eastern Province as there were reports of AAT, and cooperation with district veterinarians.

Lundazi has a human population density of 22.4 people/km² whilst Mambwe has a population density of approximately 13.4 people/km². An increase in pressure on natural resources in the plateau area of the district has led to the relocation and expansion of the human population into the edges of the Luangwa valley expanding the wildlife-livestock interface. HAT cases have also occurred in the valley

Selection of variables

The vulnerability of a community has been defined as a product of exposure, sensitivity and capacity to adapt when an extreme event takes place. We consider exposure to AAT as the risk of AAT occurrence in the community which is influenced by climatic factors and the eco-epidemiology of the disease in the area. Sensitivity is defined by factors influencing the potential impact of AAT in the community, for example the susceptibility of cattle breeds, and the relative importance of cattle. Adaption refers to current measures to reduce the impact of the disease, either through the actions of farmers, governments or local authorities.

The first step for the MCA was to identify variables likely to be associated with the exposure, sensitivity and adaption to AAT in an area. This was done using existing literature and the available field data. It was based on two principal criteria: firstly, the relevance of variables to the objective of the assessment and secondly, the completeness of data collected.

Multiple correspondence analysis (MCA) and cluster analysis

MCA is a data reduction technique (similar to factor analysis or principle components analysis) which allows complex patterns in a dataset of categorical variables to be identified. Briefly, MCA provides a graphic representation describing the relationships

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between categories of variables and creates factors which describe the variation in the data.

This technique allows variables exhibiting little variation between the communities to be excluded and those which vary the most between communities to be identified. This technique has previously been used to identify biosecurity profiles of farms.

MCA was performed on the selected variables at community level using the Indicator method. The coordinates of each community were calculated on three dimensions explaining 47.1 per cent of the variance and HCA was then performed on the selected dimensions using Ward's method to aggregate areas into relatively homogeneous subgroups or profiles.

Cluster analysis

The results from this study were then compared to previous surveys available in the study areas. Cluster 1 appeared to be vulnerable to AAT and prevalence's as high as 35.4 per cent have been reported in the Adamawa Plateau study areas. Burkina Faso study areas appeared to have the lowest AAT prevalence, and these communities were the most likely to be using trypanotolerant breed.

Some communities in Uganda (Cluster 3) reported rare AAT occurrence, though others reported it as frequent or constant. Previous prevalence estimates of AAT in Uganda were higher than the majority of other study areas, however, these studies were conducted in markets and may represent a higher risk population. Cluster 3 also included Ethiopian communities, in some areas close to the study region farmers have ranked the importance of the disease as "moderate" and prevalence estimates were around 8.7 per cent. This is likely due to the establishment of the Southern Tsetse Eradication Programme (STEP). Further work is needed to assess how farmers' perceptions of the disease compare with the epidemiology of the disease in different areas.

The variables considered in the analysis were assumed to describe the vulnerability of a community to AAT and this information could help target communities to receive support to implement control options. Given the heterogeneity across communities studied, in some communities farmers may be successful at managing the disease on their own. In clusters 2 and 3 farmers have developed some strategies to manage the disease, such as restricted grazing or the use of trypanotolerant cattle. Whereas for some cattle-owning communities, for example those in cluster 1 experiencing treatment failure or high mortalities, the vulnerability may be so high that considerable external support and investment is needed to reduce the trypanosome burden.

However, the study used data provided by cattle-owners and did not investigate parasitological prevalence or surveys of tsetse. The results should be integrated with other data e.g., recent tsetse and unbiased cattle prevalence surveys and interviews with managers of AAT control to investigate the relationship between these data sources and the burden reported by cattle-owners.

Farmers are heavily reliant on chemotherapy for AAT control. Trypanocide use was ubiquitous throughout the study areas and therefore showed no association with any particular cluster. In these communities there appeared to be a lack of vector control. Alternative control measures, such as ITC or live bait technologies, screens, traps and targets may represent a cost-effective alternative to trypanocides. Although in some communities there may have

Cluster 1: Cameroon	<ul style="list-style-type: none"> • AAT constant with trypanosensitive communal grazing cattle (and some cross breeds) • Livestock primary income and largest herd sizes • Farmers most likely to diagnose & treat AAT with frequent treatment failure & concerns over drug quality • Good knowledge of control but little traps/targets reported
Cluster 2: Burkina Faso, Zambia & Ethiopia	<ul style="list-style-type: none"> • AAT constant with seasonal pattern, some trypanotolerant breeds & communal grazing • Moderate herd sizes with crops primary income source and losses to draft reported • Slightly higher mortalities & moderate costs diagnosing and treating • Less likely to report treatment failure • Low knowledge of control and no tsetse traps/targets reported
Cluster 3: Uganda, Ethiopia & Zambia	<ul style="list-style-type: none"> • Moderate AAT challenge, trypanosensitive, some tethering • Smallest herd sizes with mixed farming primary source of income • Good knowledge of tsetse control and some traps/targets reported • Some concerns with resistance and losses to draft reported • Most likely to keep pigs and some sheep and goats

been a lack of awareness of these tsetse control methods (particularly in cluster 2), farmers face a collective-action dilemma when it comes to the financing and organising of community-level interventions. These areas may benefit from governmental or institutional interventions to provide community-level tsetse control or to help mobilise communities to organise themselves and adopt technologies from which all community members may benefit. Cost-recovery schemes have had some success, but depend on financial resources of the farmers and the perceived benefits of the initiative.

In Ethiopia a cost-recovery scheme was initiated in an area with high trypanocide resistance consisting of monthly pour-on application with cypermethrin and chemotherapy. In the study area an average decrease of 57 per cent in calf mortality (including stillbirths) by 12 months of age and an increase of 8 per cent in the body weight of adult males was observed, suggesting that the scheme was successful.

In some communities cattle production is unlikely to be sustainable due to the high tsetse-trypanosome burden and lack of herd or community-level control of the disease due to lack of resources or technical capacity. In these communities, farmers explore alternative sources of income. This is the case in the valley study area of Lundazi (cluster 2), where access to markets and veterinary services are poor and farmers co-exist with an expanding wildlife and tsetse population.

There are few-cattle owning households in this region, and primary source of household income tends to be from crop production. Here communities tend to keep trypanosensitive Angoni breeds whose draft power provision is greatly reduced by AAT. Some farmers in Burkina Faso managed the disease by using the trypanotolerant Métis or Baoule cattle breeds; similarly, the introduction of trypanotolerant breeds may be of benefit in Zambia. However, trypanotolerant breeds are considered to have reduced traction which is the main use of cattle in this area, although this may be offset in areas with high morbidity and mortalities in trypanosensitive draft animals.

Where seasonality allows, an alternative management strategy to reduce the risk of AAT is to only graze in tsetse infested areas in certain times of the year. In the case of Cameroon, which was mainly represented by cluster 1, farmers manage the disease by only entering the valley region during the dry season where AAT risk is at its lowest. The majority of farmers kept trypanosensitive Fulani and Gudali cattle, therefore perhaps the use of trypanotolerant cattle would also reduce the impact here. Although farmers in the region have a strong cultural preference for the traditional Fulani breeds. Trypanotolerant breeds such as N'Dama of West Africa may have comparable productivity in terms of meat and milk to trypanosensitive breeds in areas where AAT burden is high, and the

Where seasonality allows, an alternative management strategy to reduce the risk of AAT is to only graze in tsetse infested areas in certain times of the year.

majority of cattle in the Cameroonian study areas are kept for this purpose. Few communities kept a large proportion of trypanotolerant breeds, and those that did were mainly communities of Burkina Faso in cluster 2, it is estimated that there were 11.68 mn trypanotolerant cattle in 1998 of which 11 mn were in West Africa and 0.68 mn in Central Africa.

Communities in cluster 1 reported no tsetse control, despite the Mission spéciale pour l'éradication des glossines (MSEG) running low level control operations for many years. However, there are only a small number of traps and targets in the cleared area and buffer zone in the Faro et Deo region of Cameroon (personal communication: MSEG). The MSEG also reported some bi-annual trypanocide and ITC campaigns before and after transhumance. However, the majority of cattle-owners are responsible for AAT diagnosis and administration of trypanocidal drugs. The farmers in these communities reported frequent treatment failures. Around a third of communities here, and in cluster 3, attributed treatment failure to misdiagnosis.

The evidence as to whether farmer-based diagnosis and treatment is satisfactory is conflicting and will vary between communities depending on experiences and training received. In a previous study in Busia in Kenya farmers underestimated the bodyweight of 85.7 per cent of cattle by an average of 46.9 per cent, which has serious implications for the development of trypanocide resistance.

Ideally, livestock owners should be encouraged to use trained veterinarians and veterinary assistants to diagnose and treat the disease. However, an estimated 35mn trypanocide doses are administered every year, large numbers of animals can be affected

in certain seasons and many communities with the disease are in more remote areas close to national parks or game reserves where access to veterinary services may be reduced. Training of farmers and selected individuals in the community (CAHWs) can be highly effective to improve diagnosis and ensure correct dosing, although this can be expensive. Following privatisation of the veterinary services in many SSA countries, CAHWs are increasingly used by livestock owners, particularly in remote communities. Providing tools such as weigh-bands to estimate correct dosing for cattle could also be of use in these communities.

Trypanocide resistance was the main reason attributed to treatment failure in cluster 2, and second most cited reason in clusters 1 and 3. Trypanocide resistance may be linked to under-dosing, or drugs containing insufficient quantities of the active compound. Problems with the drugs were mentioned as a major reason of treatment failure by cluster 1 communities. A study found that 69 per cent of trypanocides purchased from legal and illegal markets in Cameroon failed to comply with pharmaceutical requirements, with 42 per cent due to insufficient quantities of the active ingredient.

This study only considered AAT and not HAT, in areas where both diseases overlap efforts between animal and public health officers should be coordinated. For example, the Stamp Out Sleeping Sickness campaign was a public-private partnership designed to target the cattle reservoir of *T. b. rhodesiense* in newly affected areas of Northern Uganda by block treating around 180,000 head of cattle. Communities in Uganda were also the most likely to keep pigs and the prevalence of *T. brucei* of pigs in the Iganga study area has been reported to be around 8.1 per cent. ^(E)



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There are scores of different *Phytophthora* species and it should come as no surprise, given their reliance on and love for water, that humid tropics has more than its fair share of species. Dr Terry Mabbett reports.

Stemming *Phytophthora* canker disease in cocoa



PHYTOPHTHORA PLANT PATHOGENS are enigmas. Following their discovery in the nineteenth century they were classified as fungi (originally Class Phycomycetes and latterly Oomycetes) and dubbed by mycologists as 'water fungi' or 'water moulds' due to a 'love' for and reliance on water, both liquid water on leaf surfaces and water vapour in the air, for infection of the host plant, sporulation and dissemination of disease. They were recently re-classified and placed in a group alongside the algae which taxonomists said they were closest to, both morphologically (in form) and anatomically (by structure).

That said, *Phytophthoras* still have much in common with true fungi by looking and behaving like fungi and most notably as the causal agents of most diseases of green plants including many economic crop plants. *Phytophthoras* are now more accurately described as fungus-like plant pathogens.

There are scores of different *Phytophthora* species and it should come as no surprise given their reliance on and love for water that humid tropics has more than its fair share of species. Most

widespread as a plant pathogen and notorious for its wide host range and the extent of damage caused to economic crop plants is *Phytophthora palmivora*.

Among the many hosts of *P. palmivora* are oil palm, coconut, papaya, rubber, citrus and mango although cocoa (*Theobroma cacao*) is by far the worst affected of all mainstream tree crops. Cocoa crops in the hot humid climate of West Africa, in countries like Nigeria, Ghana and Cameroon, is the worst affected of all, including that in other main cocoa production regions such as south and South East Asia and South America.

West African cocoa worst hit by *Phytophthora*

West African cocoa is burdened by additional disease-causing *Phytophthora* species and notably *Phytophthora megakarya* and proven to be much more pathogenic (virulent or aggressive), and therefore more damaging, than *P. palmivora*. During the past 30 years *P. megakarya* has spread throughout the cocoa growing areas of West and Central Africa to rapidly overtake *P. palmivora* in

economic importance. *Phytophthora megakarya* has its own epidemiology including capacity to persist and sporulate on cocoa debris in the soil, as well as on pods still attached to the tree.

Phytophthora plant pathogens cause two completely different and distinct types of disease on trees. The first and most well-known is a fast-moving and all-consuming dark necrosis of the foliage (fruit or pods in the case of cocoa) and the second is a wet necrosis of the bark usually affecting the main stem (trunk or bole) and main scaffold branches. These diseases are called *Phytophthora* pod rot (black pod) and *Phytophthora* stem canker of cocoa.

In general, leaf or fruit infection is invariably accompanied by sporulation (production of asexual spores called sporangia). Tree host species thus affected are termed 'sporulation hosts', whereas tree hosts on which bark necrosis (stem canker) is the only type of disease recorded, and without sporulation, are called 'terminal hosts'. *Theobroma cacao* is a bit of an exception if not unique because cocoa trees suffers pod infection with sporulation but also stem/bark necrosis, and thus have to cope with the 'worst of both disease worlds'.

Phytophthora pod rot disease has the capacity to destroy a whole season's crop of cocoa pods but as a rule will not kill the tree, whereas *Phytophthora* stem canker and bark necrosis if left

Among the many hosts of *P. palmivora* are oil palm, coconut, papaya, rubber, citrus and mango although cocoa is by far the worst affected of all mainstream tree crops.



Image Credit: Dr Terry Mabbett

Low hanging pods are especially vulnerable to infection by *Phytophthora*.

unchecked girdles the tree trunk and eventually kills the tree. Stem canker phase of the disease is therefore the most damaging especially in the longer term and especially since cocoa trees when well looked after can be expected to yield profitable crops for at least half a century. Despite the longer-term economic consequences of the stem canker disease phase of *P. palmivor*, this disease dimension generally receives far less attention than *Phytophthora* pod rot disease, probably because the latter is the more immediate threat to a current year's crop.





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Inoculum reservoirs and dissemination

Multiple factors have combined to secure the supreme success of *Phytophthora* as a pathogen of cocoa, and none more so than pathogens' ability to build up a large reservoir of inoculum and freely spread by the very high rainfall levels experienced by cocoa for at least part of the year in West and Central Africa. Inoculum reservoirs build up mainly from sporulation on infected pods in the canopy, with the spore load transferred down through the canopy in rain drops, drips, splashes and rivulets to create new infection foci further down the tree. If sporulation occurs on infected cocoa debris in the soil, then a two-way transfer of inoculum may occur with spores splashed up and onto the tree trunk and low hanging pods during heavy rainfall.

These *Phytophthora* pathogens are primarily wound pathogens so damage to bark during routine operations including pod harvest and mechanical weed control using sharp implements should be avoided. However, another route for the development of stem canker is thought to be via the flower cushions. *Theobroma cacao* exhibits an unusual though not rare mode of flowering called cauliflory with flowers and the newly formed pods (called cherelles) borne directly on the trunk and main branches and from areas of raised bark tissue called flower cushions.

Cocoa cherelles are very susceptible to *Phytophthora* infection which may subsequently move down the pedicels (pod stalks) and into the cushions to initiate stem canker disease. Whether originating from spores washed down through the canopy or spores splashed up from the soil, stem canker is most likely to establish in the lower regions of the canopy where humidity is always at its highest. The lower the site of stem canker disease on the tree, the more likely is the tree to die if stem cankers are not excised and exposed wood treated with fungicide.

Phytophthora control in cocoa

Good hygiene including removal of all diseased pods, not only from the tree but also from the plantation is essential although



Image Credit: Dr Terry Mabbett

fungicide spraying has always been, and still is, the only practical option of reducing inoculum levels and protecting cocoa trees and pods. And it is amazing to think that a copper-containing compound was the first fungicide used in West Africa to control and manage *Phytophthora* on the island of Fernando Po (now called Bioko in Equatorial Guinea) at the end of the nineteenth century.

That fungicide was Bordeaux Mixture a gelatinous complex



Image Credit: Trond Kristiansen/Nordox

formed by mixing blue hydrated copper sulphate and calcium hydroxide (slaked lime). However, the majority of contemporary copper-based fungicide now comes from a range of fixed copper compounds, of which cuprous oxide, cupric hydroxide and copper oxychloride are three mainstream examples. The term 'fixed' describes the sparingly soluble property of these fungicides, a factor which sees these products really come into their own as foliar sprays to control *Phytophthora* in cocoa.

This is because they are able to form inherently tenacious deposits on cocoa pod surfaces to protect against *Phytophthora* infection even under the most intense tropical rainfall conditions. Furthermore, the fungicidally-active copper ion (Cu^{2+}) is released gradually from the fungicide deposit and residue and then redistributed down through the canopy to offer continual longer term protection of a wider area of the tree canopy. And in all probability, copper ions are redistributed in the same water sources (drops, drips and rivulets) that contain the *Phytophthora* spores.

Established stem cankers are traditionally treated by carefully excising all diseased wood using, for example, a small chisel and light-weight hammer to leave a clear area of clean disease-free wood around the periphery of the excised area of bark. This is painted over with a canker paint comprising a fixed copper

Cocoa cherelles are very susceptible to *Phytophthora* infection which may subsequently move down the pedicels (pod stalks) and into the cushions to initiate stem canker disease.



Image Credit: Trond Kristiansen/Nordox

Phytophthora stem cankers are excised using sharp tools to expose clean, disease-free wood before applying cuprous oxide canker paint.

fungicide mixed with sticker for extra adhesion. A layer of petrolatum grease can be applied over the whole area to completely seal off the 'wound' and protect the canker paint from erosion by rainfall and water running down the main branches and trunk of the tree. Nordox cuprous oxide is currently used as a canker paint to control *Phytophthora* stem canker on cocoa in Southeast Asia with a high degree of success. ¹⁰



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It is estimated that the fall armyworm in Africa could cause maize yield losses of up to 20.6mn tonnes per annum in 12 of Africa's maize-producing countries, with 40 African countries already infected.

CABI outlines three urgent action areas to implement before 2020

IN RESPONSE TO the growing threat of invasive species, the Centre for Agriculture and Biosciences International (CABI) has called for urgent action to tackle the global spread of invasive species, even as the recent fall armyworm outbreak casts doubts over Africa and Asia's preparedness to fight the scourge.

The call was made at the 2018 Africa Green Revolution Forum (AGRF) in Kigali, Rwanda, by CABI's director general for development, Dr Dennis Rangi. His announcement follows publication of CABI's insights paper: *Invasive Species: The hidden threat to sustainable development* at AGRF and this year's launch of CABI's Action on Invasives programme.

The ultimate goal of the programme is to enable developing countries to prevent or detect and control invasive species in order to protect and restore agricultural and natural ecosystems, reduce crop losses, improve health, remove trade barriers and reduce degradation of natural resources, infrastructure and vulnerable areas.

Centre for Agriculture and Biosciences International is a not-for-profit organisation that draws on scientific expertise to solve problems in agriculture and the environment.

"We are falling behind, and progress is currently too slow to achieve the ambitious targets set by the international community. If we do not accelerate progress on these critical issues, further outbreaks cannot be prevented," says Dr Rangi. "We believe the international community needs a renewed commitment to implementing change and investing in measures that will help countries become better prepared to handle the impact of any new invasive species outbreak."

The organisation has recommended three critical areas for urgent action:

National strategy and planning – every country must have an invasive species strategy and action plan in place by 2020



Caterpillar has a voracious appetite and is known to eat 186 plant species from 42 families.

Image Credit: Adobe Stock

including a national priority list identifying their highest outbreak risks and targeting national efforts accordingly

Increased investment in tackling invasive species – making this a cross-government priority and an integral component of development projects to help fund important initiatives like the need to harness big data

Lower risk management methods – development of policy/regulation that encourages the use of lower risk management methods (biocontrol, Integrated Pest Management (IPM).


The Action on Invasives programme has already been piloted on specific species in Ghana and Pakistan, with support and funding from the UK's Department for International Development (DFID) and the Netherlands' Directorate-General for International Cooperation (DGIS). It is now being scaled up so that people around the world can fulfil their potential and help their countries prosper.

The fall armyworm – a moth indigenous to the Americas – has been spreading rapidly across Africa since 2016. While just 12 African countries had confirmed the presence of fall armyworm a year ago, today there are over 40 African countries infected by the pest.

It is estimated that the fall armyworm in Africa has the potential to cause maize yield

losses of up to 20.6 mn tonnes per annum in 12 of Africa's maize-producing countries. This represents nearly 53 per cent of annual production. The value of these losses is estimated to be up to US\$6.2 bn. This despite the fact that maize is the most important staple cereal crop grown by smallholders in sub-Saharan Africa and is the dominant cereal grown in most other African countries.

In Africa, fall armyworm is best known for eating maize, but the caterpillar has a voracious appetite and is known to eat 186 plant species from 42 families, including rice, sorghum and sugarcane, as well as cabbage, beet, peanut, soybean, alfalfa, onion, cotton, pasture grasses, millet, tomato, potato and cotton.

"CABI believes the Action on Invasive programme will contribute to improving people's livelihoods and food security, as well as countries' trade opportunities and commitment to environmental protection. This in turn will support the United Nations' SDGs, the International Plant Protection Convention and the Convention on Biological Diversity. CABI is asking the global community to commit to reducing the impact of invasive species and we invite everyone to support the Action on Invasives programme in any way they can," explains Dr Rangi. 

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The mandate of the organisation is to promote, streamline, coordinate and regulate all aspects of research in agriculture and livestock development, says Dr Eliud Kireger, the director general of KALRO.

'We are undertaking cutting-edge research on a wide range of areas'

Let's start with some background on KALRO, your mission and your role there

Kenya Agricultural and Livestock Research Organisation (KALRO) is the premier national agricultural research organisation mandated to conduct agricultural research of strategic and national importance and produce public goods in the form of technologies, information and new knowledge.

What KALRO projects are you most excited about?

We are undertaking cutting edge research on a wide range of areas including staples, horticulture, livestock/dairy, natural resource management, climate change and socio-economic issues. We are particularly excited by our research outcomes such as development of a highly effective local bio-control product called aflasafe KE01 that cuts down aflatoxin levels by over 80 per cent, development and dissemination of dryland crops such as; sorghum, pigeon peas, cowpeas, pearl millet, finger millet and chickpeas among others.

KALRO was established by merging Kenya Agricultural Research Institute, Kenya Sugar Research Foundation, Tea Research Foundation of Kenya and Coffee research Foundation.

In livestock health, we have secured major milestones including the recent development of a new vaccine against the contagious bovine pleuropneumonia (CBPP).

In dairy, we are the host of the regional centre of excellence for research and development under projects supported by World Bank. We have a regional resource centre for scientists, milk processing plant for technology demonstration and value addition, and well equipped laboratories. We have specialised in development of



Image Credit: Adobe Stock

Farmers lack modern agricultural production skills and knowledge and do not have adequate access to financial and other supportive service in Kenya.

adapted Friesian and dual purpose Sahiwal cattle breeds, and their crosses, to expand dairy production to low potential agro-ecosystems. Our beef cattle programme is breeding and studying Boran cattle production systems. In poultry, KALRO's improved indigenous chicken is in high demand.

In your view, what are the main challenges to the agri sector in Kenya?

Like many African countries, Kenya's agriculture sector is faced with many challenges that include climate. Only 20 per cent of the country's land is arable under rain-fed, while production and productivity of major crops is still low due to minimal use of improved varieties and other agricultural inputs. Farmers lack modern agricultural production skills and knowledge and do not have adequate access to financial and other supportive services. Consequently, the majority of the smallholder farmers continue to be poor and food security remains threatened despite our efforts to build the economy.

We have poor mechanisms and infrastructure for sharing and exchanging agriculture knowledge generated from research at national and regional levels which at times result to duplications, hence further constraining meagre resources available for agricultural development.

We also have the inefficient mechanisms

and infrastructure for transferring technologies to either directly or through intermediaries. Knowledge and technologies fostering agricultural production and environment conservation are examples.

Although many extension documents are produced by national agriculture research and extension systems to inform farmers about the latest recommendations concerning different agricultural practices, these documents are not sufficiently disseminated, updated or managed to respond to the needs of extension workers, advisers and farmers.

This is also true for technical reports, books and research papers related to production. Forums like the one we are organising will provide us with an opportunity to share information and knowledge with all the actors in the agricultural value chain.

What is your vision for the agriculture sector in Kenya?

We are implementing Kenya's development blueprint, the Vision 2030 and the government's Big Four agenda where the agriculture sector is recognised as one of the key drivers of our economic growth. The aim is to transform Kenya into "a newly industrializing, middle income country providing a high quality of life to all its citizens in a clean and secure environment". **E**

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The advantage of the field research unit is that it can be deployed in market, close to the source of produce, and at any stage of the supply chain from the orchard through to the point-of-sale.

Compac launches field research unit for fresh produce industry

COMPAC, PART OF TOMRA Food, has launched a new field research unit which can be deployed directly into the field to research the industry's most challenging fresh produce issues. The state-of-the-art laboratory, which is equipped with a broad range of sophisticated analytical sensor technologies from across TOMRA, is the first of its kind for the fresh produce industry. The field research unit was launched at the 10th Citrus Research International Symposium in Drakensburg, South Africa (19-22 August).

Compac delivers packhouse automation systems for sorting fresh produce (fruits and vegetables) based on weight, size, shape, colour, surface blemishes and internal quality. Compac and TOMRA have research and sensor development centres in Europe and New Zealand, however there can be challenges accessing produce, particularly with shipping restrictions associated with infected and diseased produce.

The main advantage of the field research unit (FRU) is that it can be deployed in market, close to the source of produce, and at any stage of the supply chain from the orchard through to the point-of-sale. The data collected can be analysed to improve produce-sorting and decision making throughout the supply chain, as well as helping to drive new technology research and future product development.

The FRU is equipped with benchtop spectrometers, hyperspectral imaging equipment, texture analysers, the new Compac Inspectra2 internal inspection system for fresh produce, and the TOMRA QVision optimised for protein, moisture and fat analysis. A converted 40-foot shipping container is used to facilitate easy transport to hotspots where fresh produce needs to be investigated.

"Compac's new project is a welcome initiative for the citrus industry and we look forward to being able to work with the unit in advancing this important technology within the citrus industry", said Dr Sean Moore, IPM Portfolio Manager with Citrus



Compac provides integrated post-harvest solutions and services to the global fresh produce industry.

Research International, during the event.

The four-day CRI Symposium is a biennial gathering to share findings of recent research conducted on behalf of the southern African citrus industry and features an international mix of keynote speakers.

Dean Barker, director of Research & Development Projects at Compac, commented: "For our customers, the field research unit has the unrivalled convenience of bringing a sophisticated test laboratory right to their front door. This is confirmation of Compac's agile response to customers' needs."

The demands of feeding the growing global population are driving the need to know more about each piece of produce as it is sorted in the packhouse and in repack centres. Advanced Compac sensors are already deployed in packhouses but measuring other attributes can further improve sorting to optimise productivity, reduce waste and maximise customer value.

Compac provides integrated post-harvest solutions and services to the global fresh produce industry using the world's most advanced grading technology. Combining industry leading solutions with award-winning grading platforms like Spectrim, the company's mission is to enable its customers to improve returns, gain operational efficiencies, and ensure a safe food supply via smart, usable

technologies. To achieve this, Compac operates centres of excellence, regional offices and manufacturing locations within the United States, Europe, South America, Asia, Africa and Australasia.

The state-of-the-art laboratory, equipped with a broad range of sophisticated analytical sensor technologies from across TOMRA, is the first of its kind for the fresh produce industry.

Compac is a member of the TOMRA Group, founded in 1972. It began with design, manufacturing and sale of reverse vending machines (RVMs) for automated collection of used beverage containers. Today, TOMRA has more than 90,000 installations in over 80 markets worldwide and had total revenues of more than US\$740 mn 2016. The group employs around 3,500 personnel globally and is publicly listed on the Oslo Stock Exchange. The TOMRA Group continues to innovate and provide cutting-edge solutions for optimal resource productivity within two main business areas: Collection Solutions (reverse vending and material recovery) and Sorting Solutions (recycling, mining and food sorting). 

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Food warehousing and logistics: represent a growth market as new investment targets an expanded role in agricultural production, Martin Clark reports.

Africa's agricultural warehousing potential

INVESTORS ARE SHOWING renewed interest in Africa's food logistics sector as attempts are made to elevate overall agricultural commodities trade.

Despite the emergence over the past 20-plus years of overnight fresh produce delivered from African farms direct to European supermarkets, experts believe the continent's agricultural potential has barely been touched.

Africa has been a net importer of agricultural products for some decades, mostly characterised by a small number of primary commodities, such as cocoa, tea and coffee. The goal is to reverse that and restore the continent as a net agricultural exporter. This would mean a greater need for storage and warehousing facilities, and a much-improved logistics chain generally.

Agriculture accounts for 15 per cent of Africa's GDP, and is the main source of income for 90 per cent of rural population.

New joint venture

It is not hard to find examples of how Africa's agricultural sector is evolving, bringing with it high profile investors.

US Nasdaq-listed S&W Seed Company recently teamed up with AGT Foods Africa, a subsidiary of Canadian-based AGT Food and Ingredients, to form a new joint venture SeedVision SA registered in South Africa.

The new company will leverage AGT Foods Africa's production and processing facilities to produce S&W's hybrid sunflower, grain sorghum and forage sorghum for sale by SeedVision across the African continent, as well as in the Middle East and Europe.

AGT Foods Africa will utilise its production resources in South Africa, Zambia and Tanzania, and its seed cleaning and warehousing facilities at Krugersdorp, South Africa.

AGT boss Murad Al-Katib said Africa represents a large untapped market for its products and to help meet global food production needs.



Image Credit: AGT Foods Africa

He said, "This new joint venture allows us to extend our major processing and distribution assets in southern Africa to grow opportunities for more targeted agricultural production of these important crops in the region."

AGT is one of the largest suppliers of value-added pulses, staple foods and food ingredients in the world, while S&W provides expertise in agricultural breeding, production and processing for the alfalfa, sunflower, sorghum species, and stevia industries.

Foreign investment

Increased interest in Africa's agricultural sector is bringing with it investment from major players.

Export Trading Group (ETG), the largest independent agricultural-commodity supply chain manager in Africa, announced at the end of 2017 that it had agreed to introduce Japan's Mitsui & Co as a strategic minority investor.

The deal brings with it an investment worth US\$265mn.

Founded in 1967, ETG has 6,600 employees across 36 countries globally and operates 71 processing plants and more than 300 warehouses.

The company sources crops such as pulses, sesame and raw cashew nuts from smallholder farmers across Africa, aggregating, processing and distributing them across its network around the world.

ETG also maintains depots for containerised cargo at strategic ports, including Dar es Salaam, Mombasa, Beira and Durban.

The group's pan-African warehousing capacity stands at more than 1.8 million MT across 23 different countries. Investment in cold storage facilities is also on the rise. Shipping giant Maersk recently introduced containerised cold storage facilities for Kenyan agricultural exporters.

The move paves the way for more exports of avocados and other fruits across major markets in Europe and the Middle East, the company says.

Commodities market

While there are signs of a revival in Africa's agricultural sector, and in exports, the continent still relies on vast quantities of imports.

Main ports, such as Mombasa are handling huge levels of foodstuff imports, including crops such as wheat and maize, as well as fertiliser products and other farming inputs. It also accounts for approximately 20 per cent of total export value.

But there is ample scope for more.

A recent AfDB report highlights the need to create a better functioning agricultural market one that includes millions of smallholder farms across the continent to boost local trade and enhance production.

The report, Africa's Agricultural Commodity Exchanges, Warehouse Receipt Systems and New Standards, says ensuring market inclusion for all, even the smallest farms, is a prerequisite for driving long-term growth. It says the sector is underperforming. **E**







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The African continent has the largest proportion of women entrepreneurs.

Women entrepreneurs face cultural and gender biases that restrict them from opening or expanding their own businesses, says Dr Jemimah Njuki, senior programme specialist at Canada's International Development Research.

A clarion call to break the glass ceiling in agribusiness

THE AFRICAN GREEN Revolution Forum 2018 has just ended in Kigali Rwanda. And befitting of the progress the country has made in gender equality and women's empowerment – a day before the event, the country held parliamentary elections and the proportion of women elected to parliament rose from 64 per cent to 67 per cent — a group of organisations came together to put a spotlight on women in agribusiness.

At the meeting, I told the story of three women, Charity, Loise and Jane. In 2012, they founded Exotic EPZ Limited, a company which processes macadamia nuts for export.

When they decided to go into business together, nobody took them seriously. The banks said that as women with no property or land for collateral, they were too big a risk for a loan. The farmers they contacted were skeptical about women surviving in international trade, a business where "even men had failed". But they were determined. They pulled together their savings,

borrowed from friends and family. They started with 7.5 tonnes of shelled nuts each month. They have now doubled that capacity and employ over 100 people, most of them women, and have created a market for thousands of smallholder macadamia farmers.

The story of Charity, Loise and Jane is a story of the huge opportunity that women agribusinesses present, but it is also a story of the challenges and gender barriers that women still face.

Story of Charity, Loise and Jane is a story of the huge opportunity that women agribusinesses present, but also a story of the challenges and gender barriers that women still face.

Food production and processing in Africa currently generates over US\$300bn annually, and this figure could rise to US\$1 trillion a year by 2030 if farmers were given the right access to inputs and resources. Women must be part of this business and can contribute immensely to it if they are provided with the right resources. And women are already involved in the agriculture and agribusiness. Across the continent, 68 per cent of economically active women are in the agricultural sector. The continent has the largest proportion of women entrepreneurs.

However, no country in Africa has achieved parity in business ownership. Ghana has the highest proportion at 46.4 per cent of total businesses owned by women, followed by Uganda at 33.8 per cent and Botswana at 24.5 per cent. And women still face numerous challenges in growing their agribusinesses. Despite expansion of microfinance organisations that are now reaching millions of women,

research shows that the financing gap for women owned small and medium enterprises is about US\$20 bn. Women are still less likely to have bank accounts. In Zambia for example, only 26 per cent of women farmers have a bank account, compared to 49 per cent of men.

And even when women apply for loans, they are less likely to be successful than men. SCORE, a nonprofit association dedicated to helping small businesses get off the ground, grow and achieve their goals through education and mentorship released a study on women owned businesses that showed that while 59 per cent of businesses owned by women would like financing, only 25 per cent sought the finance. And of those 25 per cent, only 31 per cent were successful.

Having young children can be a huge hindrance to women starting a business or seeking employment away from home.

There are other challenges beyond access to finance. In 2017, the International Development Research Centre, commissioned a series of studies to better understand barriers to women's financial inclusion. Results showed that, women entrepreneurs faced cultural and gender biases that restrict them from opening or expanding their own businesses. Society is still less receptive towards female entrepreneurs because they are not perceived as having the same level of know-how as men.

Family responsibilities are also a challenge. For example in informal urban settings, having young children can be a huge hindrance to women starting a business or seeking employment away from home. Results also showed that even for



Dr Jemimah Njuki

women already in agribusiness, getting connected to global value chains was a huge challenge due to societal perceptions.

There are actions that we can take to support women to grow their businesses.

First, we need to recognise that financial inclusion interventions are not gender-neutral and the uptake and usage gaps would be reduced if products and services suited women's needs and priorities. A lot of efforts have been put into trying to make women bankable, training them, organising them into groups among other interventions. We need a paradigm shift. We now need to make financial institutions woman-able. Financial institutions usually have products that have population wide benefits. And women have benefited from these. But faced with gender barriers, there is need for innovations that meet the specific needs and priorities of women.

Second, recognising the multiple needs of women owned businesses beyond financial inclusion and bundling services that they need. Combining financial

services, skills such as financial literacy, linking to business support services and mentoring can help women-owned businesses thrive and grow. Research that we have been funding at the United States International University in Kenya has shown that when you only offer skills training to business owners, the likelihood that their businesses will be successful is 57 per cent. This increases to 93 per cent when you combine training, mentoring and business support services.

Third, integrating women in national and global supply chains as that has been successful is integrating suppliers of raw materials, as aggregators and as processors is key to enabling women to thrive.

In Kenya and Uganda for example, over 20,000 women smallholder farmers are supplying beans to a company that is doing industrial precooking of beans. The factory produces the beans and supplies to supermarkets and institutions. Women producers get a market for their beans, act as aggregators using ICTs and get improved seeds and inputs to increase their productivity.

And finally, recognising that women are not homogenous goes a long way. We need to understand entrepreneurship barriers for different types of women in order to have interventions that work for them. Addressing the childcare needs of young women for example can increase their participation in employment and agribusiness. In the informal settlements in Kenya, providing childcare services to young women, has increased their rate of employment and rate of starting business away from their homes. ¹

Dr Jemimah Njuki is a senior programme specialist at Canada's International Development Research and an Aspen New Voices Fellow. She publishes on issues of gender equality, women and girls. Follow her on Twitter @jemimah_njuki

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Ethiopex has become a fully fledged international event meticulously planned to provide an upbeat, pioneering and value-based platform for the poultry sector stakeholders to gather under one roof.

Two-day poultry expo Ethiopex to kick off on 18 October

CHICKEN PRODUCTION HAS a major role in the economy of developing countries and backyard farmers particularly important for improving chicken production as a means to reduce poverty. Although Ethiopia has huge resources, the country is not receiving benefits from this sector due to poor productivity of local hens and cocks, undeveloped production systems and high disease prevalence, among many other reasons.

In Ethiopia, traditional practices continue to dominate domestic poultry production, however, there has been a shift to commercial production with an increase in small and medium-scale producers that have been established to exploit the urban demand in the past 20-25 years.

Chickens are the most popular poultry species used for meat and egg production in Ethiopia. Chicken and chicken products provide a valuable source of protein and income for the families.

The trends in the consumption of poultry products are major indicator of opportunities for investment. The total chicken population in the country is estimated to be 59.5mn with indigenous breed representing 90.85 per cent, hybrid chicken 4.76 per cent and exotic breeds 4.39 per cent (CSA, 2016/2017).

The inception of Ethio Poultry Expo is to provide the best possible exposure for the promotion and development of the most promising poultry sector in Ethiopia.

Chickens are the most popular poultry species used for meat and egg production in Ethiopia. They provide a valuable source of protein and income for the families.

Ethiopex has become a fully fledged international event meticulously planned to provide an upbeat, pioneering and value-based platform for the poultry sector stakeholders to gather under one roof, with an overall mission of accelerating the growth of the poultry sector in the country.

The event creates a platform for exhibitors to communicate, establish strong networks and transact with major sector stakeholders, professionals and business owners besides creating a platform to attain maximum exposure for their brands to increase revenue source.

The event has proved to be the major platform that fuels the growth of poultry sector through expansion of supply chains and veterinary services to improve the productivity and the economics contribution of the poultry sector. The sector plays an important role in poverty alleviation by means of income generation and household food security as it attracts various stakeholders in one place so they can share expertise and products. This prestigious poultry event has been backed by the Ministry of Agriculture and



In Ethiopia traditional practices continue to dominate domestic poultry production.

Image Credit: Adobe Stock

Livestock, Ethiopian Meat and Dairy Industry Development Institute (EMDIDI) and Ethiopian Poultry Producers-Processors Association.

Why Ethiopia?

- The fastest growing economy in Africa and fourth in the world (IMF 2018)
- 10.3 per cent GDP growth per year from 2005/06 to 2015/16 (World Bank)
- Forecast of real GDP growth 8.5 per cent in 2018 (IMF)
- Ethiopia is the largest economy in East and Central Africa
- Ethiopia aims to achieve middle income status by 2025

Opportunities in the poultry sector

- Increasing demand for poultry products
- A lucrative export market potential that awaits to be exploited
- Upcoming agro-industrial parks for value addition of poultry products
- Presence of laboratories which can cater for diagnosis of poultry diseases
- Availability of vaccine producer and quality lab (PANVAC) in the country
- Government plan to improve chicken meat production to 164,000 in the year 2020.

The event will be held at the Millennium Hall, Addis Ababa.
For more details: www.ethiopoultryexpo.com/ 

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The irony is that Africa is spending US\$35bn on food imports each year, which, if nothing is done, will rise to US\$110bn dollars by 2020, says African Development Bank president Akinwumi Adesina.

How to make agriculture work for Africa and the world

Image Credit: Adobe Stock



Africa has 65 per cent of all uncultivated arable land in the world to feed nine billion people by 2050.

AKINWUMI ADESINA, PRESIDENT of the African Development Bank, addressed Wageningen University & Research, a research facility located in the Netherlands. He was addressing delegates at the Sustainable Development Goals conference, which was held in Wageningen in August. He gave the opening speech at the conference under the theme of "Towards Zero Hunger: Partnerships for Impact." He was also involved in a high-level panel discussion on this theme with Paul Polman, CEO, Unilever, and Etharin Cousin, lecturer and Stanford University and former executive director of the World Food Programme.

Here is an edited version of Mr Adesina's address.

There are certain things we should never get used to. The abnormal should never become normal. Not having food is abnormal.

In the world today, the number of hungry people has increased from 777 mn in 2015 to 815 million people in 2016. In the case of Africa, climate change will add an additional 38 million people that are hungry by 2050, according to the International Food Policy Research Institute. Let's also be clear, we are not yet winning the war against global hunger and malnutrition. We have a moral responsibility to tackle this problem. It's one that we

can collectively address. In the case of Africa, there is absolutely no reason for food insecurity on the continent.

Africa has 65 per cent of all uncultivated arable land in the world to feed 9bn people by 2050.

Therefore, what Africa does with agriculture will determine the future of food in the world. The greatest agenda we have is how to unlock Africa's agricultural potential. As my late mentor, Dr Norman Borlaug used to say, "you cannot eat potential."

Let's talk about the opportunities in agriculture. First and foremost is the size of food and agribusiness in Africa, which will be a one trillion-dollar industry by 2030. Quite naturally, this is a money-making sector to help not only to feed Africa, but also to create an enormous amount of wealth for Africa. The irony is that Africa is spending US\$35 bn on food imports each year, which, if nothing is done, will rise to US\$110 bn dollars by 2020.

Just think of the Savannas of Africa. There are 400 million hectares of Savannah, of which only 10 per cent is cultivated. That is, a mere 40 million hectares.

If Africa can get the right tech to raise productivity, transform its savannas, turn agriculture into a business and address the issue of nutrition — Africa can feed itself in 10 years and contribute to feeding the world in the years to come.

What is the African Development Bank doing to unlock that potential?

- The Bank has launched the Feed Africa strategy, investing US\$24 bn in agriculture over the next 10 years. Our focus is scaling up technology to reach millions of farmers.
- As part of this plan, the Bank is building and developing agricultural value chains that will allow Africa to process and add value to everything it produces.
- Third, we support the production, distribution and availability of nutritious food to address malnutrition and stunting and finally,
- Turn agriculture into a wealth creating sector and not one for managing poverty.

Major programmes AfDB has rolled out.

- Technologies for African Agricultural Transformation (TAAT). This is a billion-dollar initiative the Bank is working on with several partners, including the Bill and Melinda Gates Foundation, the Consultative Group on International Agricultural Research (CGIR), the private sector, the International Fund for Agricultural Development (IFAD) and the Alliance for a Green Revolution in Africa (AGRA). TAAT is focused on making sure that existing technologies that can transform agriculture are taken off the shelves; We seek to impact 40mn farmers

with different commodities. TAAT is about technology without borders, and we have rolled out the programme in 15 countries.

- The second major programme is Enable Youth. This is an innovative strategy for getting younger people interested in agriculture. Better still, investing in a new generation of young commercial farmers, agribusiness entrepreneurs to make agriculture cool and attractive, and we are investing a US\$300 million in five countries.
- The third area of our investment is the African Leaders for Nutrition program, which is endorsed by African Union with a goal of developing an African nutrition index to rate and rank countries in terms of their progress on nutrition. The point here is to have political accountability on nutrition, because we know the solution to it and we want it to be scaled up. And to eliminate the scourge that has afflicted 54 million children today.
- I would like to say something about the savannahs. We have launched an initiative to transform Africa's savannahs using the best technology available and we have started in five countries already including 10,000 ha in northern Ghana.



African Development Bank president Akinwumi Adesina.

- And finally, we are investing in the idea of Staple Crop Processing Zones that will impact rural economies, enabling investments in infrastructure like power, water, and roads that will support private agribusiness and agro-allied industries to be located in and around the rural areas. This will add value to agricultural products

and turn rural economies from zones of economic misery to zones of economic posterity via agricultural industrialization.

- In conclusion, I believe these initiatives will help us significantly raise agricultural productivity and change the perspective on agriculture.
- They will get young people into agriculture, help to focus on the cultivation of nutritious foods and structurally transform agriculture into a dominant sector for food and nutrition security. The productive base of African economies will also be diversified even as they become competitive in the global markets through value addition to everything that they produce.
- At the end of the day, it is all about having partners on board, and involving stakeholders in the private sector, the CGIAR, national governments, civil society, universities and research institutions, financial institutions, multilateral and bilateral donors.

I just want to say that what the Bank does is in alignment with the development policy of the Netherlands. I am delighted to be here in the Netherlands with a great partner in agriculture. 

Image Credit: Akinwumi Adesina/Twitter



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Danfoss has helped a citrus farmer to water his citrus trees in a cost-efficient way. Solar-powered pumps driven by Frequency Drive provide an environmentally friendly, economical and robust solution.

Solar-powered irrigation for citrus trees in Morocco

IN MOROCCO, RAINFALL fluctuates sharply from year to year, and summer months are especially hot. On a citrus tree farm located between Marrakech and Casablanca, a farmer had used a gas engine to power the irrigation system. Replacing the gas tank regularly with a new one required labor work, time and money, and was dangerous due to a high explosion risk. It was also necessary to supervise that the system is working properly. Moreover, irrigation was needed for five to six hours a day, and gas is not cheap in Morocco. Danfoss Frequency Drive is versatile.

An efficient way to cut costs in irrigation is to use renewable energy and AC drive technology. Edil 9, an Italian system integrator in the construction business, visited Vacon's factory in Merano, where they were introduced to Danfoss Frequency Drive:

"We had heard positive news about other customers using the Frequency Drive in demanding application environments, and we were impressed by these references. That's why we thought that the Frequency Drive would be the right choice also for solar-powered irrigation systems, and we were right! Designed for tough environments, the Frequency Drive truly is very robust and is provided with the IP66/Type 4X outdoor enclosure with a die-cast metal frame. It can be installed outdoors without a problem! It also has highly advanced control capability which guarantees that processes run exactly how the end customer wants them to run in any environment or climatic condition," explains Paolo Mossali, technician and designer, Edil 9.

The Frequency Drive was selected for the solar-powered irrigation system for the citrus farm.

Frequency Drive starts to control the speed of the motors in the pumps, compressors or fans as soon as the sun comes up and continue to do so until the sun sets in the evening.

"Cooperation with Danfoss ran smoothly and Danfoss engineers are very competent in explaining the functionality of the drive in the solar-powered application," Mr Mossali concludes.

The solar-powered water pump system is reliable and enables an increased harvest and cost savings. The new system requires less work and brings also many other benefits:

- **Cost-efficiency:** the new system requires only three hours to bring the necessary water to the trees. This is half the time the old system required.
- **Clear savings:** buying expensive gas tanks, storing and replacing them and supervising the system are no longer needed
- **Improved safety:** no gas explosion risks
- **Environmental friendliness:** the new system is powered by solar energy

The solar-powered irrigation system is able to pump water at a rate of 10 m³/h and includes the following components:

- 21 panels/string, 2 strings, total of 10.5 kW without tracker
- 11 kW Frequency Drive
- 7.5 kW submersible pump (Caprari E6X) at a depth of 66 m to pump water from a well with a depth of 150 m (static level of 38 m and dynamic level of 44 m)

Solar-powered pumps are ideal for remote areas. Such applications are increasingly being employed in environments where electricity supplies are scarce or unreliable. They are used to power:

- Water pumps, to provide clean water for drinking and cooking or for irrigation
- Compressors, for refrigeration of food and dairy products




Image Credit: Danfoss

The solar-powered irrigation system is able to pump water at a rate of 10 m³/h

- Other applications including fans, for ventilation and air conditioning

Frequency Drives can utilise the maximum available energy from the photovoltaic solar panels in all situations. The drives start to control the speed of the motors in the pumps, compressors or fans as soon as the sun starts to shine in the morning, and continue to do so until the sun sets in the evening.

"AC-drive-controlled solar pump systems are ideal for irrigation, especially in remote areas. Proper irrigation will increase harvests which will provide farmers with a better livelihood. Frequency Drives have dedicated functionality to drive the solar-powered pump with an optimized efficiency," says Nicola Gomiero, product manager, Vacon Italy. 

The latest generation CP15 knapsack sprayer, the CP15 Evolution, can now be equipped with a revolutionary ergonomic carrying system with ultra-comfortable shoulder straps and waist belt to work better and longer.

CP15 Evolution: New ergonomic carrying system to ease workload

THE COOPER PEGLER products is part of Exel Industries, a group of companies that have become a leader in precision spraying techniques for plant protection products. Cooper Pegler products have been manufactured and distributed for the last 10 years by the French company Hozelock Exel.

For more than 20 years, the CP15 has been a widely used sprayer for users in agriculture, horticulture and parks and gardens all over the world, thanks to its durability, toughness and spray quality. Its unique diaphragm pump system ensures a long life for the equipment and maximum convenience in spraying, thanks to its flexible pumping.

With no direct friction between the diaphragm and the surfaces, pumping is made easier and more comfortable compared to a piston pump. Therefore, the Cooper Pegler diaphragm sprayers require no service maintenance nor lubrication other than routine cleaning, resulting in a long-life product.

The latest generation CP15 knapsack sprayer, called CP15 Evolution, can now be equipped with a revolutionary ergonomic carrying system with ultra-comfortable shoulder straps and waist belt to work better and longer. It is also fitted with two handles on the tank to for easy handling.

Professional, technical and built to last, the Cooper Pegler CP15 Evolution comfort knapsack sprayer offers a full experience of what is called the "comfort" sprayer.

The CP15 Evolution Comfort's "safety harness" sets this sprayer apart, with extra-wide shoulder and waist straps that ensure that the weight is carried ergonomically on the hips and shoulders.

The Cooper Pegler diaphragm sprayers require no service maintenance nor lubrication except for the routine cleaning, resulting in a longer shelf life.

Cooper Pegler knapsacks are built to a high quality specification.



Image Credit: Hozelock Exel

Clinically tested, the safety harness provides an optimised design:

- Adjustable straps with reinforced foam and tensioners
- Chest strap which ensures sprayer stability and alleviates lateral tension
- Adjustable waist strap to distribute sprayer weight at 70 per cent on the hips and 30 per cent on shoulders
- Reinforced back support to ensure no direct contact with the tank for improved comfort.

Cooper Pegler, with an heritage of more than 120 years of expertise, enjoys a strong reputation for durability and ease of use. Cooper Pegler knapsacks are built to a high quality specification, not down to a price. That is so important to operators who need a reliable sprayer that is comfortable for use over long hours. **E**

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Case IH 2000 Series Early Riser planter delivers precise placement with extreme accuracy across all terrains, crop types and speeds for faster, more uniform emergence.

Case IH demonstrates new 2000 Series Early Riser planter

CASE IH DISTRIBUTOR Northmec and Cairo Group hosted the Annual Farmers Day in Koppies Free State on August 15. The event attracted more than 500 farmers from across South Africa to Farm Cairo in Heilbron District for a day of product presentations, demonstrations and test-drives. Johan Van Der Merwe, managing director of Northmec and Jaap Van Der Westhuizen, dealer principal at Cairo Group opened the proceedings, welcoming the guests and outlining the activities of the day.

The main attraction at the Annual Farmers Day was the new Case IH 2000 Series Early Riser planter, which delivers precise placement with extreme accuracy across all terrains, crop types and speeds for faster, more uniform emergence. It is designed for modern seed types, treatments, populations and conditions. The new planter can be easily customised to a range of soil types, terrain, fertiliser and chemical application needs, and various crop residue management practices.

Case IH 2000 Series Early Riser planter can be customised to a range of soil types, terrain, fertiliser and chemical application needs, and various crop residue management practices.

The event's participants were able to see an Early Riser 2150 24 row planter in action in a live demonstration, and have a close look at a 12-row model that was on display in a covered area.

They heard a first-hand account of the benefits of the Early Riser 2150 planter from Case IH customer Brink Bosman, who took delivery of a 24-row model in 2017 for his farm in Zimbabwe. B Bosman Farms needed a simple, robust and reliable planter that would ensure accurate seed placement and a perfect seed stand. Their requirements included self-diagnostics, different options for particular planting



Case IH demonstrates 2000 Series Early Riser planter at Annual Farmers Day.

Image Credit: Case IH

conditions and good backup from their dealer.

Bosman had high expectations of the new Early Riser 2150 planter based on this product family's reputation for early, uniform emergence and high yields: "We farm 1,110 ha, of which 150 ha dryland on maize and soybeans, and 950 ha on winter wheat, and we have a small window of just 10 days between summer harvest and winter wheat planting, so having the right planter is critical. The Early Riser 2150 exceeded our expectations. We completed the planting operation smoothly and without a hitch, and the results are testament to the high standards of the planter. Just to make a couple of examples, we had 100 per cent maize emergence and germination and perfect stand in our maize crops, which has led to high yields."

Case IH showcased its extensive tractor offering at the Annual Farmers Day, with displays and demonstrations of models ranging from the 75 hp JXT 75 utility tractor ideally suited for light cultivation, grassland or speciality crops all the way up to the mighty 600 hp tracked Quadtrac 600.

They included the 125 hp Maxxum 125 high-productivity multi-tasking tractor and the Puma, which delivers high efficiency in primary tillage, cultivation, drilling and transport. Also at the event was the

Magnum, the tough row crop range that offers a mix of industry-leading horsepower and fuel efficiency, represented by a wheeled 340 hp model and the tracked Magnum 380 RowTrac featuring Case IH's CVT state-of-the-art Continuously Variable Transmission.

Completing the display were Case IH sprayers, including the new Patriot 250 Extreme, which provides an entry-level option for farmers to step up from tractor-pulled to self-propelled spraying, and is proving popular because of its low running costs, ease of use, and ease of maintenance.

The Annual Farmers Day took place at one of the sites of Cairo Farms, which plants more than 15,000 ha of grain per year in farms that span a wide geographic area throughout South Africa. The event benefited from the expertise of Northmec's product specialists as well as the equipment knowledge of Cairo Mechanisation's team and first-hand agricultural experience of Cairo Farm's hosts.

Jaap Van Der Westhuizen said: "At Cairo Farms we utilise the most advanced precision farming and mechanisation practices. This is critical in the face of food safety becoming an increasingly pressing issue. Hosting the Annual Farmers Day enables us to share our know-how and promote efficient farming practices that rely on well-planned mechanisation." **E**



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Image Credit: Case IH

Case IH chose the two-day event, held in the grounds of the Dairy Research Institute in Naivasha, to give the first Kenyan showing of its new Patriot 250 Extreme self-propelled sprayer and new Puma 185 ROPS tractor.

Case IH launches multi-purpose tractor and self-propelled sprayer

CASE IH, A global agricultural equipment leader, and its distributor for Kenya and Uganda, Toyota Tsusho East Africa, played a major role at Farm-Tech Expo Kenya on 12-13 September by launching two new products, giving live equipment demonstrations, and supporting the event as a Gold Sponsor. Case IH chose the two-day event, held in the grounds of the Dairy Research Institute in Naivasha, to give the first Kenyan showing of its Patriot 250 Extreme self-propelled sprayer and new Puma 185 ROPS tractor. During the show, the team hosted several high-profile representatives of Kenyan agriculture, including Hon. Mwangi Kiunjuri, the country's cabinet secretary, Ministry of Agriculture.

This year's Farm-Tech Expo featured more than 90 exhibitors' stands, machinery and equipment demonstrations, a livestock zone, live crop trials, and workshops focusing on regional plans for agricultural development. The annual event is strategically important to agricultural businesses at an international level because Kenya is a

regional hub for East Africa, and assumed greater importance this year at a domestic level because food security is one of the pillars of President Kenyatta's new 'Big Four' agenda.

Making African farm-work easier and more productive

The Patriot 250 Extreme sprayer is the entry-level option in the four-model Patriot range, giving farmers an easier step-up from tractor-pulled sprayers to self-propelled sprayers. All Patriots have advanced spray technology to help farmers maximise yield potential by keeping fields clean and plants healthy. The Patriot's design makes spraying fast, accurate and easy to apply.

The Patriot's distinctive cab-forward and rear-engine layout contributes to its performance by placing the static weight of the cab and engine over the front and rear axles, with the dynamic weight of the chemical tank located in the centre of the machine. This means there is more equal weight distribution between the axles when

the tank is full and the booms are out, benefiting stability and comfort and reducing rutting and soil compaction. The long reach of the booms, with a total span of 27 metres, allows for fewer passes and a greater sprayed area, resulting in higher crop yield, reduced component wear, and lower fuel consumption.

The Puma 185 ROPS tractor, which produces 197 hp and 760 Nm of torque, was introduced in response to demand for more powerful multi-purpose tractors with an open deck, a canopy, and a rollover protective structure (ROPS). Capable of performing light and heavy tasks in a wide range of applications, the new Puma is expected to go into service across Africa and the Middle East in haulage, cultivation, seeding, crop protection, and heavy draft operations.

The Puma 185 ROPS is powered by a 6.75-litre six-cylinder FPT Industrial engine, with turbocharging and intercooling, and drives through a 15x12 synchronised mechanical transmission designed for minimal power losses. Through the PTO

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that automatically reduces engine speed to match power and to maximize fuel efficiency. These transmissions are sized for high horsepower demands, to achieve maximum reliability and durability. Choose from a wide selection of five models ranging from 250 to 380 hp.

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(power take off) system, the Puma can efficiently operate large implements. It has a real lift capacity of 6,475 kg.

Ian Allen, general manager of Toyota Tsusho East Africa – Agri Mechanisation Dept commented: “Farm-Tech Expo is a great platform for Case IH to showcase the equipment that can help Kenyan farmers increase productivity and gain a great return on investment. The Patriot 250 Extreme is a new way into self-propelled sprayers which is easy to use and easy to maintain, with the low running costs that many Kenyan farmers are looking for. The Puma 185 ROPS tractor is ideal for farmers who need multipurpose tractors in the medium horsepower range with a perfect balance between power and weight.”

Case IH gave live demonstrations of both the Puma 185 ROPS and the Patriot 250 Extreme at Farm-Tech Expo. Visitors could also see in action a Puma 185 tractor with the AFS AccuGuide Autoguidance system. This enables year-to-year repeatable accuracy to reduce skips and overlaps, minimising waste of fuel, seed, fertilisers and chemicals.

Another tractor, a Farmall 90 JXM, was demonstrated with a reversible plough, and Case IH's static displays featured four more tractors: a Farmall 80 JXM; 55 hp and 75 hp JXT utility tractors, which are available in both two and four-wheel-drive and are perfect for small farms; and the mid-range Maxxum 125, a model with just the right level of technology to meet modern-day demands

Axial-Flow 140 Series and 240 Series combines

Case IH displayed at Nampo Fair, 2018 edition, its 140 Series and 240 Series combines featuring the brand's proven



Patriot 250 Extreme self-propelled sprayer

Image Credit: Case IH

Axial-Flow single rotor technology that revolutionised combine harvesting for its simplicity, grain quality, grain savings and crop adaptability.

The Axial-Flow 240 Series now features the brand's telematics system as standard, enabling the customer to monitor the machine and its working functions from their mobile devices, laptop or PC, increasing the overall efficiency of the harvesting operation. The AFS AccuGuide system is also available as standard, simplifying wheat, barley, canola and soya bean harvesting.

Patriot self-propelled sprayer range offers a model for every need

The SPX Patriot 250 Extreme sprayer which was introduced to the market at Nampo 2017 is making again its appearance at the

show. It is fitted with a 2500 litre plastic tank, 27 metre boom, full Auto-Pilot and section control.

The new AIM Command FLEX advanced spray technology, which will make its debut at the show, enables operators to deliver consistent, flexible and accurate application, regardless of speed and terrain.

Also in the range are the SPX Patriot 3230, featuring a 3078 litre Stainless steel tank, the new AIM Command FLEX with a 30m boom (market leader in its segment); the SPX Patriot 3330 with a 3800 litre stainless steel tank, AIM Command FLEX with a 30m boom; and the SPX Patriot 44430 fitted with a 4500 litre stainless steel tank, AIM Command FLEX with a 36m boom.

Case IH showcased new spray technology and full product range

The new AIM Command FLEX advanced spray technology made its debut at Nampo 2018. This enables operators of the Patriot self-propelled sprayer range to deliver consistent, flexible and accurate application, regardless of speed and terrain. The Patriot 250 Extreme sprayer, introduced to the market at Nampo 2017, was also displayed at the show.

Case IH additionally displayed at Nampo 2018 its Axial-Flow 140 Series and 240 Series combines. Both these models, featuring the Axial-Flow single-rotor technology which revolutionised combine harvesting with its simplicity, grain quality, grain savings and crop adaptability, were wrapped in an American flag and attracted a lot of attention. Interested visitors to the Case IH stand included one of South Africa's most famous sports stars, rugby player Bakkies Botha. **E**



The Axial-Flow 240

Image Credit: Case IH



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MWM Genset TCG 2032B with fast ramp-up option

DUE TO THE fluctuations of renewable energies, many operators of gas-fired power plants depend on flexible operation. To avoid major supply fluctuations, the plants must be able to start up quickly. A special operating mode enables the MWM TCG 2032B V16 generator set to alternate between normal and fast ramp-up in a flexible way.

Thanks to a newly developed software option, the MWM TCG 2032B V16 is able to start up in less than five minutes from the ramp-

up request to 100 per cent load on the grid. This fast ramp-up option is available for voltages from 6,000 V to 11,000 V with a network frequency of 50 Hz. Flexible Operation The benefits of the fast ramp-up option are evident in gas applications in areas such as the UK STOR (Short Term Operating Reserve) market or the provision of control energy. Thanks to the fast genset ramp-up, network operators can call off energy within a very short time in order to buffer load peaks

in the grids. Henceforth, operators can switch between normal and fast genset ramp-up in a flexible manner.

Due to the inherent fluctuation in the availability of renewable energies such as wind or solar energy, gas power plant operators increasingly make use of flexible operation. To efficiently utilise the higher income potential, quick and flexible availability of the gas genset output is vital. This is possible with the MWM TCG 2032B V16.

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