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and Food Processing

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Animal Feed

Made-to-measure mycotoxins

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Conservation agriculture improves yields - cover crop growing in cotton and tomato residues.

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Farming Calendar 2015

APRIL

9-11	2nd Agritech International Conference 2015 www.biz-fora.com	DAR ES SALAAM
14-16	AGRIKEXPO 2015 www.agrikexpo.com	LAGOS
15	International Poultry Council Conference www.internationalpoultrycouncil.org	ROME
17-18	Agritech Expo www.agritech-expo.com	CHISAMBA

MAY

1-31 Oct	Expo Milano 2015 www.expo2015	MILAN
12-15	NAMPO Harvest Day www.grainsa.co.za	BOTHAVILLE
14-17	SIPSA 2015 www.sipsa-dz.net	ALGIERS
20-22	Pumps, Valves and Pipes Africa www.exhibitionsafrica.com	JOHANNESBURG
28-30	AGRENA 2015 www.agrena.net	CAIRO

JUNE

9-11	FIAAP/VICTAM/GRAPAS International 2015 www.victam.com	COLOGNE
17-19	Agritec Africa www.agritecafrica.com	NAIROBI
21-23	Africa's Big Seven 2015 www.exhibitionsafrica.com	JOHANNESBURG
23-25	AVI AFRICA 2015 www.sapoultry.co.za	JOHANNESBURG

Readers should verify dates and location with sponsoring organisations, as this information is sometimes subject to change.

NAMPO well established as Africa's networking platform for agriculture

THE NAMPO AGRICULTURE Trade Show is the largest show of agricultural machinery in the southern hemisphere. The show embraces all agricultural machinery, products, service manufacturers and distributors.

NAMPO, located in Bothaville, the heart of the grain-producing belt of South Africa, will be held during South Africa's harvest season, 12-15 May. Visitors are able to take their time to view all sectors of the show from livestock to computers.

The practical demonstrations of implements and machinery are a unique feature and distinguish NAMPO from any other agricultural show. They allow the farmer to view agricultural equipment on a comparative and non-competitive basis under full working conditions. 80 ha of land, cultivated with different crops, have been set aside for this purpose. Special arrangements for

specific one-on-one demonstrations outside the normal programme times will also be possible.

There is also a farm patents competition for farmers. Farmers who have invented or designed or adapted equipment to solve their own practical problems are invited to share these inventions with their fellow farmers. No patented products may be entered, but enticing prizes are offered, assuring a large number of entries in each of the different categories.



50th anniversary of Victam

2015 IS A special year for the organisers of FIAAP, VICTAM & GRAPAS INTERNATIONAL 2015 as it is their 50th year. Now held all together, it has become the world's largest dedicated animal feed and grain processing event.

Over 250 exhibitors from all over the world will come together at the events to display the latest technology and developments for the production of animal feeds, flour milling, grain processing and biomass pelleting.

Each exhibition has its own exhibitor profile: FIAAP: Specialist ingredients and additives that are used within the formulation of feeds for animals.

VICTAM: Technology, equipment and systems for the production of animal feeds. Now the technology is also used in the production of biomass pellets.

GRAPAS: Flour milling, grain processing equipment and technology.

Besides these specialist systems there will also be a very wide range of auxiliary equipment that are used throughout a mill – silos, conveyors, PC's and programs, elevators, bagging, trucks and many more.

West African expo B2B meeting platform for agri-business stakeholders

AGRIKEXPO WEST AFRICA is an international agriculture industry-based event scheduled to be held in Lagos 14-16 April. All the latest industrial techniques, agricultural machinery, advanced producing technology and various primary agricultural commodities will be presented in this event. It is a perfect business destination for a professional gathering, and the interactive sessions and influential conference programmes will lead to debate on the most required solutions to various present day industrial challenges encountered. Agrikexpo West Africa is a must-attend for the leading industrial manufacturers and providers of agro-allied services.

Made-in-Italy pavilion at Africa's Big Seven

SOUTHERN AFRICA IS a market with great potential for growth and it's ready to be challenged. This idea has driven Kölnmesse Italy to stage an Italian Pavilion at Africa's Big Seven (AB7) this year. The pavilion will focus on agrifood technologies dedicated to food industry products, such as raw materials, machinery and supplies.

"After organising highly successful agrifood technology exhibitions in China, Japan and Thailand, we are turning our attention towards the many potential opportunities in Africa for agribusiness, technology and exports," said Lara Marsilio, sales and marketing manager for Kölnmesse Italy.

"AB7 is a massive opportunity for Italian companies to exhibit in South Africa, the premier gateway to sub-Saharan markets," continued Marsilio. "South Africa has experienced significant economic growth in recent years, particularly after joining the 'BRICS' bloc countries in 2010. African economies will see an annual average growth of 4.7 per cent, whilst 10mn of South Africa's 54mn population are considered high income earners."



First harvest

LESS THAN SIX months after Boeing and South African Airways (SAA) announced their plans to turn "energy tobacco" into sustainable aviation biofuel, farmers in South Africa's Limpopo province are harvesting their first crop of a nicotine-free, energy-rich tobacco plant. About 50 ha of the tobacco variety, which is called Solaris, are already growing on large commercial farms and small community farms in northeastern South Africa.

Boeing and SAA, along with SkyNRG of the Netherlands and Sunchem SA, also launched Project Solaris, their collaborative effort to develop an aviation biofuel supply chain in South Africa with the plant.

Boeing has worked with SAA for more than a year to develop a biofuel strategy that supports the airline's environmental goals and South Africa's economic development goals. Oil from the plant's seeds will be converted into jet fuel this year, with an eventual test flight by SAA.

Sustainable aviation biofuel will help SAA to become "the world's most environmentally sustainable airline," among other benefits, according to Ian Cruickshank, environmental affairs specialist, SAA Group. By 2023, the airline wants to use biofuel produced to supply 50 per cent - more than 400mn litres - of its jet fuel needs at Johannesburg's international airport, Cruickshank added.

"The impact that the biofuel programme will have on South Africans is astounding," Cruickshank said, including "thousands of jobs mostly in rural areas, new skills and technology, energy security and stability and macro-economic benefits to South Africa and, of course, a massive reduction in the amount of CO₂ that is emitted into our atmosphere."

Supporting skills development in the region, Boeing is helping to fund local efforts to train farmers with small plots of land to grow and market Solaris plants. If the test farming in Limpopo is successful, the project will be expanded in South Africa and potentially to other countries.

Zambia can feed the region - Zambeef CEO

ZAMBIA'S NATURAL RESOURCES combined with Japanese wealth and technology can help the country feed the region, according to Zambeef joint CEO Francis Grogan.



HE Kiyoshi Koinuma visiting Zambeef's operation in Chisamba.

Speaking during a recent visit to the company's operation in Chisamba by Japanese ambassador to Zambia HE Kiyoshi Koinuma, he said: "Japan has vast wealth and technology. We in Zambia have vast natural resources, specifically in the food business; we have huge opportunities to process food, value add food and distribute food to the region."

Mr Grogan described Zambia as a country that is ideal for foreign investment because of the huge market opportunity it has to "feed the 400mn" inhabitants in the region. He stated that the Japanese with their wealth and technology could reap great rewards if they invested in agribusiness in Zambia, particularly from water harvesting, irrigation and fish farming.

The delegation, which was led by the ambassador, toured Zambeef's meat processing plant and feedlot where they were shown how the company sources and processes its meat before distributing it around the country. Kimihiko Inaba, a member of the delegation and the executive director of the Japan External Trade Organisation (JETRO), said after the tour that he was impressed by Zambeef's quality control and the care it takes of its animals.

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ZNFU continues legacy of agri-business event

THE LAUNCH OF Agritech Expo in 2014 was a landmark event for Zambia's agriculture, creating for the first time a business-to-business platform for agricultural professionals, from small scale farmers to commercial enterprises, to engage and conduct business with some of the world's leading suppliers to the agricultural industry.

From live crop trials and machinery demonstrations, to technical and practical workshops for emerging farmers and VIP business lounges for commercial players, Agritech Expo is the only business event servicing the needs of the entire agri-value chain in Zambia and its neighbouring countries.

In 2014, Agritech Expo delivered just short of 7,500 farming professionals and 64 international exhibitors. Looking ahead to 2015, these figures are set to rise to 10,000+ visitors and 130 exhibiting companies, further cementing the position of Agritech Expo as the 'must attend' agricultural event in the region.

The president of the Zambian National Farmers Union (ZNFU), Dr Evelyn Nguleka, gave an exclusive interview to the Agritech Expo team, sharing her thoughts on the significance of the expo for Zambia and her expectations for the 2015 event. The full interview can be read at agritech-expo.com.



How would you describe the response from the Zambian agri community to the first Agritech Expo last year?

Fantastic! It was so much more than anticipated. All the major agricultural stakeholders from our small scale to large and corporate farmers, as well as our agribusiness firms embraced Agritech wholeheartedly, thus their overwhelming turn out and participation.

What is the ZNFU's message at this year's Agritech? What are you hoping to achieve with this year's show?

This year, our aim is to make Agritech bigger, stronger and real. We have increased the exhibition space. We have also dedicated one of the three days as a focus day for commercial and emerging commercial farmers.

Agritech has proven itself not only as a networking platform, but a unique and targeted business platform, where actual sales happen. We therefore want to see exhibitors and participants this time around come in ready to transact.

What are the main reasons you would give someone to invest in the Zambian agri-sector?

If not in Zambia, then where else? One just has to look at our natural resource endowments, our economic and political stability, our geographical location and progressive investment policies. You need not scratch your head thinking where to invest if you want to be part of the current agricultural transformation in Africa.

What is your vision for the sector, also in terms of the region?

Zambia has traditionally been known as the bread basket of the region. For example, at the moment, Zambia is the only country that is self-sufficient in wheat production. We would like to strengthen this position and continue to make Zambia relevant in the region in as far as agriculture is concerned. Zambia is surrounded by eight neighbours who are a potential market for agricultural produce. Our vision is that, when the region thinks of food, it should think Zambia.

Agritech Expo takes place from 16-18 April 2015 at the GART Research Centre, Chisamba. The event is free to attend for all visitors and is the only event of its kind taking place in Zambia and the surrounding regions in 2015.



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Zambia prioritises agriculture

THE GOVERNMENT HAS issued the Green Paper in the Medium Term Expenditure Framework (MTEF) for 2015-17 and the 2015 budget as an on-going commitment to engage all stakeholders in the country's development agenda. The focus will be on ensuring that growth is inclusive and pro-poor so that the benefits of a stable macroeconomic environment, positive economic growth and single digit inflation bring about improved standards of living for the Zambian people.

One of the key sectors being explored on the route to economic prosperity is agriculture, which contributes more to the livelihoods of citizens than any other sector.

In order to ensure food security, improve nutrition and create sufficient jobs in the agricultural sector, the strategic focus for agriculture will be to increase productivity and value in the crops, livestock, fisheries and horticultural sub-sectors. To achieve this, the government will continue to facilitate the modernisation and mechanisation of the agricultural sector.

In the crop sub-sector, the government will promote and enhance crop diversification from maize to other crops such as soya beans, wheat, rice, cashew nuts, cotton, coffee and tea. Measures will also be undertaken to increase the area under irrigation, enhance and decentralise research and extension services and actualise the development of farm blocks.

"These measures will be augmented by the use of good farming practices such as conservation farming, use of improved seed varieties and advancing the adoption rate of appropriate agricultural technologies," the document reads in part.

The key thrust of the livestock sub-sector will involve the establishment of livestock breeding centres, promotion of artificial insemination and increasing milk collection centres in all provinces. The government will also continue to promote the fisheries sub-sector. *Nawa Mutumweno*

PelGar to give Burkina Faso rodenticide training

RODENTS ARE A global pest problem and the African country of Burkina Faso is certainly not exempt from rats and mice.

PelGar International supplies both rodenticide blocks and pellets to the



country which are distributed by Prophyma, the local subsidiary of Savana based in Bobo Dioulasso.

"The main problem faced with rodent control here in Burkina Faso is that users are normally not aware of the anticoagulant technique," explained Emmanuel Mahdavi, PelGar's sales and marketing manager for the Middle East and Africa.

"Having been used to zinc phosphide, they tend to think that if they do not find a rodent dead straight after the baiting then the product is not working. The local dealers and farmers need to be educated on how to use rodenticides safely and how an anticoagulant works.

"To help in the education process we have been organising training workshops for local dealers to promote PelGar's products and to explain how anticoagulants work. They can then visit small market village shows and agricultural fairs to promote the products and explain how to use them.

"Those attending the workshop will receive a diploma to put in their small shops indicating that they are competent to inform and advise on the products' use," explained Emmanuel.

First-ever "African Seed Access Index" launched

A NEW ANALYSIS of African efforts to put more productive crop varieties into the hands of smallholder farmers has been launched.

The African Seed Access Index (TASAI) - the first ever initiative dedicated solely to monitoring the state of Africa's rapidly evolving seed sector - has issued detailed scorecards on seed development and distribution in Kenya, Uganda, South Africa and Zimbabwe, with a focus on increasing choices for smallholder farmers.

"We've known for a long time that a key reason yields on African farms lag far behind even those in other developing countries is that

African farmers often lack access to improved varieties of staple crops such as maize, cowpea and sorghum," said Ed Mabaya, assistant director of Cornell University's International Institute for Food, Agriculture and Development (CIIFAD) and head of the TASAI project. "We think that by tracking indicators along the seed delivery chain - like the number of crop breeders, varieties released, industry competitiveness, availability of seed in small packages, and quality of the seed policy framework - investors and policymakers can target choke points that are impeding the flow of seeds to smallholder farmers."



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AKTC rolls to life

THE ZAMBIAN GERMAN Agricultural Knowledge and Training Centre (AKTC) is being set up at Golden Valley Agricultural Research Trust (GART) in Chisamba by three long-term experts.

The team comprises Martin Sikanyika from Zambia, the machinery specialist, Leslie de Jager from Zimbabwe, the plant production specialist and Helmut Anschuetz from Germany, the team leader who worked as a farm manager and advisor for an organisational development in Eastern and Southern Africa.

The team started its preparatory work in August 2014 and did a first survey of the agricultural conditions on GART's commercial farm, Chaloshi. Soil sampling was carried out to develop a production plan for the first season.

The centre is part of the bilateral co-operation programme of the German Ministry of Food and Agriculture, and is supported by the Zambian Ministry of Agriculture and Livestock, as well as by GART and the Zambian National Farmers Union (ZNFU).

The centre will cultivate soybeans and wheat for demonstrations, field trials and



training purposes on 72 ha under irrigation. There will also be potato growing and testing of new varieties for Zambia.

In September 2014 all three experts travelled to Germany for an exclusive two week training course. They also visited Europe's largest potato show

Back in Zambia, the first machinery has been delivered, with more to follow during 2015. In November 2014, 56 second-year students of agricultural engineering came and received an introduction to the machinery.

The planting of the 72 ha soybean was

finished using the new machinery. This proved well suited for local conditions and delivered great results.

In addition to the expertise provided by the consortium, 12 different private sector partners from Germany are also supporting the Centre.

Together with the private sector partners and the expertise of the implementing consortium, AKTC plans to become a state-of-the-art training centre. It will conduct training for machine operators, farm managers, agricultural institutions, farm owners and other players in the industry.



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Elanco supports East Africa dairy project

ELANCO ANIMAL HEALTH is continuing its commitment to break the cycle of hunger for those most in need with a US\$1.5mn matching challenge to help Heifer International fund Phase II of the East Africa Dairy Development Project (EADD). Elanco is the animal health division of Eli Lilly and Company, and funding for the matching challenge is generously provided by the Eli Lilly and Company Foundation, supporting Elanco's vision of a world with safe, affordable, and nutritious food for all.

Phase I of EADD was launched in 2008 with a generous grant from the Bill & Melinda Gates Foundation. Building on that success, Elanco joins a variety of partners, including the Bill & Melinda Gates Foundation, to help fund Phase II. Elanco's US\$1.5mn gift is offered as a dollar-for-dollar match with Heifer International donors' gifts. The matching programme provides an opportunity for donations to deliver twice the economic value and accelerate the pace of change toward achieving more food secure communities in East Africa. Full utilisation of the fundraising effort that complements donor gifts with an Elanco matching donation will result in US\$3mn to help fund EADD Phase II.

EADD focuses on empowering small dairy producers to move beyond subsistence toward sustainable livelihoods. Farmers receive training and resources to increase milk productivity on their farms as well as technology for collecting, preserving and transporting milk to the marketplace. This approach addresses practices that boost smallholders' productivity while creating an infrastructure that supports a sustained market for farmers' products. Key successes achieved in Phase I include:

- 179,000 smallholder dairy farmers doubled their household income
- 27 new milk collection hubs were established
- Farmers earned US\$131mn in milk sales and sold 94mn gallons of milk

Elanco's matching challenge will help support Phase II, expanding EADD into Tanzania while continuing to work with smallholders in Kenya and Uganda.

Intelligent housing systems

FARMER AUTOMATIC, A German manufacturer of economic poultry housing systems, impressed visitors at the International Poultry Expo 2015 trade show in Atlanta, USA, with its intelligent housing systems. From 27-29 January, Farmer Automatic exhibited various products at its 185 sq m booth with a fresh, modern design, including its new system for aviary and small group housing: Combi II and Eco II.

The Combi II

Combi II is a flexible housing system for layers. As the feed, water, nest and perch components can be arranged in different configurations, the system is perfect for use as a colony housing system or as an aviary system. With the feed troughs and egg belts on the inside, the complete system width of the Combi II counts as floor area.

The Eco II system is the innovative colony housing system for small groups of layers. With its variable section lengths, the Eco II system can be ideally configured for different house dimensions. This allows for efficient and economical use of available building space and optimised stocking density. With its versatile design options, the system can be individually adapted to meet customer requirements.

A few days after the trade show, Farmer Automatic summed up on a very positive note: "The trade show visitors were very interested in our new systems Combi II and Eco II," the managing director mentioned.



"Our fair team had the opportunity to engage in many interesting discussions and to establish new contacts, and we are really very satisfied with the results. What more could we want?"

The International Production & Processing Expo (IPPE) is a collaboration of three shows - International Poultry Expo, International Feed Expo, and International Meat Expo - representing the entire chain of protein production and processing. Trade visitors from over 100 countries came to Atlanta, to see the range of products and services offered by the exhibitors.

Poultry processing facility for Uganda

UGANDA'S PRESIDENT YOWERI Museveni has commissioned a US\$10mn poultry processing facility at Semuto Nakaseke district about 107 km north west of Kampala. Hudani Manji Holdings managing director, Rafiki Manji said the new plant will reduce the supply gap of poultry products.

"The demand for chicken protein is on the rise in Uganda among the growing middle class whose lifestyles are changing to appreciate more white meat-based diets. The demand has quickly outstripped supply because there is no dominant integrated player in the Ugandan poultry sector which is, itself, highly

unregulated. That is why we are coming up with this plant in Uganda to close the supply gap," he said.

The new plant has the capacity to close the supply gap. Its total output capacity stands at 32,500 birds per week and the total abattoir capacity is 2,500 birds per hour and 220,000 birds per week.

The new broiler farm and processing plant will be the first highly mechanised abattoir in Uganda and the largest chicken processing facility in East Africa.

Moses Kalisa Seruwagi



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Poultry play an important role on smallholder farms. Improving poultry's health improves their production efficiency, so it is important to reduce the threat of disease outbreaks to both poultry and human populations by improved disease diagnosis and control, particularly for ND and highly pathogenic avian influenza (HPAI).*

Vaccines, poultry and the poor - making a difference in Africa

SEVENTY PER CENT of the world's rural poor rely on raising livestock for their day-to-day living. Livestock contribute to both poverty alleviation and food security. They not only provide protein and micronutrients for human nutrition and wellbeing, they are also an important source of cash income, can assist with manual labour and provide financial security as a form of savings.

In eastern and southern Africa, poultry are owned by 70 to 80 per cent of households; as opposed to cattle, which are only owned by around 20 to 30 per cent of families. Poultry are not only by far the most common type of livestock owned; they are often the only livestock owned by the most vulnerable families. Poultry play an important role on smallholder farms, because they:

- are a relatively low-cost way to access quality food
- provide eggs and meat that can be sold or traded easily for other essential family items
- are usually the only livestock under the control of women
- assist with pest control
- provide manure for fertiliser.

In progressing family poultry production, it is important to reduce the threat of disease outbreaks to both poultry and human populations, by improved disease diagnosis and control.

Newcastle disease (ND) is considered the most economically significant poultry disease worldwide and its impact on family-based poultry producers and traders is considerable. This situation was the motivation for the Australian Centre for International Agricultural Research (ACIAR) and Australian Agency for International Development (AusAID) to support research into developing and using thermostolerant (I-2) ND vaccines that have subsequently been taken up by other donors over the past two decades. This work has delivered exceptionally high socio-economic returns.

Improving poultry's health improves their production efficiency. This in turn contributes to improved food security, poverty alleviation and wildlife conservation. The latter is due to the fact that when people have poultry meat to consume, they are less likely to hunt for wildlife.

Poultry meat and eggs provide high quality protein and micronutrients and its production is extremely efficient in terms of feed and water inputs in village poultry systems. These nutritious products can be key additions to household grain-based diets. The utilisation of poultry products, such as eggs, can be impacted by social taboos that limit the use of resources that are scarce. In many areas, farmers are reluctant to eat surplus chickens or eggs and, in some regions, the consumption of eggs is prohibited for children and women by tradition (taboos). For example, often only men are permitted to eat eggs when there are not enough to go



The I-2 ND vaccine is now produced in Angola, DR Congo, Kenya, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

around. The conservation of eggs and the hatching of chickens are important in situations of high chicken mortality, where replacement birds are essential. When sustainable ND control programmes are implemented and chicken numbers increase, then the consumption of eggs becomes an option and a very good use of resources. The egg provides a range of nutrients apart from protein that could make a substantial contribution to the nutrition of children as well as pregnant and nursing women.

While anecdotal evidence suggests that poultry meat and eggs are important supplements to household grain-based diets, no systemic study has yet been done to determine the specific means and pathways by which food security and human nutrition have been improved and how they could be further strengthened.

Factors that facilitate or impede uptake and adaptation of new interventions in family poultry across a spectrum of farming systems have not been formally documented and investigated. In progressing family poultry production, it is important to reduce the threat of disease outbreaks to both poultry and human populations, by improved disease diagnosis and control, particularly for ND and highly pathogenic avian influenza (HPAI). In the past, the diagnosis of outbreaks of HPAI (subtype H5N1) in West Africa was delayed as most producers assumed chicken deaths were due to ND. The improved control of ND through vaccination will support the more rapid detection of HPAI and decrease losses to live birds between the point of purchase and the point of sale. In eastern and southern

Africa, the I-2 ND vaccine is now produced in Angola, DR Congo, Kenya, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

Understanding farmers' realities and improvements to the crop-livestock value chains

In general terms, farmers will make investments and take the time to learn new practices if they believe a certain intervention will yield useful returns. Chronically poor-performing farming leads to fatalistic attitudes, whereas interventions that are successful encourage farmers to strive for further improvements. Just as ND vaccination has dramatically improved confidence in poultry farming, crop management has similarly benefited from interventions such as the strategic use of fertilisers and improved seed varieties. Farmers that have seen the success of the former are more likely to adopt the latter and vice versa.

A key aspect of this study is to look at the potential success of programmes that support poultry farming and crop farming at the same time. There are many potential benefits in helping farmers to simultaneously improve their crop and poultry production, both at systems and at community levels. These benefits include:

- income from poultry production can be used to purchase new seed stock or storage facilities for postharvest crops
- poultry can provide fertiliser and pest control to farmed crops
- improvements to family poultry production tend to occur faster in mixed farming systems where farmers are already used to buying inputs and selling surplus products
- both livestock and crop production are dependent on effective market systems to yield maximum benefits, so strengthening market systems overall should benefit both types of farming
- children are often taught to look after poultry as a stepping stone to developing broader farming and entrepreneurial skills, so providing them with this opportunity may also help them to become successful farmers.

Moving from food security to improved human nutrition

Family poultry production can directly increase nutritional outcomes by providing food and indirectly by providing cash to buy food. Poultry meat and eggs provide high-quality protein and micronutrients that are more easily taken up by the human body than plant-based nutrients. These benefits are of notable significance to vulnerable community members such as growing children and people infected with HIV.

Poor quality agricultural production can be detrimental to human nutrition. For example, contaminated meat and crops treated with poorly regulated pesticides can cause human illness and as a result avoidance of vital food resources by family groups or communities. These issues become especially raw in the food-insecure environments in rural eastern and southern Africa.

Research aims

In support of increased poultry and crop value chain efficiency and household food and nutrition security, this AIFSC-funded research partnership will answer the following questions:

- Can deliberate and strategic linkages between family-run poultry production and crop farming improve the socio-economic and biological efficiency of both operations?
- Can family poultry production and trade be increased by supplementing the birds' feed intake with by-products from crop farming?
- Can increased efficiency of family poultry production and trade contribute to ecologically sustainable agriculture and improved food security and human nutrition?

On-the-ground participation and partnership are central to the project, as are gender and ecologically sustainable production.



Poultry promotes prosperity in Mozambique.

Rural women contribute 60-80 per cent of farm labour in sub-Saharan Africa and this project has the potential to support women farmers and yield beneficial outcomes for their households and their wider communities. ¹⁰

* by Assoc. Prof. Robyn Alders and Penny Farrell at AIFSC (Australian International Food Security Research Centre).

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Careful and thorough plucking of feathers can greatly minimise damage to chickens and reduce operational costs.

Improve plucking during processing of poultry

AS PART OF poultry processing, birds must be thoroughly plucked, and all feathers must be removed, including those that are most firmly attached. The most common approach to achieving this is to include scalders as part of plucking operations to loosen the head and wing feathers. These scalders will also loosen the leg cuticle.

There are ways that this process can be carried out along the overhead conveyor.

However, to achieve a well-plucked bird, several aspects prior to plucking need to be carried out well, including:

- Waiting time of the live birds at the processing plant
- Hanging on the overhead conveyor
- Stunning
- Slaughter and bleeding
- Scalding

Plucking needs to be viewed as the removal of feathers without, for example, ripping the skin, the emergence of bones through the skin, or the excessive accumulation of blood due to the application of too much pressure.

Waiting in the reception area

Birds should be kept in comfortable conditions. In hot climates, heat stress needs to be prevented. Should birds overheat, they will pant and this results in an excessive accumulation of blood in the legs and wings.

Hanging on the overhead conveyor

Birds must be properly held. Use only three fingers — the thumb, index and ring fingers. When placing onto the shackles, hold by the legs, not the thighs, to prevent possible bruising and blood accumulation. While moving birds from the cages to the shackles, flapping must be minimised. Installation of a breast comforter is also recommended.

Stunning

To help keep birds as calm as possible while being transported from the hanging area to the stunner entrance, a tunnel made from a



Plucking needs to be viewed as the removal of feathers without ripping the skin.

dark plastic sheet could be erected. Passage through this will calm the birds.

Slaughter and bleeding

Stunning leads to a lack of consciousness and lowering of the heartbeat to 350 beats per minute. This lowered heartbeat will stay low for only 10-12 seconds. It is also important to remember that the various parameters of the stunning bath must be adjusted to the average weight of the bird, for example, frequency, voltage and bath height.

Scalding

If carcasses are not fully submerged during their movement through the scalders, the most firmly attached feathers, ie, those of the tail and the neck, will not enter the water. Consequently, their follicles will not properly dilate and the feathers will not be loosened. The correct choice of rubber fingers is important to avoid chicken carcasses.

Additionally, if the water level in the tank does not ensure that the shackles are submerged to a depth of at least three inches, those feathers close to the leg joints and the cuticle will not be loosened. It is also worth keeping in mind that for this to be successfully achieved, water needs to be of a sufficiently high temperature.

Scalding raises the carcass temperature, and it is worth trying to retain the heat during passage from the scalders to the plucker.

Given all of the above, it is worth

considering the challenges faced during the operation. Nevertheless it is possible to pluck birds and keep costs low and quality and yield high, while they remain on the overhead conveyor. This can be achieved, if the following rules are implemented:

Heat and water

Carcasses must be kept warm. Warm water (34-36°C) should be used during plucking and any heat that has been absorbed from the scalders must be preserved throughout the plucking process.

This can be achieved by installing a structure that prevents heat loss during passage from the scalders to the plucker. Strategically place hot water (70-75°C) sprayers along the approach to the plucker. These should be directed towards the head and thigh joint and spray water for approximately six seconds.

Plucking technological advances

Advances in plucking machine technology mean that various types of equipment can now be used in combination, for example:

- That can adjust automatically to the anatomy of the bird
- That rotates counter-clockwise
- That can be placed inside moving cabinets, ie, if the cabinet or structure itself moves, all the plucking units move with it

In the selection of plucking fingers, three types should be used — soft, semi-hard and hard. They must be carefully positioned to ensure that they remove feathers without damaging skin.

Depending on the sequential efficiency of the plucking operations, some plucking lines should be avoided to prevent dislocated or broken wings, skin and breast scratches, blood accumulation in the tips and other areas of the wings.

If this is followed in a disciplined manner, it is possible to reduce the damage to chickens during plucking and so reduce operational costs. **E**

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Hatchery vaccine effective against H5N1, says study

A RECENT EGYPTIAN study by Dr Walid Kilany published in *Avian Pathology* confirmed that a single hatchery vaccination using rHVT-AI vector vaccine can be an effective tool to address H5N1 prevention and control in endemic countries.

The research also found that the immunisation by-passed maternally derived antibody (MDA) resistance to the vaccine. Furthermore, it noted that a single dose given in the hatchery delivered up to 19 weeks of protection and was far more cost-effective and efficient than existing vaccination systems, which cannot be applied until week four and require boosters during the chicken's lifetime.

The AI vector vaccine is suitable for layers, broilers and breeders. It has been developed by Ceva "using contemporary science and novel technology which has been applied to a 50-year-old proven frozen Marek's vaccine (HVT)".

Moreover, the application of the vaccine within the controlled environment of a hatchery when the chick is one day old, means that they are protected earlier in their lives, are at significantly less risk of infection during their lives and will live healthily and productively to provide safe proteins (eggs and meat) to consumers.

Ceva stated, "Vectormune AI's protection has been evaluated against about 13 different strains of the AI virus (H5N1), isolated from around the world belonging to different categories of strains of this rapidly-spreading and fast-mutating virus. Its efficacy is well proven ensuring a survival rate of between 80 and 100 per cent of flocks within the test, no matter the provenance of the AI strain. Once inoculated, the vaccine remains in the chick."

Commenting on the results of the Egyptian study, Pierre-Marie Borne, public health zoonoses and food safety and public affairs director, Ceva, said, "Avian Influenza remains a major threat to the global poultry industry and ultimately to human health. This study, like many before it, proves that a vector hatchery vaccine is labour saving, cost effective and provides clinical protection after a single dose immunisation."

Hubbard and CPGP support successful 18th CPC poultry school in Egypt



THE WELL-ATTENDED 18th CPC Poultry School took place at the Jasmine Palace resort in Hurghada on the Red Sea in Egypt at the end of 2014. Owners and senior project managers from a host of companies joined new farm managers for the six-day event, which included presentations on breeding, incubation, management, nutrition, physiology and veterinary/pathology issues. The two full days from the Hubbard technical team revolved around the theme of male and female management and disease.

International speakers included Thomas Verrey (area sales manager for the region), and Dr Miguel Valls (Hubbard veterinarian) who updated the group on the importance and control of coccidiosis. Hammed Abdelmotal (Hubbard technician) talked about the 'right females for right stimulation', Stéphane Hémon (Hubbard incubation specialist) talked about 'key points for hatchery management' and Alastair Lewin (Hubbard senior technician) presented talks on breeder male and female management.

Egyptian speakers included Dr Said Shalash on nutrition, Dr Hassen Byoumy on lighting and ventilation, Dr Abd El Rahman on physiology and reproduction, Dr Awad on respiratory diseases, and Dr Mohammed El Manawy on management. Dr Shahin (CPC vet manager) gave a talk on "dealing with manure" to reduce

the spread of disease and presented a case study, which opened the door for much discussion. Furthermore, Dr Hamoud (CPC technical director) gave a good talk regarding hot points on "avian immunity and vaccination", and Dr Mohamed Kamel (veterinary manager of the technical follow up team) gave a talk on current challenging diseases.

Each participant received the talks in English and Arabic and many Hubbard technical presentations and bulletins. After the exams on the final day, the three best students were rewarded with a watch.

Hubbard, co-sponsor of the event, thanked Dr Nabil Darwish, executive managing director of CPGP (Hubbard distributor for Egypt), Dr Khaled Mostafa, general manager of CPGP and the organisers: Eng Ezat, Eng Medhat and Dr Ahmad Hassan, along with Dr Sayed Shalash and their colleagues, for their "hard work, excellent organisation and continued CPC Poultry School commitment to the continuous education of project managers, farm managers and supervisors".

The CPC Poultry School has worked to enable technicians to achieve the best results and benefits from the Hubbard Classic product. The 18th CPC Poultry School continued with these aims, bringing together key member of the industry for a week of communication.

Ethiopia National Poultry Training Centre to open in June

THE NATIONAL POULTRY Training Centre is expected to open in Bishoftu, Ethiopia, in June 2015. Holland-Africa Poultry Partners (HAPP) announced that an opening celebration for the facility will take place on 9 June.

The training centre will include housing, feeding, solar energy and hatchery equipment, which has been sponsored by HAPP members.

During the week of the National Poultry Training Centre's opening, a set of training sessions will be offered to a select group, of which the detailed programme will be shared beforehand. New equipment is being installed and HAPP representatives have been in Ethiopia to arrange a smooth execution of the opening and the training sessions to be given.

HAPP had hoped for an earlier opening, but delays in the arrival of the sponsored equipment pushed the opening date back to June. HAPP hailed the arrival of the equipment, saying it marks the end of a long logistical process and will ensure the opening of the facility.

The Ethiopian Institute for Agricultural Research (EIAR), the Ethiopian Poultry Producers Association (EPPA) and the Dutch and Ethiopian governments helped support the project.



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Dr Terry Mabbett discusses getting the measure of mycotoxins on standing cereal crops - what to test for, at what stage and how often.

Made-to-measure mycotoxins in animal feed

MEASURING UP TO mycotoxins is not an easy task, especially for the wide range of cereals grown, traded and used around the world in livestock feed. Many field fungal pathogens and storage moulds synthesise mycotoxins. Each group of fungi including the aflatoxin-producing *Aspergillus* moulds, and the large number of *Fusarium* fungal pathogens delivering a broadside of Deoxynivalenol (DON), Zearalenone (ZEA), T-2 and HS-2 mycotoxins, has its own intrinsic environmental requirements.

A mycotoxin is essentially the 'signature' chemical and 'calling card' left by a specific fungus or a group of related fungi. Many of these highly versatile microbes 'start life' as disease-causing pathogens on cereal crops in the field, extending later into feed grain spoilage and mycotoxin contamination at any stage along the supply chain from on-farm storage to bags of finished livestock feed.

A mycotoxin is essentially the 'signature' chemical and 'calling card' left by a specific fungus or a group of related fungi.

Mycotoxins in the field

Field factors including fungicide treatment (by seed dressings or foliar sprays), fertiliser treatments and irrigation regimes, and the inherent disease resistance of the corn or wheat variety grown, plays a part in the nature and magnitude of mycotoxin contamination. Watching over all this cereal agronomy is weather as the 'wild card'. The majority of cereal pathogens, and certainly *Fusarium* spp such as *Fusarium graminearum*, responsible for wheat head blight and stalk and ear rot in corn (maize), respond favourably to cool, cloudy, moist and humid conditions

Other fungal moulds prefer it hot and dry. A classic case is the aflatoxin producing *Aspergillus* fungi, mainly *A. flavus* and *A. parasiticus*. *Aspergillus* spp are predominantly storage fungi and do not



Aflatoxin contamination of milk is caused by dairy cows eating poorly produced, stored and inadequately tested feed grain and finished feed. Image: Dr Terry Mabbett.

generally contaminate cereal grain prior to harvest. However, drought stress and insect damage, which are often high during dry weather in drought stressed crops, may allow infection by *Aspergillus* fungi and therefore aflatoxin production prior to harvest.

Mycotoxins moving into store

Mycotoxins first appear on the panicles of standing cereal crops, but cleaned grain arriving at the farm silo or loaded onto trucks for off-farm shipment is the first opportunity to test for what and how much mycotoxin is there. Getting the measure of mycotoxins from here on is a matter of what to test for, at what stage and how often.

Farmers and traders are generally familiar with the range of mycotoxins they need to test for in relation to the type of cereal and the conditions under which it was grown. However, the presence of one mycotoxin can often act as a 'marker' for others because several different mycotoxins may be produced by closely related moulds

enjoying similar field conditions for fungal infection and mycotoxin production. Thus, DON and ZEA will often occur together. These two mycotoxins are produced by *Fusarium graminearum* and also by a number of other closely-related *Fusarium* fungi which infect a range of cereal crops.

Proper grain cleaning to remove all crop debris, especially the glumes (integuments surrounding small grain cereals like wheat), go a long way to preventing the fungal moulds that make mycotoxins from entering the grain storage and grain processing stages. The extent to which mycotoxin-making moulds become active in store to contaminate grain, and subsequently animal feed, will depend on grain moisture content and the conditions of storage.

Maintaining the balance

Twelve per cent grain moisture is generally posted as the figure below which fungal mould activity ceases, but the situation is considerably more complex than that. Moisture level within the grain and in the

surrounding air is dependent on temperature because warmer air has a greater water holding capacity

Moisture inside the kernels of stored grain establishes an equilibrium level (balance) with the air outside and the resulting relative humidity (RH) may become sufficiently high to encourage the growth of deteriorative organisms including mycotoxin synthesising fungi. Bacteria, fungal moulds (including mycotoxin producers) and mites require a minimum RH of 90 per cent, 70 per cent and 60 per cent, respectively. Insects depending on species need an RH level between 30 to 50 per cent.

Grain storage specialists utilise this information to relate the equilibrium moisture content of stored grain and RH of the surrounding air for a range of cereal commodities. Relationships calculated for a range of cereals stored at a temperature of 25°C are shown in Table 1. Grain moisture content in equilibrium with a RH of 70 per cent (shown in bold type) is the figure beyond which the stored cereal grain becomes at risk of microbial damage and therefore mycotoxin contamination. In practical terms this means grain scheduled for storage at 25°C should be dried to and maintained at that maximum moisture level. Equilibrium grain moisture contents and corresponding RH levels are re-calculated for higher or lower storage temperatures.

Measuring up to mycotoxins

Exactly when and where to test along the supply chain, is now formalised into HACCP (Hazard Analysis Critical Control Point) testing. Experienced operators will already be aware of the inherently high-risk points where testing has always been advised. This may be grain loads coming in from different parts of the farm and experiencing different growing conditions including soil moisture and irrigation levels.



Storage in custom-designed metal silos is the secret to the safety of harvested cereal grain. Image; Bentall Rowlands.

Mycotoxin testing will alert the farmer to any real-time mycotoxin problems and provide important farm and crop data for use in later years.

Routine testing of grain loads from different sources for mixing in silos or during feed manufacture is clearly a priority for managers of central grain depots and

feedmills. Any point along the supply chain where grain and other debris can accumulate, whether in conveyors at the grain store or feed mixers and bins in the feedmill, are high-risk points for fungal growth and mycotoxin accumulation.

Mycotoxins are not randomly or uniformly distributed throughout static grain

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loads but tend to occur in so called 'hot spots' corresponding to damp spots and pockets of mechanically-damaged or insect-infested grain that encourage mould growth. Sampling a moving stream of grain or finished feed product reduces any selection bias associated with sampling and testing a static load. Static grain loads should be probed many times and all over, with sub samples bulked to produce a more representative gross sample for testing.

Speed and sensitivity of testing are the

twin main thrusts of mycotoxin testing over the last two decades, including actual time taken to obtain an accurate and actionable reading and result. If a test result is achieved on site within minutes then 'rogue loads' can be dealt with promptly and isolated without contaminating the main bulk of grain. When samples were taken back to laboratories for testing no prompt action was possible for suspicious loads with visible mould or a musty smell, without holding up operations.

This need to know on-site and on-time led to the rapid development of portable on-site testing equipment like the VICAM Vertu Lateral Flow reader, used to identify and quantify key mycotoxin hazards at critical control points right along the feedgrain supply chain. VICAM has gone one stage further with introduction of five-minute on-site quantitative strip tests to detect DON (DON-V) and aflatoxins (Alfa-V).

VICAM's quantitative strip tests are designed for use with the Vertu Lateral Flow Reader and can be performed with a minimum of on-site training and technical expertise. These novel tests employ the highly sensitive and selective monoclonal antibodies required to accurately measure DON and aflatoxins in feedgrain or manufactured feed material.

The current aim is to drive down testing times to just several minutes. Even more important is the overall on-site picture which facilitates prompt testing by non-scientists, on the spot and anywhere along the supply chain, to secure prompt accurate and repeatable results over the sensitivity range required. Whether the actual testing time is three or five minutes is secondary. **B**

Table 1 Equilibrium moisture levels (g/kg) for selected cereal grains stored at 25°C

Cereal grain at 25°C	Relative Humidity (per cent)						
	40	50	60	70	80	90	100
Barley	97	108	121	135	158	195	268
Corn, shelled, yellow dent	98	112	129	140	156	196	238
Oats	91	103	118	130	149	185	241
Rye	99	109	122	135	157	206	267
Sorghum	98	110	120	138	158	188	219
Wheat							
Soft red winter	97	109	119	136	157	197	256
Hard red winter	97	109	125	139	159	197	250
Hard red spring	98	111	125	139	159	197	250
Durum	94	105	115	131	154	193	267

Equilibrium moisture level expressed as g/kg grain. Divide by 10 to express as per cent moisture content on a weight to weight (w/w) basis. For example 135 g/kg is equivalent to 13.5 per cent w/w.

From: Henry, R.J. and Kettlewell, P.S. (1996) Cereal grain quality. Chapman & Hall. 488 pages

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The International Fertiliser Development Centre together with 2SCALE has started a citrus production training programme for farmers in parts of Ghana. Francis Kokutse finds out what it is all about and what it means to the farmers.

IFDC and 2SCALE promote agri-business in West Africa

THE INTERNATIONAL FERTILISER Development Centre (IFDC) together with the Netherlands-funded, 'Toward Sustainable Clusters in Agribusiness through Learning in Entrepreneurship (2SCALE)' have embarked on various agri-business projects to improve the lives of small holder farmers across the West Africa region.

In Ghana, a citrus development project has already taken off and it is intended to improve citrus production as well as provide the opportunity for Dutch private firm, Fruitiland, to buy from over 4,000 farmers to produce juice and concentrates by 2017, regional communications officer for East and Southern Africa of the 2SCALE project, Ajay Varadachary told African Farming.

The 2SCALE project is the largest agribusiness incubator in Africa, working with farmers and small-scale entrepreneurs in 12 countries. "We build networks that connect farmers, buyers and intermediaries, enabling them to create and grow new businesses," he said, adding that, "they do this through capacity building in agro-business as well as business support services."

In addition, 2SCALE also works with private firms, by assisting them to find business opportunities for sourcing products from, or selling agro-inputs to, smallholder farmers in Africa.

Varadachary said, "Field activities began in 2012, but were suspended in 2013 due to technical problems at the factory. Activities re-started in February 2014. We are currently negotiating a four-way partnership between Fruitiland, Fair Trade Original, Verbruggen Juice and 2SCALE."

Training workshops

The group is organising workshops to train farmers in selected citrus production areas across southern Ghana together with extension staff on production methods, disease control and agribusiness practices, especially accounting, marketing practices and group dynamics.

He said they have realised that agro-processing is mostly done by companies, not smallholder farmers. As a result, "we assist processing companies, including technical assistance through consultants and partners as well as train farmers to do some form of simple processing to add value".

Varadachary said the concentration on agri-business is due to the fact that greater market participation by small-scale local entrepreneurs will boost food security and agriculture-based trade in Africa, stating that "market expansion will also give farmers the incentive to invest in productivity-enhancing technologies".

Unfortunately, he said, potential market entrants face huge challenges – lack of scale economies, high transaction costs, and limited knowledge of markets. It is for this reason that 2SCALE helps create new businesses and expand existing ones, by bringing the right partners together for collective, co-ordinated action.

Apart from the citrus project, there is also a partnership with the Ghanaian Ministry of Agriculture and a leading university to help scale out new maize varieties that give yields more than six times the national average.



Citrus farming has the potential to become a major source of income contributor to the Ghanaian economy.

The 2SCALE project is the largest agribusiness incubator in Africa.

So far, 2SCALE agribusiness clusters in the Brong Ahafo region have tested four new maize varieties as part of a government research programme. Field trials – planted and managed by farmers, and monitored by 2SCALE partners, have been conducted at 11 sites in two districts. The varieties were also tested under near-optimal conditions by maize scientists from the Methodist University and the Wenchi Agricultural Station.

All four varieties gave better yields than the local traditional variety (planted alongside, for comparison). But two varieties stood out: 30Y87 and PAN 53. Both are drought-tolerant hybrids, developed by private seed companies and successfully grown in several African countries.

Another project in Benin

There is also another project in Benin, where a group of 2,500 female farmer entrepreneurs have been shaking up the rice business. They grow high-quality rice using the best available technologies, and process their harvest into nutritious, affordable parboiled rice for sale to restaurants and supermarkets.

Changing Nigeria's dairy sector

In Nigeria, dairy giant Friesland Campina Wamco is sourcing milk from traditional Fulani pastoralists for the first time. Fulani communities, mobilised and trained by 2SCALE, now supply 7,000

litres of fresh milk per day to collection centres where the milk is tested, bulked, chilled and trucked to the processing plant in Lagos. Five pilot dairy farms have been set up – on Fulani land, with the local communities sharing costs – to showcase best practices in herd management, animal nutrition and veterinary care.

Cattle owners are using practices introduced by 2SCALE: hygienic milking procedures to prevent spoilage, enrichment of rice straw with urea and molasses to increase energy and protein content, and supplemental feeding to maintain milk yields during the dry season. Cows that gave less than two litres of milk per day now give 3.5 litres. Profitability per lactating animal has increased by nearly 80 per cent.

Over 350 milk producers and extension agents have been trained. Community-based livestock workers have been trained and deployed.

A business support organisation works closely with Fulani communities, providing mentoring and technical advice. A tsetse fly control plan is being piloted in the South West region, in collaboration with the Nigerian Institute for Trypanosomiasis Research. The Fulani produce about 70 per cent of the country's

With some assistance, smallholders can improve their farming methods, increase crop yields, and work with agri-businesses for mutual benefit.



Fulani communities, mobilised and trained by 2SCALE, now supply 7,000 litres of fresh milk per day.



Citrus farmers at work.

milk – but, until now, they sold only limited quantities, almost exclusively on the informal market. This partnership, bringing technologies and markets to small-scale producers, has fundamentally changed Nigeria's dairy sector.

Varadachary said that smallholder farming does not have to be subsistence farming. "Many smallholders in Africa grow crops for sale, but in limited quantities. With some assistance, they can improve their farming methods, increase crop yields, and work with agri-businesses for mutual benefit," he added.

As the 2SCALE project has shown, creating these partnerships can enable farmers and entrepreneurs to grow together. The Netherlands-funded 2SCALE project was launched in June 2012. By December 2013, 192 agribusiness 'clusters' were operational in 10 countries, involving 390,000 farmers – of whom 38 per cent are women. A total of 1,025 private firms, from small-scale to multinational, are buying farm produce from or selling agricultural inputs to 2SCALE clusters.

It has operations in 12 countries comprising Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Mali, Mozambique, Niger, Nigeria, South Sudan, Togo and Uganda. Eight of the 12 are Dutch partner countries (ie, priorities for government development assistance). A ninth country, Nigeria, is the biggest agricultural market in the region. Three countries (Burkina Faso, Niger, Togo) were included for a limited two-year period. Previous agribusiness projects by 2SCALE partners have been successful in these countries, and it was anticipated they could provide lessons for other target countries. **E**



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The practice of CA in Africa is now maturing with increasing demand for more sustainable agricultural practices and better natural resources management and conservation.

Conservation agriculture improves yields

Cover crop growing in cotton and tomato residues.

CONSERVATION AGRICULTURE (CA) IS a combination of tested scientific technologies and/or principles in agricultural production. The practice of CA in Africa is now maturing with increasing demand for more sustainable agricultural practices and better natural resources management and conservation. CA, as a concept for natural resource-saving, strives to achieve acceptable profits with high and sustained production levels while concurrently conserving the environment. It appears to be a promising way of attaining sustainable agricultural production. In practice, CA relies on simultaneous application of three basic principles:

- **Minimum soil disturbance or if possible, no tillage:** To the greatest extent possible, the soil should not be disturbed (eg, through ploughing). This allows for the soil ecosystem and structure to return to a more natural state.
- **Permanent soil cover:** To the greatest extent possible, the soil surface should not be left bare – most easily achieved by leaving crop stubble and residues on the field after harvest. This reduces the soil’s exposure to environmental degradation and increases soil moisture retention.
- **Crop rotations:** Crops should be grown in rotation, rather than in a monoculture. Crop rotation systems increase the diversity of production; intensive, nutrient-depleting crops are interspersed with more soil-friendly crops in short or long-term cycles. This may necessitate planting beneficial cover crops, rather than simply fallowing (resting) land. For example, farmers will no longer plant wheat following a wheat harvest, but may instead rotate wheat with canola, grasses or nitrogen-fixing legumes.

Growing concerns

Growing concerns in regards to global warming and rising food prices could drive an increasing adoption of CA.

Conservation Agriculture and no-till systems are not new agricultural production methods in Africa. The evolution of such systems can be traced far into the past of African agricultural

The simultaneous application of the three principles known as CA started recently and has emerged in several places.

practices when food was produced using pointed sticks to punch holes into the ground to prepare land for planting.

Agricultural production changed drastically due to colonial powers and missionaries who introduced mechanisation and tillage implements with extensionists and learning institutions promoting the hoe and plough. However, not all of Africa’s farmland was put to mechanisation, or to the deep-till hoe, and pockets of CA-friendly farming still exist.

In Africa, the simultaneous application of the three principles known as CA started recently and has emerged in several places, most notably in South Africa, Zimbabwe, Zambia, Kenya and Tanzania. It has also spread rapidly in Ghana.

Prospects for scaling up CA in Africa

Experiences of CA take-up in Africa have so far been diverse. It has mainly been driven by donor and non-governmental organisations and the need to reduce crop establishment costs. Consequently, there is a huge challenge to upscale in order for CA to tackle the following issues (among others):

- **Improve African yields:** The African population continues to increase while crop yields and consequently food production in many areas are actually falling. The intensive annual tilling of the soil destroys soil structure, produces a hard pan in the soil, restricting root growth and stunting plant growth. Moreover, the impact of raindrops on bare soil causes sheet and rill erosion. The resulting soil erosion and land degradation are quite severe in Africa and lead to an annual decrease of three per cent agricultural production. CA, where it has been implemented, has shown a high potential to reverse this trend.

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- **Reduce production costs:** Conventional agricultural practices such as tilling are expensive, especially within the context of rising fuel and labour costs. Experiences in Ghana and Kenya have shown a decrease of labour costs by 40 per cent input by using no tillage methods.
- **Shortage of labour and farm power:** A number of factors including rural-urban migration, HIV/AIDS and cash constraints among others are contributing to shortage of labour and farm power. Conservation Agriculture takes less work, thus enabling efforts to be channelled to other development activities
- **Environmental degradation:** Conservation Agriculture protects the land and feeds the soil. It has the potential to halt and reverse land degradation and could be a major part of the package for Sustainable Land Management (SLM).

Because it is a soil-focused system that brings CA into the centre of a new, more sustainable and very different farming system, there is a need to be better soil-science educated.

Conservation Agriculture is based upon soil life and health; therefore soils have to be brought up to a condition where healthy life can develop. Physical and chemical soil limitations like compactions; pH, phosphorus (P) and potassium (K) have to be corrected before changing to Conservation Agriculture.

Especially in highly degraded or depleted soils, this means some investment is necessary to recover them, such as removing compactions, liming, use of green manure and synthetic fertiliser to control extreme nutrient deficiencies.

CA is a different production system and one of the biggest changes is in weed control. In conventional tillage, generally no special knowledge is needed about specific weeds, because tillage implements bury and kill most of the weeds. In Conservation Agriculture often farmers must know the weeds and herbicides as well as other characteristics, to control specific weed and avoid competition with crops.

Most advantages of CA in terms of building up of soil life, soil organic matter and weed management come from permanent cover of the soil. Not tilling the soil, however, provides the basis for the soil cover to be maintained, the soil organic matter not to be mineralised faster than it can be supplied and for the soil life, macro-pores and structure not to be disturbed, which reduces enormously erosion control and flood prevention under CA. No-tillage with low amounts of crop residues does not give the full benefits of the system and often results in yield decrease in the first two to three years.

Using leguminous cover crops such as mucuna pruriens, pueraria phasheoloides, centrosema pacuorum, macrotyloma uniflorum, dual purpose food legume cowpeas (like IT93k-452-1), and glycin max [soybean] (like TGX1448-2E), and groundnut like (SAMNUT 21) have proven to successfully control some of the obnoxious weeds. There is need however, to also build the soil cover process on indigenous farm and wild species.

Benefits

CA, when practiced in a comprehensive way, improves crop yields over time and reduces the required quantity of most inputs. As the soil recovers from decades of tillage, and cover crops and residues add organic matter and nutrients, soil fertility and soil moisture, the system's resilience to environmental pressures improves dramatically.

CA increases soil organic matter content and soil moisture retention, while sharply reducing run-off (and therefore chemical pollution of nearby waterways), erosion by wind and water, and soil surface temperatures (helping to protect soil biota from extreme heat). As the health of soil fauna improves, soil organisms naturally



Using conservation agriculture to help Zimbabwe's farmers produce more. Image: FAO.

till the soil, drawing nutrients from the surface down into the root zone, reducing soil compaction (thereby facilitating root penetration and water infiltration) and breaking down organic matter to make nutrients readily available for crops.


CA also reduces input costs by cutting fuel consumption in mechanised systems (planting is done using single-pass machinery), seed costs (due to direct planting) and fertiliser inputs, though herbicide use may increase. Crop rotations also allow for the inclusion of crops that contribute to increased soil fertility (eg, nitrogen-fixing legumes). Pesticide use may also decrease – crop rotation systems under no-till are particularly resistant to pests and disease, since those that are crop specific have no host in the intervening years, and because robust soil biota increase the soil's resistance to pathogens.

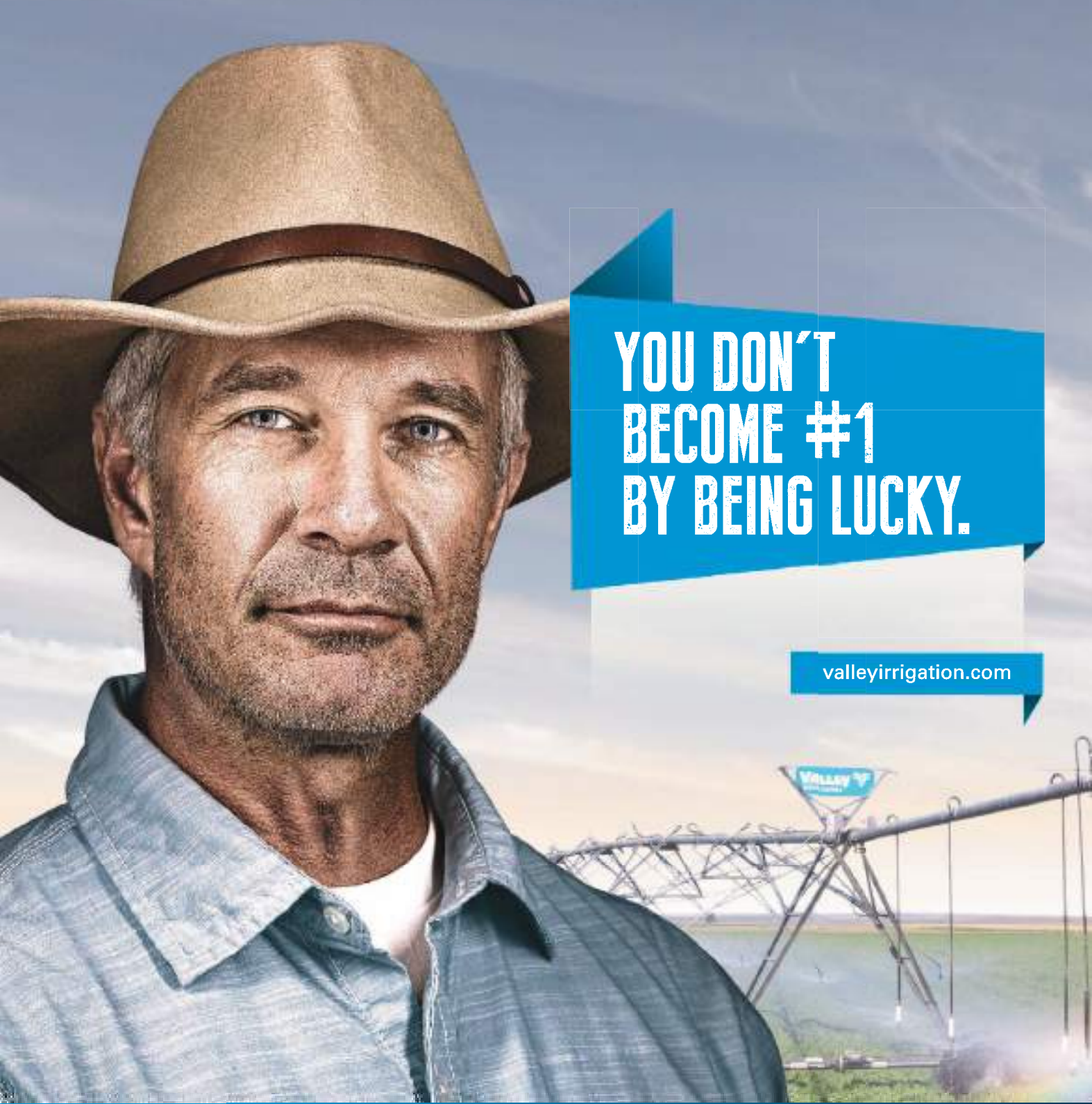
The practice specifically decreases the farm system's sensitivity to weather variability and extremes (eg, improving both water-logging and drought performance over time). For example, improved soil moisture retention makes for more reliable planting conditions, while single-pass techniques allow for planting to be completed within a much shorter timeframe. Planting under the CA approach therefore requires less rainfall and a smaller window of good weather, improving the farmer's ability to optimally time planting relative to the growing season.

In non-mechanised systems, CA may reduce labour inputs, though this finding has been variable across different studies. At the very least, CA requires less animal traction and may allow for labour inputs to be spread over a larger timeframe, since permanent soil cover reduces erosion between preparation and planting, allowing for earlier preparation.

Aggregate or off-farm benefits include increased food security, improved water quality through reductions in the agricultural pollution and sedimentation of water bodies, more regular and predictable river flows, increased soil biodiversity, lower greenhouse gas emissions from diesel use and soil processes, increased carbon sequestration in soil organic matter and higher soil albedo (reducing surface temperatures).

The promotion and development of CA in Africa requires a step-by-step approach with enough flexibility at the outset so as to capture the needs, expectations and capabilities of resource-poor farmers.

Appropriate policy support including incentives and subsidies, particularly for small and medium scale farmers is essential. The involvement of the private sector (mainly local manufacturers of CA tools and equipment production) will be instrumental to sustain the successes of various on-going and past projects. Linking increased agricultural production to local and international markets including the emerging new market based opportunities such as carbon credits, eco-tourism, organic products among others could be key in the upscaling of CA practices with strong support from policy makers. 



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AGCO has recently launched a demonstration “Future Farm” initiative in Zambia, in which Harper Adams is a partner. Joseph Martlew* looks at the control traffic farming project currently running on the farm.



Subsoiling to standardise field.

Mechanisation for Africa: What about the soil?

MODERN, HIGHLY MECHANISED agriculture results in serious compaction that damages the properties of soil. Negative consequences include poor soil health, declines in crop performance and increased soil erosion. To reverse these negative consequences intensive tillage is used to ready soil for planting; this causes further damage and more compaction. The solution is to use field management approaches to reduce compaction and so allow much less intensive tillage, practices collectively known as conservation agriculture.

Conservation agriculture in Africa

Back in 2008, the Food and Agriculture Organisation of the United Nations told us that it was time “for a new look at agricultural mechanisation in Africa”. In an agenda that included a call for environmentally sustainable mechanisation, a plan was set out to cultivate Africa’s very own green revolution. But what are our options for achieving viable yields and practicing sustainable stewardship?

Since the report, the pressure for Africa to increase mechanisation has intensified. Figures published in 2014 claimed agricultural production in developing regions will have to increase by around 80 per cent in order to fulfil their role, alongside more modest targets in developed regions, to cope with the expected 39 per cent increase in global

Time for a new look at agricultural mechanisation in Africa.

population by 2050. The International Fund for Agricultural Development emphasised this priority at last years’ African Green Revolution Forum in Addis Ababa.

On farm there are now countless choices for the producer considering adopting the principles of conservation agriculture. Yet, with evidence largely based on North American and European farming, how best do we tailor the lessons learned abroad for mechanisation in Africa?

What are our options?

The options fall largely within the two broad categories that characterise our seasonal field operations - how we traffic the field surface and how we work the upper soil layer.

Where field traffic is concerned, research has demonstrated that conventional field management can result in more than 80 per cent of the field surface being run over at least once per season. Even where a conservation system has been put in place, reducing the number of annual field operations, that figure remains at 60 per cent. The resulting compaction has been shown to damage soil health and has proven difficult to effectively reverse, worsened in the subsoil by the rapid

increase in modern machinery size.

There are two available solutions. We either accept traffic intensity is high and attempt to limit compaction damage, or we use a strict field traffic control system in order to drastically reduce the surface area run over.

The first of these concerns is lowering ground pressures. This encompasses both newly developed tyres capable of effective load carrying/torque transmission at low inflation pressures and rubber tracks. These solutions reduce the transmission of peak stress to the soil and therefore lessen the damage associated with compaction under conventional pressure tyres. Changing to a different type of tyre is a relatively painless adjustment to make on a farm.

The second of these - controlled traffic farming - eliminates the need to reduce damage as it avoids compaction in the first place. By confining all field operations to the same permanent wheel ways each season we effectively leave between 70-80 per cent of the field area untrafficked, allowing natural soil structure to develop.

Worldwide, the area under controlled traffic farming has been slowly growing with particular success in South America and Australia. The positive impact in these regions has been widely shown and alongside economic benefits, controlled traffic farming improves yield, soil structure, field efficiency, soil organic matter, water storage, fertiliser use and lowers energy requirements.

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Challenger 865 & Radium PowerCombo (conventional tillage).

In the case of tillage, again two broad options are available; reduced tillage or no-tillage.

Reduced tillage restricts overall soil disturbance to a shallow depth and is often called shallow, minimum or zone tillage whereas no-tillage sows seeds directly into the soil. Both of these approaches have favourable benefits for the farmer; reductions in energy consumption/labour costs, moisture conservation, increased plant cover to combat erosion and minimising organic matter losses.

There is little doubt that a carefully considered switch to any of the above systems is likely to improve crop performance and benefit the environment, but which combination is best for sub-Saharan Africa?

A field-scale trial

On the AGCO Future Farm, Zambia, these traffic and tillage practices are being tested at field-scale, under realistic sub-Saharan African cropping conditions. In a fully replicated field trial we have combined the field traffic and tillage approaches to investigate their effects on soil health, operation efficiency and crop performance in an attempt to establish the best combination.

We are testing three traffic intensities:

- 70 per cent Plot Surface Area – to represent conventional management
- 50 per cent Plot Surface Area – to represent conservation management
- 20 per cent Plot Surface Area – to represent controlled traffic management

And three types of tillage:

- Intensive – to represent conventional tillage
- Shallow depth/zone tillage – to represent conservation tillage
- Zero Tillage – to represent direct drilling/no-till

Under a centre pivot irrigation setup the 7.5 hectare trial site is being monitored for factors that prior research has demonstrated are vulnerable to compaction and intensive tillage. Soil moisture, physical structure, health properties and infiltration rate alongside machinery performance are being used to evaluate each combination of traffic and tillage on the cropping system and the environment.

The AGCO Future Farm not only gives us an opportunity to demonstrate these systems at field scale with commercial equipment, but it also allows us to interact with representatives from industry through to the general public. The project is accessible on the ground and so alongside published scientific data, farmers, sales partners and anyone with an interest can come and see the results for themselves.

Although this project is the first of its kind in Africa the experimental design is based on a similar project that has been running at Harper Adams University, UK, since 2011. Tailored to European agriculture, the Harper Adams project compared similar levels of traffic intensity but used only shallow and deep tillage comparisons.

Early results have shown significant yield improvements in untrafficked areas with fuel consumption and draft force benefits evident when using varied combinations of the conservation farming approaches. In addition the project has highlighted unexpected difficulties, such as drill choice, in challenging conditions.

Establishing best practice guidelines

Our ambition with the AGCO Future Farm project is to reveal the effects of conservation traffic and tillage in the much more fragile soil environment of sub-Saharan Africa. Through the results we will establish some best practice guidelines. We

aim to determine which combination results in the best compromise between yield, crop quality, soil health, system economics and the environment.

The project is currently at the end of its normalisation year. The field has been standardised and any remaining field variation recorded. This current season we will apply the traffic and tillage treatments and begin to measure the results.

Thinking to the future

Soil is the fundamental material that supports all agriculture and has serious implications for ecosystem services. Soil can be as varied from one country to the next as it can be within one field. Therefore, it is critical that we understand what we have to work with in a given region and adjust our agricultural practices accordingly.

Despite conservation agricultural solutions having been proven effective and with machinery widely available to implement them, soil is in generally still treated as a limitless resource capable of withstanding unsustainable manipulation.

There is an opportunity to implement best practice from the start of intensification and spread of large-scale, mechanised agriculture in sub-Saharan Africa. If we avoid causing problems of compaction and unsuitable tillage at the outset, we avoid having to go to great lengths and expense to fix the problem later on. A lesson many North American and European farmers would, I hope, agree with. **E**

**Joseph Martlew is a postgraduate researcher at Harper Adams University engaged in a PhD research project with AGCO Corp. on their Future Farm, Zambia. They are investigating mitigation strategies for field traffic and tillage damage in the sub-Saharan African cropping environment.*



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Although there has been a switch to reduced cultivation methods, there are still plenty of situations where powered implements continue to provide the most cost-effective cultivation method. Mike Williams reports.

Powered cultivators

THE TILLAGE TREND on many farms has brought a switch to reduced cultivation methods, using high output equipment that can save time and fuel when producing a seedbed, and this makes using wide, non-powered implements an attractive option for those with large fields and a big workload.

With non-powered discs and tines featuring on so many of the latest cultivators, p-t-o driven power harrows and rotary cultivators have lost some of their previous popularity, but there are still plenty of situations where powered implements continue to provide the most cost-effective cultivation method. They are often the preferred choice for seedbed preparation, particularly preparing land for vegetable crops and ornamentals, and they are a popular option for working in vineyards and for fruit production.

Design improvements in power harrows have brought stronger tines and gear drives that can stand up to difficult conditions including stony soils.

Rotary cultivators

One of the attractions of rotary cultivators equipped with either curved or L-shaped blades is that they offer a high degree of versatility and can be used for primary tillage including stubble cultivation and breaking up pasture, as well as secondary work such as seedbed preparation. They remain a highly efficient method of chopping residues from previous crops and they also have an effective mixing action for incorporating the chopped material into the soil. Rotary cultivation is also used to make a seedbed in difficult soil conditions, and this includes breaking down hard clods, and the powered blades can also be used to make the deep, even seedbeds needed by some vegetable and root crops.

Another attraction of rotary cultivators is that the quality of the seedbed can be varied by selecting the appropriate



A Lemken Zircon power harrow equipped with a rear p-t-o drive.

combination of forward speed and rotor speed. On most of the medium and larger width machines there is a gearbox to adjust the rotor speed, and a coarse seedbed can be produced by choosing a slow rotor speed with a faster forward speed.

Power harrows

There was a time when power harrows had a reputation for poor reliability, especially in hard or stony soil conditions, but design improvements have brought stronger tines and gear drives that can stand up to difficult conditions including stony soils, and the troughs that contain the gears and support the rotors are usually strengthened to gain increased rigidity. Many leading manufacturers now offer quick-attach tines, either as an option or as standard equipment, making it easier to fit a replacement in the field without using tools. Some of the latest tines are also designed to reduce the power requirement.

Most power harrows have a gearbox to adjust the tine speed and there is a selection of different press rolls to attach behind the tines to level and consolidate the surface. The wider versions have hydraulically operated folding for transport, and a big attraction of many power harrows is that they are designed to be used in combination with a seed drill which allows the seedbed to be prepared and the seed sown in a single time and fuel-saving operation.

A design feature available from many of the leading power harrow manufacturers is

reducing the diameter of the tine rotors in order to space them closer together. This typically provides four rotors per metre of cultivation width to allow a finer seedbed to be produced while reducing the risk of tine breakage.

A special feature on some models in the Italian built Moreni range of power harrows is to have three tines on each rotor instead of the usual two, providing an alternative way to increase the number of tines to allow a finer seedbed to be produced. Moreni, which claims to be the only manufacturer offering a three-tined rotor, started making power harrows in 1970 and the current range starts with a 0.86m wide model needing 15hp plus at the p-t-o and suitable for small vegetable and ornamental production as well as landscaping. The top model from Moreni has hydraulic folding and an 8.0m working width and can be used on tractors up to 400hp.

A power harrow pioneer

The Maschio company in Italy was one of the power harrow pioneers, building their first machines more than 50 years ago, and they now have one of the biggest ranges offering working widths from 1.3 to 8.0 metres to suit tractors between 30 and 450hp. The tines on the current machines are made of boron steel for strength, with a quick-fit attachment system on all but the smallest models, and the tine rotors are spaced at four per metre.

The newest addition to the Lemken range of power harrows from Germany is the



The new Lion 103 series power harrows from Pottinger are a lightweight design for smaller tractors.

Zircon 12 series announced in 2013. There are two versions, one with the standard lever changed gearbox offering the choice of different rotor speeds to produce a finer or coarser seedbed, and there is also a lower priced two-speed gearbox with manually changed gears for customers who adjust the rotor speeds less frequently. The new models also feature hydraulically operated adjustment of the working depth and quick-change tines are available. Like most Lemken power harrows, the Zircon 12 models can be equipped to work with a seed drill in a one-pass till-and-drill combination.

The versatility of some power harrows and rotary cultivators can be increased by adding a set of deep working soil loosening tines. These are designed to work below the main cultivation depth, fracturing the soil to break up compaction for easier moisture movement and root penetration. Sets of four, six or eight subsoiling tines are available for the Kverneland range of power harrows, suitable for tractors up to 250hp and providing a maximum working depth of 40cm. Kverneland power harrows with a

rigid frame are available up to four metres wide and working widths from four to six metres have hydraulically operated folding.

The top models in the Lion range of power harrows from Pottinger are up to six metres wide and are suitable for tractors up to 270hp, but the newest additions are the Lion 103 series lightweight models designed for smaller tractors including four-cylinder models producing 100hp or less. Working widths are from 2.5 to four metres and they can be used with 540 or 1000rpm input speeds at the p-t-o. The lightweight design, which includes an aluminium cover over the gear trough, allows the 103 series to be used on tractors with modest lift capacity. Pottinger offers a wide choice of rear press rolls that can be used with the Lion 103 series, and their power harrows can also be used in a till-and-drill combination with Pottinger Vitasem or Aerosem seed drills.

The versatility of some power harrows and rotary cultivators can be increased by adding a set of deep working soil loosening tines.

Power harrows for secondary tillage

Power harrows are typically used for secondary tillage, working on land that has previously been ploughed or cultivated, and this is the role of Amazone's KE series rotary harrows available in 2.5 and four metre widths. Amazone also makes the heavier duty KX model described as a dual purpose

rotary harrow and cultivator, equipped with a stronger gear trough, drive shafts and tines to cope with more challenging conditions. The KX model has a three metre working width and is designed for tractors up to 190hp. Amazone also offers the heavy duty KG series cultivators in four, five and six metre widths with a gear trough made of 8mm steel and a gear drive designed for up to 360hp.

Kuhn Farm Machinery based in France is one of the few companies offering both a range of power harrows and a comprehensive selection of rotary cultivators. There are 22 models with working widths from 2.5 to six metres in the HR power harrow series plus a choice of 33 EL series rotary cultivators. The rotary cultivator working widths start at 1.26 metres with a specification that includes a chain drive to the rotor shaft, a minimum power requirement of only 10hp at the p-t-o and a working depth adjustment between five and 12cm. Further up the range the rotor drive is by gears instead of a chain and sprocket and the top model in the EL series has a 4.5 metre working width, up to 26cm maximum blade depth setting and is suitable for 270hp maximum power input.

The Powavator series rotary cultivators are made by Standen Engineering in the UK where they are a popular choice for a wide range of jobs such as preparing deep seedbeds for potatoes and other root crops. Working widths are from 1.8 to six metres and all models have a gear drive to the rotor shaft. There is a list of optional equipment that includes an A-frame and a rear p-t-o drive extension for operating a seed drill, and rear press rolls are also available. As well as the standard L-shaped blades, the rotors can also be equipped with curved speed blades that absorb less power, special stubble blades are available and there are also steel spikes that lack the chopping action of the blades but allow faster working speeds. **B**

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Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. The pump supply system, sprinklers and operating conditions must be designed to enable a uniform application of water.

Sprinkler irrigation

SPRINKLER IRRIGATION IS suited for most row, field and tree crops and water can be sprayed over or under the crop canopy. However, large sprinklers are not recommended for irrigation of delicate crops such as lettuce because the large water drops produced by the sprinklers may damage the crop.

Sprinkler irrigation is adaptable to any farmable slope, whether uniform or undulating. The lateral pipes supplying water to the sprinklers should always be laid out along the land contour whenever possible. This will minimise the pressure changes at the sprinklers and provide a uniform irrigation.

Sprinklers are best suited to sandy soils with high infiltration rates although they are adaptable to most soils. The average application rate from the sprinklers (in mm/hour) is always chosen to be less than the basic infiltration rate of the soil so that surface ponding and runoff can be avoided.

Sprinklers are not suitable for soils which easily form a crust. If sprinkler irrigation is the only method available, then light fine sprays should be used. The larger sprinklers producing larger water droplets are to be avoided.

Clean supply of water essential

A good clean supply of water, free of suspended sediments, is required to avoid problems of sprinkler nozzle blockage and spoiling the crop by coating it with sediment.

A typical sprinkler irrigation system consists of the following components:

- Pump unit
- Mainline and sometimes submainlines
- Laterals
- Sprinklers

The pump unit is usually a centrifugal pump which takes water from the source and provides adequate pressure for delivery into the pipe system.

The mainline - and submainlines - are pipes which deliver water from the pump to the laterals. In some cases these pipelines



Sprinkler irrigation is adaptable to any farmable slope, whether uniform or undulating.

The main objective of a sprinkler system is to apply water as uniformly as possible to fill the root zone of the crop with water.

are permanent and are laid on the soil surface or buried below ground. In other cases they are temporary, and can be moved from field to field.

The laterals deliver water from the mainlines or submainlines to the sprinklers. They can be permanent but more often they are portable and made of aluminium alloy or plastic so that they can be moved easily.

The most common type of sprinkler system layout consists of a system of lightweight aluminium or plastic pipes which are moved by hand. The rotary sprinklers are usually spaced 9-24 metres apart along the lateral which is normally 5-12.5 cm in diameter. This is so it can be carried easily. The lateral pipe is located in the field until the irrigation is complete. The pump is then switched off and the lateral is disconnected from the mainline and moved to the next location. It is re-assembled and connected to the mainline and the irrigation

begins again. The lateral can be moved one to four times a day. It is gradually moved around the field until the whole field is irrigated. This is the simplest of all systems. Some use more than one lateral to irrigate larger areas.

A common problem

A common problem with sprinkler irrigation is the large labour force needed to move the pipes and sprinklers around the field. In some places such labour may not be available and may also be costly. To overcome this problem many mobile systems have been developed such as the hose reel rain gun and the centre pivot.

Another system which does not need a large labour force is the drag-hose sprinkler system. Main and laterals are buried PVC pipes; one lateral covers three positions.

Operating sprinkler systems

Centre pivot: This self-propelled sprinkler system rotates around the pivot point and has the lowest labour requirements of the systems considered here. It is constructed using pipes attached to moveable towers. The amount of water applied is controlled by the speed of rotation. Centre pivots can be adjusted to any crop height and are

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particularly suited for lighter soils. With a computerised control system, the operator is able to programme many features for the irrigation process. Furthermore, it is possible to install a corner attachment system (also called “end-gun”) that allows irrigation of corner areas missed out by conventional centre pivot systems (centre pivot systems will be discussed in more detail in the September/October issue).

Linear move: The linear move (also called lateral move) irrigation system is built the same way as a centre pivot; that is moving towers and pipes interconnecting the towers. The main difference is that all the towers move at the same speed and in the same direction. Water is pumped into one of the ends or into the centre. Due to the high capital investment, linear moves are used on high-value crops such as potatoes and vegetables.

The uniformity of sprinkler applications can be affected by wind and water pressure.

Travelling big gun: The travelling big gun system uses a large-capacity nozzle and high pressure to throw water out over the crop as it is pulled through an alley in the field. Travelling big guns come in two main configurations; hard-hose or flexible-hose feed. With the hard-hose system, a hard polyethylene hose is wrapped on a reel mounted on a trailer. The trailer is anchored at the end or centre of the field. The gun is connected to the end of the hose and is pulled towards the trailer. The gun is pulled across the field by the hose winding up on the reel. With the flexible-hose system, the gun is mounted on a four-wheel cart. Water is supplied to the gun by a flexible hose from the main line. A cable winch pulls the cart through the field towards the cart.

Side roll: The side roll (also called wheel roll) system consists of a lateral, usually a quarter mile long, mounted on wheels with a diameter of between one to three metres, with the pipe serving as an axle. When the desired amount of water has been applied to an area, a gasoline engine at the centre is used to move the side roll to the next. The sprinklers are generally mounted on weighted, swivelling connectors so that no matter where the side roll is stopped, the sprinklers will always be on top. This type of system is not recommended for gradients greater than five per cent and should be used mainly on flat ground. Side roll systems are adapted only to low growing



Drop size is controlled by pressure and nozzle size.

crops, have medium labour requirements and moderate initial investment.

The main objective of a sprinkler system is to apply water as uniformly as possible to fill the root zone of the crop with water.

The wetting pattern from a single rotary sprinkler is not very uniform. Normally the area wetted is circular. The heaviest wetting is close to the sprinkler. For good uniformity several sprinklers must be operated close together so that their patterns overlap. For good uniformity the overlap should be at least 65 per cent of the wetted diameter. This determines the maximum spacing between sprinklers.

The uniformity of sprinkler applications can be affected by wind and water pressure. Spray from sprinklers is easily blown about by even a gentle breeze and this can seriously reduce uniformity. To reduce the effects of wind the sprinklers can be positioned more closely together.

Sprinklers will only work well at the right operating pressure recommended by the manufacturer. If the pressure is above or below this then the distribution will be affected. The most common problem is when the pressure is too low. This happens when pumps and pipes wear. Friction increases and so pressure at the sprinkler reduces. The result is that the water jet does not break up and all the water tends to fall in one area towards the outside of the wetted circle. If the pressure is too high then the distribution will also be poor. A fine spray develops which falls close to the sprinkler.

The application rate is the average rate at which water is sprayed onto the crops and is measured in mm/hour. It depends on the size of sprinkler nozzles, the operating pressure and the distance between sprinklers. When selecting a sprinkler system it is important to make sure that the average application rate is less than the basic infiltration rate of the soil. In this way all the water applied will be readily absorbed by

the soil and there should be no runoff.

As water sprays from a sprinkler it breaks up into small drops between 0.5 and 4.0 mm in size. The small drops fall close to the sprinkler whereas the larger ones fall close to the edge of the wetted circle. Large drops can damage delicate crops and soils and so in such conditions it is best to use the smaller sprinklers.

Drop size is also controlled by pressure and nozzle size. When the pressure is low, drops tend to be much larger as the water jet does not break up easily. So to avoid crop and soil damage use small diameter nozzles operating at or above the normal recommended operating pressure.

Applicability

Sprinklers are suited best for sandy soil with high infiltration rates although they are adaptable to most soil types. The average application rate of the sprinklers (in mm/hour) is set lower than the basic infiltration rate of the soil so that surface ponding and runoff can be avoided. Sprinklers are not suitable for soils that easily form a crust or in case of risk of salinisation. Moreover, they can easily clog with the presence of sediments or debris. If sprinkler irrigation is the only method available, then light fine sprays should be used. Sprinklers producing larger water droplets should be avoided.

Advantages

- No terracing required
- Suitable for almost all types of soil
- Doses, application rates and times adaptable to the needs of the plant and soil type
- Independent from the topography of the area (even areas located at higher elevations than the source can be irrigated)
- Utilisation of the entire area with no need for channels
- Possibility of adding fertilisers or pesticides
- Possibility of irrigating for other purposes, sprouting, frost protection or cooling during hot periods

Disadvantages

Incurs high operation expenses due to the energy needed for pumping, labour and relatively large investment in equipment, sprinklers and pipes

- Sensitivity to wind, causing evaporation losses
- The unavoidable wetting of foliage in field crops results in increased sensitivity to diseases
- Debris and sediments can cause clogging
- Capital cost is high with greater operational costs due to higher energy requirements **B**

A US market research company has partnered with a Netherlands-based company that does independent agricultural certifications to engage and educate farmers via mobile phones.

How mobile phones could help farmers sell more products

GEOPOLL, THE WORLD'S largest real-time mobile survey platform, has announced a strategic partnership with Control Union, global leader in agricultural certifications, food safety, and sustainability. Partnering allows Control Union to tap into GeoPoll's multimodal mobile platform and database of 200mn users, giving them access the fastest and most cost effective data collection method available in emerging markets. Together, GeoPoll and Control Union will utilise mobile surveys to engage and educate smallholder farmers in emerging economies, with the goal of reaching one million farmers by 2020 via SMS and voice messaging. The partnership will allow commercial organisations such as global brands, exporters, and suppliers, as well as governments and non-profits to ensure social compliance in key value chains and to empower farmers to gain greater access to markets, ultimately adding value for both farmers and consumers.

"Control Union is excited to focus its expertise and better support smallholder farmers. GeoPoll's team and platform provides us practical tools to connect with rural farming communities to educate, certify and link them to a global marketplace. The survey tools also empower our commercial clients to monitor goods as they move through



GeoPoll and Control Union are to use mobile surveys to engage with farmers in Africa and Asia. Image: CIO East Africa

supply chains, increasing transparency and helping them report better economic and social impact. Accessing information from the most remote farming communities will no longer be a barrier to asking or answering consumer questions," said Johan Maris, managing director, Control Union..

Together they will launch several mobile products aimed at non-profits, commercial organisations, exporters and suppliers:

- **Certification Surveys:** Mobile survey instruments which will monitor farmers' compliance with programmes such as Global GAP and Organic certifications.
- **Value Chain Monitoring:** Mobile survey instruments that will serve as a tool for sustainable value chain design and monitor social, economic and ecological impact.
- **Compliance Messages:** One-way push content messages promoting agricultural compliance.
- **Custom Surveys:** Mobile survey instruments with customized questions and design, allowing clients to collect mobile data which will inform and enhance their operations in local markets.

The partnership will initially focus on countries in Africa including Ghana, Kenya, Nigeria, Ethiopia, Tanzania and Uganda, expanding to key markets in Asia including Indonesia and the Philippines. With consumers demanding increased transparency, target value chains include coffee, cocoa, cotton, palm oil, rice, tea, tobacco, and fresh fruits and vegetables. ¹



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Moisture levels and consequences

BENTALL ROWLANDS STORAGE Systems Ltd is a leading UK manufacturer in complete storage and processing equipment solutions for the agricultural and industrial markets. The company offers a wide range of galvanised steel silos and hoppers, water tanks, catwalks and platforms, material handling equipment, cleaning, grading, weighing and drying systems that are assembled worldwide.



Grain dryers.

Getting the moisture levels right in a silo can be challenging. Fungi is one of the main consequences of a variety of different moisture contents and temperatures stored in grain. To control this, a principal method known as drying and cooling is needed. No storage fungi will grow below a moisture content of 14.5 per cent. They do continue to grow slowly at near 0°C, meaning that cooling alone is not sufficient but the lower the temperature, the slower the growth rate.

Storage mites, which breed rapidly under favourable conditions are another nuisance and will cause direct damage to the grain by hollowing out oilseeds or eating the germ. Physical control methods are used for mites. If the grain is dried to 14.5 per cent moisture content then the mites are unable to breed. If the grain is cooled to 5°C, this can also help to prevent their build up.

Good store hygiene is an important first step in eliminating these pests. Both the building structure and the stored grain should be monitored using traps. Traps within the grain bulk should be positioned approximately 5–10cm below the surface to monitor any insect species with different behaviours.

Key features of a good grain store include being clean, dry, well ventilated, correctly functioning equipment, proofed against rodent and bird entry, watertight, no physical contaminants and secure.

For further information about Bentall Rowlands, please visit: www.bentallrowlands.com

Case IH first '2015 innovations' at SIMA

FARMALL, MAXXUM, PUMA, Magnum and Quadtrac models, Axial-Flow combine, round and square balers and the Austoft 8000 Series sugar cane harvester made for an impressive – yet still incomplete – overview of the Case IH product range, an offering that today is broader than ever before. One of the innovations presented at SIMA was the Magnum 380 CVX in the wheeled and Rowtrac version. "After the distinction of "Tractor of the Year 2015" at EIMA in Bologna last autumn, the Magnum has now been awarded "Machine of the Year 2015" at SIMA. "We are really thrilled that the Magnum received these two awards one after the other," emphasised Dan Stuart, Case IH product marketing manager tractors for Europe, Middle East & Africa.

The Case IH Puma tractors presented at SIMA equally surpass the highest standards. The powerful, efficient and 'clean' engine technology ensures low fuel consumption and high performance. "Simple and efficient, the system also enables Case IH to achieve engine oil change intervals of 600 hours", highlighted Stuart.

"Customer satisfaction is one of our main priorities and we are well aware of the key role played by our dealers locally. To further support our network and strengthen our presence in the region, this year we are creating a dedicated Case IH team for Africa and the Middle East to support the region's huge potential for growth, with particular attention to the corporate farming segment," emphasised Mathew Foster, Case IH VP responsible for Europe, the Middle East and Africa.



Puma 150.

John Deere partners with Zanaco

JOHN DEERE FINANCIAL and Afgri in partnership with Zanaco Bank have launched a project to help smallholder farmers improve yields and increase income at household level through provision of equipment and finance.

The project's objective is to create a system for

farmers to improve their input procurement, production efficiency through access to new technology and effectiveness in the marketing of agricultural commodities.

According to John Deere Financial sub-Saharan Africa managing director, Jacques Taylor, the

launch of the project dubbed 'Innovative Finance Solutions for Emerging Farmers and Contractors', small-scale farmers should graduate into commercial entrepreneurs.

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Pichon unveils its 'Vac&Flow' solution

PICHON HAS DEVELOPED a unique pumping system named 'Vac&Flow' Triple-Action so as to obtain a high outflow of spreading adapted to all kinds of slurries.

Of simple conception, the system is doted with a standard pump and a new centrifugal pump equipped with blades and reverse blades. This assembly allows a complete filling of the tanker in record time, an internal slurry mixer inside the tanker and a high-performance spreading tool with supply of a high and regular outflow.

- During the pumping phase, the vacuum pump starts the centrifugal pump which will fill the tank while grinding slurry. Once this action is done, according to the expected outflow of the work site, the user chooses either to pump using a combination of the two pumping systems or only with the centrifugal pump. It is also possible to pump solely with the vacuum pump for the slurries which are more fluid.
- During the internal mixing phase, the centrifugal pump (with blades) pumps at the front of the tanker and fills at the rear or inversely to improve the homogeneity of the material to be spread.
- During the spreading phase, when the material is easily spreadable, the user powers his spreading tool through the centrifugal pump which will once again mix the fluids (or with the aide of the vacuum pump). When the material is more difficult to spread, he can combine the use of centrifugal pump and vacuum pump to reach very high outflow rates.

This system is equipped with a valve at the front and the rear of the tanker which allows it to adapt to the typology of the field.

The new Pichon 'Vac&Flow' Master is an innovation designed for large farms and businesses wishing to reconcile big capacities, usage flexibility and low functioning costs and achieving this, thanks to just one centrifugal pump and one vacuum pump.

High-end generation Terrasem seed drills

THE GENERATION OF TERRASEM R3, R4 and C4 seed drills from Pöttinger handles the tillage, packing and seeding stages in a single pass at working widths of three and four metres. In addition to precise seed grain placement - thanks to the parallelogram-guided Dual-Disc double coulter with trailed depth rollers - these machines feature ground tracking, central coulter pressure adjustment between 40 and 120 kg per coulter and a high volume seed tank. The TERRASEM R3 and R4 rigid versions feature a short overall length, high manoeuvrability and optimum ground protection. The universal TERRASEM C4 version is folding. The hinged disc harrow, packer and seed rail elements follow the contours of the ground perfectly. TERRASEM C6, C8 and C9 have been developed for large area coverage.



The innovations featured on the TERRASEM seed drills aim at cost-effectiveness, soil and crop protection, intelligent technology and attractive design.

Depending on the seed rate, the metering wheel can be changed for normal or small seed quickly and easily. The metering unit is electrically driven, controlled via radar sensor or ISOBUS signal from the tractor. The leading tillage tools - featuring an integrated disc harrow - ensure intensive mixing of the soil while the dual disc seed coulters guarantee a neat seed drill to finish off the process. The metering system also offers the highest level of precision - exact placement of the seed guaranteed by the latest seed drill technology. Both units are completely maintenance-free, meaning the farmer spends less time working on the machine.

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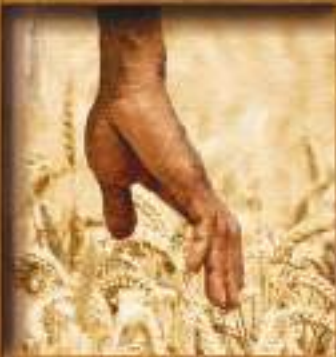
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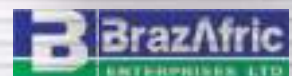


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