

African Farming

and Food Processing

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GM for sustainable pest control

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A combine harvester in the distance on a wheat field in the western cape of South Africa. (Image: Shutterstock/Dewald Kirsten)



Transgenic crops should be given a chance in Africa to help solve the continent's food, agriculture and human security challenges.



Fields irrigated by centre pivot irrigation.

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Farming Calendar 2016

SEPTEMBER

26-28 Agrikexpo 2016 ABUJA
www.agrikexpo.com

OCTOBER

4-6 Ethiopia Agrofood Plastpack ADDIS ABABA
www.agrofood-plastpack.com

21-22 Aviana Uganda 2016 KAMPALA
www.avianafrica.com

23-24 Naivasha Horticultural Fair NAIVASHA
www.naivashahortifair.com

24-25 Cropworld Global 2016 AMSTERDAM
www.cropworld.com

24-25 Starch World Europe VIENNA
www.cmtevents.com

NOVEMBER

9-13 EIMA International BOLOGNA
www.eima.it

15-18 EuroTier HANOVER
www.eurotier.com

17-18 Commercial Farm Africa ADDIS ABABA
www.cmtevents.com

23-25 Agra Innovate LAGOS
www.agra-innovate.com

28-30 African Agri Investment Indaba (AAII) CAPE TOWN
www.agri-indaba.com

29-30 4th Annual Agribusiness Congress East Africa KAMPALA
www.agri-eastafrika.com

Readers should verify dates and location with sponsoring organisations

Aviana Uganda 2016 - international expo for poultry and livestock

AVIANA UGANDA 2016, to be held in Kampala in October, will present a gateway to East Africa by providing a platform to exhibit products, services and innovative technologies to top decision makers as well as create business partnerships. With serious and potential exhibitors from more than 20 countries, Aviana Uganda - a poultry and livestock expo - will exemplify a single aim of prosperity in the African animal health sector, with the mission "Animals' Health Nation's Wealth". More than 100 exhibitors are expected from 20 countries.

Concurrently there will be a high class poultry and dairy conference for two days. Visitors will come from Kenya, Uganda, Rwanda, Burundi and Tanzania. There will be a lot of export opportunities, including feed supplements, poultry equipment and veterinary pharmaceuticals, API formulators, hatcheries, breeders and feed raw materials.

Growing your business at Agra Innovate

FROM 23-25 NOVEMBER 2016, Nigerian and international agricultural policy makers, agribusiness leaders, farmers, technologists and investors will gather in Lagos to discuss the latest in agriculture in Nigeria and the whole of West Africa.

Once again the conference and exhibition is being supported by the Federal Ministry of Agriculture and Rural Development and the Nigeria Agribusiness Group.

Chief Audu Ogbah, the Honourable Minister for Agriculture and Rural Development, has confirmed he will participate in the opening ceremony on 24 November. Other confirmed speakers are Dr Harold Roy-Macauley, Fatima Ali Mohammed, Dr 'Bisi Adeleye-Fayemi, Irede Ajala and Ade Adefeko.

Apart from over 50 exhibitors and 50 speakers at the conference, this year's edition has a practical 'Farmers Training Day', where farmers can learn best agronomy practice to enhance farm productivity. The farmer's day is free to attend.

EuroTier to bring livestock producers to Germany

MORE THAN 2,400 exhibitors will participate in EuroTier 2016, to be held 15-18 November 2016, in Hanover, Germany.

In excess of 1,300 exhibiting companies will travel from 54 countries, including 230 from the Netherlands, 170 from China, 150 from France, 130 from Italy and 60 from Turkey.

EuroTier is a meeting place for livestock farmers who want to learn what solutions are available, as well as what will be coming in the future. The leading companies operating in the dairy, beef, pig, poultry and sheep sectors will be represented in Hanover. There will be a particularly strong poultry presence this year, as the World Poultry Show will also take place within EuroTier 2016.

The range of products and services on display at EuroTier will be larger than previous editions of the fair, especially in the cross-species sectors such as feedstuffs, equipment for milling, mixing and pelleting of feed, and animal health.

Other features to be included at the fair are breeding stock, breeding programmes

and reproduction technology; feed storage; animal housing, including controlled-environment technology; machinery and equipment for animal husbandry and feeding; milking equipment and milk storage systems; machinery and equipment for storing and handling solid and liquid manure; food processing equipment; and advisory, management and consultancy services.

EuroTier is recognised as a global innovation showcase for technical machinery and equipment for professional animal husbandry. Numerous exhibitors will time their innovation launches to coincide with EuroTier in Hanover, where they will be able to display their new products to the international markets.

Aquaculture is an international growth market and an integral part of EuroTier 2016. Leading companies - including suppliers of modern fish farm technology related to husbandry, feeding and feed, networks and innovative water treatment systems, have already registered, and will

present their latest developments in Hanover.

For the first time, an Aquaculture InfoCenter can be found at the fair. With the title "Growth in the water instead of on the surface," it will offer advice and a special area for living exhibits: fish, seaweed, shrimp, shellfish. Practical lectures, discussions and an extensive consultation area will complement the wide range of exhibitors.

EuroTier provides the world's leading forum looking at the future of professional animal husbandry. Here, technology trends related to modern animal husbandry and animal breeding are traditionally identified and fully explored.

Together with partners from industry, academia, consultancy, associations and organisations, the DLG will once again present an extensive technical programme to complement the offerings of the exhibitors. This will include international conferences and events on current trends and important developments in the industry.

Kenya Forum pledges commitment to transform African agriculture

THE 6TH AFRICAN Green Revolution Forum took place during September in Nairobi, with delegates endorsing a communique to hasten agricultural transformation in the continent.

About 1,500 delegates from 40 countries, including heads of state, industry executives, and heads of donor agencies and researchers, attended the forum that sought to inject fresh impetus into the quest for a green revolution in Africa.

The communique said governments, donors and the private sector will invest up to US\$200bn in the next 16 months to transform subsistence farming in Africa.

Kenya's agriculture minister, Willy Bett, said the summit reactivated the momentum towards realising a hunger-free Africa in line with the continent's 2063 agenda on socio-economic renewal.

"We have covered a new milestone in our journey towards a continent free from hunger and malnutrition," Bett said.

Bett said that African governments will redouble efforts to achieve the 10-per cent budgetary allocation to the agricultural sector as spelt out in several continental instruments.

He added that African countries will explore innovative financing mechanisms to ensure small holders have access to credit, inputs and markets.

Agnes Kalibata, president of the Nairobi-based



Smallholder farmers in Kenya.

Alliance for Green Revolution in Africa (AGRA), hailed the renewed political commitment to transform farming systems in the African continent.

"There is a renewed political attention on agriculture given its potential to catalyse economic growth in this continent," Kalibata said, adding that robust public-private partnerships were key to re-invent Africa's food production systems.

White onion programme for Egypt

FOR THE PAST three years the Olam SVI team has been conducting a series of agronomic trials to evaluate the production of new white onion varieties in Egypt. Only recently has the team been able to celebrate the successful completion of the first, large scale harvest of these onions. This is particularly significant for customers as the proprietary, US-bred onion seed utilised in Egypt delivers unmatched consistency, quality, flavour, and product application performance.

Dave Watkins, senior vice-president, Olam SVI said: "SVI's white onion programme gives us control of the supply chain...we supply the seed, we plant it, we provide growing oversight to our contract growers, and then we do the harvest. This allows us to provide complete traceability, food safety assurance, and outstanding quality to our processing plants."

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ACTESA kicks off fertiliser distribution in Zambia

THE ALLIANCE FOR Commodity Trade in Eastern and Southern Africa (ACTESA), a specialised agency of COMESA, in partnership with African Potash Limited, a UK public-listed company and its main and preferred supplier Gavilon, has begun the supply of fertilisers to the Zambia Co-operative Federation (ZCF). ZCF is a co-operative society body which constitutes over two million smallholder farmers across Zambia as members.

The initial deliveries of 1,500 mt has already begun going out to ZCF. The fertiliser supply to ZCF will continue for a minimum of three years.

This supply is in line with and meant to tap into the Government of Zambia's recently launched E-Voucher system, in which the government is investing approximately US\$130mn to support and

manage an integrated ecosystem of technical and financial support for the smallholder farmers. The scheme enables the purchase of inputs, including fertiliser, for smallholder farmers as well as supporting the sale of outputs. Under the scheme, the Government provides financial support to the farmer via a specialised card, which he can only use to purchase fertiliser (or other inputs). ZCF are managing the logistics for the supply of fertiliser, ensuring farmers can access the supply across Zambia.

"We are excited to be working with African Potash and COMESA/ACTESA on this ground-breaking scheme to supply our two million plus farmers with timely, affordable and good quality fertilisers, to be distributed via the e-voucher initiative." said James Chirwa, director general of ZCF.

Intertek launches soil manager app to support local farmers in Africa

INTERTEK, A LEADING total quality assurance provider to industries worldwide, has launched a soil manager app which enables farmers to access a range of precision-based farming services across Africa.

Africa is home to more than 10 million farmers with 50 per cent owning a mobile device. The app allows 24/7 access to a range of services which can assist with enriching soil fertility and increase yields whilst minimising input costs. It is available free of charge from the Google Play store, and is an innovative way for local farmers to connect with qualified specialists, fertiliser merchants and even allowing for direct investments by sponsors.

Simple video tutorials are available on the app to aid farmers in the process of mapping their land and drawing soil samples. To submit test samples, farmers can access real time information on the nearest drop-off depot or send the soil sample directly to Intertek, with the results directly available along with fertiliser recommendations on the app. In addition, farmers can connect with a qualified agronomist to discuss the results, a service that is often beyond the reach of the small scale farmers in Africa.

Charles Botha, Intertek regional manager for agricultural services, commented: "There is a pressing need to support the agricultural sector in Africa in order to ensure food security. This app could revolutionise the way that farmers do business through linking farmers with fertiliser merchants and even by integrating sponsorship into the process. Given enough time, the data collected from the app will enable farmers and sponsors alike access to progress made by their actions, through the results on specific crop yields achieved."

International support for Côte d'Ivoire to grow cocoa

COTE D'IVOIRE'S COCOA growing industry has received a funding boost from International Finance Corporation (IFC), a member of the World Bank Group, Barry Callebaut, a leading manufacturer of high-quality chocolate, and the Netherlands Sustainable Trade Initiative (IDH). IFC announced a US\$9mn risk-sharing agreement to help up to 100,000 smallholder cocoa farmers in Côte d'Ivoire access credit needed to grow their production and earnings.

Under the agreement, IFC and Barry Callebaut will equally share the risk in the US\$9mn local currency-equivalent credit facility, which will help farmers purchase fertilisers and lease large equipment, such as tractors. As farmers increase production and formalise their operations, they will establish the track records required to borrow directly from local financial institutions. The farmers are supplying cocoa to two subsidiaries of Barry Callebaut: the Société Africaine de Cacao, and Biopartenaire, both operating in Côte d'Ivoire.

Antoine de Saint-Affrique, CEO of Barry Callebaut, said, "Sustainability is at the heart of our business model and values. The start of this initiative represents an important step in promoting professional, sustainable cocoa farming, helping subsistence farmers become entrepreneurs. Barry Callebaut is proud to lead the efforts to professionalise cocoa farming, and is excited about the support of our partners in this endeavor."

IFC director for manufacturing, agribusiness and services, Alzabeta Klein, said, "IFC's partnership with Barry Callebaut and the Netherlands Sustainable Trade Initiative will help farmers in Côte d'Ivoire gain access to credit and training that will enable them to upgrade their operations and join value chains linking them to cocoa buyers and global chocolate consumers."

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Bayer, Monsanto to create agricultural global leader

BAYER AND MONSANTO have signed a definitive merger agreement under which Bayer will acquire Monsanto for US\$128 per share in an all-cash transaction. Based on Monsanto's closing share price on 9 May 2016, the day before Bayer's first written proposal to Monsanto, the offer represents a premium of 44 per cent to that price.

"We are pleased to announce the combination of our two great organisations. This represents a major step forward for our Crop Science business and reinforces Bayer's leadership position as a global innovation driven Life Science company with leadership positions in its core segments, delivering substantial value to shareholders, our customers, employees and society at large," said Werner Baumann, CEO of Bayer AG.

"This announcement is a testament to everything we've achieved and the value that we have created for our stakeholders at Monsanto. We believe that this combination with Bayer represents the most compelling value for our shareowners, with the most certainty through the all-cash consideration," said Hugh Grant, chairman and CEO of Monsanto.

This transaction brings together two different, but highly complementary businesses. The combined business will benefit from Monsanto's leadership in seeds and traits and climate corporation platform along with Bayer's broad crop protection product line across a comprehensive range of indications and crops in all key geographies. As a result, growers will benefit from a broad set of solutions to meet their current and future needs, including enhanced solutions in seeds and traits, digital agriculture, and crop protection.

The combination also brings together both companies' leading innovation capabilities and R&D technology platforms.

Powering Ghana's fishing industry

THE GHANAIN FISHING sector plays an important role contributing significantly to national economic development objectives related to employment, livelihood support, poverty reduction, food security, foreign exchange earnings and resource sustainability.



Ghanaian fish farming. (Image: Fish Feed Extruder)

The Agricultural Development Bank (ADB) has been at the forefront of enhancing fish production in the country by providing support to players in the aquaculture sector and those engaged in the more traditional forms of marine and inland fishing.

Farmers engaged in aquaculture have been supported to acquire/construct capital assets such as cages, ponds, cold storage facilities, nurseries and laboratories, hatcheries, etc. Operators in the aquaculture sub-sector have also been provided with advanced working capital facilities, mostly to purchase feed and feed ingredients as well as meeting other working capital needs.

The fishing sector generates more than US\$250mn in revenue annually, and accounts for about 4.5 per cent of Ghana's Gross Domestic Product (GDP). Fish is a preferred source of animal protein in Ghana, and about 75 per cent of the total domestic production of fish is consumed locally. Fish is expected to contribute about 60 per cent of animal protein intake.

Offering end-to-end rice milling solutions globally

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Milltec is ISO 9001 and 14001 certified with state-of-the-art manufacturing facilities with TQM as its core organisational structure, and a customer-centric focus on quality and commitments.

"The company has overall installations of more than 12,000 rice mills across India, SE Asia and Africa.

Milltec has well-established channel partner's network in Bangladesh, Sri Lanka, Pakistan, Nigeria, Thailand, Myanmar and Cambodia markets to serve existing customers in these regions."



Milltec's silica plant

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Jobs of the month

Head of Farming – Egypt

International agribusiness company with extensive operations throughout the company are looking for an experienced and commercially minded head of agriculture. Excellent role in a rapidly expanding company.

Agronomy Manager – Nigeria

A 200 hectare greenhouse tomato farm is looking for an experienced horticulture Agronomy Manager, the role is based in Abuja and is a greenfield operation. A candidate with previous Tomato and Hydroponic experience is preferred.

Farm Manager – Sudan

One of Africa's largest Alfalfa farming operations is looking for a strong and dynamic leader to manage all on-site operations, the candidate will be responsible for all on-site departments including, Finance & Administration, Technical, Operations and Logistics.

Agronomists of all levels – West Africa

Leading tropical plantation business is looking for degree educated agronomists to join their team across various palm oil and rubber plantations in West and Central Africa. No experience needed in the particular crops however strong management skills and a willingness to work in remote locations.

Workshop Manager – Zimbabwe

A leading Sugar plantation and processing company are looking for a Workshop Manager to join their senior management team. We require a candidate with excellent agricultural equipment experience and that is happy to remain very hands on in the role.

For further details of these and other roles, visit our website or contact us on our database and be contacted for any one of our roles then please send your CV to info@millarcameron.com

HE Olusegun Obasanjo, former President of Nigeria, explains what the Africa Food Prize means to African youth, and why we need a renewed focus on sustainable practices.

Why agribusiness is Africa's biggest economic opportunity

FOR SOME DECADES, a former President of the Federal Republic of Nigeria has promoted sustainable opportunities in infrastructure, power, agribusiness, tourism and natural resources.

His Excellency Olusegun Obasanjo holds a number of progressive positions on investment. In particular, he seeks "to support Africa's growth and develop its workforce" by facilitating and encouraging entrepreneurship. Amongst his current concerns is the African Entrepreneurship Programme (AEP), launched in 2015 with the former Nigerian president's support and with backing from Aliko Dangote, one of Africa's most successful businessmen. Since its launch, AEP has supported African entrepreneurs as they have sought to realise investment objectives by affording them opportunities to connect with and appeal to financial stakeholders.

Farming needs more than money. It needs leadership. It needs structure.

HE Obasanjo spoke recently to African Farming about agribusiness, arguably his greatest passion - and about the Africa Food Prize, which acknowledges individuals and institutions for their efforts towards changing the perceptions of agriculture and agribusiness in Africa. He explained why farming needs more than money. It needs



HE Olusegun Obasanjo,

leadership. It needs structure. It needs enterprising individuals, and networks of support at various levels of society and economy.

HE Obasanjo stressed to African Farming that he understands the farmers are struggling, that farmers are wrestling with the consequences of climate change, with the costs of production, and the obstacles in delivering produce to market.

He knows that farmers can be forced to sell their produce at low prices, and often at the farm gate, before the products spoil, because roads are in a state of disrepair or the cost of tractor fuel is prohibitive. However, he also knows that, when there is provision of opportunity, when farmers are given a wider range of seeds to plant, or a greater choice of fertilisers to use, or more agricultural markets to sell to, the potential for progress is massive, and the opportunity for "equitable, long-lasting growth across Africa" is a reality.

Sustainable, productive and profitable

The key to continued progress in farming is innovation. Across Africa, this will continue to mean adoption of 'climate-smart' practices like planting drought-resistant seed varieties, participation in crop and livestock insurance programmes that compensate farmers when weather conditions deteriorate, and managing soil to improve water retention and prevent runoff and erosion. HE Obasanjo is most concerned that agricultural endeavours are geared to be sustainable, productive, and profitable, and he is keen to reinforce the message that "the continent is well-placed to provide innovative solutions".

The former President of Nigeria speaks with qualification and from experience. In conversation with African Farming, he drew on his personal experience, as the son of a farmer in Nigeria's Ogun State - and in his

Tanzanian coffee plantation achieves stewardship Africa's Agriculture to get a big boost

OLAM INTERNATIONAL HAS advanced its approach to water stewardship by becoming the first agri-business globally to achieve the AWS certification for its Aviv Coffee Plantation in Southern Tanzania. This means it conforms to the AWS International Water Stewardship Standard - global best practice in collaborative water management.

In doing so, it is helping to build the collaborative partnerships and tackle the challenges needed to ensure water security for the 300,000 people living in the surrounding Ruvuma River Basin. With 1,025 ha of arabica coffee in the Songea Rural

District, Aviv also becomes the first business in Africa to achieve the Standard which guides, recognises and verifies responsible water use by private sector users.

"The Ruvuma River is the lifeblood of the whole region, so, in developing the plantation, we take care to ensure that our irrigation needs do not impact adversely on its eco-system and the other water users, such as local communities and the local hydro-electric plant," said Jeremy Dufour, Olam's environmental & social manager, plantations & farming, South & East Africa.

"But with climate change an increasing threat,

we must ensure that our usage in years to come does not upset the balance. The Standard brought three major benefits: for communities beyond our boundaries, the best practice guidance helped us to convene the different river users to address shared challenges and scenario plan, particularly for extreme events such as droughts.

The team is now exploring rolling out the AWS Standard across other processing facilities and applying learnings to the water stewardship work they already do with its large-scale onion and tomato farmer suppliers.

Today, African farmers need several things that my father lacked but which farmers elsewhere in the world take for granted.

current role as an Ogun State farmer himself. His insights, gained from years of experience in government and from experience working the land, informs his approach to food security. In his point of view, agriculture alone does not present Africa with opportunities to end hunger and malnutrition. Farmers must focus on



agribusiness to achieve change, creating employment and generating income, addressing climate change and many other issues impacting African nations.

HE Obasanjo stressed that agribusiness is the prime component of the continent's economy. He noted, also, that the business of farming has not received the attention needed. Many farmers are correctly concerned with agricultural techniques, but they do not also concern themselves with profitability, with sustainable commercial practices.

He spoke freely of how his return to farming at Obasanjo Farms has afforded him with a more refined understanding of ways in which farmers can change, can




The Africa Food Prize Agricultural Contest for African Farmers 2016, for which there is a US\$100,000 prize.

reframe agriculture so that their farms become true agribusinesses. Profitability means provision of employment opportunities to youth. When African people under 25 years of age, half of whom are reckoned to be unemployed, see that money can be made from the land, there is a greater chance that they will stay in the village and on the farm. It is more likely that they will help develop local communities through business practices. It is more likely that Africa's "cycles of food crises" will cease.

Acknowledging agricultural entrepreneurs

HE President Obasanjo has preferred at times to describe his own return to farming in terms of his "coming full circle", returning to a path he left as a youth for success in the city, the professionalism of the army, and the ultimate position in political leadership. However, he disowns this stance for African Farming. He values his past achievements, but he has no need to return to the past. He wants to empower African youth to create a better future for all. He wants to help create agricultural and agribusiness opportunities that lead Africa's youth to "lucrative, exciting entrepreneurial pursuits" and to help reward

young people for aspiring to be farmers because it is "a rewarding career". To that end, the Africa Food Prize has been created to recognise outstanding contributions to the continent's agricultural agenda. Above all, the Africa Food Prize has been created to signal to the world that agriculture is a priority for Africa that can and should be embraced. It spotlights those who can inspire innovation, and spread best practices across the continent. The new goal for HE President Obasanjo is that the Africa Food Prize "becomes a symbol of all that agriculture in Africa can offer".

"Today, African farmers need several things that my father lacked but which farmers elsewhere in the world take for granted. We need improved crop varieties developed to resist disease and tolerate drought. We need access to modern inputs, like fertilisers. We need markets where farmers can profit from their labour and thus justify investments in improved production. We need affordable credit that all small businesses require, and extension services that help us keep abreast of sustainable farming practices." - HE President Olusegun Obasanjo 

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African trypanosomosis

ANIMAL TRYPANOSOMOSIS IS a major factor limiting the development of animal production both in Africa and South America. It results in losses estimated to be between one and five billion dollars in Africa alone [1]. This parasitic disease is due primarily to infection with the protozoa *Trypanosoma congolense* and *Trypanosoma vivax*.



Dr Ousmane NDiaye,
Private veterinarian, Senegal

"In Africa, most cattle farming is widely spread with herds migrating to areas affected by trypanosomosis. One of the major obstacles to overcome this disease is the problem of diagnosis, which is rendered difficult by the lack of specific clinical features. A rapid test in the field would be a major contribution to the effective treatment of cattle and would provide useful information for farmers."

Current diagnosis

The clinical signs of bovine trypanosomosis (loss of weight and productivity, anaemia, pyrexia, etc.) are non-specific and may be seen, for example, in animals with babesiosis or anaplasmosis. Thus, clinical signs do not help greatly in making a secure diagnosis.

As a result, in the African bush, cattle farmers and veterinary practitioners take into account geographical or seasonal clues to the presence of the trypanosome. Currently, genuine demonstration of infection requires the possession of relatively expensive equipment and a certain degree

of expertise, neither of which is available in the field. Currently, microscopy is the technique that is most frequently used to detect the trypanosome. This can be recognised at a threshold of 5 x 10³ parasites/ml of blood or 2.5 x 10² parasites/ml if coupled with methods of concentration such as the buffy coat method ...

In order to improve the sensitivity of the methods to detect this disease, molecular biological techniques have been developed, particularly using PCR (Polymerase Chain Reaction). This has become the standard procedure to diagnose the parasitic infestation as it can detect small amounts of DNA in a blood specimen, corresponding to 10 parasites per ml of blood [2] and has been used in several epidemiological studies [3]. However, it does require samples to be taken in the field followed by analysis in a laboratory equipped with costly machines and technicians with a high level of expertise. This means that the technique is not feasible practically for direct use in the bush. It was, therefore, desirable and necessary to develop a rapid diagnostic field test which would be robust enough to tolerate environmental conditions and also sensitive and specific.

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VerY Diag therefore
represents a real option for
farmers and veterinarians.**

VerY Diag, the first rapid field test for the diagnosis of bovine trypanosomosis:

It represents a major advance. It results from years of collaboration with a number of partners (GALVmed, CIRAD, University of Bordeaux, etc.), whom we want to thank. VerY Diag responds to the needs in the field of those concerned with animal health, particularly in Africa where this disease is a major scourge for cattle farmers and is also presents a zoonotic risk. Ceva Santé Animale has had a profile in Africa for many years and wants to arm

veterinary practitioners, technicians, and farmers with a rational base to combat the trypanosome.



Dr Cyrille Chevtzoff
Marketing and technical
manager for ruminant health
InterTropical Africa

The provision of VerY Diag contributes directly to our mission: "Together beyond animal health".



Dr Hassane Mahamat,
General director of the Institute
for Research in Farming for
Development (Chad),

**Former Co-ordinator of the
PATTEC (Pan-African Tsetse and
Trypanosomosis Eradication
Campaign) programme,
African Union**

"Trypanosomes limits human colonisation of new territory and social and economic development.

Treatment limits on an accurate diagnosis, so that farmers and owners of cattle can continue to use their animals as a means of subsistence. In 2000, the Heads of

State and governments of the member countries of the African Union decided to declare that it was necessary to eradicate the tsetse fly and trypanosomes from the continent as quickly as possible and to adopt the PATTEC (Pan-African Tsetse and Trypanosomosis Eradication Campaign) initiative. This aspiration can only be realised with the co-operation of all the parties involved in fighting the vectors, diagnosis, treatment, training, land management, etc.

The new CEVA test for diagnosis is one of the tools which will contribute to the successful implementation of the PATTEC initiative to fight against animal trypanosomosis. At the Institute for Research in Farming (breeding and rearing) for Development (IRED) in Chad, we shall test this new diagnostic tool to determine the prevalence of animal trypanosomal disease in the country."

Very Diag is a rapid diagnostic test which establishes the diagnosis of trypanosomosis in a few minutes using immunochromatography on strips (Lateral Flow Test). This leads to the appearance of a specific colour which means the result can be read immediately. It is a simple, rapid method which can be used in the field and is not expensive. **E**

(1) Mattioli RC, Faye JA, Jaitner J. (2001). Estimation of trypanosomal status by the buffy coat technique and an antibody ELISA for assessment of the impact of trypanosomosis on health and productivity of N'Dama cattle in The Gambia. *Vet Parasitol.*; 95(1):25-35.

(2) Cox AP, Tosas O, Tilley A, Picozzi K, Coleman P, Hide G, Welburn SC. (2010). Constraints to estimating the prevalence of trypanosome infections in East African zebu cattle. *Parasit Vectors.*; 3:82.

(3) de Clare Bronsvort BM, von Wissmann B, Fèvre EM, Handel IG, Picozzi K, Welburn SC. (2010). No gold standard estimation of the sensitivity and specificity of two molecular diagnostic protocols for *Trypanosoma brucei* spp. in Western Kenya. *PLoS One.* 2010 Jan 7;5(1).

VerY Diag

**FINALLY A TEST FOR DETECTION
OF TRYPANOSOMOSIS
IN THE FIELD**



It is a simple, rapid method which can be used in the field

**Establishes the diagnosis
of trypanosomosis in a few minutes.**



Proper farm management, biosecurity and use of novel feed ingredients can all help in reducing levels of antibiotic resistance on poultry farms.

How to reduce antibiotic resistance on poultry farms

ALTHOUGH MORE THAN 30 countries have already banned antibiotic growth promoters, where poultry production is concerned, antibiotics in many parts of the world are generally administered to the entire flock for prophylaxis, disease treatment and growth promotion.

However, there is growing pressure on poultry and other livestock producers to change their practices as antibiotic resistance has emerged as one of the biggest public health concerns of the 21st century.

According to think tank the RAND Corporation, failing to tackle antimicrobial resistance will mean that the world population by 2050 could be between 11 million and 44 million lower than it would otherwise be in the absence of antimicrobial resistance.

While completely eliminating antibiotic resistance is unlikely, the overall position can be improved.

Antibiotic resistance has emerged as one of the biggest public health concerns of the 21st century.

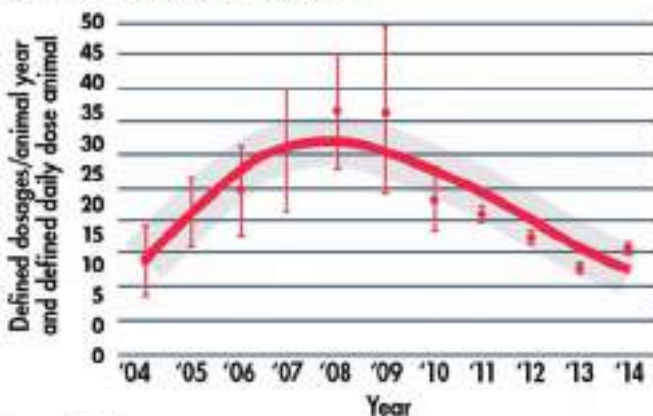
Key strategies

When poultry have a disease that requires antibiotic treatment, they have to be treated with antibiotics, and this is something that cannot be changed.

However, what can be changed is the use of antibiotics for growth promotion and prophylaxis -- their use substituted with proper farm management, increased biosecurity, and the use of novel feed ingredients.

Biosecurity constitutes a set of measures to prevent the

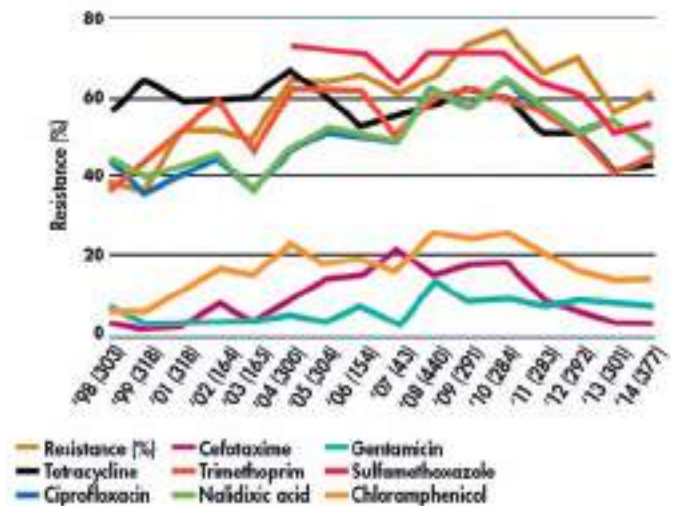
Antimicrobial medicine use in Dutch broilers 2004-2014 (defined dosage/animal year)



Source: MAAFH

Figure 1: Levels of antibiotic resistance in Dutch broilers have declined as antibiotic use has been reduced, suggesting that stewardship is an effective strategy

Percentage of antibiotic resistant E.coli in broilers in the Netherlands



Numbers in brackets show the number of tested E. coli isolates

Figure 2. Levels of antibiotic resistance in Dutch broilers have declined as antibiotic use has been reduced, suggesting that stewardship is an effective strategy.

introduction of infectious disease agents and to minimise the incidence and spread of disease agents in poultry flocks.

Management of the poultry farm, including the transfer of birds between production areas, checks on people and other animals entering the farm, as well as the proper management of equipment, vehicles, air, feed and water supply all need to be carefully monitored. There are several professional farm management and biosecurity guides available to help with this.

Where nutrition is concerned, a recent meta-analysis of poultry feeding trials has found that some novel feed additives have been found to perform as well, if not better, than antibiotic growth promoters.

Antibiotic use spurs resistance

Given the connection between antibiotic resistance and antibiotic use, it is worth considering how widely antibiotics are used in meat production.

Globally, livestock consumed an estimated 63,151 tons of antibiotics in 2010, yet, with an absence of monitoring programmes in many countries, the true figure remains unknown.

In China, for example, where coccidiostats are favored, poultry consumed an estimated 4,500 tons of antibiotics in 2012 while, for 2011, the USDA report that 48 per cent of broilers in the US received antimicrobials for disease treatment while 20-52 per cent received antimicrobials for nontherapeutic reasons.

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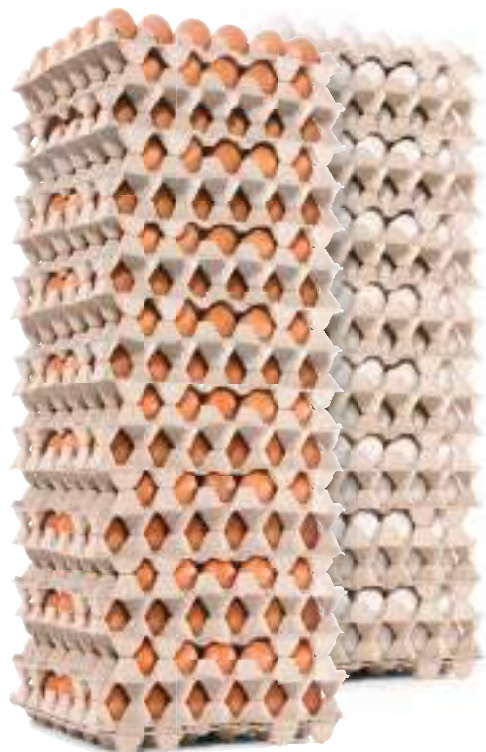
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Dutch resistance reduction

The case of broiler production in the Netherlands is instructive in demonstrating that antibiotic resistance may be reduced through lower use of antibiotics.

Recent data from Monitoring of Antimicrobial Resistance and Antimicrobial Usage in Animals (MARAN) shows that the use of antibiotics in broilers has declined since 2008. This decline coincides with a lower level of antibiotic resistance in commensal *Escherichia coli* in broilers, considered as an indicator bacteria for resistance detection.

The Dutch study offers an example for other poultry producers, demonstrating that combating antibiotic resistance by reducing the use of antibiotics offers a way to preserve the value of medicines for disease treatment. **D**

Hybrid opens new Cobb parent hatchery in Zambia

HYBRID POULTRY FARM, the Cobb franchise distributor in Zambia, has opened a new parent hatchery on its farm at Kabwe.

The company has invested more than US\$12mn in the fully environment controlled facility on a 2,023-ha block of land bought solely for the parent operation. It is situated in an isolated farming area and provides a high degree of biosecurity.

The hatchery has the latest technology with the incubation systems remotely monitored and controlled through a satellite interface.

Managing director Richard Keeley was delighted with the quality of the initial hatch of Cobb500 parents for placement on Hybrid Poultry farms.

He stated: "It was our intention to ensure that we developed a world-class facility that would not compromise on any aspects of technology or standards, and I am delighted to say that the first hatches to come through our new facility have shown marked improvement in hatchability and chick quality."



Hybrid Poultry Farm has opened a new Cobb parent hatchery at its farm at Kabwe, Zambia. (Image: Cobb)

"The facility will provide for our future growth not only for our Hybrid integration in Zambia but our associated companies in Kenya and Tanzania in supplying Cobb products to meet regional demands."

Pieter Oosthuysen, key accounts and regional technical manager for Cobb in Africa, added: "I'm very happy to see this new investment in Zambia, as the market is expanding and Hybrid is ideally positioned to supply quality chicks to other Cobb customers in the region like Zamhatch. The sister operations Kenchic and Tanbreed will receive imported flock placements as they have large parent flocks, which is a huge benefit for improved uniformity and better chick production."

Poultry smartphone apps

USING THE "HUMBLE" mobile phone you can look up common poultry diseases, calculate dosages for medication and swot up on latest best practice for vaccinations – all from the comfort of your poultry shed.

ThermoTool, developed by French feed additive firm Groupe CCPA, offers a straightforward indicator as to whether birds are likely to be stressed in the current climate. All that needs to be done is to input one's location and the app will work out whether heat stress is likely at that moment in the broiler flock. What is more, it will pull in weather forecast information for the next five days, and calculate whether heat stress is likely to occur then.

You can also input ambient air and heat temperatures manually, and calculate specifically the risk heat levels in a shed present

While the app Poultry Diseases is not as comprehensive as the vet textbook of the same name, it provides a handy overview of common afflictions that cause health problems in layers, broilers, turkeys and other poultry. It gives a layman's overview of the disease, explains the likely problems and describes the probable symptoms.

It outlines which birds are most susceptible, the age they become vulnerable and how the disease is transmitted. Guides to common treatment and diagnoses are at-hand, as are pictures of how the disease presents.

Huvepharma has built a relatively straightforward calculator that allows one to check the amount of medication that should be administered to feed or water.

Simply select whether it is medication in water or feed, the concentration of an active ingredient, recommended dose and age of the birds. Then press "calculate" for a value indicating how much medication should be administered for each 1,000 litres of water or tonne of feed.

Zambian poultry industry registers growth

DESPITE PROBLEMS WITH weather patterns, rising imports and disease outbreaks, prices and supplies of poultry products in leading Southern African markets continue to firm up, while chicken production in West Africa could be affected by shortages of layer pullets in an industry hard hit by outbreaks of bird flu this year.



(Image: znbc.co.zm)

In Zambia, prices of road runners (village chickens – known for their high nutrition) have increased owing to supply shortages.

The Poultry Association of Zambia (PAZ) has said to have recorded a rise in production of day old broiler chicks from 73.9mn in 2014 to 78.9mn in 2015. This has been attributed to the rising demand for broiler chickens in the country.

"During the period under review, the poultry sector continued to record positive and sustained annual growth rates which were mainly driven by the broiler and layers sub-sector.

"The good performance of the poultry industry can be attributed to high demand for consumption of poultry meat and investments in both primary and secondary upstream value addition," said Rhodie Sisala, national chairman of the Zambian association of poultry producers.

Adverse weather conditions in Southern African nations have worsened grain supplies for both human consumption and livestock feeds. South African banking group, Absa, has said that beef prices have risen although poultry prices had declined owing to an oversupply in the market. This, according to other experts had forced poultry producers to lower prices in a bid to ramp up competitiveness.

Poultry development fund could help Ghana's poultry industry

A POULTRY DEVELOPMENT fund could be Ghana's best bet for arresting the rising level of poultry imports and creating much-needed jobs, says a report from the African Centre for Economic Transformation (ACET). Currently, only 42 per cent of domestic consumption is said to be supplied by domestic production.

Although the Export Trade, Agricultural & Industrial Development Fund (EDAIF) has been created, the acute nature of the poultry sector's difficulties requires a specialised fund, the Ghana version of the report titled 'Promoting Rural Sustainable Development and Transformation in Africa' noted.

In addition to outbreaks of bird flu, the sector's troubles include the high cost of production, inefficient production methods, limited know-how, lack of funding, and processing difficulties, the report noted.

"The domestic poultry sector remains largely uncompetitive against imports; rising demand has been met by rising imports. Imported products tend to be 30-40 per cent cheaper than locally produced chicken," the report said.

The report, which is part of a larger study of five African countries including Burkina Faso, Kenya, Tanzania and Uganda, identifies fewer than 20 large-scale poultry operators (over 10,000 birds) in Ghana, which mainly produce eggs.

ACET also proposed the use of pre-owned fridges to make hatcheries in a bid to reduce the importation of day-old chicks. "The success of locally-based fabricated cassava-processing equipment from scrap metal by local artisans shows that Ghana has what it takes to develop cheap local hatcheries."

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Genetics in the modern poultry industry has resulted in extremely fast-growing birds compared to the past.

Gut health so important in modern poultry production

IN THE MODERN poultry production industry, the concept of "gut health" is very important. This derives from multiple factors that can affect it including intestinal physiology, interaction of intestinal microflora, colonisation and the number of bacteria, about which very little information is known.

Unfortunately very little is known about the nutritional requirements of pathogenic micro-organisms, making it difficult to understand how nutrition affects the intestinal microbiology of birds.

Genetics in the modern poultry industry has resulted in extremely fast-growing birds compared to the past.

As a result, changes happen in the intestinal pathophysiology as an adaptation to such rapid growth; on the other hand there is dysbiosis caused by countless unknown bacteria and by the inability of the animal to physiologically resist the consequences of the short time of their production cycle; the time is so short that the animal has to recover while the problem is still present. All of this translates into irreversible and significant economic loss for the poultry company.

That is why the concept of prevention or limitation of the damage to the gastrointestinal tract is important.

There are countless pathogenic micro-organisms (Clostridium, E coli, Salmonella, Eimeria, etc), and also micro-organisms which are nonpathogenic but cause stress, which causes intestinal damage with inflammatory bowel disease, increased transit speed, decreased absorption of nutrients, diarrhea, undigested feed, reduction in litter quality, pollution, footpad lesions, etc.

As a result there is a decrease in the growth and uniformity of birds, altered feed conversion ratio, decreased production and low profits for the company.

The concept of prevention or limitation of the damage to the gastrointestinal tract is important.

New product to reduce pathogenic bacteria count

Eurofeed Technologies Spa, an Italian producer of feed additives, premixes and chelates, has proposed a new product: **Shortacid**.

The components of **Shortacid** have a specific, accurate and synergic action throughout the gastrointestinal tract.

Shortacid begins acting in the feed or water, reducing the pathogenic bacteria count, and keeps modulating the pH throughout the gastrointestinal tract, reaching even the final parts of the intestine, nourishing the intestinal mucosa, increasing the surface of the villi and creating a balancing action of the intestinal ecosystem benefiting symbiotic micro-organisms and not allowing the proliferation of pathogens by inhibiting gene expression of pathogenicity as in the

Summary of Shortacid results in Argentinian trial

Treatment	Broilers	Initial body weight	Final body weight	FCR	Mortality
Control	24508	50gm	2.737	1.95	3.15
Shortacid	24606	46gm	2.930	1.83	1.62
Difference	+ 193 gr	-120 gr	-1,53 %		

Full details of this trials and others are available on request.



case of Clostridium, E coli and Salmonella (studies at the University of Ghent, Belgium).


The mono- and diglycerides of butyric acid, the main components of **Shortacid**, can be considered as a growth promoter because of the fact that they induce growth and development of the epithelial mucosa through the nutrition of enterocytes, thus obtaining a greater absorption of nutrients in young broilers, mainly in the first seven days of life, when it's often limited by inflammatory processes and, in some cases, necrotic enteritis, generally caused by Clostridium and Coccidia.

The mono-diglycerides of butyric acid form, being a fat, are stable at the pH of the stomach and pelletising temperature, do not give any unpleasant smell because they are naturally protected; they reach the intestine without being altered, and there they are separated by the pancreatic enzyme lipase into glycerol and butyric acid in a gradual manner. The latter feeds the enterocytes supporting their reproduction, while the glycerol acts as carrier of butyric acid through the cell walls of bacteria such as Salmonella, Clostridium, E coli, with a potent bacteriostatic action exerted by this short chain fatty acid.

In practice the benefits of using **Shortacid** can be summarised as follows:

- Better digestibility
- Increased growth
- Improved FCR
- Greater uniformity in birds
- Lower mortality
- Better litter condition
- Reduction of foot and breast lesions
- Less environmental pollution
- Reduction of pollution of wastewater in the slaughterhouse

Shortacid is easy to apply, is available in liquid and powder form and, therefore, it can be used mixed in drinking water or in the feed. It is applied in a stage of the production cycle; it is stable at high temperatures (pelletising); it has no contraindications and it has no unpleasant odor.

Eurofeed Technologies has made several different trials in various countries with **Shortacid** with excellent results, which show between 50 and 200 grams of weight improvement and 50 to 120 grams of FCR improvement at 21 days of age. As an example of the trials, see the summary table on the left. 

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Management techniques for a hot climate

HOT CONDITIONS SIGNIFICANTLY affect the performance of layers, particularly in temperatures higher than 30°C, a challenge faced by most egg producers in Africa. Getting good technical results requires some adjustments in the management of layer flocks. The main impact of hot temperature is on the daily feed intake, which can affect growth during the rearing period and egg production during the production period.

Ambient conditions must be optimum in terms of density, ventilation, access to water and feed (density on the floor must not be more than six birds/sq m in hot conditions). Fans can be added to increase air speed inside the house (an increase of 0.2m/s reduces the temperature felt by the birds by 1°C). In the case of an open house system, curtains should be added to the side of the house in order to reduce light intensity. Control of bodyweight is very important as good bodyweight is one of the key factors to achieve optimum performance.

Any deviation must be detected quickly in order to adapt management as soon as possible and limit the impact on production. A weekly measurement until the end of the

growth period (0-30 weeks) is necessary.

Feed presentation must be good in order to optimise feed consumption and get the best possible growth and production. Do not hesitate to maintain starter feed (crumble feed presentation is recommended for the starter feed) until six weeks of age if growth is not good enough in the first weeks. We recommend allowing the birds to empty the feeders in the hot period of the day to guard against selective feeding and to give the last feeding three hours before lights off. The feed formula (protein level in particular) must be adjusted to compensate for lower feed intake levels seen during higher temperature periods.

Importance of drinking water

Water quality can deteriorate more quickly than in temperate countries. Therefore, water must be treated to be of good quality. Chlorination is the easiest way to treat the drinking water. Residual chlorine levels must be checked in the end of the drinking system once per week to ensure that this is effective. Water temperature is also a key point as it influences the feed intake. The water tank

must not be exposed to direct sunlight and temperatures should be kept as cool as practical. Flushing the pipes can help to maintain fresh water in the pipes and avoid stagnant water whose bacteriological quality may decrease.

We often see open house systems in hot conditions. This increases the risk of introduction of contaminants in the flock. Strict biosecurity rules must be applied: houses must be bird-proof and rodent baiting stations must be installed around the house. Ideally farms should not be placed close to another poultry house. Single age farms are also desirable.

In case of overheating, electrolytes (KCl) and antioxidant products (C or E vitamins can be used in the drinking water to reduced stress induced by high temperatures (oxidative stress and respiratory alkalosis).

With these techniques in mind, egg producers in Africa are well equipped to manage the potential challenges of an extreme climate and achieve the best performance from their birds.

Dr Paul Grignon Dumoulin, veterinarian and technical specialist, ISA.

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A by-product of palm oil production offers a cattle feeding alternative as well as a viable solution to deal with troublesome nomadic herdsmen in the region.

Palm kernel cake raises cattle prospects in West Africa

THOUGH ABUNDANT THROUGHOUT across the globe, the palm plant is known to have originated from West Africa. Almost every country in the sub-region produces significant amounts of palm oil and palm kernel cake.

Nigeria was the world's leading producer until 1970, when Malaysia and Indonesia rose to become the leaders. The latter now account for more than 80 per cent of global production.

In recent times, however, significant production increases are being registered in West Africa, thanks to increased plantation investments and out-grower support. At the same time, palm kernel cake is gaining prominence as a foreign exchange earner and solution to a major problem in West Africa: the inadequacy of grassland resources to sustain domestic cattle production.

Experts believe that PKC has the potential to make West Africa self sufficient in beef production.

By-product with promise

Palm kernel cake (PKC) is a by-product of palm oil production. Palm oil is the world's most widely produced oil, and growing global demand has naturally increased the supply of PKC. While India, Europe and China are the major palm oil importing countries, the bulk of PKC exports go to New Zealand and Europe.

A significant amount of PKC is used domestically as cattle feed in Malaysia and Indonesia, where it is fed to feedlot cattle at very high levels. One report states that "it is a common practice in Malaysia to produce complete feeds based on PKC, either as pellets, cubes or total mixed ration."

PKC is widely known in West Africa as a viable feed ingredient, but until recently it has been mostly used as a source of energy and fibre in poultry, pig and fish rations.



Growing global demand of palm oil has increased the supply of its by-product, palm kernel cake, for use in animal feed.

West Africa also exports modest quantities. Although PKC has traditionally been used by smallholders as a complimentary cattle feed source, its deployment in large herd cattle feed is a recent development.

Experts believe that PKC has the potential to make West Africa self sufficient in beef production, and thus solve the major headache associated with dependence on Fulani herdsmen. West Africa also has the potential to substantially increase revenues from PKC exports.

Investments in PKC

All over West Africa, investments are being made in palm plantations and processing plants. Of the world's 23 major producers of PKC, 10 are West African, accounting for some 370,000 metric tons annually.

Nigeria leads with 75,000 metric tons, followed by Ghana with 56,000 and the Côte d'Ivoire with 53,000.

Small exporters account for the bulk of current export figures. But this is expected to change quite soon, as bigger producers enter the market. For example, the Siat Group, with palm plantations in Ghana, Côte d'Ivoire and Nigeria, raised Ghana's output potential significantly when its local subsidiary, GOPDC, started the first production of pelletised PKC in 2014.

Even though small farmers account for most palm oil and PKC production, big plantation investors are driving recent production increases.

PKC's role in conflict resolution?

PKC has the potential to solve a major problem associated with beef supply in the sub-region.

Most of West Africa's beef consumption is supplied by semi-nomadic Fulani herdsmen, originally from the Sahelian parts of Africa, who can now be found across West and Central Africa. In recent times, they have been involved in often violent clashes with farmers of towns and villages where they have driven their cattle, destroying crops and water sources.

There are regular reports of criminal behaviour among the herdsmen. In April, the Nigerian president ordered a crackdown on Fulani herdsmen who had killed scores of people across the nation. In Ghana, farmers and residents of various communities have often demanded government action against armed Fulani herdsmen who have regularly destroyed crops, polluted water sources and committed various criminal offenses.

Governments are seeking to establish ranches as a means of solving this problem. On 10 May 2016, Nigeria's Minister of State, Agriculture, Heineken Lokpobiri, announced that the Federal Government was planning to establish cattle ranches to solve the problem of continuous clashes between the herdsmen and farmers. The Minister of Agriculture, Audu Ogbeh, announced recently that the government had imported grass seedlings from Brazil, to be grown at "massive grasslots" for feeding cattle.

"We can't allow cows to be roaming around anyhow," Lokpobiri



A Fulani herdsman waters his cattle in Malkohi, Nigeria. (Image: Emmanuel Arewa/AFP/Getty Images)

said. The Senate Committee on Agriculture has expressed its support for the scheme. Ghana's Deputy Minister for Agriculture, Hannah Bissu, has also proposed the establishment of a "big cattle ranch", where cattle would be confined, to solve this problem.

But quite a number of people, including agriculture experts, have criticised and even derided the idea. While government officials believe that the "massive grasslots" would start producing feed for cattle within two years, most informed observers say this is highly optimistic, given the major financial problems facing government, and the logistic issues involved in implementing such a scheme.

They argue that Nigeria and its West African neighbours can solve this apparently intractable problem by deploying palm kernel cake in addition to their limited grassland resources. The viability of PKC, they state, is already proven, and it can be produced in vast quantities for local cattle production, and to increase export revenue.

It is an interesting fact that, for many years, West Africans have used PKC and other agricultural by-products in dry season fattening of cattle in small feedlots, where cattle are fattened for 90 to 120 days. This is done to increase weight gain, carcass quality and carcass yield.

The viability of PKC is already proven, and it can be produced in vast quantities for local cattle production, and to increase export revenue.

Dairy industry also benefits

With governments determined to stop the cross-territorial herding of cattle, the problem of sourcing feed for the big ranches and feedlots can be solved by the use of PKC. There are substantial amounts of PKC at palm oil processing sites, which would be enough to support feeding at the ranches and feedlots. With plantation farmers accounting for most of the growth in palm production, West Africa can count on sufficient amounts of PKC to increase export revenues, and to support domestic cattle production.

Indeed, hopes are being raised that PKC could also give West Africa's struggling dairy industry a badly needed thrust. A substantial amount of PKC used within Malaysia and Indonesia is used to feed dairy cows. Yet in Ghana, dairy production is based on imported bulk milk products, while Nigeria imports 75 per cent.

Though West Africa has struggled with the problem of meeting domestic meat requirements, experts believe that PKC has the potential to solve the problem. **E**

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Pest control in crops can be approached in a variety of ways, many of which have been discussed in recent issues in African Farming (AF) magazine due to their widespread applications across Africa. There seems, however, to be a bigger 'pest-control' story breaking, that the whole world needs to sit up and be aware of, as Tim Guest reports.

GM - the only future to sustainable pest control and food security

EARLIER THIS YEAR African Farming (AF) took a look at developments in Integrated Pest management (IPM) as an alternative to the use of toxic chemical pesticides in the whole pest-control-in-plants-and-crops arena. When it comes to this subject, few individuals know more, including a special knowledge of pest control in African settings, than the 'Michael Elliott Distinguished Research Fellow' at Rothamsted Research in the UK, Professor John Pickett CBE, DSc, FRS. When AF approached him to discuss recent developments in this area for this latest feature, in the Professor's own words, there is a "bigger story", which he's recently discussed in his article: 'The Essential Need for GM Crops in Nature Plants'.

Safeguarding food security is one of the greatest challenges for the future of mankind.

The "Bigger Story" is GM-based

Safeguarding food security is one of the greatest challenges for the future of mankind. Producing more food using current agricultural methods – fertilisers and pesticide use with all the associated logistics involved in their delivery - is certainly possible, but, according to John Pickett, will only add to the growing and 'excessive' agricultural carbon emissions already generated from agriculture today.

At the same time, effective pest control needs to be in place for optimum levels of productivity to be achieved, though traditional control, including the production of fertilisers and pesticides, adds even further to agricultural carbon emissions trying to be avoided.

What Pickett has stated is that, with seasonal soil/land inputs such as nitrogen and phosphorous, and an already high carbon footprint through attempts to counter 'crop resistance to pest diseases and weeds', seeds and other materials with 'new traits' need to be used in planting so that the less carbon efficient seasonal inputs can be eliminated.



Transgenic crops should be given a chance in Africa to help solve the continent's food, agriculture and human security challenges. (Image: Anne Wangalachi/CIMMYT)

Pickett sees genetic modification (GM) as the only clear approach at this time to solving, what he terms, 'this dramatically difficult scientific and technological quest'. However, this approach will have other implications that need to be countered with a parallel GM approach; converting from annual to perennial crops through innovative breeding to reduce current intense farming activities, for example, is likely to encourage rhizosphere pests and disease occurrence often associated with new crops.

By introducing new GM traits into the breeding process, greater resistance to pests, such as nematodes and fungi, can be conferred to the new plants. Pickett explains that GM in this context includes 'genome editing and synthetic biology' required to transfer the appropriate traits to new crops, although a scarcity of genes and public opinion are the two key factors determining the success or failure of this approach.

While there has been an apparent improvement in the acceptance of GM crops in places like the UK, according to Pickett, he also warns that the scientific establishment must remain engaged with all involved in any GM-based future – and that

includes the public. For, while the UK populace may have tempered its abhorrence to GM, widespread work on these technologies is still being thwarted across Europe with continuing objections and crop destruction by GM antagonists in other countries.

Pickett makes it clear, however, that to deal with such, the scientific community must never again take the arrogant approach it did in the early days of GM when rapid expansion flew in the face of the public's voice.

That said, Pickett also sees the importance of food security growing to a point where GM crops become, through necessity, more widely accepted and, resultantly, GM food more widely consumed.

The quest for more genes

Professor Pickett is leading his team at Rothamsted Research to uncover new genes that will help drive this whole approach. He says not enough headway has been made, as yet, to find more genes that can improve nitrogen fixation, and adds that more research is also needed – together with the necessary funding – to further the

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understanding of the genetics and, by inference, a GM approach to herbivore and disease resistance in new crops.

He adds that new GM-based traits that might be used with annual mono-cultured crops should be worked on in parallel with mixed cropping studies, as well as the potential 'engineering of rhizosphere organisms'.

His team at Rothamsted has so far been 'successful in testing the scientific principles' behind the use of pheromone genes to regulate pest behaviour, although he says no new crop-protection device has yet emerged. In addition, the team also made 'dramatic progress' in controlling certain fungal pathogens, including those causing Asian soybean rust and potato late blight, not simply by focusing on these target pathogens but, in Pickett's words, 'by targeting genetics well beyond the contaminated host species'.

Sentinels in an increasingly threatened world

While the use of synthetic fungicides is still the backbone for protection of animal feeds globally and crop-production research into C4 photosynthesis and biotechnological nitrogen fixation are, according to Pickett, proving most successful, he stresses that turning these advances into practical solutions is paramount.

Rather than focusing just on the 'expression of new GM traits', he places the



GM crops already feed much of the world today – why not tomorrow's generations? (Image: Andrea Booher)

emphasis on 'tactical gene promoter systems' that might eventually lead to 'self-protecting crops'. In the practical scenario of a planted field, these 'Sentinel' plants would be the early-warning system for the main crop by their ability to identify threats before and as they emerge, in turn sending 'volatile signals' to the rest of the crop, which, in turn, responds with its own defensive mechanisms. Such dangers as the arrival of pests or an increasing dearth of nutrients might be protected against in this way.

Pickett is profound in his belief that this GM-based approach is the 'Bigger Story',

the crucial way forward towards food security, but one which will not reach its optimum potential without the right, and massive, funding. That funding and those efforts must not simply be limited to the UK and Europe, but the rest of the world, including Africa. Without such investment and research to deliver these practical solutions into the field, Pickett pulls no punches in painting a picture of a world in which, if the technological challenges have not been solved, the impact of food shortages on the wider world will render debate about GM totally pointless. **E**

Rothampsted Research's international strategy

ROTHAMPSTED RESEARCH HAS an evolving international strategy built around a broad set of principles, including engaging developed countries on a peer-to-peer basis emphasising scientific excellence. The institute has many active peer-to-peer collaborations and seeks to strengthen these by initiating new

programmes in which collaborations are actively promoted with world-class labs in other industrialised countries. It already has many joint projects involving international partners and seeks to structure its activities in these areas to bring about coherent, yet flexible, platforms maximising collaboration across its strongest research

areas. It also aims to engage developing countries in a strategic manner, continuing to build strong relationships with such countries but with greater reference to its overall scientific strategy. The Rothamsted International programme also continues to fund fellowships for appropriately-qualified scientists from developing countries.



Dr Terry Mabbett spoke to Peter Prentis (export director) and Alan Lowes (regional director) at Omex, who have recognised the requirement and opportunity for an early boost to germination followed by fast early growth and establishment.

Priming the early growth and establishment of sugar cane

DESPITE OVERALL GROWTH rate, eventual size and density, sugar cane is a notoriously slow-starting crop in need of priming with nutrients so that new strong shoots can get out of the ground as quickly as possible. Sugar cane is propagated from short lengths of stalk called stem cuttings or setts each with a number of buds. Buds develop into shoots and grow into new 'stalks' (canes) which are harvested for their rich sucrose (cane sugar) content. It takes between 10-24 months before the canes are ready for harvest but, surprisingly for such a generally vigorous crop, the initial phase – germination of the setts, growth of the buds into shoots and establishment of the root system – is a very slow and drawn-out process.



'Germinated' cane setts showing new shoots and the initial system of thin, branched, superficial and transitory roots of the cane sett itself. Also showing are the first signs of stem roots which will be longer, straighter, thicker and more permanent. (Image: Omex)

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Getting to the root of the problem

At the root of sugar cane's tardy take off is the unfolding complexity of root development featuring three separate and disparate rooting systems appearing at different stages of the plant's growth and development.

The initial roots of the sugar cane sett itself are thin, branched, superficial and transitory. These are succeeded by stem roots which are longer, straighter and more permanent. These second stage roots have two primary functions – to supply water and nutrients and to provide physical support to the rapidly establishing sugar cane plant. Finally the buttress roots will go deeper into the soil to anchor the, by now, substantial plants firmly into the ground.

By this time, sugar cane will have already grown to a considerable height and density and difficult to work inside to carry out fertiliser application. However, the slow initial growth stage presents an early window of work opportunity at the very time when sugar cane requires a nutrient boost, to kick start germination and establishment of the setts as rapidly and securely as possible. It offers farmers a valuable opportunity to carry out growth priming procedures by applying soluble nutrient formulations to sugar cane setts in the furrow.

Nutrient-led growth priming procedures

Omex Agrifluids, supplier of soluble nutrient products to farmers and growers throughout the world, has recognised the requirement and opportunity for an early boost to germination followed by fast early

growth and establishment. The Omex philosophy is based on treating setts in the furrow with soluble nutrients and biostimulants to achieve earlier crop establishment and enhanced tillering to give more and bigger canes to cut at harvest time.

To this end Omex, in co-operation with distributors and farmers in the sugar cane world, has monitored early growth and establishment with a multitude of measurements. What they essentially found is shoots coming out of the ground earlier and faster and looking stronger for at least two to three months. Growth is quicker and sugar cane plants become more securely established in a shorter space of time.

There is another good reason for priming planted cane setts but this is often overlooked due to a general but misinformed view that sugar cane, because of its overall fast growth rate, high foliar density and size, is not troubled by weed competition. While this may be true once sugar cane tillers have covered the ground, it is certainly not true in the early stages of the crop.

Weed control is most needed just after planting the setts because they will have to grow for a considerable time before reaching the stubble stage to cover the soil. In fact, during this early growth stage, weeds grow much faster than sugar cane with more time and opportunity to develop, because they will have begun to germinate and grow immediately after the last harrowing or furrowing.

Later on, the sugar cane will have covered the ground and formed a canopy to

shade out weeds, but this takes four to five months for planted cane and three months for ratoon cane in a moist warm climate. Thus anything which gives sugar cane a kick start and a boost at this early stage can only help to mitigate weed competition.

An Omex boost for sugar cane

So what are the soluble nutrients and commercial products from Omex which underpin this philosophy and best practice for early stage growth and establishment in sugar cane? To find out I went to the company's headquarters at Kings Lynn in the UK to speak with Peter Prentis (export director) and Alan Lowes (regional director) at Omex.

"First on the sugar cane 'set' and scene is our Omex Bio 20," said Prentis, "applied as a spray to sugar cane setts in the furrow." "This well tried and tested product, combining a full range of essential macronutrients and micronutrients, and boosted by the addition of organic material derived from a single variety of seaweed, stimulates early growth activity of the sugar cane sett," said Lowes.

Alan and Peter said that Omex Bio 20 is more than just a balanced formulation of essential plant growth nutrients. "This bio-stimulant does just what the name says by stimulating root growth and development to promote greater root biomass and to ultimately maximise access, absorption and utilisation of soil moisture and soil nutrients dissolved therein. The net result is quicker establishment and faster and stronger early plant growth," they said.

Next on the list for treatment of cane setts in the furrow are two of Omex's single nutrient products. They are Omex 'Kingfol Zinc' and Omex 'Kingfol Manganese' featuring a pair of essential micronutrients which underpin the growth, development, yield and quality of sugar cane.

Omex Kingfol Zinc contains 70 per cent w/v (weight/volume) zinc. "Zinc is the most widely-spread soil-based micronutrient but invariably the most inaccessible to crop plants because huge amounts are locked up as insoluble zinc and therefore unavailable to plant roots," said Prentis. Plant available shortfalls in naturally occurring soil-based zinc make deficiency of this essential micronutrient the most acute and widespread across the world's major field crops and sugar cane is no exception," added Lowes.

Zinc stimulates root activity and is well established for its crucial role in early crop growth. Deficiencies of zinc in sugar cane are reflected in reduced tillering, shorter internodes and thinner stalks exhibiting a loss in turgidity. At leaf tissue level zinc



Despite the sugar cane crop's ultimate height and density, the early stages of sett 'germination' and establishment is a slow and long drawn-out process benefitting from the boost given by spraying specific nutrients and biostimulants to cane setts in the furrow. (Image: Omex)

deficiency shows up as a marked chlorosis (yellowing) of the veins and especially on young leaves. The area around the midrib and the leaf margin remains green but the leaf blade is otherwise chlorotic. Leaves are less numerous and generally shorter in length with a high incidence of leaf tip death. The presence of red areas or lesions is due to the presence of anthocyanin pigment. At cell level zinc is a crucial co-factor for a number of enzyme systems.

Omex 'Kingfol Manganese' contains 52.8 per cent w/v manganese. Like zinc the manganese micronutrient is an important enzyme activator. Deficiencies will rapidly show up as chlorosis (yellowing) of the leaves but in this case of the leaf lamina tissue between the veins from the leaf tip and towards the centre of young leaves. In acute deficiency cases the chlorotic tissue may die, turn brown and split along the lines of necrosis with marked leaf twisting. Mature leaves are also affected but, in this case, accompanied by reddish coloured necrosis also indicating the presence of anthocyanin pigment. Inter-vein leaf necrosis rather than necrosis of the vein itself is what distinguishes manganese deficiency from zinc deficiency in sugar cane.

Zinc stimulates root activity and is well established for its crucial role in early crop growth.

Securing early growth and establishment

With prompt early treatment of cane setts in the furrow, new shoots push out through the soil sooner and look stronger. They start to photosynthesise more rapidly, thus contributing to growth, establishment and development that much sooner in the crop cycle. Compared with untreated setts in the same field these earlier appearing shoots continue to look stronger and more robust for two to three months after which the advantage appears to fade as a more even stand is presented. However, 'the proof of the pudding comes in the eating' or, in this case, the harvesting of treated and untreated plants. Those treated with Bio 20, Kingfol Zinc and Kingfol Manganese yield a higher tonnage due to bigger and heavier canes and, more crucially, having a higher sugar content.

Early treatment of setts in the furrow with Omex soluble nutrient and biostimulant products is now carried out in most of the

key sugar cane growing countries of the world including Mozambique, South Africa, Brazil, India, Thailand and Indonesia. Farmers and growers will clearly balk at the prospect of trying to spray well grown sugar cane for the simple reason that they will be unable to move with any ease and efficiency through the crop with either tractor drawn/mounted sprayers or manually-operated sprayers. The only other option for spraying sugar cane at this advanced stage of growth and development is by aerial spraying.

Peter Prentis and Alan Lowes summed up the situation for sugar cane. "Applying nutrients and biostimulants at the very beginning of the crop is by far the easiest option for sugar cane farmers and growers. It allows them to avoid the logistical constraints on driving vehicles through or walking through well grown sugar cane with all the associated problems of achieving adequate spray coverage. However, the single biggest advantage of treating sugar cane setts in the furrow is providing these fledgling sugar plants with the right nutrient requirements at the right time, which is at the rooting and establishment stage of the crop." ¹

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CATALIST-Uganda improves rice production and incomes

RICE FARMERS IN Eastern Uganda are expanding production and profits thanks to technologies and market linkages through the Netherlands-funded CATALIST-Uganda project. The four-year project has been raising smallholder incomes and enhancing food security by improving productivity and market development since 2012. Using the accelerated agribusiness cluster development model, the project develops integrated cropping systems for several value chains, including rice.

Rice was not widely grown in CATALIST-Uganda's target districts before the project was implemented. Traditional planting techniques hampered farmers' success. However, project interventions, such as introducing new high-yielding varieties and training on proper techniques, resulted in doubled or tripled yields. Now, more than 6,000 farmers – 45 per cent being women – grow rice for the market in Eastern Uganda.

Project partners include several agro-dealers and small- and medium-scale rice processors that provide a range of agricultural inputs and a guaranteed market for rice. Extension services and a drying



A smallholder growing paddy in Doho Eastern Uganda. (Image: Gates Foundation)

yard are provided free of charge by the company. Storage facilities are offered at affordable rates, permitting farmers to delay sales until prices improve. Farmers are linked to a private sector agro-input supplier, which, with project support, provides free extension services. These linkages and growing sales encouraged the agro-input company to quadruple its staff to 20 full-time extension officers.

Farmer training has been provided on nursery establishment, good agricultural practices (GAP), water management,

fertiliser and herbicide application and post-harvest management. Field trials began in 2013 with 50 farmer groups and now involve over 500 groups, each with 25-50 farmers. CATALIST training has enabled 12 farmer groups in the Tororo district to improve yields and profits, form savings associations and access loans.

Members of the community-based organisation SWODEPRO have increased yields four to fivefold. Rose Akello, SWODEPRO chairwoman, praised her organisation's newfound productivity: "Now we sell as a group and get much better prices. We know how many kilograms we have and how much money we can expect to make. And we spend less on transport because IFDC has linked us to a buyer nearby."

CATALIST-Uganda will conclude activities in 2016. By that time, an estimated 110,000 smallholders will have doubled yields, achieved a 50 per cent increase in incomes and produced annual marketable surpluses of 200,000 mt. These surpluses will contribute to increased rural incomes and trade in Uganda and higher regional food security.

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PROVIDING A CORRECT solution is the essence of any irrigation system such that water just covers the root zone of every plant. Any water that goes beyond the root zone is actually waste, feeding just the weeds. Further waste of costly fertilisers if injected into it.

Furthermore, optimising the use of all irrigation components is the real challenge. For example, if a requirement for an irrigation system is 2hp pump with 2" main pipe, then using even a 3hp pump with a 3" line is just a recurring waste of money.

Also important is the ease of operating a system every day with the best arrangement and positioning of the pumps, filters, pipes and control valves. Such a layout needs actual practical experience of every farm type.

The necessary specifications of driplines or sprinklers best suited to the water availability, plantation type and budget of the farmer is most important of all. Automation of any system is necessary only if the labour is very expensive as in western countries. Otherwise it is expensive and reduces the viability of the system.

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Advantages and disadvantages of centre pivot systems

CENTRE PIVOT SYSTEMS offer many advantages over other irrigation application methods:

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Disadvantages of centre pivot systems include:

- Relatively high initial cost
- Relatively high pipe-friction losses
- Circular pattern leaves dry corners and potentially lower yield
- Topographic changes cause potential operating pressure variations
- Can have operational challenges requiring human interventions
- Potential risk for injury if the operator is not familiar with operation

Centre pivots are well-engineered structures that effectively deliver water to large circular fields.

Centre pivot system layout

Centre pivot irrigation is a form of overhead (sprinkler) irrigation consisting of several segments of pipe (usually galvanised steel or aluminum) joined together and supported by trusses, mounted on wheeled towers with sprinklers positioned along its length. The major components include:

- Pivot
- Pivot tower
- Control panel
- Spans of pipe between towers
- Trusses to support the spans
- Tower drive wheels

Most centre pivot systems now have drops hanging from a U-shaped pipe called



Fields irrigated by central pivot irrigation

a gooseneck (see Fig. 1) attached at the top of the pipe with sprinkler heads positioned a few feet (at most) above the crop, thus limiting evaporative losses and wind drift.

Irrigators typically install pressure regulators upstream of each nozzle to ensure each is operating at the correct design pressure. They can also use drops with drag hoses that deposit the water directly on the ground between crops or with spray-type sprinklers less than 0.6 metres off the ground. These types of systems are respectively known as Low Energy Precision Application (LEPA) or Low Elevation Spray Application (LESA). Most centre pivots originally operated with high water pressure, a practice later replaced by hydraulic systems and electric motor-driven systems. Most systems today are driven by an electric motor mounted at each tower.

How centre pivots work

Centre pivots are well-engineered structures that effectively deliver water to large circular fields. Each has a main water delivery pipe suspended over the field out of the way of the crops.

Sprinklers or spray nozzles can be spaced along that pipe to apply water wherever the pipe is travelling. At each tower, pipe sections are connected with flexible joints that allow the pipe to move

through a limited range without twisting or breaking. This flexibility also allows vertical bending that enables pivots to climb moderate hilly slopes.

General centre pivot movement

The machine moves in a circular pattern, and is fed with water from the pivot point at the centre of the circle. The water is usually pumped from a source such as a well or a river. The pump is connected to the pivot at the pivot point. The outside set of wheels covers the greatest distance and thus sets the master pace for the rotation. The inner sets of wheels are mounted at hubs between two segments and use angle sensors to detect when the bend at the joint exceeds a certain threshold (the wheels should be rotated to keep the segments aligned). Most centre pivots irrigate a circular area 0.4 km in radius, although some can cover a larger area. Centre pivots are typically less than 0.5 km in length. Most manufacturers offer a way to adjust the speed of the pivot, and thus the amount of water being applied over a given area, a process called Variable Speed Irrigation (VSI).

Some manufacturers offer packages that not only vary the speed, but also turn valves for groups of sprinklers on the pivot system during operation on and off. This is known as Variable Rate Irrigation (VRI).



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Challenges with centre pivots

With all of its advantages, centre pivot irrigation does present some challenges. Per the Natural Resources Conservation Service (NRCS) (Shae, Robinson 2009),

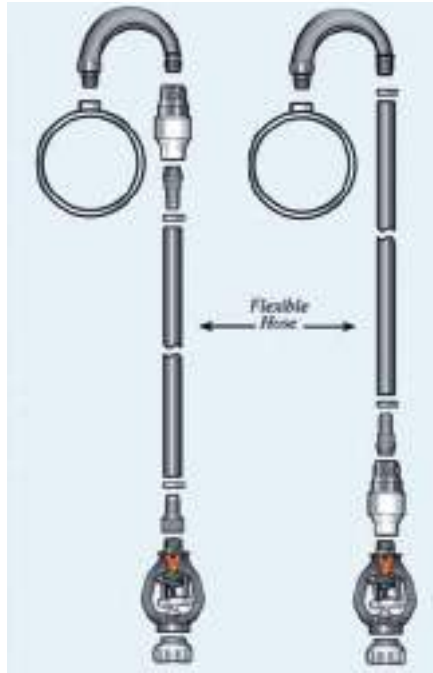



Fig. 1. Senninger sprinklers with gooseneck pipes.

irrigating in circular patterns is just plain “trickier” than irrigating in rectangles. In a rectangular system, each sprinkler applies water to an identically-sized area. In a circular system, the area increases as the radius increases so that the sprinkler applies water to a differently-sized area.

To overcome this irrigated surface area challenge, and to maintain uniform coverage, irrigators calculate and size sprinklers appropriately along the length of the pivot. This maintains uniform water application along the linear length of the

centre pivot. The greater the radius of the circle, the more the grower must adjust the litres per minute to overcome frictional losses and the increased delivery acreage. This is accomplished by adjusting the nozzle diameter to increase flow.

Since the outermost spans of the pivot travel farther in a given time period than do the innermost spans, nozzle sizes are smallest at the inner spans and increase with distance from the pivot point. This helps keep a uniform flow of water as the outer wheels set the pace of the rotation. 

New anchor package allows centre pivots to irrigate more land

IN TODAY’S MARKET, it is more important than ever for growers to make the most of cropland to get the highest possible yield. For many growers, this means irrigating land that may be difficult to reach with traditional centre pivots.

Valley Irrigation is expanding its Bender product line with a new anchor package that extends the reach of irrigation machines even further. Valley Bender products allow a centre pivot to bend and wrap around in-field obstacles, irrigating the acres behind it. The new Bender Anchor allows growers to use Benders on longer machines, up 610 metres after the Bender, as well as on rough or rolling terrain, to irrigate even more acres.

Only Valley offers an anchor for its bending units because only Valley pivots have the strength to handle long Bender machines, said Valley Irrigation vice president of global marketing Matt Ondrejko.

“Our studies found that growers can increase their profits by at least US\$300 per acre in Nebraska, just by irrigating more of the land they already have,” Ondrejko said. “The new Bender Anchor extends those irrigated acres at a low per-acre cost, improving yield and profit.”



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Although small to medium capacity models remain the popular choice for many farmers in Africa, there is also an increasing demand for harvesters offering more output. Mike Williams reports.

Combine harvester progress

ALL THE LEADING manufacturers say demand in the high output sector of the market is growing. There is also increasing interest in equipment that can improve efficiency, and this includes features such as automatic steering, moisture measurement and bigger capacity grain tanks with a faster unloading speed.

John Deere is the biggest combine harvester manufacturer and a recent addition to the small to medium capacity sector of their range of combines for the African market is the W70 model made in a John Deere factory in India. The same factory also builds a smaller, entry-level model, the W50 powered by a 75hp engine.

The W70 is designed to handle a wide range of crops including soyabeans, cereals, rice and pulses, and it has a 100hp John Deere engine with the power delivered through a manual gearbox with four forward speeds and as reverse. The cutterbar is adjustable and has a 4.2 metre working width with electric adjustment of the reel speed, and the rasp bar and spike tooth threshing system is followed by straw walker separation. Grain tank capacity is 2,700 litres.

Case IH is the only company with an all rotary combine range.

The entry level models from John Deere are pull type harvesters suitable for tractors in the 60 to 100hp range. They include bagger and grain tank models and are designed as a cost-effective option for small acreage growers. For contractors and farms with big harvesting workload the John Deere range includes four S series models powered by engines from 9.0 to 13.5 litres with outputs from 449 to 617hp. Grain tanks have 10,600 or 14,100 litres capacity and the discharge rate is 120 or 135 litres per second (l/sec).

The arrival of the first combines with rotary separation in 1977 was an important development in harvester design, providing the first serious challenge to the long-established straw walker system for separating the grain. The company that developed the first combines with rotary separation was International Harvester when they announced the first of their Axial-Flow models, and the success of the new combines is said to have been one of the main reasons why International Harvester was taken over to join Case as part of Case IH.

Other leading harvester manufacturers now offer at least some rotary models, but Case IH is the only company with an all rotary combine range. While demand for larger capacity models is increasing, especially for big farms in South Africa, most of the sales of Axial-Flow combine harvesters in Africa are the mid-range 140 series models. These start with the 5140 powered by a 6.7-litre engine developing up to 308hp, and the 6140 and 7140 combines both have 8.7-litre engines with 348 and 375hp maximum output respectively. The widest headers for the three 140 series models are 6.7, 7.6 and 9.1 metres respectively and grain tank capacities are 8,810 litres for the 5140, increasing to 10,570 for the two larger models.



John Deere's 100hp W70 combine is built in India.

AccuGuide automatic guidance system

One of the features offered on Axial-Flow combines is AccuGuide, an automatic guidance system that can help the driver to increase harvesting efficiency. Used with yield and moisture data, AccuGuide can produce field maps highlighting areas where crops could benefit from additional fertiliser or irrigation. AccuGuide is becoming increasingly popular, especially with customers choosing larger Axial-Flow models, reports Case IH.

One of the biggest combine choices is available from Massey Ferguson with models sourced from factories in the United States, Brazil and Italy. The most popular MF models in African countries are in the small to medium capacity range including the Brazilian-built MF32 powered by a 200hp Agco Power engine. The separation system has five straw walkers and the specification includes a 5,500-litre grain tank with an 84 l/sec unloading rate. Headers are available for a wide range of crops including rice, soya, maize and beans as well as cereals.

The Activa and Activa S series combines from the Massey Ferguson factory in Italy include an MF7345 version with a 243hp engine and five straw walkers, and the power output increases to 306hp maximum for the MF7347 model with six straw walkers. The grain tank capacity for both versions is 8,600 litres with a 105 l/sec and the discharge rate is 105 l/sec. Yield monitoring and moisture sensing equipment are on the options list.

Options available for Massey Ferguson's Beta series harvesters include Auto-Guide automatic steering control providing accuracy within five cm, and the ParaLevel versions provide a self-levelling action to maintain threshing efficiency on slopes up to 20 per cent. Beta combines have 360hp maximum engine power, the separation system has six straw walkers and the grain tank capacity is 9,000 litres, reducing to 8,600 litres for the ParaLevel versions. Massey Ferguson says the demand from big acreage farms for

combines such as the Beta series is growing, particularly in South Africa. They also report increasing interest in equipment that can increase efficiency such as automatic guidance and yield mapping.

Massey Ferguson says the demand from big acreage farms for combines such as the Beta series is growing, particularly in South Africa.

The Claas range includes some of the highest output combines available, but they also cater for growers with a modest work load by offering the Crop Tiger models built in a Claas factory in India. There are two models, the 30 and 40, both available on wheels or as a Terra Trac version on Bridgestone rubber tracks for soft ground conditions including rice harvesting. Both are powered by Tata four-cylinder engines with outputs of 62hp for the 30 model, increasing to 76hp in the 40 version. Grain tank capacities range from 1,200 to 1,700 litres with 30 l/sec unloading. Header widths are from 2.1 to 2.6 metres and the cleaning system for both models includes an air blast fan and a 450 mm diameter rotor with speed adjustment between 500 and 1282 rpm.

Claas also offers the Dominator, a combine with a long and immensely successful history. The Dominator 130 model is powered by a six-cylinder Perkins engine developing up to 152hp, the cutting width options are 4.27 or 4.57 metres and there are four straw walkers. Grain is delivered to a 3,200-litre tank with a 35 l/sec unloading rate.

For those needing more harvesting capacity, Claas has announced specification updates for their Lexion 600 series



Case IH reports an increasing demand for large capacity models like this Axial-Flow 9240 combine.

combines. There are four models, three with six straw walkers while the entry level 620 has five. Outputs from the Mercedes engines are from 313 to 435hp, and the engines for the top two models now have the Dynamic Cooling feature already included on the 700 series. With Dynamic Cooling the fan drive automatically



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adjusts to match the exact cooling requirements of the engine, reducing fuel consumption by power savings amounting potentially to 20hp. Other changes include straw chopper modifications to improve the spread pattern and the options list includes sensors and a control system to reduce the risk of crop material blockages.

New Holland's extensive harvester range starts with the TC series including three combines with a 175hp engine. The entry-level


New Holland's TC4-90 combine has a 175hp engine and a 5,000-litre grain tank.



For those needing more harvesting capacity, Claas has announced specification updates for their Lexion 600 series combines.

model is the TC5040 with four straw walkers and available with headers up to 4.57m wide or a five-row maize header. The grain tank capacity is 4,000 litres and the transmission is a manual gearbox. The same 6.8-litre engine is used on the TC4-90 and TC5-70 with four and five straw walkers, 5,000-litre grain tanks and a hydrostatic transmission, and the power output increases to 231 and 243hp for the five-straw walker TC5-80 and TC5-90 with tanks holding 6,400 litres.

Grain tank capacities for the three CX Elevation models from New Holland range from 8,000 to 11,500 litres and the FPT Industrial engines have from 258 to 490hp maximum output. The CX5000 has five straw walkers, with six on the 8,000 model, and the 8,000 also has a four-speed hydrostatic transmission instead of the three speeds on the other models, and all three models have the Smart Sieve feature compensating for up to 25 per cent side slopes.

The flagship models in the New Holland range are the CR 8070 and 9080 with rotary separation with 422 and 530hp engines and four-speed hydrostatic drive. The rotor in both models is 2,638 mm long and diameters are 432 and 559mm, maximum header widths for grain are up to 10.67 and 13.72 metres and grain tank sizes are 11,500 and 12,333 litres. A SmartTrax rubber track conversion is an option for the CR9080 model. 

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Precision farming means the targeted and site-specific management of farm land. This article looks at the use of microdrones in this rapidly expanding market.

Future agriculture: precision farming with microdrones

THE AGRICULTURE SECTOR is »ploughed up«: A revolution towards automation is taking place in one of the oldest and most important sectors of humanity. According to a survey conducted by the Technical University of Munich and the DLZ agricultural magazine in 2014, over 80 per cent of farmers in Germany use electronic documentation systems in crop production.

Unmanned aerial systems (UAV) make an important contribution to the technological revolution in agriculture. Equipped with several sensors and microcontrollers, NIR and multispectral cameras, GPS receivers and many more, they support farmers in the efficient use of plant protection products, providing important data on the type of soil and protecting wildlife from death. The use of microdrones in agriculture has a huge potential and a wide-ranging field of applications.

The advantages of the use of UAVs in agriculture are obvious: Due to their capacity of starting and landing absolutely vertically they can interact in a very small or hard-to-reach space. In addition, some information is easier to get out of the air and give the farmer a meaningful picture of the state of the plant and the soil thanks to various sensors.

The following report gives an insight on existing application scenarios and offers an outlook on the near future of agriculture.

Precise crop-management with microdrones

In times of a growing global population and progressing climate change, farmers are more and more concerned about the sustainable management of the farmland: On the one hand, how to protect the environment, and on the other, how to supply the people of tomorrow with enough food without unnecessarily straining the earth. Where a farmer's »green fingers« once were essential for a good harvest, now it is microdrones that will optimise the agricultural land to optimal management and protect us from famine in the future.



This md4-1000 from Microdrones is equipped with a multispectral camera that can deliver data on humus content, the irrigation condition or stone and weed content at the surface.

Agricultural and vineyard automation: Pest control

One third of the annual harvest worldwide is lost due to pests and fungal infestation. Today, thanks to the latest technology the farmer can take early countermeasures and actively work against the threat of crop loss. On the field UAVs equipped with multispectral cameras determine the pest infestation of plants – even before the leaves wilt. With the microdrones technology an efficient and environmental field management is already possible today.

In Japan unmanned flying objects have been used for precise spraying of rice plants for a number of years. The method is more efficient and ecofriendly for the farmer than using an agricultural machine or even a helicopter with a human pilot on board.

In viticulture microdrones have asserted themselves as the vineyard-managers of tomorrow. Wine-growers often struggle with the fungal infestation of the vines growing on steep slopes. In addition, the regions are very difficult to prepare. Microdrones are able to fly in the remotest corner to the exact spot of the fungal infestation and specifically tackle the disease.

In advance, the UAVs determine accurately the points where pesticides may be used or whether there is a lack of water. The wine-grower can act purposefully and early without losing the harvest or needing to spray the entire vineyard. The German Ministry of Food, Agriculture and Consumer Protection already supported the use of drones in vineyards for a total of Euros 800,000 since 2011.

Another scenario: Rooks used to be a major problem. The greedy birds looted much of the seed and caused devastating damage. Today a flying platform serves to deter the animals, while, at the same time, provides important analysis of the condition of soils.

Other advantages are that the UAV constantly holds its position and can be controlled exactly by a GPS waypoint system. They can also be used for site-specific fertilisation without heavy machines burdening the soil and giving off emissions. The opportunities for flying agricultural workers are almost unlimited and attractive even for smaller businesses.

Studies already report on the devastating consequences of the massive use of

pesticides: According to Soil Atlas of 2015 of the Heinrich Böll Foundation, European cropland has lost around 45 per cent of its organic matter (humus and soil organisms) due to agricultural use. Nevertheless, the use of fertilisers is increasing worldwide: While in 1960 the use of fertiliser per hectare was below 50 kg, in 2020 it will be around 200 kg per hectare. The massive use of fertilisers has disastrous consequences for the ecosystem and thus for the food supply of the future.

Using microdrones, the massive use of fertilisers can be reduced: They collect important and multifaceted data of the state of the fields and help the farmers to work targeted, ecological and profitable. The possibilities are huge and meet the most diverse requirements. The main method in this context is remote sensing, providing meaningful data of the state of the soil.

Providing aerial images of the fields, microdrones give important information of the condition and the degree of maturity based on the colour saturation of the plants. In advance of planting, the data of microdrones give an insight into the location productivity, for example, by elevation models or by analysis of local weather data. On the basis of the aerial photos of the soil surface, water erosions are visible at a glance. Colour and brightness of the earth allow the farmer to draw conclusions about the humus content, the irrigation condition or stone and weed

The use of microdrones in agriculture has a huge potential and a wide-ranging field of applications.



In viticulture microdrones have asserted themselves as the vineyard managers of tomorrow.

content at the surface.

In the non-visible range, UAVs equipped with NIR cameras supply information about the leaf structure or the water content of the plants. Examining the reflected wavelengths of the plants, the data provide statements about the need for fertiliser, nutritional status and the population density of the plants. The farmer is able to act targeted and locally differentiated without having to extensively use fertiliser and polluting the environment.

There are countless examples of the use of UAVs for examination, monitoring and cartography of cropland. Other application scenarios include:

- Monitoring and assessment of crop yield
- Monitoring and testing fertiliser requirements
- Planning and mapping of water-drainages

Conclusion and outlook

The report shows that the flying agricultural workers are no longer part of a future scenario. They are a part of the current agricultural revolution in precision agriculture. The specific applications of UAVs in farming show that a successful and environmentally friendly implementation in the agricultural business is already possible and will continue to be of great importance, although some obstacles still need to be overcome.

The agricultural sector is one of the biggest expanding markets, especially with the background of a growing world population and threatening famine. Microdrones will be an integral part of this revolution: In the future, the deployment of UAVs will support the improvement of the yield, save the world's cropland from a nutrition loss and will even save lives! **E**

How building 3D models is helping rural communities

A PROCESS OF building three-dimensional physical models in a village setting is helping to bring together traditional and modern scientific knowledge to tackle challenges ranging from soil degradation to land use planning, and from forest management to climate change. The technique, known as Participatory 3-Dimensional Modelling (P3DM) enables marginalised communities to present their territory – together with their own valuable knowledge – in a visual form, offering them the opportunity to protect precious natural resources from outside threats and preserve them for future generations. Some of the field experiences have been published in a new report. 'The Power of Maps: Bringing the third dimension to the negotiation table' is published by the Technical Centre for Agricultural and

Rural Co-operation (CTA), which has been in the forefront of promoting the practice across African, Caribbean and Pacific (ACP) countries. Developed in the early 1990s in Southeast Asia, P3DM is rapidly gaining ground in other parts of the developing world. Participatory 3D models, made out of cardboard and illustrated with coloured paints, pushpins and yarn, portray land cover, such as farmland, rivers and forests, as well as other features, including coastal resources and sea depth. Uniquely, they also depict traditional knowledge, such as ancestral land rights and sacred places. These features are generally supplied by elders in the community, while younger members build the map itself. The result is a free standing relief model which provides tangible evidence of local knowledge, serving as an effective tool

for analysis, decision-making, advocacy, action and monitoring.

Often, the process of participatory 3-dimensional modelling is in itself empowering, bringing communities and generations together and helping them to visualise the extent of their resources, and how climate change and other threats, such as mining and deforestation, may be affecting them. Once completed, the physical model remains with the community. Case studies presented from Ethiopia, Fiji and Madagascar show how P3DM has led to the development of community-driven natural resource management plans. Other examples of P3DM initiatives described in the book demonstrate how the technique can give marginalised rural people a voice to make their case heard.

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Autonomous tractor gives glimpse of the future of precision farming

CASE IH UNVEILED AN autonomous concept vehicle at the Farm Progress Show in Iowa, USA. The concept vehicle is a cabless Case IH row crop tractor that can operate autonomously with a wide range of field implements. "In many parts of the world, finding skilled labour during peak use seasons is a constant challenge for our customers," said Case IH brand president Andreas Klausner. "While we offer auto-steering and telematics on our equipment today for remote management of farm machinery and employees, this autonomous tractor concept demonstrates how our customers and their employees could remotely monitor and control machines directly. This technology will offer our customers greater operational efficiencies for tasks such as tillage, planting, spraying and harvesting."

Klausner explained that the concept was created to validate the technology and to collect customer feedback regarding their interest and need for future autonomous products for their operations. "It is very exciting for us to explore the possibilities that this technology can provide to our customers. We look forward to getting their input regarding this concept and how it can help them achieve new production efficiencies," said Klausner.

Case IH and CNH Industrial's Innovation Group based the cabless autonomous concept on an existing Case IH Magnum tractor with reimagined styling. The vehicle was built for a fully interactive interface to allow for remote monitoring of pre-programmed operations. The onboard system automatically accounts for implement widths and plots the most efficient paths depending on the terrain, obstructions and other machines in use in the same field. The remote operator can supervise and adjust pathways via a desktop computer or portable tablet interface.

Through the use of radar, lidar (light imaging, detection, and ranging) and onboard video cameras, the vehicle can sense stationary or moving obstacles in its path and will stop on its own until the operator, notified by



audio and visual alerts, assigns a new path. The vehicle will also stop immediately if the GPS signal or position data is lost, or if the manual stop button is pushed. Machine tasks can also be modified in real time with via remote interface or automatic weather warnings.

AFS global product marketing manager, Rob Zemenchik, explained that autonomous tractor operation brings together the latest in guidance, telemetry, data sharing, and agronomic management to offer farm managers more control, monitoring capabilities and cost savings. Although the autonomous vehicle is presently considered only as a concept tractor, Zemenchik said the technology could function just as well in a standard cabbled tractor where it could use real-time weather and satellite data to optimally apply crop inputs such as nitrogen, herbicides, or fungicides.

CNH executives said the tractor would carry an array of built-in sensors to avoid obstacles. Skilled farmers would still be needed to supervise the tractor, they said. Farmers could monitor and control the tractors via desktop computer or tablet, from home or in their pickup trucks.

Tatoma builds plant for fodder and silage mixes in Israel

TATOMA IS BUILDING a stationary production plant for Ambar in Israel to obtain fodder and silage mixes to feed more than 10,000 cattle daily.

The plant is the result of Tatoma's experience of over thirty years in the design, construction and commissioning of Totally Mixed Ration (TMR)-type feeding systems for ruminant livestock both in trailed and self-propelled machinery and more than twenty years building these industrial facilities, with over a hundred units on the market of various sizes and configurations.

Substantial improvements have been provided by this system:

- One of the most important goals from the nutritional point of view is to make every mouthful taken by the cow at the trough have the same characteristics and nutritional requirements as that planned by the dietician. Only through this automatic mixing method is it possible to achieve this.
- Using the automatic system reduces leftovers and waste percentages of ingredients from 2.0 to 0.2 per cent in grains and concentrates, from 5.0 to 1.0 per cent in hay and from 7.0 to 3.0-4.0 per cent in silage (real results achieved at the Ambar-Dvira Feeding Centre)



This year a new extension has been made to produce 10,000 daily rations and cater to the demand generated by new customers eager to improve their production rates.

- The operator's tasks are significantly reduced as they can control the operation of the system from the loading vehicle through a computer (laptop) thus enabling savings in hours of work and other tasks performed by operators when using previous systems.
- From an economic point of view the increase in the profits of the company, obtained essentially by the savings in losses, waste, labour, fuel, and moving machinery depreciation is estimated at over 45 per cent for a 24-month period.
- The farmer receives the same heterogeneous ration daily, which is the same colour and fibre size, helping prevent spikes or fluctuations in milk production, ie, if the programmed operation is the same, milk production will only vary according to lactation periods or the length of time from calving.

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AGCO launches Challenger 1000 four-wheel-drive tractor

AGCO LAUNCHED THEIR Challenger 1000 Series tractors, the "must-see innovation for 2016," at the recent Farm Progress Show in Iowa, USA.

According to Josh Keeney, tactical marketing manager at AGCO: "The Challenger 1000 Series tractors bring an entirely new solution to the market. These tractors combine the power of a small-frame, articulated four-wheel drive with the flexibility and speed of a lighter-weight, fixed-frame row crop machine."

The Challenger 1000 Series tractors include four models that range from 396 HP to 517 hp. Keeney said several things set the 1000 Series apart, including a new AccuDrive powertrain concept, where engine and drive-train are integrally linked by sophisticated software and a first-of-its-kind continuously variable transmission, and upgraded stepless CVT transmission. The tractors are able to serve a variety of on-farm needs, from planting and heavy tillage to row-crop work and harvesting. On-road hauling speeds can reach 31 mph, Keeney added.



High-tech, high-horsepower: The new Challenger 1000 line offers four models up to 517 hp.

The AccuDrive system controls engine and transmission with plenty of feedback from the ground. That's key because this is a four-wheel drive tractor, but power doesn't go to the front wheels unless you need it. "The front wheels, in road travel, are actually decoupled from the drivetrain to boost efficiency," Keeney explained.

Flexible and convenient front ballasting options ensure the tractors are versatile enough for use from the beginning to the end of each crop year. Easy ballast pickup and self-leveling front axle suspension allow the weights to be changed in minutes.

In-cab features include air-ride suspension and leather seats, as well as ergonomic and intuitive tractor controls. All models also include an ISO-compliant AccuTerminal that allows one-stop control of all tractor and implement functions.



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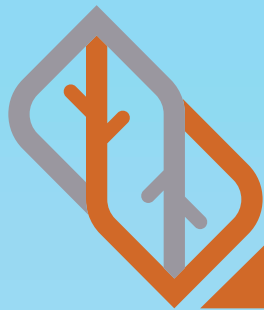
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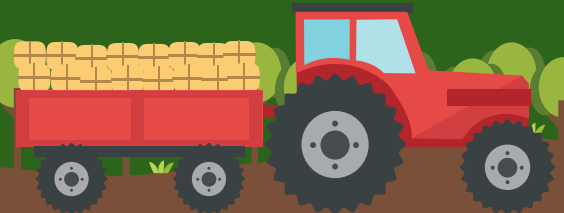
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