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agrofood Nigeria preview. p4

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Saving the planet one drop at a time



Image credit: Adobe Stock



Sustainable, water-efficient methods of poultry production are being adopted to provide a hygienic and stress-free environment for chickens.



Livestock farmers are largely benefitting from modern methods of animal reproduction.



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MARCH 2023

28-30 agrofood Nigeria NIGERIA
www.agrofood-nigeria.com

08-10 Hortiflora Expo ETHIOPIA
<https://hfpexhibitions.com/hfe/>

15-17 Agritech West Africa GHANA
www.agritechwestafrica.com

APRIL 2023

20-22 AgriTech Expo Zambia ZAMBIA
www.agritech-expo.com

MAY 2023

16-19 Nampo Harvest Day BOTHAVILLE
www.showsbee.com/fairs/NAMPO-Harvest-Day.html

JUNE 2023

06-08 IFTEX Nairobi NAIROBI
www.iftex.org

8-10 Agrofood Ethiopia ETHIOPIA
<https://www.agrofood-ethiopia.com/>

Readers are advised to verify dates and location with sponsoring organisations, as the information provided is sometimes subject to change.

Nigeria agrofood returns in March 2023

THE EIGHTH EDITION of Nigeria agrofood is all set to start in March 2023. This edition onwards, a specific focus will be placed on a particular topic each year as part of the general exhibition programme. Prominent beverage technology and ingredient suppliers will be exhibiting at the show. Here's what exhibitors from the last year have to say:

"We are looking for food manufacturers interested in FESTO process automation solutions and customers for other brands we are representing like STIHL and HANGCHA," said Onome Ayide, head marketing and communication – C. Woermann.

"Here we have met with bakery business owners, start-up entrepreneurs who got money. We are satisfied with the visitors' quality," said Gaston Maidana, head of sales and marketing-Macadams.

SIMA 2022 celebrated its centenary

SIMA 2022 EDITION marked the centenary of the international exhibition of solutions and technologies for efficient and sustainable agriculture. For this occasion, the show pushed further its ambition to accompany the agricultural world is experiencing today. It was held at Villepinte in France from 6 to 10 November.

The show was an assortment of exhaustive agricultural and livestock offering, which included row crops, livestock farming and specialist crops to name a few. There were also diverse sectors from traction equipment, tilling equipment, drilling and planting equipment, irrigation equipment and fertilising equipment to handling, transport and storage machinery and buildings, agri-inputs, products for livestock farming, components and accessories, robotics, and renewable energy among others.

The exhibiting countries included the Netherlands, Turkey, China, Spain, Belgium, United Kingdom, United States, Korea, Denmark, Russia and many more.

EIMA 2022 highlights internationalisation and innovation

EIMA INTERNATIONAL, THE great exhibition of agricultural machinery, took place in Bologna from 9 to 13 November. Internationalisation, richness of range, and innovation made the exhibition a reference point for all players in the agro-mechanical supply chain. EIMA 2022 was a 'high intensity' event that demonstrated its ability to involve a vast audience of operators.

The 45th edition marked the return of the trade exhibition event to pre-pandemic levels. The exhibition area covered a total of 128,000 sq m, 8000 of which are located outside, in the exhibition halls. Over the five days of the exhibition, there was the Tractor of the Year finalists' show, demonstration tests of gardening and green maintenance vehicles (one of the great novelties of EIMA 2022), and those of machines for the bio-energy chain, as well as skill tests reserved for contractors.

Range completeness, technological innovation and internalisation are the flagships of an event that this year returned to its natural biennial location after the health emergency that had caused the postponement of the 2020 edition to 2021.

"The 14 product sectors, the five theme halls, and the approximately 60,000 models on display make EIMA a hyper-specialised exhibition that embraces the entire agro-industrial and agro-mechanical supply chain and offers solutions for every model of agriculture, making it a world reference point for the entire industry," said Simona Rapastella, general manager of FederUnacoma, the Italian association of agricultural machinery manufacturers that is the direct

Image Credit: EIMA



EIMA 2022 marked the return of the trade exhibition event to pre-pandemic levels.

organiser of the event, at a press conference.

Over the years, the Bologna exhibition has established itself as an attraction, and the 2022 edition fully confirmed its international character. Organised by the ICE Agency and MAECI in cooperation with FederUnacoma, they include 450 businesspeople from 80 countries.

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Wadi Group celebrates 30 years of partnership with Ross

WADI GROUP, OUR Ross Parent Stock (PS) distributor in Egypt, recently celebrated a landmark anniversary of 30 years as a Ross customer, at its seventh Wadi Poultry Academy held from 25-29 September in Cairo, Egypt.

The Wadi Poultry Academy was established in 2017 to implement regular, more formal training. The aim was to hold the Academy twice a year, the first would be for internal Wadi personnel and the second would be for Wadi's PS and broiler customers, in order to exchange knowledge regarding the latest technologies and techniques in modern production methods globally.

The Academy took place over four days at the Hyatt Regency in Cairo, with over 220 guests in attendance.

See & Spray comes to Europe

AT THIS YEAR'S SIMA, John Deere will present See & Spray for the first time on its European sprayers built in Horst (Netherlands). Following the introduction of See & Spray™ Select and Ultimate in the US, John Deere is taking the next important step towards precise crop protection.

The See & Spray system for Europe is based on the See & Spray Select technology already introduced in the US. It uses camera technology to detect colour differences in the field. The cameras and other hardware components are integrated directly into the boom or chassis of the machine. One camera is mounted per meter of working width, which captures green plants at lightning speed. Processors handle the images and the nozzles are triggered individually for spot treatment. The green detection on the field soil enables a targeted application of pre-emergence herbicides. All weeds that are also visible to the naked eye are detected by the cameras.

Africa marks special day at COP27 with a resolve to tackle climate change relentlessly

AFRICAN NATIONS HAVE marked a special day on the sidelines of the 27th United Nations Climate Conference (COP27) in Egypt, with a common resolve to mobilise internal and external resources to tackle climate change.

The event, dubbed 'Africa Day,' provided countries and development partners, including the African Development Bank (AfDB), the opportunity to highlight measures to tap the continent's unique economic potential. Hundreds of youths from across the continent seized the chance to urge the world's industrialised nations to deliver on their climate finance pledges and other commitments to Africa without further delay.

In his opening remarks, African Union Commission chairperson Moussa Faki Mahamat said the challenges facing Africa in the wake of the Covid-19 pandemic and the Russia-Ukraine war had become enormous, and had taken a toll on government budgets.

"Work is going on across the continent and many governments have rolled out initiatives to address climate impacts and build resilience," Mahamat said. "But the challenges are huge, and time is not on our side," he told the audience. Mahamat called on member countries to remain steadfast in their fight for climate justice.

AfDB president Akinwumi Adesina said with Africa's vast and unique arable land, what the continent does with agriculture could impact global output. Adesina pointed to the fact that the African Development Bank Group was leading many climate action initiatives to boost mitigation and adaption. They include scaling up adaption finance, providing farmers with climate-resilient technologies, supporting the youth to adapt to climate change, and launching the 'desert-to-power' solar energy project to turn the Sahel region into a renewable energy powerhouse.



Image Credit: ADB Group

On Africa Day, COP 27, African youth group present a symbolic torch to their leaders as a constant reminder for climate action

Kenyan minister of state for environment and forestry Soipan Tuya said Africa remained a strong force in the climate negotiations. "To maintain this unity of purpose, it remains important that the negotiators and the AU are in continuous dialogue and engagement," Tuya said. She called on developed nations to scale up mitigation actions and support.

Young people at the event called on the African Union to ensure that the conference implement decisions reached at the meetings with no further delay. "We are making a request as young people that adaptation is of importance to the African people. We want action now," youth leader Lucky Abeng said.

The African Union Commission and the Global Center for Adaption signed a memorandum of understanding to mobilise at least US\$25bn for the African Adaptation Acceleration Program—established by the Centre and the African Development Bank—over five years. This is to prepare the continent for the consequences of climate change faster and at scale.

Pöttinger's TERRADISC T can now be equipped with knife roller from 4-6 m

THE TERRADISC 4001 T, 5001 T and 6001 T trailed compact disc harrow made by the arable farming professionals at Pöttinger can now be combined with a front knife roller. Compact disc harrows are extremely versatile tillage implements which become even more effective and flexible when combined with knife rollers. The TERRADISC T with working widths of up to 6 m can be equipped with a knife roller as a pre-tool to cover an even greater range of applications. This opens up a wide range of applications from seedbed preparation, stubble cultivation of cereals, oil seed rape, sunflowers and maize, to the incorporation of cover crops. The additional shredding effect eliminates the need for prior cultivation and breaking up of the stubble, saving time and resources. Likewise, it promotes the

incorporation of organic matter as well as its microbial decomposition. Also, if the knife roller is not required on a particular job, it can be folded away completely so that it no longer contacts the soil. The knives on the leading knife roller are arranged in a spiral. This ensures that it rotates smoothly since it is in constant contact with the ground to produce a uniform load on the cutting edge. The roller diameter of 350 mm ensures a high speed of rotation. These features deliver consistent chopping quality and high cutting intensity, resulting in a powerful shredding effect. Due to the knife roller's consistently high cutting resistance, it operates reliably even on hard soils. All the mounting points required for this are already on the machines, which means that no modifications to the TERRADISC are necessary.

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Ishida launches multihead weighers at Dubai exhibition

THE LAUNCH OF a brand-new range of multihead weighers will form the centrepiece of the Ishida Europe stand at this year's Gulfood Manufacturing exhibition in Dubai. The stand will also highlight some of Ishida's other latest developments in weighing, packing and quality control solutions. With global markets facing challenges such as labour shortages and fast-rising raw material and energy prices, Ishida will demonstrate how its equipment can help packing lines become leaner and more efficient, increasing yields, throughput and energy-efficiency while meeting the strictest quality standards of the retail sector. These benefits will help manufacturers maximise opportunities and respond to the latest market trends in fast-moving and competitive food markets.

Highlights include the world's first and only single-source fully

integrated snacks packing system; an entry-level multihead weigher, emphasising the breadth of Ishida's offering in this sector; and two X-ray inspection systems from its extensive quality control solutions portfolio.

The model combines the company's top-of-the-range RV multihead weigher with its high-performance rotary bagmaker. The system delivers almost zero giveaway and greater than 99% efficiency at speeds of up to 200 bags per minute (bpm) for extruded snacks and up to 150 bpm for potato chips. Advanced software and servo-controlled variable seal time, jaw temperature and jaw pressure enable the bagmaker to handle a variety of films, including standard, metallised, recyclable and biodegradable, as well as gusseted and block bottom bags, with minimal change parts.

SheVax+ rolls out solar-based refrigerators to empower women AHSPs

WORLDWIDE, OVER 750 million people keep livestock as a source of income, 400 million of whom are women. However, animal diseases – such as Newcastle disease in chickens and peste des petits ruminants (PPR) in goats – create widespread devastation. Women are disproportionately affected because they are less likely able to access the vaccines which prevent such losses as opposed to men.

A lack of access to adequate information by women on vaccinations, animal health, and livestock management, coupled with a lack of cold chain vaccine storage in East African rural areas, have complicated matters. A significant shortage of animal health service providers (AHSPs) is an added challenge.

Currently, there is limited research on the different roles that women and men have in livestock vaccine systems, and on the factors that affect their ability to participate in and benefit from them. To address these barriers faced by women in East Africa, and generate new evidence on how they can better benefit and participate in these systems, SheVax+ – a regional livestock vaccine initiative – was launched in 2019, with support from the International Development Research Centre, Global Affairs Canada, and the Bill & Melinda Gates Foundation through the Livestock Vaccine Innovation Fund.

The project is enhancing the number of women AHSPs, training and equipping them with livestock drugs and vaccines, creating a local source through the introduction of solar-based refrigerators, and enhancing women's access to livestock vaccines. This, in turn, increases vaccination demand and closes the gender gap.

"Currently, 24 women have been trained across three countries to provide vaccination and animal health-related services to 140,000 farming households. This equates to one AHSP for every 6,000 farming households, a five-fold improvement on the previous ratio,"



The project creates entrepreneurial opportunities for women.

Image Credit: SheVax+ Project

said Hellen Amuguni from the Cummings School of Veterinary Medicine at Tufts University and the principal investigator for SheVax+.

The project creates entrepreneurial opportunities for women by providing them with a valuable source of income and the capability to move into vaccine distribution and manufacturing. Across Kenya, Rwanda, and Uganda, women AHSPs make US\$50-300 per month – with the amount dependent on the country's economy and labour rates. To put this into context, Amuguni said, "a Rwandan family of four needs US\$25 to purchase health insurance for an entire year."

In light of non-existent or unreliable electricity sources, the organisation is also rolling-out solar-powered fridges. So far, they've installed 30 across Kenya, Rwanda, and Uganda.

World's first tractor-based reality show is back with season 2

THE MASSEY FERGUSON Master Mechanic Season 2 returned on 18 November in an even bigger and better format. "Season 1 of the world's first tractor-based reality show was an incredibly successful journey that was wonderful to share with the world," says Dr. Dominik Reus, Managing Director Africa, AGCO. It had highlighted a previously underrated job yet such a critical role in the industry – the technician.

Once again, three teams of two will battle it out for a grand prize of approximately US\$5,624. Also, the winning team gets a once-in-a-lifetime opportunity to visit and

train at the Massey Ferguson Beauvais factory in France where the MF high horsepower tractors are manufactured.

The show will focus on built-in technology in MF high horsepower tractors and demonstrate how farmers can utilise the technology and features to their full potential, which indirectly benefits their bottom line. Last but by no means least, Massey Ferguson offers world-class technical training to its technicians, hence the confidence to showcase the capabilities and expertise of MF high horsepower technicians countrywide.

Master Mechanic Season 2 features super-sized challenges to showcase the highly motivated and trained technicians throughout the country. It provides a unique glimpse into the technicians' world of fixing tractors, who not only swing spanners and travel to amazing and different places but use their intellect in conjunction with world-leading technology.

The show highlights that a technician's life has changed in recent times with the advent of computers and the internet. Being an MF technician is filled with adventure, continually learning and opportunities to travel to unique places.

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With more countries committing to net-zero emissions by 2050, the urgent need to switch to sustainable and water-efficient methods of poultry production is being acknowledged.

Adopting water-efficient methods of poultry production

JUST LIKE HUMANS, chickens have feelings too. A happy and healthy chicken is also a strong and productive one. Hence, providing a hygienic and stress-free environment will help chickens perform to their full potential.

Given its short life cycle and low capital investment, the poultry sector is one of the clusters on which countries like Rwanda rely upon for value chain development. In an article published by KT Press, Theoneste Sikubwabo, sales and marketing manager at Uzima Chicken Ltd., the three important factors that determine successful poultry farming.

First of course came poultry health and hygiene. Second came clean water and air quality, while providing quality food came third. He further mentioned that keeping poultry disease free was equally important. Chicks in particular were extremely sensitive and needed to be properly vaccinated to avoid contracting deadly viral diseases. Among the three factors mentioned above, providing clean and cool water is fundamental to maximising poultry production. This is because without adequate water, consumption of feed will decline, in turn affecting poultry performance. Hence, using the right type of drinking equipment matters. Moreover, since water and feed consumption are correlated, monitoring water consumption using water meters is a good practice since it helps to determine the quantity of feed consumed.

“Nipple drinkers are highly mechanised and cause no spillage, which is why they are considered safer and more sustainable when compared to open drinking systems.”

Types of drinking systems

Drinking systems are of two types, open and closed. In open drinking systems, water is supplied through an open cup or basin. Bell or cup drinkers are examples of open drinking systems which are most commonly adopted by farmers due to their cheap installation cost. However, this type of system, although cheap, comes with several disadvantages and is usually not preferred since it exposes water to environmental contaminants. Hence, nipple drinkers which belong to the closed drinking system category are highly mechanised and cause no spillage, which is why they are considered safer, and preferred over open drinking systems.

Delving into the history of nipple drinkers, it is interesting to note that the existence of this closed drinking system dates back to 1967, when it was first introduced by LUBING for laying hens and pigs. Nipple drinkers operate at high or low pressure and provide a bead of water at the end of the nipple. In order to prevent leakage and resulting water wastage, they also consist of cups to catch excess water leaking from the nipples.

Wet floors often caused by spillage is one of the most common cause of mould and bacteria in the coop, which in turn affect the



Image Credit: Adobe Stock

Monitoring water intake is key to ensuring good poultry health.

chicken as well as the humans that come in contact with them. This is why it is important to maintain the quality of the coop by regularly ensuring that the area is dry. It is important to optimally adjust the drinker lines so that they are low enough for chickens to comfortably drink from, while at the same time being high enough to minimise the litter from getting wet.

What makes water critically important for poultry health?

It is noticed that broilers consume almost twice as much water as they consume feed. Research shows that water consumption can be an indicator of overall flock performance. In fact, water is considered to be the most essential nutrient for poultry health.

Water comprises nearly 70% of the total body weight of chickens and plays an important role in every aspect of metabolism, from regulating body temperature and digesting food to eliminating wastes. Water also helps in softening the feed, thus enabling smooth passage and resulting in better digestion.

Moreover, given that eggs comprise of approximately 75% water, the quality of eggs produced by chickens depends on the quality and quantity of water consumed. Temperature of water also greatly influences egg production.

One of the biggest challenges arises during freezing temperatures, when chickens tend to consume more feed and water. It becomes necessary to ensure that water is maintained in liquid form throughout this period. It is also important to monitor the presence of salt, medications and other substances in water since an excess of these can make the water sour. High water temperature is also not considered suitable. All these factors tend to reduce water consumption and result in dehydration, in turn affecting poultry performance.

Heat stress is also a major problem that needs to be addressed. This generally occurs due to an imbalance between body heat

production and heat loss. Moreover, heat stress can occur irrespective of a bird's age, but tends to affect older birds which are larger in size. While chickens are generally adaptable to varying weather conditions, excessive heat stress if left unaddressed can however cause hyperthermia and result in the death of the birds.

Tackling heat stress in poultry houses

Heat stress is also a major problem that needs to be addressed. The phenomenon generally occurs due to an imbalance between body heat production and heat loss. Moreover, heat stress can occur irrespective of a bird's age, but tends to affect older birds which are larger in size.

In conventional practice, pad-type evaporative cooling system and vapour compression-based air-conditioning systems are often used to maintain temperature and humidity in poultry houses. However, although these conventional systems might seem satisfactory, they end up consuming a massive amount of primary energy, making them expensive and hard to afford.

Moreover, systems like these are also quite hard on the environment as they utilise hydrofluorocarbons, and hydrochlorofluorocarbons as refrigerant, making them direct contributors of environmental degradation.

Switching to sustainable options

With more and more countries committing to net-zero emissions by 2050, the need to switch over to sustainable, water-efficient options of poultry production is being acknowledged. For example, to deal with heat stress, sprinkler technology, which consumes 66% less water, is being preferred over the conventional systems mentioned above. Sprinklers also help in preserving intracellular energy in broilers by mitigating systemic and intracellular stress induced by heat load. This in turn contributes to the improvement of poultry well-being and growth performance.

efficient technique to conserve water: 'wastewater reuse'. This can be achieved through technologies such as Freetilizer which help in recycling water from manure. The water recycled through this process can either be used as organic fertiliser or various other animal production processes.

“Compared to all land-based livestock species, chickens are known to be the most efficient feed to meat converters.”

It is also interesting to note that poultry litter has been seen as a very important resource in agriculture. For instance, it can be used as organic fertiliser for crops and for preparing beddings in houses, thus making it – as Chicken Check In mentions – a 'closed, sustainable nutrient loop'. In addition, the site also pointed out that over 95% of broiler poultry litter was recycled in 2010.

Besides water consumption, energy consumption has also been recognised as a pressing issue in the poultry sector. The solution involves using alternative sources of energy, such as solar energy, to reduce the amount of electricity utilised in poultry slaughter plants. Traditionally used incandescent bulbs have also been replaced by LED lighting, resulting in energy savings of up to 80-85%.

Chicken production in general seems to have a comparatively smaller environmental footprint than most other animal agriculture industries. With the continued advancement of sustainable practices, the poultry sector is definitely headed in the right direction. 



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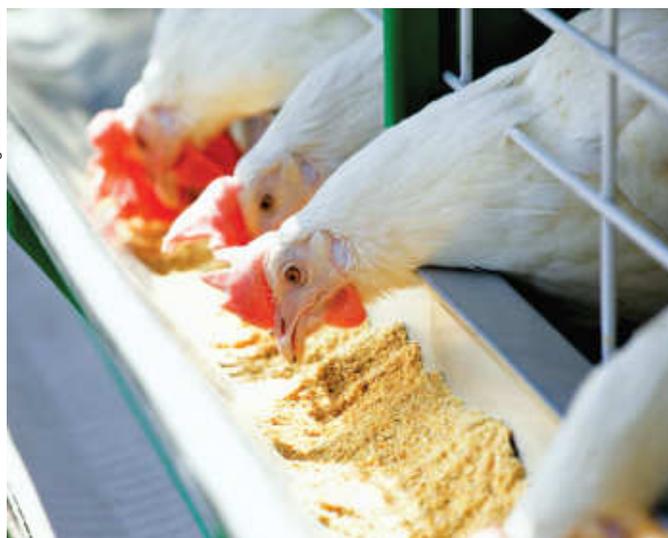
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Feed containing the right proportions ingredients can reduce the amount of food required for chicken growth.

Furthermore, the water required to grow corn and soybean for the production of poultry feed consumes the maximum amount of water in chicken production. However, nutritious chicken feed that is formulated by certified animal nutritionists and contain the right proportions of each of these ingredients can significantly reduce the amount of food required by chickens to grow. In fact, compared to all land-based livestock species, chickens are known to be the most efficient feed to meat converters.

An article published by The Poultry Site mentioned another

As global economies are recovering after the huge blow from the pandemic, clean, pocket friendly and sustainable sources of protein come as a great benefit.

Unlocking the potential of BSF larvae to improve feed quality for laying hens

IN KENYA, POULTRY farming remains an essential activity to help keep up with the ever-increasing demand for eggs. Hence, it is necessary to ensure that farmers have adequate knowledge and information about raising chickens for egg production.

This year on World Egg Day, the Kenya Veterinary Association (KVA) – Kenya Pigs and Poultry Veterinary Association (KePPOVA) organised a farmers' field day and scientific conference in Nakuru County to encourage discussions regarding the latest industry trends and advancements along with knowledge and solution sharing to help tackle the challenges that frequent the poultry sector.

An article published by The Standard mentioned KVA national chair, Dr Nicholas Muyale pointing out that Kenyans were required to increase their egg consumption. Kenya's neighbouring country Uganda stands first in egg production. This is due to the surplus amount of raw materials available in the region. Kenyan farmers on the other hand, mostly rely on obtaining commercial feeds from imported raw materials. This has resulted in the price of eggs in the country to shoot up since feeds constitute nearly 70% of the total production costs.

To address these challenges, farmers in Kenya are being encouraged to source from reputable breeders, administer timely vaccinations, improve hygiene standards and adopt biosecurity measures to prevent deadly diseases. When it comes to feed, farmers are being advised to embrace the latest feed technologies. One example includes using the black soldier fly as a protein source in place of soya and sunflower.

What makes the black soldier fly so useful?

The black soldier fly (BSF) is basically a harmless insect that serves as a protein-rich, sustainable alternative to soy, which is thus far the most common source of protein in poultry feeds.

In an effort to avoid the usage of genetically modified soy and tackle a number of issues such as deforestation, policymakers

“The Black Soldier Fly (BSF) is a harmless insect that serves as a protein-rich, sustainable alternative to soy.”



Image Credit: Adobe Stock

The black soldier fly has multiple benefits and is an important asset in the poultry sector.

have been on a constant lookout for sustainable alternatives. Meat, fish and insect meals have often been considered as replacements for soy.

However, meat meals, although rich in protein, are at risk of carrying transmissible spongiform encephalopathies (TSE), a group of fatal regenerative diseases that are likely to affect both humans and animals. This is why using meat meal in animal feed was banned by the EU in the 1980s. Fish meal is also a great source of protein, however, in order to avoid overfishing, the use of fish meal is often not encouraged.

Insect meals on the other hand have proved to be both inexpensive and protein-rich, thus emerging as the perfect sustainable alternative. Moreover, insects require limited amounts of water and land, and are also capable of adding value to low-value by-products.

Coming to the black soldier fly, what makes the insect a huge asset to the poultry sector is its extraordinary ability of converting waste into high quality protein during the larval stage. With depleting resources and increasing carbon footprint, insect rearing has been seen as an effective way of boosting food security.

Insects like the black soldier fly offer a plethora of benefits. For instance, since they are cold blooded, they possess high feed conversion efficiency. They also grow and reproduce easily and can be reared conveniently on bio-waste streams. Rearing these insects on a large scale, especially on substrates or organic side streams can be feasible since the insects feed on the waste biomass and convert them into high value feeds.

The black soldier flies are either dried and ground or used live and chopped. They can help solve a number of environmental issues involving manure and organic wastes. When reared in large numbers, they are capable of converting a large amount of organic waste into biomass. Their fast pace of conversion along with their ability to aerate and dry the manure prevents bacterial growth, hence reducing bad odours. This in turn brings down manure accumulation without the additional requirement of energy. The fact that they are not attracted to human habitats also make them relatively safe for humans. BSF larvae are also capable of withstanding wider temperature and moisture levels when compared to red worms.

Moreover, as global economies are recovering after the huge

“Research has shown that including a 50g/kg concentration of BSF larvae in layer diet significantly improved egg production and quality.”

blow from the pandemic, clean, pocket-friendly and sustainable sources of protein like these come as a great benefit.

Other interesting benefits of black soldier flies include their ability to improve the health and hygiene of people and animals by bringing down the population of houseflies, often considered to be major disease vectors. This is because black soldier flies often convert pig and poultry manure into liquid form, making them less suitable for houseflies. Furthermore, the flies, during the breakdown process, manage to modify the manure microflora, in turn reducing harmful bacteria such as *Escherichia coli* and *Salmonella enterica*.

Role of the black soldier fly in improving egg quality

Research has shown that including a 50g/kg concentration of BSF larvae in layer diet significantly improved egg production and quality. In addition to this, a study was also conducted to observe the egg quality and laying performance of hens fed with BSF larvae meal as a long-term substitute for fish meal. A balanced, rational amino acid inclusion is crucial to avoiding energy loss and improving overall performance. This means that the omission of even a single amino acid is enough to significantly affect layers' performance.

Image Credit: Adobe Stock



BSF larvae can significantly improve egg quality and production.

In this regard, BSF larvae were found to contain a well-balanced amino acid composition which was similar to that of fish meal. It was also observed that a diet rich in BSF larvae significantly increased yolk and egg weight. Hence, it was concluded from the study that BSF larvae could safely be used as a substitute to fish meal without any adverse effects.

Moreover, another study conducted to demonstrate the efficiency of BSF larvae as a possible substitute to soybean meal in broiler breeders concluded that supplementing around 3% BSF larvae could result in significant improvement of egg weight and feed intake. 

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Although chickens are generally considered resilient, they do often fall prey to heat stress. Phytogenic feed additives and synergistic feed additive blends can efficiently help combat this.

Keeping poultry heat stress at bay



Feeding chickens only during the cooler hours of the morning and night time and withdrawing the feed six hours before afternoon when the heat is at its peak can help combat heat stress, although it can result in weight loss.

Image Credit: Adobe Stock

THE RISING GLOBAL demand for chicken meat and eggs, combined with Africa's growing population has contributed to the progressive growth of the poultry sector in the continent. Optimising poultry performance was a core area of discussion at the international poultry exhibition: Poultry Africa, held from 5-6 October in Rwanda this year. Issues such as increasing feed costs were addressed at the event along with solutions to tackle heat stress and maintain biosecurity in poultry farms.

What causes heat stress and why is it so harmful?

When high temperatures, low humidity and low airspeed come together, they cause a condition called heat stress in chicken. Depending on a number of factors such as genetic predisposition, living conditions, water supply, ventilation and the availability of cooling equipment, the effect of heat stress on chickens can vary in intensity, from

being just a minor discomfort to life threatening.

Some chickens, such as broilers, are found to be more vulnerable to heat stress than others, along with chickens that are older and heavier.

Excessive heat can cause chickens to become clumsy, irritable, less productive and in some cases even lead to death. In case of broilers, heat stress can cause them to stop eating, thus reducing weight gain. Laying hens are also affected in a similar way. To compensate for the fluid loss caused by dehydration, they consume more water and end up producing watery faeces and stained eggs that are under-calcified.

“Some chickens such as broilers are found to be more vulnerable to heat stress than others, along with those that are older and heavier.”

This is why heat stress can have a severe impact on poultry and egg production.

Ways to alleviate heat stress

As mentioned earlier, heat stress is one of the most common problems affecting poultry performance and can be prevented and managed in a number of ways:

Poultry house architecture: Quality of housing is one of the primary factors that determine good poultry health. Poultry houses should be adequately insulated, avoiding overactivity, especially during summers. Moreover, it is important to monitor stocking density since overcrowding happens to be a major contributor to heat stress.

Ventilation and air flow: Keeping poultry houses adequately ventilated is key to avoiding heat stress. Although poultry houses may be naturally or mechanically ventilated, it is still important to ensure the presence of either air coolers, fans, foggers, pressure coolers or evaporative coolers to



Using phytogetic feed additives and synergistic blends are highly effective in reducing poultry heat stress.

Image Credit: Adobe Stock

help combat heat stress in severe cases. An article published by *Poultry Punch* mentioned the tunnel ventilation system

“Hens supplemented with phytogetic feed additives recorded a 2.3% increase in laying rate along with a significant improvement in feed conversion.”

being a new type of arrangement which allows air to rapidly flow along the building axis from inlets to exhaust fans, thus increasing convective air loss and reducing the effective temperature experienced by birds.

Drinking water management: It is important to ensure the availability of clean and cool drinking water at all times to prevent poultry heat stress. Tanks containing drinking water can be painted with a reflective colour such as white and kept under a roof, away from direct sunlight. Adding

electrolytes to drinking water prior to the heat stress period also offers multiple benefits since electrolytes increase water intake and help restore the minerals lost during the heat stress period.

Feed management: There are various ways in which feed can be managed to reduce heat stress in poultry. First, is by feeding the birds only during the cooler hours of the morning and night time, withdrawing the feed six hours before afternoon, when the heat is at its peak. Doing this may, however, cause some weight loss. Hence, it should be kept in mind to carry out this practice only during the heat stress period. The second method involves using additives and blends containing antioxidant and anti-inflammatory properties to combat the negative effect of heat stress in birds.

Poultry nutrition

Focusing more on the nutrition aspect, it is interesting to note that the types and combinations of feed additives used can, to a great extent, impact poultry health and performance. Using phytogetic feed additives and maximising feed synergy, for instance are two highly recommended

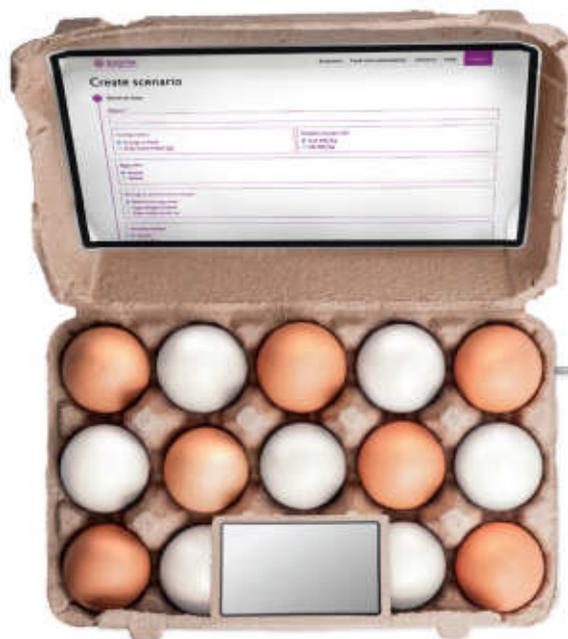
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approaches that can do wonders in reducing poultry heat stress.

Phytogetic feed additives and their role in alleviating heat stress

Also known as botanicals, PFAs, phytobiotics or phytoadditives, phytogetic feed additives are plant-sourced substances derived from herbs, spices and plant extracts such as essential oils that are added to animal diets to improve their overall performance. These are generally regarded as being all-natural, and hence less toxic in nature.

As mentioned earlier, phytogetic feed additives largely play a role in alleviating the impact of heat stress in poultry. An article published by DSM mentioned a study conducted in Germany involving Lohmann brown classic chickens that were divided into two groups: control and treatment. The control group was fed a basal diet while the treatment group was fed a basal diet, which also included the phytogetic feed additive 'Digesterom'. The study was carried out during the early summer months when temperatures in poultry houses were at their peak.

Results from the study indicated that hens supplemented with the phytogetic feed additive recorded a 2.3% increase in laying rate along with a significant improvement in feed conversion. The average egg mass and egg weight was also found to be higher in the Digesterom supplement group. Moreover, a consistent steady peak was observed throughout the 41 week heat stress period despite high temperatures, lack of proper insulation, ventilation and other unfavourable conditions in the poultry house.

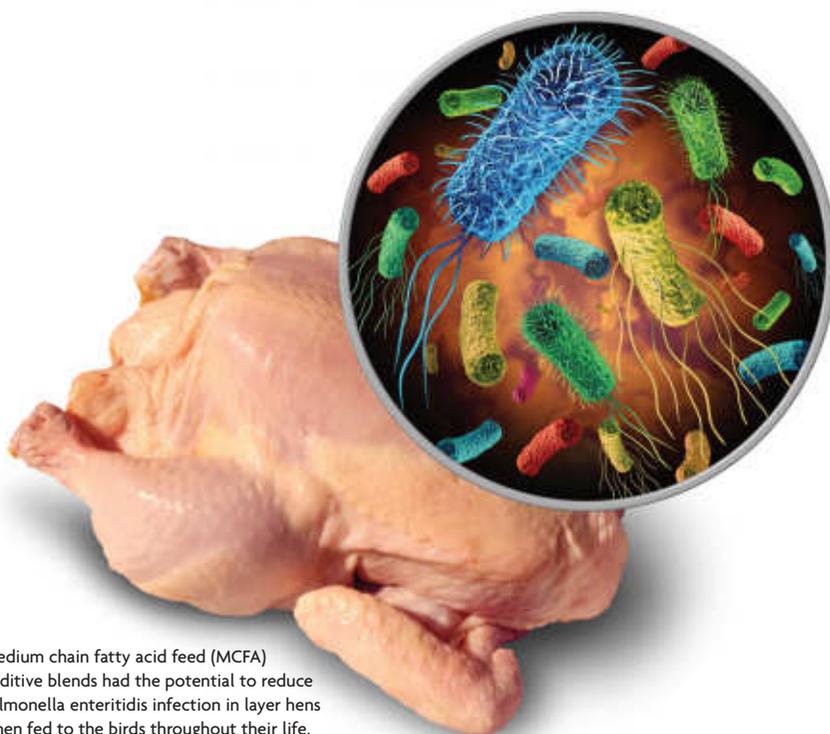
It could hence be inferred that phytogetic feed additives are indeed successful in combating heat stress and are highly capable of boosting poultry performance and production.

Similarly, studies have also confirmed that a synergy in certain types feed additive blends can have a positive effect on chickens impacted by heat stress.

What is food synergy?

While we are aware that eating certain foods individually can have a desirable nutritional value, combining two or more of

“Vitamins E and C would be individually sufficient to alleviate heat stress related issues in poultry, but a synergy between the two would in fact strengthen their effects.”



Medium chain fatty acid feed (MCFA) additive blends had the potential to reduce *Salmonella enteritidis* infection in layer hens when fed to the birds throughout their life.

these foods or ingredients, also known as food synergy can offer a whole new range of health benefits.

Moreover, just like the concept of food synergy, has advanced in human nutrition, it has also been significantly advancing in livestock nutrition as well.

Synergistic effect of feed additive blends on heat stress and poultry performance

A study carried out in October 2017 drew out a comparison between the individual and synergistic effects of vitamin E, vitamin C and probiotics on improving chronic heat stress tolerance in broilers.

The only difference between vitamins E and C is that vitamin E is fat-soluble, while vitamin C is water-soluble. Besides this, both vitamins share similarities in their possession of natural antioxidant properties which help protect cell membranes against oxidation. Individually, these two vitamins were found to be effective against chronic heat stress since they contributed to significant weight gain and growth among broilers, both of which were suppressed during heat stress. Combining these two vitamins produced synergistic effects to reduce chronic heat stress in chickens.

It was hence concluded from the study that vitamins E and C would be individually sufficient to alleviate heat stress related issues in poultry. However, a synergy between these two would in fact strengthen their effects of heat stress alleviation when compared to using them individually.

Moreover, probiotics, which constitute naturally present intestinal microflora were

also found to reduce the effects of heat stress by improving growth rate and enhancing digestion.

It is also important to note that apart from its ability to efficiently tackle heat stress, feed synergy also has many other interesting benefits.

For instance, antibiotic promoters, which have long since been used as growth promoters in livestock production, are now being replaced by synergistic feed additive blends containing free and buffered organic acids. Global health authorities have warned about the human health threat posed by antimicrobial resistance, in turn causing many governments to impose legislative bans on the use of antibiotics as growth promoters in livestock production. In 2018, two studies presented by Trouw Nutrition showed how synergistic feed additive blends when added to drinking water or feed could help lower mortality rates in broilers and most importantly, reduce antibiotic use.

Furthermore, food pathogens such as *Salmonella*, are found to be one of the most common contaminants in meat products. The mitigation of these pathogens continues to be a focus in poultry production. A March 2022 study showed that medium chain fatty acid (MCFA) feed additive blends had the potential to reduce *Salmonella enteritidis* infection in layer hens when fed to the birds throughout their life.

Therefore, taking necessary steps to maintain poultry health is key to boosting overall performance and production. **E**

AMINOHen: The egg industry nutrition software

EVONIK ANIMAL NUTRITION is working on solutions to make egg production more sustainable. As a specialist in animal nutrition, they focus on efficient feeding of laying hens. With the new software AMINOHen, egg producers, feed compounders, laying hen breeders, and other players in the value chain can optimise layer feeds with regard to nutritional requirements and feed costs. Evonik provides nutritional recommendations for laying hens under different production conditions, such as animal breed, bird age, or housing system. The software is based on the most current nutritional concepts for laying hens from poultry institutions, Evonik research, and commercial feeding practices around the world.

AMINOHen is a digital solution that combines the most up-to-date nutritional concepts for laying hens in production from poultry institutions, Evonik Animal Research and commercial feeding practices around the world. The software presents nutrient requirements for laying hens under different production conditions in dynamic and flexible week-long feeding programs, adapted to the needs of modern genetically advanced layers.

It lets the customer design up to 15 feeding phases along 100 weeks of layer age, generating dynamic and flexible week-long

feeding programmes. The software sets up nutritional recommendations based on specific feed intake or energy level in the diet, estimating feed intake per feeding phase for better feed production planning. AMINOHen enables you to adjust nutritional recommendations for maximum egg mass or egg market needs, controlling egg size or pushing up egg weight along the laying cycle. AMINOHen offers the option of designing a feeding programme, including 'pre-peaking' diet.

Evonik Animal Research team has developed and validated 'Ideal amino acid profile' as a base for optimal laying hen performance.



Image Credit: Evonik

Evonik Animal Nutrition is working on solutions to make egg production more sustainable.

AMINOHen also provides mineral recommendations and proper distribution of coarse particle of calcium in the feed.

The software provides nutritional recommendations for laying hens under different production conditions, such as animal breed, bird age, or housing system. AMINOHen is helpful with the feed manufacturing planning, it can be configured as metabolisable energy needed in the feed and get an estimation of feed intake per bird per feeding phase, or directly indicating the feed intake expected and the system will provide the energy needed per bird.

Coccidiosis becomes a key predisposing factor to necrotic enteritis, explains PlusVet Animal Health

NECROTIC ENTERITIS IS the result of the overgrowth of *Clostridium perfringens* in the upper part of the intestines.

In conditions of optimal gut health, *Clostridium perfringens* is present in the lower part of the intestines without causing disease. Whenever there is damage in the gut epithelium, imbalance of the gut flora, impairment of the digestive immunity, or sudden changes in the diet, *Clostridium perfringens* may overgrow not only in the distal parts of intestines, but also in the proximal parts, resulting in a disease called necrotic enteritis.

Coccidiosis is an enteric disease caused by several *Eimeria* species. During a part of its life cycle, coccidia penetrates the epithelial cells, causing tissue damage and the leakage of plasma proteins to the intestinal lumen. As a part of the defense mechanism against coccidia, the epithelium increases the secretion of mucus.

The presence of coccidia predisposes to necrotic enteritis in three ways:

1. Both the plasmatic proteins and the mucus constitute a rich source of nutrients for *Clostridium perfringens*, which starts proliferating.
2. The presence of coccidia also disrupts the balance of the gut flora by decreasing the counts of beneficial or non-pathogenic bacteria such as *Lactobacillus*, *Faecalibacterium*, and *Candidatus sp.*, while increasing the counts of pathogenic bacteria such as *Lysinibacillus*, and *Escherichia*. The drift in the gut flora composition favors the growth of *Clostridium perfringens*.
3. On the other hand, the penetration of *Eimeria* in the intestinal epithelium breaks the gut barrier, allows *Clostridium perfringens* to access the bloodstream and travel to the liver, where it starts an infection.

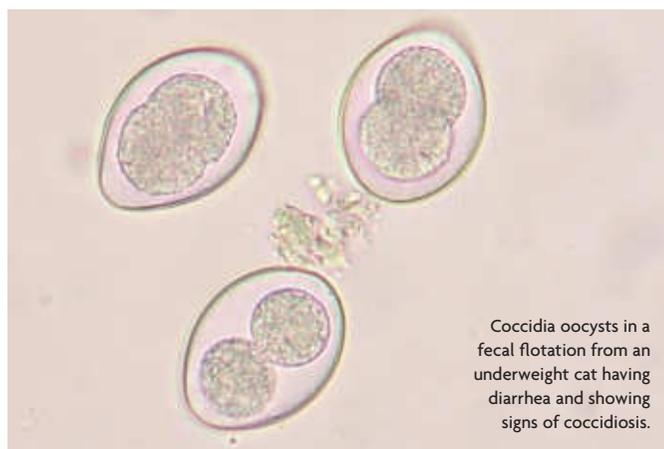


Image Credit: Plus Vet

Coccidia oocysts in a fecal flotation from an underweight cat having diarrhea and showing signs of coccidiosis.

Given their experience in the field, PlusVet Animal Health explained that many cases of necrotic enteritis were linked to subclinical coccidiosis. Examination of the intestinal contents and the faeces under the microscope helped diagnose the subclinical coccidiosis and was the first step towards resolution of the disease. Thanks to their antibacterial, anticoccidial, anti-inflammatory and antioxidant activities, plant extracts are found to be effective in optimising gut health, thus helping to prevent coccidiosis and necrotic enteritis.

More information can be found on the company website: www.plusvet.eu

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“Desmet coordinates its worldwide activities making the best use of the very important technical, technological and commercial synergies existing between its operations.”

synergies existing between its operations, and is able to provide globally sourced competitive services, plants and equipment.

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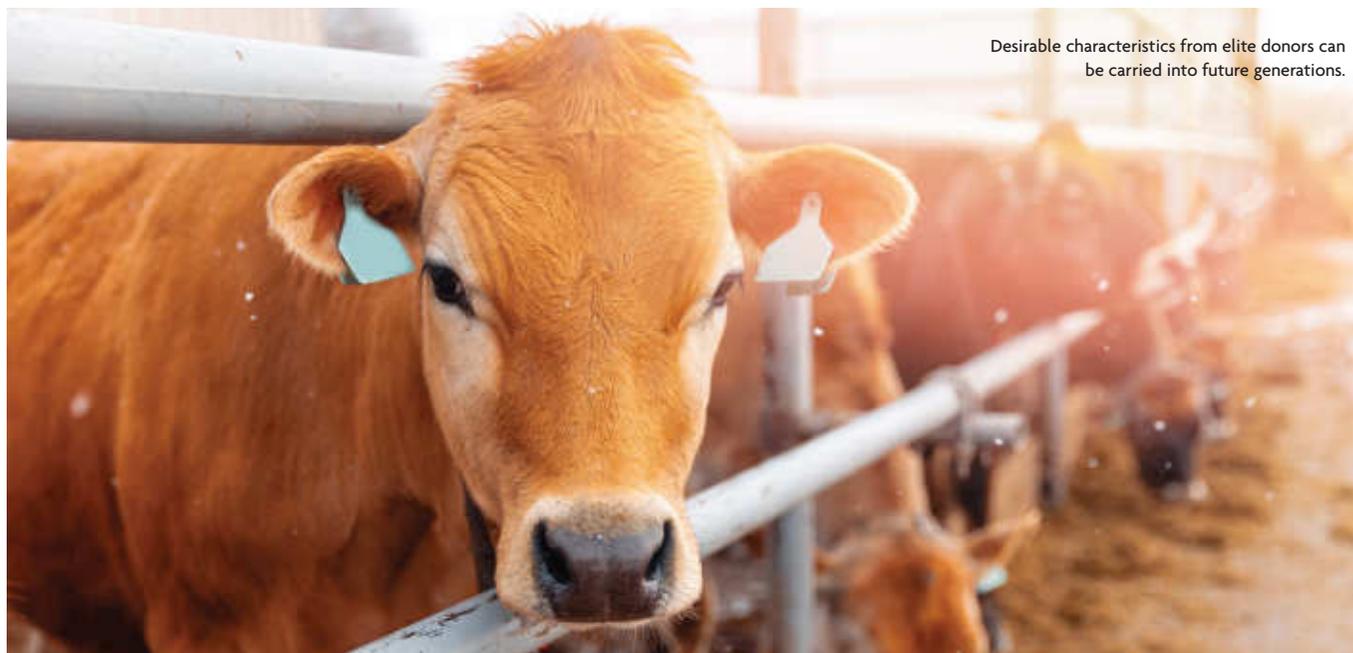
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When properly managed, modern methods of animal reproduction can bring significant advantages to livestock formers.

Gaining the genetic edge



Desirable characteristics from elite donors can be carried into future generations.

Image Credit: Adobe Stock

ASSISTED REPRODUCTIVE TECHNIQUES helped by modern technological advances are rapidly transforming the world of livestock.

One of the rising stars in this field, embryo transfer, involves conveying embryos to recipient females from a donor. The process is used to carry desirable characteristics from elite females into future generations of the species, and is used across a variety of domesticated animals such as cattle, sheep, goats and pigs.

While the price is high for this technique (which accounts for its main disadvantage), the gains can be enormous, with a number of distinct advantages.

According to the Food and Agriculture Organisation of the United Nations (FAO), the primary use of embryo transfer in cattle (for example) is to amplify reproductive rates of valuable females.

Low reproductive rates and long generation intervals means that breeding in strong characteristics can pose a difficult challenge. However, with embryo transfer it is possible to increase the reproductive rates of valuable cows (who boast traits such as disease resistance or greater milk production) by an average of tenfold or more in a given year and fivefold or more per lifetime – these rates also appear set to increase as technology continues to mature.

Because potential recipients must be on-hand to await embryos, it can mean fewer calves are produced overall (as the recipients will not be pregnant as they would conventionally). However, FAO notes that this waiting time can be minimised with good manage-

With embryo transfer it is possible to increase the reproductive rates of valuable cows by an average of tenfold or more in a given year.

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ment and, if properly conducted, the benefits of increased reproduction from donors outweighs the slight decrease in production rates overall.

In some cases, it is even possible to produce offspring from cows that have become infertile by means of superovulation and embryo transfer. Success rates are certainly not as high with fertile subjects, but it does mean it is possible to pass on valuable genetic traits from animals which would (without this treatment) be unable to do so.

Some other advantages of undertaking this treatment are that it can reduce the need for animal transportation. Traditionally, doing so can incur high costs and can open herds up to new disease due to mixing with foreign bodies, and so the simple transportation logistics of embryo transfer is certainly a tick in its favour.

Furthermore, the FAO has also noted that few infectious organisms can be routinely spread by embryo transfer, procedures do not result in higher rates of abnormality among offspring and, due to the fact the offspring is 100% of the desired genotype, it will adapt to the new environment more quickly because of passive immunity acquired from the recipient. It is also possible to wash, treat and examine the individual embryo, which represents a very effective safeguard mechanism. Ultimately this means the importation of genetic material via this process is safer than that by post-natal animals or semen.

Increasing IVF rates

According to Patricia Villamediana, SDSU extension dairy field specialist, in vitro fertilisation (IVF), is being successfully utilised in North America and is resulting in producers improving their reproductive performance, efficiency and genetic gain.

In South Dakota, USA, producers have been applying assisted-reproductive techniques as has increased its milk production by 27% since 2019 and an impressive 60% in the last ten years. In 2020, the state performed around 50,000 embryo transfers with a growth rate of 161.5% in general compared to the previous year. Dairy embryo transfer activities specifically increased by 473%.

The state has subsequently been ranked as the most-improved state in the USA in embryo transfer activities and many assisted reproductive technology companies have since settled in the state

The rationale for the establishment of the centre is to produce quality and genetically superior germplasm and to ensure its fast dissemination.

to provide dairy producers with fast genetic improvement. While there are still concerns for wider implementation worldwide (due to factors such as reduced pregnancy rates), the process in North Dakota has brought more efficient, profitable and sustainable operations for farmers operating across the state.

Advances in Africa

While concerns do prevail around this process, many projects on the continent are barrelling ahead to ensure farmers reap the benefits it can bring.

In Uganda, for instance, at the end of last year, the National Livestock Resources Research Institute (NaLIRRI) developed an embryo production facility which can reportedly produce more than 200,000 affordable seeds per year. The facility was commissioned with a view to reducing the cost of embryos for Ugandan farmers which was peaking due to the lack of quality seeds – many farmers, as a result, were forced to buy from Kenya at high prices.

Scientists from NaLIRRI, speaking at the Seeds of Gold Farm Clinic at NaLIRRI, have since stated that the embryo programme has provided a chance for farmers to purchase embryos and select valuable cows as candidates for the process.

Elsewhere, in Rwanda, earlier this year, the answer to raising production rates has been sought in artificial insemination, with a new centre being constructed at Rwanda's Agricultural and Animal Resource Development Board's Songa station in Huye District, Southern Province. The first phase is expected to be completed by the end of the year and, once fully delivered, it will become a recognised centre at international level, according to the Ministry of Agriculture and Animal Resources.

The Ministry has stated that the facility will produce bovine semen from highly valued bulls of different breeds, which will then be introduced to support the government's improvement programme. In addition, the centre will be used to produce and conserve embryos as well as providing embryo transfer services.

Solange Uwituzé, deputy director general in charge of Animal Resources Research and Technology Transfer, said "the rationale for the establishment of the centre is to produce quality and genetically superior germplasm and to ensure its fast dissemination, faster bovine genetic improvement and conservation in Uganda."

Addressing fears around low reproduction rates for artificial insemination, which has been a concern for livestock breeders, Uwituzé continued that the low conception rates are typically due to a number of different factors such as nutrition and disease, and that in farms with good practices in management, the success rate can be maximum while efforts are also being made to improve the success of the process.

Breeding success

There are indeed a number of factors that can affect the success rate of embryo transfer and should therefore be considered when embarking on a programme. Absolute Genetics, a bovine quarantine facility in South Africa, has outlined the key considerations in regards to cattle which include:

- Fertility: animals which are fertile are better candidates for recipients
- Age: With cattle, animals that have calve three times are best to

Image Credit: Adobe Stock



Many projects on the continent are moving ahead to the benefit of African farmers.



Image Credit: Adobe Stock

Embryo transfer can be used on a variety of animals.

play the role as recipient

- Breed: factors include adaptability, size and temperament to ensure easy calving. Animals less used to handling can be stressed which can reduce success
- Body condition score: recipients should be in a rising condition state at transfer to ensure optimal conception rates
- Post-partum: 80 days post calving is the ideal time for a recipient to undergo treatment
- Facilities: handling facilities should be neat and enable easy handling to reduce stress for the recipient
- Environment: the weather can have a major effect and it always important to take this into account and accommodate as much as possible – providing a cover if it rains for example.
- Season: it is best to do the embryo transfer during the mating season
- Management: it is important to manage synchronisation and implement proper measures to reduce stress post transfer.

By taking on board research and advice before undertaking embryo transfer activities, farmers can maximise their chances of success and reap the multiple advantages they bring.

By taking on board research and advice such as this before undertaking embryo transfer activities, farmers can maximise their chances of success and reap the multiple advantages of these innovative techniques. **1**

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Tea picking is more of an art than just a chore, and is the primary source of income for a majority of small-holder farmers in Kenya.

Man vs machine: Kenya's battle against mechanised tea harvesting

AS PART OF efforts to mechanise agriculture, harvesting machines were introduced in Kenya in recent years, which however received a strong backlash.

Methods of tea harvesting

The traditional method of plucking tea leaves is by hand, which can be done in four ways: breaking off the tea, pulling the tea, plucking using both hands and picking with the help of simple tools. Manual tea picking is a very long and tedious process which is also very labour intensive. Tea-picking machines, commonly called tea harvesters on the other hand, help reduce the duration of the picking cycle as well as labour cost and requirement. However, when it comes to producing high quality teas, picking by hand is the most preferred method of harvesting since the heavy demand for raw materials, tea buds, one tea bud with two leaves, one tea bud with one leaf, etc., can only be met by hand picking.

What makes tea harvesters so controversial?

With advancements in technology, tea harvesters are becoming popular in many regions of the world, one of them being the South Rift, which mainly consists of six counties namely, Samburu, Baringo, Nakuru, Kericho, Bomet and Narok. These regions, along with the highlands located within the West and East of Rift are most popular for growing tea due to the highly



When it comes to producing high quality teas, picking by hand is the most preferred method of harvesting.

“In October 2022, an attempt to resist mechanisation resulted in 10 harvesting machines being torched down in the Tagabi estate owned by the Ekaterra tea company, previously trading as Unilever Tea.”

favourable soil, weather patterns and well-distributed rainfall that these regions receive. The introduction of tea harvesters has however threatened the livelihood of a majority of people living in these regions, who mainly rely on the crop as their main source of income. This is why continued protests resisting mechanisation have broken out in these regions over the years.

An article published by Nation mentioned Cotu secretary-general Francis Atwoli stating that mechanisation has indeed resulted in the loss of more than 200,000 jobs in the region. The main problem stems from the fact that multinational companies have embraced mechanisation and invested a huge sum in acquiring harvesting machines. However, they have long since been facing a backlash from local residents as well as governors and are now caught in a dilemma of reversing the two-decade old advancement and going back to manual labour in favour of the local residents. In October 2022, an attempt to resist mechanisation resulted in 10 harvesting machines being set on fire in the Tagabi estate owned by the Ekaterra tea company.



Tea plucking machines have a plethora of advantages, but have however replaced workers, resulting in job losses.

Viewing the issue through a new lens

This issue can however be looked at from different perspectives. For instance, while mechanisation does indeed lead to job losses, some have argued that it would be unfair to take Kenya out of the equation, especially at a time when the country is experiencing a population explosion, which is expected to double in the next few years. Moreover, given that Kenya is a developing country whose future is dependent on agriculture, relying entirely on manual labour without considering mechanisation would lead to more struggles in the long run.

One of the multinationals pointed out that the decision to adopt mechanisation had to be viewed as an opportunity and requirement for business growth and development, rather than merely viewing it as an industrial issue. The Food and Agriculture Organisation (FAO) has also emphasised the importance of mechanisation as being a crucial input for production.

Machines that improve harvesting efficiency

Putting aside the issue of job losses, some harvesting machines are in fact quicker and have also been credited for their precision in tea picking, thus making them a great asset for top-quality tea production. One such example is the waterproof, rechargeable tea harvester M-Chai which picks tea eight hours a day and is capable of producing high quality tea at a pocket friendly price.

The M-Chai technology has the following benefits:

- They pluck faster and can thus cover a larger area compared to hand plucking.
- They regularly keep a check on height and always ensure to maintain low plucking heights.
- They significantly reduce manpower.
- They increase productivity by ensuring timely plucking during times of labour constraint.



Mechanisation has resulted in the loss of more than 200,000 jobs in the region.

Image Credit: Adobe Stock

- They reduce crop loss.
- They have a comfortable handle design and are also waterproof, which allows them to be operable even on rainy days.
- They have a large tea collecting tray.

“The FAO emphasised the importance of mechanisation as being a crucial input for production.”

Moreover, unlike quality tea plucked by hand, which usually constitutes ‘two leaves and a bud’, a good machine plucks leaves of different types which include:

- Two leaves and a bud
- One leaf and a bud
- Soft banjhi shoot
- Loose buds
- Soft loose leaf

The M-Chai machine also has a rechargeable lithium ion battery and has received approval by the Kenya Tea Development Authority (KTDA). After three picking cycles, the machine operates in a similar way to hand picking, but with more efficiency, thereby increasing yield.

KTDA plans to introduce harvesting machines in factories throughout Kenya

On March 7 2022, Peter Munya, the Agriculture Cabinet Secretary revealed that the KTDA would be adopting tea plucking machines in their factories. Not all farmers were compelled to use them but they were however encouraged to give them a try. Prices would also be reduced to enable farmers to buy them.

Are harvesting machines feasible for use in Kenya?

A report published in 2017 analysed the feasibility of mechanical tea harvesting in Kenya. Financial analysis was performed and the results indicated that mechanised harvesting was indeed more profitable. Therefore, the report suggested that workers who opposed mechanised harvesting due to fear of losing their jobs needed positive assurance from the government. Local industries also required an encouraging push to manufacture tea harvesting equipment for use in the country.

KTDA deploys SAP to boost payment efficiency

The Kenya Tea Development Agency (KTDA) Holdings Ltd. is a wholly owned farmers company which has invested in various subsidiary companies along the tea value chain in Kenya. Through the KTDA Management Services company, the operations on 71 factories are seamlessly managed. The deployment of SAP by KTDA and its managed factories has provided analytical tools that are used for better decision making while making payment for farmers’ green leaf efficient and quick. SAP has therefore come in handy in enhancing operational efficiencies with the aim of increasing transparency and profitability in the businesses. The deployment of SAP also means there is a uniformity and consistency in how each of the factories is run. The Agency is working to have all other factories deploy the solution for group-wide benefit. 



Image Credit: Adobe Stock

Kenya is one of the main global tea exporters, after China and Sri Lanka.

Dr Terry Mabbett speaks to Dr Ben Odunlami from Omex to discuss the variety of foliar feeding products available for African rice farmers.

Feeding rice the foliar way



Nutrient products having high contents of soluble zinc, and applied during the vegetative stage, will ensure high-zinc grain of high nutritional quality.

Image Credit: Omex

ASK ABOUT THE origins of rice and where most of this cereal staple is cultivated and consumed, and you will invariably be told Asia and specifically the Indian sub-continent, South East Asia and what is colloquially called the Far East, comprising China, Japan and Korea. However, only one of two domesticated species of rice (*Oryza sativa*) is native to Asia, because the other (*Oryza glaberrima*) is irrefutably native to Africa, sub-Saharan Africa to be exact. *O. sativa* has been grown in Asia for at least 7,000 to 8,000 years with its first roots in China. However, in real and relative terms Africa is not far behind because *O. glaberrima* was first domesticated 3,000 to 3,500 years ago in the Inland Delta of the Upper Niger River in what is now modern Mali.

Rice is cultivated throughout Africa where conditions allow and especially in countries along the coastal region of West Africa,

including Nigeria, Mali, Cote d'Ivoire, Guinea Conakry, Sierra Leone, and Senegal, and where rice is the main staple for many millions of people.

O. sativa was introduced into Africa during the 16th century by the Portuguese, with increasing amounts now grown across the continent and in many instances overtaking and replacing cultivation of *O. glaberrima*. Asian rice was initially attractive due to higher inherent yield, but the profuse vegetative growth of African rice makes the plant and crop better able to compete with weeds. Exciting new opportunities have

“New opportunities have arisen through the development of genotypes and varieties which are hybrids of *O. sativa* and *O. glaberrima*.”

arisen through the development of genotypes and varieties which are hybrids of *O. sativa* and *O. glaberrima* and which combine the best of both. The most well-established and widely known is ‘NERICA’ rice and appropriately ‘translating’ into ‘New Rice for Africa’.

However, irrespective of rice type grown, there are substantial constraints on cultivation and production, even when high-yielding hybrid varieties are grown. In fact, lowland rice may only realise half the achievable yield of grain, with variable climatic conditions a major limiting factor. Climate and weather are clearly beyond the control of rice growers, but fertilisation is not, and within the remit of the farming fraternity.

In this context the application and utilisation of the three essential macro-nutrients – nitrogen (N), phosphorous (P) and potassium (K) lead and show the way.

Prime example is the proper placement of solid potassium fertiliser which should ideally raise rice grain yields by up to 20%. But not necessarily the fault of fertiliser per se if not achieved, and down to inappropriate and inefficient application instead.

Similarly, the efficiency and efficacy of solid nitrogen fertiliser is maximised by synchronising application with stages in the rice crop cycle having the highest requirement for nitrogen. And also, phosphorous which is critically important for maximising rice grain yield and necessarily targeted at key stages in the crop growth and development cycle. Phosphorous is required in the early vegetative growth stages of rice plants to promote rapid growth of robust root systems for strong rice seedling establishment and growth.

Lowland rice, unlike other mainstream cereal staples, is grown in soil at varying stages of saturation with 9 cm widely considered to be the optimum depth of water for growing lowland paddy rice. And which clearly presents problems for the sole application of solid fertiliser for optimum rice crop nutrition.

The way round problems of this nature is foliar feeding. Completely soluble nutrient products are dissolved in water and sprayed onto the rice foliage to provide ready-available plant nutrients in exactly the right amounts and at the stage of rice crop growth and development when specific essential nutrient(s) are required.

Foliar feeding enables rice growers and farmers to supply the complete range of nutrients in ready-plant-available form as soluble-liquid or soluble-powder delivery systems mixed with appropriate volumes of water and sprayed onto the crop foliage. Foliar feeding is not a substitute or replacement for base fertilisation using solid formulations but a complementary system offering dual advantages of speed to improve timing in relation to nutrient-demanding stages in the rice crop cycle, and exact placement to maximise uptake and minimise loss and waste. Separate but of crucial importance is foliar feeding as the fastest way to correct plant deficiency of a specific nutrient.

“Foliar feeding enables rice growers and farmers to supply the complete range of nutrients in ready-plant-available form as soluble-liquid or soluble-powder delivery systems mixed with water and sprayed onto foliage.”

Foliar feeding is of particular importance and benefit where soil nutrients such as zinc are not plant-available because they are locked up, in this instance as insoluble zinc phosphate and prevalent in high phosphorous soils. Or nutrients which are not sufficiently plant available, notably calcium (Ca) due to inherent poor mobility of the divalent cation (Ca^{2+}) but nevertheless an essential secondary (meso) nutrient.

The typically narrow leaves of individual rice plants may not seem like ideal templates for impact, retention and deposition of spray droplets, but rice crops present fast-growing and dense crop canopies, filtering out spray droplets to ensure good, collective spray droplet deposition.

From leaf surface to cell

Journey from leaf surface to cell cytoplasm for soluble nutrients applied by foliar feeding is quicker and altogether less encumbered than the more tortuous journey from soil and into the rice plant's root system. Soluble nutrients in the spray tank are in stable solution unthreatened by inappropriate background pH or counteractive compounds as is frequently so for soil-based nutrients.

The foliar feeding journey is divided into two distinct and separate stages:



Omex provides an unprecedented range of soluble nutrient products which collectively bring rice crops to ripeness and readiness for harvest.

Image Credit: Dr Terry Mabbett

- Movement of nutrients from foliar surface into the leaf tissue via penetration or absorption
- Movement of nutrients from point of penetration to various sites in the plant by translocation

The two main points of entry are directly via the cuticle or via the stomata. And not without potential barriers due to the hydrophobic (water-repelling) properties of the lipid-rich cuticle, and overall negative charge on the plant tissue which discriminates in the favour of positively charged cations (e.g. K^+ and Zn^{2+}) and against negative charged anions such as the phosphate ion (PO_4)³⁻.

Extent and speed of entry via stomata will clearly depend on stomatal density and distribution across the leaf surface and the extent to which stomatal pores are open, depending on time of day and atmospheric conditions including relative humidity. The journey for soluble nutrients applied by foliar feeding is more

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rapid and less obstructive than for nutrients making their way from the soil solution, into the roots and up into the aerial parts of the plant.

What's in store from Omex for rice?

African rice farmers require access to a range of soluble products for foliar feeding so I talked with a company who can do just that. Omex Agrifluids at Kings Lynn in the East Anglian region of England.

Omex Agrifluids is a R&D (research and development) based company with a product profile spanning the entire spectrum of essential plant nutrients and used worldwide on the broadest range of crops including rice. I spoke with Dr Ben Odunlami, technical sales manager for Africa. First, I asked Ben Odunlami about the African countries supplied and supported by Omex products. "We sell our products into major rice growing countries in Africa, mainly West Africa but also key rice-producing countries like Tanzania, well south of the Sahara.

I asked Ben Odunlami about Omex products recommended for rice in Africa. He explained how the synchronisation of individual Omex products with the key nutrient requirements of rice plants throughout the crop growth and development cycle was the best way to proceed.

Zinc seed dressing – the means to an end

"First on the list is Omex Primer Zinc Bio applied as a seed dressing (3 ml product/kg rice seed), applied at the very beginning of the crop cycle but to ensure rice grain contains enough zinc to maximise nutritional quality of the rice harvest," said Odunlami. Omex Primer Zn Bio is a high concentration suspension seed treatment containing 700 g/l (70% w/v) Zn and a natural biostimulant sourced from a marine alga (seaweed). As an essential micronutrient zinc commands a pivotal position in rice plant metabolism and as a constituent of rice grain at 40 – 60 mg Zn per kg for enhanced human nutrition.

Stimulating seedling growth

Another Omex product in which nutrients are boosted by addition of a biostimulant is Omex Bio 20. "We recommend Omex Bio 20 for nursery rice seedlings as a foliar spray at 2.0 l/ha," says Ben. Omex Bio 20 is a broad spectrum formulation of the three

"Ben Odunlami explained that synchronisation of Omex products with nutrient requirements of rice plants was the best way to proceed."

macronutrients (N, P and K), each at 20% w/v and combined with magnesium and chelated micronutrients and synergised with a biostimulant boost from natural seaweed extract. Omex Bio 20 is tailor-made to supply rice seedlings with a nutrient profile that promotes greater root biomass to enhance utilisation of moisture and nutrients and therefore plant growth," says Ben Odunlami.

Post-transplant sprays at the rice tillering stage

Transplanted rice plants at the tillering stage receive a second 'shot' of Omex Bio 20 (1.0 – 2.0 l/ha) and a further boost from zinc this time using Omex Kingfol Zn, a flowable foliar applied nutrient formulation containing 700 g/l (70% w/v). Ben Odunlami told *African Farming*: "Kingfol Zn contains zinc oxide as small particles together with enhancers to optimise uptake by the leaves."

Sulphur and copper in rice

Copper and sulphur are two of the less talked about nutrients in rice but essential nevertheless.

Sulphur as a significant component of both structural and enzyme proteins has become increasingly important for cereals including rice around the world with increasing efforts to clean up industrial and traffic pollution. Previously, crop plants sourced much of their sulphur from the pollution generated by these activities. What's more, sulphur deficiency symptoms in cereals including rice are difficult to distinguish from those caused by shortfalls of nitrogen. Ben Odunlami pointed *African Farming* towards Omex Sulphomex (87.50% w/v sulphur), rapidly absorbed by the leaves and avoiding the unpleasant dust and caking characteristics of many elemental sulphur products.

The importance of copper as an essential micronutrient for rice is well-established with the consequences of deficiency well-documented over many years. Copper has a range of plant functions including as a co-factor for the activation of enzymes and for phenolic compounds which help to suppress infection by microbial pathogens. Omex Zynergy provides 2.66% w/v copper plus zinc (4.72% w/v) and sulphur (9.10% w/v) for good measure.

Post-transplant sprays at the panicle initiation and spike emergence stages

Top priority at the crucial panicle initiation and spike emergence stages is broad and balanced applications of nutrients to sustain growth and development, and specific applications of calcium and boron



Image Credit: Dr Terry Mabbett

Successful foliar feeding for rice requires farmers to synchronise the application of products according to their nutrient content profile with rice plant requirements related to specified stages in the crop growth and development cycle.



Image Credit: Dr. Terry Mabbett

Omex provides an unprecedented range of soluble nutrient products which collectively bring rice crops to ripeness and readiness for harvest.

treatments for general all round tissue strength and resilience.

Calcium boosts yield while minimising the frequency of split rice grains and boron plays a key role in the synthesis of cell wall material as well as involvement in the transport of sugars across these cell walls.

Ben Odunlami says breadth and balance at this stage in the growth and development cycle is provided by

combinations of no less than five Omex products – Omex K41 at 3.0 l/ha (a water soluble emulsion containing nitrogen,

“Breadth and balance at the panicle initiation and spike emergence stage is provided by combining five Omex products.”

magnesium, sulphur with super high potassium (41% w/v); calcium and boron supplied by Omex CalmaxB (calcium 22.50% w/v, boron 1.53% w/v plus chelated micronutrients, nitrogen and magnesium) at 2.0 l/ha; Omex Bio 20 and Omex Kingfol Zn. Last but not least is Omex Sequential 2 which is promoted in countries where Omex K41 is not available. Omex Sequential 2 offers a high level of potassium (40.0% w/v) while maintaining optimal concentrations of all other nutrients.

Soluble nutrients for a novel system of rice feeding

Foliar feeding may be novel for some farmers in Africa but the Omex programme for rice is well tried and tested. Provided the necessary knowledge and material resources are available and in place farmers can be confident when adopting this modern approach to rice crop nutrition. “Rice farmers in Africa can rest assured that Omex Agrifluids ‘has their back’ for foliar feeding with a comprehensive range of products able to meet all of their needs,” says Ben Odunlami on behalf of the company. 



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Agriculture as an industry must adapt to the ever-evolving climate crisis to meet the increasing demand, while combating developing threats.

A smarter future for agriculture



Women make up the majority of the labour workforce in agriculture in Tanzania.

Image Credit: Adobe Stock

AS THE WORLD'S population continues to grow, so too does its demand for food. According to the World Bank, a 2020 report found that 690 million people, almost 9% of the Earth's population, are without sufficient food, an increase of nearly 60 million in the last five years. To combat this, the world would need to increase food production by around 70% more by 2050 to meet the demand of a population projected to grow to nine billion by that time.

A growing population is not the only challenge which food production currently faces, as climate change adds yet another element of struggle for agriculture. Increasing temperatures, droughts, invasive crops and pests, and extreme weather events all contribute to both the quality and quantity of crop yields.

However, it is also important to note that agriculture is a large contributor to the global climate crisis. As other sectors seek new ways of reducing their output of greenhouse gases (GHG), agriculture is currently responsible for around 30% of GHG emissions, a number which can potentially rise significantly as demand increases. The matter is further exacerbated by the amount of food produced globally that is either lost or wasted, which the World Bank reports to be 1/3. Therefore, an increase of production is not enough to alleviate the risk agriculture faces; it must make necessary adaptations to the climate crisis to meet demand while also reducing its own emissions.

One such method of achieving its three main targets, is by adopting a climate-smart agriculture (CSA) approach. It is an

“Agriculture is currently responsible for around 30% of GHG emissions, a number which can potentially rise significantly as demand increases.”

integrated approach to manage key areas of agriculture including cropland, livestock, forests and fisheries. CSA endeavours to address three primary outcomes:

- Increase the production of food in terms of quality and quantity, particularly for the population of the world who live in rural areas and are dependent of agriculture to support their livelihoods.
- Increase resistance to risks related to climate change by making suitable adaptations for droughts, pests, diseases, unpredictable weather and more. This would provide security for long-term growth.
- Reduce emissions in the industry by investing in sustainable methods of producing food, avoiding deforestation in agriculture, and finding methods of absorbing carbon from the atmosphere.

CSA is primarily engaged on tackling climate change, building upon existing data and principles of sustainable agriculture. It maintains an awareness of the synergy between increasing production and resistance, while reducing emissions and how they interact with one another, including compromises. Lastly, CSA targets new investment opportunities to address the shortage of funding in agriculture.

The World Bank Group has dedicated itself to working in collaboration with countries to make available CSA to achieve its targets of increasing productivity and security, while reducing emissions.

“To enable these commitments, we are screening all projects for climate risks, and will continue to develop and use metrics and indicators to measure outcomes, and account for greenhouse gas emissions in our projects and operations. These actions will help our client countries implement their Nationally Determined Contributions in the agriculture sector, and will contribute to progress on the Sustainable Development Goals for climate action, poverty, and the eradication of hunger,” they said.

The CSA Country Profiles, which outlines the challenges

countries face regarding agriculture, eliminates ambiguity on CSA terminology, making it easily accessible for several countries with different circumstances. The profiles determine a starting point for the country in order to drive funding and expansion relating to CSA. In addition, the World Bank has established more than 10 Climate-Smart Agriculture Investment Plans (CSAIPs) for several countries which include Zimbabwe, Ghana, the Republic of Congo and more. The CSAIPs has the potential to benefit more than 80 mn people across the countries involved with investments in the region of more than US\$2.5bn.

"In Niger, a Bank-supported project that is specifically designed to deliver climate-smart agriculture aims to benefit 500,000 farmers and pastoralists in 44 communes through the distribution of improved, drought-tolerant seeds, more efficient irrigation, and expanded use of forestry for farming and conservation agriculture techniques. To date, the project has helped 336,518 farmers more sustainably manage their land and brought 79,938 hectares under more sustainable farming practices."

"In Kenya, the objective of the Climate Smart Agriculture Project is to increase agricultural productivity and build resilience to climate-change risks in smallholder farming and pastoral communities. This is done by scaling up climate-smart agricultural practices, strengthening climate-smart agricultural research and seed systems, and supporting agrometeorological, market, climate, and advisory services."

Female farmers unite to the benefit of Tanzania

The benefits of CSA practices have also extended towards female farmers who work in agriculture. One such example, is Mariam Ntungu from central Tanzania. She had only a small piece of land from which to cultivate produce, and that was barely enough for her family. "If we got lucky, we had a little extra to sell and give our children some meat or eggs that week, but sustaining this didn't seem possible at the time," she said, as reported by UN Women.

Despite the agricultural labour workforce being made up of a majority of women in Tanzania, there are obstacles in terms of land ownership and capital which hinder can their progress. This, combined with the climate crisis, means that women involved in agriculture are likely to face severe difficulties accessing relevant information and technologies.

"Over 300 women have benefitted from the programme, increasing their income almost twofold."



Image Credit: Adobe Stock

Drip irrigation cuts down on usage and wastage as it only targets specific regions of soil where the roots grow and dispenses the correct amount of water.

To answer this, women from Mariam's district formed producer groups in which they chain together their existing resources to develop larger pieces of land, from which they farmed sunflowers as this yielded the highest profits in the region. Through working together and selling their harvests as a group, they were able to reach out to a larger base of customers.

In 2020, UN Women formed a partnership with Farm Africa to promote the growth of 16 producer groups, one of which was Mariam's. Training on drip irrigation and other sustainable methods of farming was provided to increase the efficiency and yield of sunflower farming for the women.

"To date, over 300 women have benefited from the programme, increasing their income almost two-fold. Mariam's producer group has used the new revenue to diversify their crops, adding tomatoes, onions and watermelons, and Mariam was able to start a small chicken farm of her own," UN Women stated.

"As a result of a partnership between UN Women and the Tanzanian Government, she is now also a proud land-owner.

"With evidence showing that increasing women's land ownership improves their farming productivity, UN Women partnered with the Tanzanian Ministry of Lands, Housing and Human Settlements as well as local authorities to draft village land-use plans. These plans help protect women's land ownership rights under customary law, allowing women to legally register the land they own, either independently or under co-ownership, by obtaining certificates of customary rights of occupancy (CCROs)." 



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Another key element in ensuring the security of the global crop cycle, is through the use of artificial intelligence (AI). AI in agriculture has many applications, including; livestock monitoring, detecting pests or disease, farm management systems which can perform precision tasks, and crop yield predictions.

The incorporation of AI in farming can certainly support farmers to broaden both their productivity and resistance to the unpredictability of climate change. Of all the most energy-intensive tasks, tractor-operated tillage ranks at the very top in crop production due to the high horsepower tractors required for the task. This is where implementing AI tractors, which are an affordable, low-horsepower, two-wheeled alternative can be an ideal solution.

In fact, this practice has already been widely applied in Africa as early as 2014, where Hello Tractor launched and has since made application of their AI a primary goal over the tractors themselves.

An unexpected threat to agriculture

Of course, with an increasing dependence on AI, comes the risk of cybersecurity threats. Farming equipment which consist of features ranging from GPS to automated tasks run the risk of falling victim to malicious attacks where the systems are taken control of.

“What does a typical attack on a field look like? Let’s suppose

“The ICS is providing security to organisations and farmers from malicious cyberattacks that most farming equipments with smart features are falling prey to.”



Unexpected cyberattacks can cripple a farm’s crops and livestock if not detected.

Image Credit: Adobe Stock

we can change a couple of variables in the software for spraying fertiliser on the soil and increase the dose multiple times over. We could easily make the field unfit for agriculture for years, or even decades, to come,” said Vladimir Dashchenko, Kaspersky ICS CERT expert at Kaspersky. “Smart farm machinery is vulnerable to hackers, leaving supply chains across Africa and the rest of the world exposed to significant risk. It is feared hackers could exploit flaws in agricultural software or hardware used to plant and harvest crops.”

With this in mind, Industrial Cybersecurity Solutions (ICS) is necessary in providing security to organisations and farmers from cyberattacks. It is designed to systematically safeguard the production aspect in agriculture while delivering asset data collection and effective ways to monitor and manage the business.

Protection from malware is also another factor, therefore anti-malware software which can both detect and disable malware. Furthermore, Kaspersky’s Automated Security Awareness Platform (KASAP) provides staff with the necessary knowledge and training on the developing cyber threats to raise familiarity in this area. **B**

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The season of tea, which is one of the most popular beverages in the world, is upon us. East African countries account for 94% of all African tea exports by value, with Kenya being the second largest exporter.

MSC drives tea production industry in East Africa with supply chain opportunities

TEA PLAYS A key role in the East African economy. East African countries account for 94% of all African tea exports by value. Kenya is the second largest exporter of tea globally (after China). In Kenya, tea accounts for almost 18% of all its exports by value, while in Burundi, tea also accounts for a significant figure of its exports at 19%. In Rwanda, it accounts for 15% of all its exports by value and is one of the country's main export crops.

The tea supply chain typically consists of activities such as growing, picking, withering, rolling, fermenting, drying, blending and packaging. For a company providing transportation and insurance services, such as MSC Mediterranean Shipping Company, the tea production supply chain in Africa presents an economic avenue that can be tapped into.

The domestic consumption of tea in East Africa is considerably high, making it a pivotal industry with the potential to generate even more income and reduce unemployment.

According to Statista, the revenue which Uganda received from tea exports in the year 2022 is estimated to be at US\$ 134.1mn. If we analyse this revenue in relation to Uganda's population figures, we get a revenue of US\$2.77 per person. This indicates that the tea industry in Uganda generates a considerable amount of income to its overall Gross Domestic Product (GDP) and GDP per capita. According to the same source, the tea market is expected to grow with a volume of 9.4% in 2023.

Kenya received US\$109mn from its tea exports. Although the East African country received low tea export revenue compared to Uganda in 2022, it is still considered as



MSC Truck in Africa

Image Credit: MSC Mediterranean Shipping Company

one of the main tea exporters globally, after China and Sri Lanka.

The domestic consumption of tea in East Africa is also considerably high and it contributes to the tea production sector outside of exports, making it a pivotal industry with the potential to generate even more income and reduce unemployment.

There are various activities that occur at moving tea leaves from a field and into the cup of tea lovers. Transportation is central to ensuring timeous and smooth deliveries. The movement of tea products from one location to another has an impact on the profitability or success of the entire sector. Decisions surrounding raw materials, production amounts, inventory levels, distribution network configuration and shipping or receiving transportation all depend on the reliability of available transportation service providers.

MSC, with its global rail, road and sea transport network that enables offering sustainable and reliable door-to-door services, is better positioned to enhance transportation in the Kenyan and Ugandan tea production sector. The company can add value at almost every point in the tea production supply chain as follows.

The tea production supply chain relies on functional transportation and logistics networks for its success. In order to reach full capacity utilisation, participants in the tea production supply chain need a reliable intermodal transport services provision partner, a role which can be strategically fulfilled by MSC through its provision of shipping, inland and air cargo solutions which are all ideal in the delicate transportation of tea. MSC ships of an African network of local agencies in more than 40 countries, global port coverage, and integrated road and rail transport solutions. The shipping company is already the supply chain partner of choice for importers and exporters in Africa.

Additionally, MSC provides the kind of service within the tea production supply chain that is considerate of the risks. Tea is a sensitive product which can have its essential aromatic features distorted during its transportation or handling. This applies from warehouse to warehouse and anything in between to and from almost anywhere in Africa with managed restrictions as to the nature of the cargo. **E**

Drip irrigation is a step up from conventional methods of watering crops owing to its cost-efficiency and sustainable approach.

Drip irrigation is mostly used for row crops such as vegetables and soft fruits, tree and vine crops.

Saving the planet one drop at a time

DRIP IRRIGATION, ALSO referred to as trickle irrigation, is the process in which very low rates of water is dripped onto soil from an arrangement of small diameter plastic pipes fitted with emitters or drippers. The water dispersed from these pipes is limited to a very small area close to the plants, targeting only the area of soil in which the roots grow. Water is applied more frequently than alternative methods (typically every 1-3 days), which boosts moisture levels within the soil, allowing plants to prosper. This method differs from surface and sprinkler irrigation, where the area is not limited to a specific region, allowing the entire soil profile to be watered.

It is a method mostly used for row crops such as vegetables and soft fruits, tree and vine crops where individual plants can be assigned one or more emitters. Due to the high costs in setting up the system, the practice is typically reserved only for high-value crops.

Director of Irrigation and Drainage, Federal Ministry of Water Resources, Engr Esther Oluniyi, noted that the Federal Government of Nigeria is considering utilising drip irrigation for food production to combat the rising cost of food.

Speaking with Vanguard News Nigeria, she said, "The Federal

"Due to the high costs in setting up the system, the practice is typically reserved only for high-value crops."

Government is making effort through the Federal Ministry of Water Resources to promote food security and sustainable water management for irrigated agriculture towards producing more crops per drop of water.

"FAO has expressed support through Technical Cooperation Programme, TCP, to promote a 20-25 ha pilot drip irrigation system, which started with identification of suitable land/site for the project.

"This programme was initiated by the Department of Irrigation and Drainage as a pilot initiative to compare low energy drip based irrigated system side by side gravity canal, flood based irrigated system with the view to come up with some irrigation parameters such as; volume of water use; quantity of drops produced; cost of power, cost of labour, and others."

Solar-powered drip irrigation

Another way of further expanding upon efficiency and sustainability, is through the use of a solar-powered drip irrigation system. With this system, solar photovoltaic panels generate electricity which is then used to function pumps for the distribution and other purposes of irrigation water. Electricity is drawn from a solar generator for an electric motor pump, which can then distribute water to an elevated reservoir or directly into irrigation. The moisture level of the soil is carefully monitored with sensor data, and when the moisture of the soil is below a certain limit, the sensors can pick this up and communicate this to the control system to begin the irrigation process up to a suitable level.

Image Credit: Adobe Stock

The key benefits of implementing the solar drip irrigation system is its departure from the conventional demand for water and energy. Having a renewable source of energy, this method works with high-efficiency to certify security to global energy, environmental and food aspects. The system also rarely needs maintenance, therefore making it cost-effective to keep operational due to its relatively low-tech design, resulting in fewer things to go wrong. It does not generally require a battery backup, removing the necessity of regular maintenance and replacement.

Furthermore, it is entirely automated, able to react accordingly to weather conditions rather than being dependant on a programme. This means that during rainfall, when water enters the evaporator, the system can delay the start of the next irrigation. Conversely, in the event of a heatwave, the irrigation can make the correct adjustments.

Existing software in drip irrigation can require a large investment from smallholder farmers, who hold 84% of the circa 570 million farms worldwide, making it less easy to get into. By reducing the life cycle costs of solar-powered drip irrigation systems, it can be more readily available and accessible for these farmers to both increase their income, while simultaneously taking action against the global food and energy crisis.

“With the Solar-Powered Drip Irrigation Optimal Performance (SDrOP) model, it expands upon already existing software and designs.”



Image Credit: Adobe Stock

Opting for solar-powered drip irrigation certifies security to global energy, environmental and food aspects.

Solar-powered drip irrigation optimal performance model (SDrOP)

With the Solar-Powered Drip Irrigation Optimal Performance (SDrOP) model, it expands upon already existing software and designs. By taking into account all reasonable variables and modelling the performance of the complete system based on seasonal performance, it can reduce the life cycle cost and remain operationally reliable. This makes the model extensively applicable, as it can take in all variables in terms of locational factors as inputs, thus making it tailored to specific cases.

In the Moroccan olive orchard case study, the efficiency and effectiveness of SDrOP was observed. Prior results with different systems established areas of improvement, including reduction of

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costs for the system regarding power requirements, discrepancies in reliability, and a negligible effect on crop yield. SDrOP on the other hand, saw a reduction to system life cycle costs by up to 56% when compared to commercially existing software.

The test was conducted in an existing field site, where the simulated performance of an SDrOP optimal design demonstrated that it was able to function 92% of the recorded irrigation measures. The results highlighted the significant improvements of SDrOP over existing systems, as it demonstrated its ability to operate with greater reliability and reduced costs in real-world conditions.

Aptech Africa introduces solar-powered irrigation at Njala University

Njala University, located in Sierra Leone, has already installed a solar-powered drip irrigation system in collaboration with Aptech Africa through a scheme to drive smart climate technology in the region. Included in the project, is a "100 KW PV generating plant with a 50 KW inverter capacity and 145 KWh energy storage system in a containerised modular and expandable solution," according to Aptech Africa.

Groundwater that is pumped and stored is dispersed through a piped system, for which a dedicated reservoir tank that has water outlet points to dispense water for the Najala Community.

In Aptech Africa's description of the process, "The irrigation system uses solar power to pump water from a borehole to a reservoir tank and outlet water filter. The system uses gravity fed drip irrigation. The drip irrigation system is fitted in a 100m x 50m greenhouse, as well as 1 hectare of farm land that is divided into 10 plots, each with a set of terminal driplines." The system has been a strong asset to the community, directly benefitting Njala University Hospital as well as the students and staff.

GyroSA seeks to improve conventional irrigation with precision and efficiency

Comparatively, the GyroSa micro-sprinkler range has made efforts to be a more precise and efficient method of irrigation, doing away with the notion that micro-sprinklers are inherently wasteful or imprecise. Manufactured in South Africa, the system can operate at low pressure (1 bar) to reduce energy costs, deal with variation in pressure by utilising flow regulators, and has optimised droplet size

"The system has been a strong asset to the community, directly benefitting Njala University Hospital as well as the students and staff."

with a uniform dispersal of water due to the high-precision moulded components. This type of irrigation is suitable for low volume irrigation; it allows farmers to use less water and improve yields at the same time.

According to Netafim, Jerry Austen, product manager at Netafim South Africa, said that GyroSA's flow regulator is comparable to a pressure-compensating dripper, "Pressure varies with changing elevation. It increases when the elevation drops. Also, pressure drops with the increasing lengths of laterals to which the GyroSA micro-sprinklers are attached."

She also commented on the lower flow rate in the micro-sprinkler, "With decreasing tree spacing, as is common now in many orchards, we need decreasing flow rates. Also, we have seen run-off occurring in some soils with lower infiltration rates."

The value of drip irrigation

Certainly, despite the initial cost of entry into drip irrigation, it is a market in which there is a lot of interest. According to MarketsandMarkets, "The Drip Irrigation Market size is estimated to be valued at US\$5.2bn in 2022 and is projected to reach US\$8.3bn by 2027, recording a [compound annual growth rate] of 9.8% from 2022 to 2027."

The continuous increase in its popularity highlights the effectiveness and success of the method, with more and more farmers adopting sustainable means of cultivating crops. This, combined with the inevitable increase in demand for food as the world's population increases, serves to benefit the agricultural industry as it increases crop yield and quality, while reducing emissions.

As other industries make efforts to reduce total emission output, the agriculture industry could potentially see a rise in emissions because of a lack of innovation in tackling the climate crisis and failure to address current issues. Hence, a change in methodology is a step in the right direction to cut down on water and energy usage/wastage. **B**

Image Credit: Aptech Africa

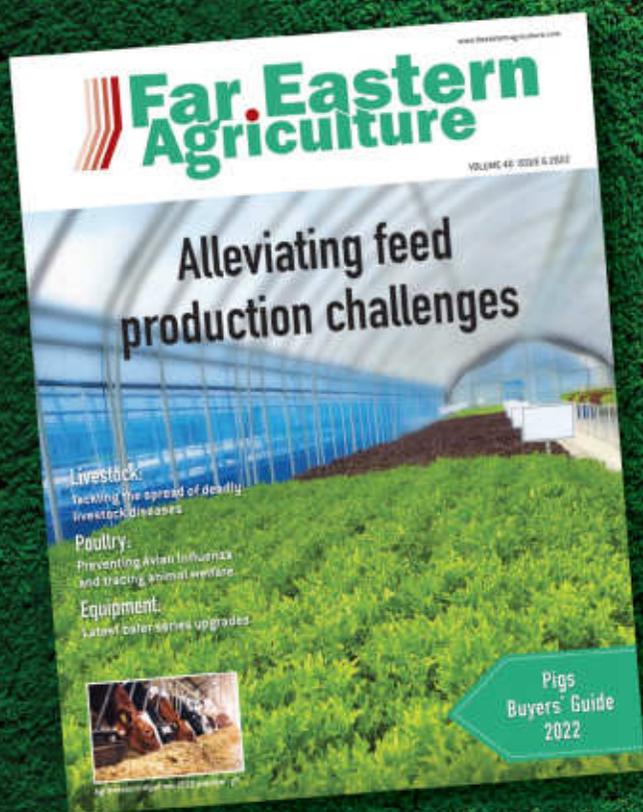


Solar-powered drip irrigation uses solar energy to generate electricity.



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With more than 50 years of experience in the sugarcane industry, Case IH has a good understanding of what it takes to meet the challenges that sugarcane growers face in nurturing crops, from establishment through harvest.

Case IH, a key partner for the African Sugarcane Industry

TO BE A world leader, you have to continuously support your customers, listen to their suggestions and come out with innovative solutions and cutting-edge technologies. You have to be a partner rather than a mere supplier. This is the Case IH mission.

“Sugarcane growers face some of the most difficult challenges in nurturing crops, from establishment through to harvest,” said Tom Davies, CNH industrial head of corporate, Farming MEA CIH. “These challenges are further aggravated by the cost of operations in the field and the quality of the crop to be delivered to the sugar mills. Here it is where Case IH helps the farmers to thrive. With the advent of the new Sugarcane Harvester Austoft A9000 series, wheel and track version, we have committed to our customer to have a faster and easier way to protect their profits out of their yields. By reducing 10% the fuel consumption, increasing the productivity by 5%, extending the engine life by 50%, and having the lowest cost of ownership in the industry is the Case IH statement to the sugarcane community to help them on the way to success.”

Case IH has a good understanding of what it takes to meet these challenges, thanks to more than 50 years of experience in the sugarcane industry. The brand has a rich history that dates back 180 years, when founder, Jerome Increase Case created a revolutionary threshing machine to speed up the separation of grain after harvest in 1842. Following the same spirit, Case IH unveiled the new Austoft 9900 at international exhibition of technologies and solutions for efficient and sustainable agriculture SIMA Paris in front of thousands of customers.

Austoft 9900 takes over the pluri-awarded sugarcane harvester Austoft 8810 and it sets new height of the competition bar.

Fitted with Cursor 11 engine, the new sugarcane harvester is giving customers a displacement of 11.1 liters and 420 hp rated power, which is 20% more than the previous generation. In turn, this change is giving customer a net reduction of fuel consumption by 10%, proving to be the



Image Credit: CNH

After more than 30,000 hours of field and bench tests, Case IH is proud to deliver the new A9900 and its wheeled version A9000 to the African corporate farms.

best investment for fleet managers and companies. More than that, the engine life has been increased by 50%, thanks also to the reduced regime at 1600 rpm.

But these are just a few of the benefits out of the new Austoft 9900.

With the hydraulic system redesigned completely, the A9900 is bringing to the market the improved AutoTrack system with which the base cutter follows the contour precisely, hence cutting the canes always at the same height without carrying inside impurities or rocks. New cylinders are also helping the front crop dividers to float over the ground smoothly and conveying canes into the harvester, even in the most

“With the hydraulic system redesigned completely, the A9900 is bringing to the market an improved AutoTrack system with which the base cutter follows the contour precisely.”

challenging situations where they are lodged down.

The new hydraulic system has allowed this machine to deliver to the market the most important innovation requested by the industry: the federate control system.

Thanks to this, the customer can benefit from the help of the software to regulate the harvesting functions, cutting cane and chopping into billets, owing to the pressure sensors on the basecutter and choppers. The A9900 will be capable to automatically adapt to the field conditions by fine tuning the basecutter and the chopper. Moreover, the speed will also be adjusted automatically in order to prevent chokes and blockages.

All this grants to the Case IH customers an increased harvesting capacity of 5%.

After more than 30,000 hours of field and bench tests, Case IH is proud to deliver the new A9900 and its wheeled version A9000, to the African corporate farms, assisting and servicing locally in their fields as a new beginning for the sugar industry. **E**

With agriculture being one of the most important sectors in Africa, mechanisation is seen as a necessity to improve the continent's productivity.

Tractors for a better future

Uganda's government has started promoting agricultural mechanisation by procuring tractors and implements for farming communities across the country.



Image Credit: Adobe Stock

UNDER THE GUIDANCE of the 'Mission To Transform Subsistence Farming to Commercial Agriculture,' the Government of Uganda has proceeded with setting up the Department of Agricultural Infrastructure, Mechanisation and Water for Agricultural Production (DAIMWAP).

Affordable tractors for small-holder farmers

Manual labour is found to be the most common practice of farming in Africa, with the continent being the least mechanised out of all others in the world. It is believed that mechanisation would be capable of eliminating most, if not all of Africa's hunger. Since small-holder farmers are unable to buy or access their own equipment, companies such as Heifer International have invested large sums to ensure that tractors are made available to a majority of small-holder farmers in the continent.

Agri-tech company Hello Tractor, sometimes referred to as 'Uber for tractors', also plays a major role in agricultural mechanisation through its tractor-sharing mobile app which enables the company to connect

small-holder farmers with tractor owners in sub-Saharan Africa.

PAYG makes tractor ownership a reality

In April 2022, Heifer International announced its investment of US\$1mn in Hello Tractor to provide loans for tractor purchases which could later be repaid from the revenues earned by leasing them to local farmers. The programme, 'Pay-As-You-Go (PAYG) Tractor Financing for Increased Agricultural Productivity in Nigeria,' has already enabled tractor purchases in the states of Nasarrawa, Abuja and Enugu, thus making tractors accessible to thousands of small-holder farmers through the popular Hello Tractor platform.

Globally, there are roughly 200 tractors per 100 sq km of agriculture lands, but in

sub-Saharan Africa, there are only about 27. This is illustrative of a mechanisation deficit that has a significant impact on farm productivity and local economies in a region where most people depend on smallholder farming for income. The objective of the PAYG programme was to make tractor ownership a reality for entrepreneurs who found it impossible to receive credit through normal channels. Adesuwa Ifedi, senior vice president of Africa Programs at Heifer International, noted that Heifer International was stepping into the breach to demonstrate the potential of agritech investments to generate jobs for the 10 and 12 million young people who were entering the workforce in Africa every year.

During a function held at Kati-Kati restaurant in Kampala, Heifer International announced a US\$4.5mn investment in the Hello Tractor platform over the course of the next 10 years. A total of 11 tractors were also handed out to youth entrepreneurs from different parts of the country, who agreed that the tractors were indeed benefitting them. Heifer International which first started as a small-scale project involving the distribution of cows, has now grown into becoming one of

"The Pay-As-You-Go (PAYG) programme has made tractors accessible to thousands of smallholder farmers through the popular Hello Tractor platform."

Uganda's leading agricultural development organisations that has successfully supported more than 932,000 families in the country.

Expanding mechanisation across Uganda

Since 2019, Hello Tractor and Africa Agribusiness Services (AAS) have also been operating closely as a team with the aim of expanding mechanisation across Uganda. Both companies share a common goal that revolves around increasing the number of devices in the market. Despite economic difficulties that resulted in a fall in revenue during the Covid-19 pandemic, they did successfully manage to expand their services to new parts of Uganda.

Uganda also seems to have a great interest in the Case IH tractor series. In March 2022, two of Case IH's popular tractors JXT and Magnum 250 were displayed at the Harvest Money Expo agricultural exhibition held in Kampala and managed to receive special attention from the National Minister of Agriculture, Frank Tumwebaze.

In the same month, districts of Soroti and Katakwi received a total of 24 tractors from Uganda's Vice President Jessica Alupo, out of which 20 were walking tractors and 4 were big tractors. She advised the recipients to put the tractors immediately to use and work towards the goal of ensuring high productivity and food security, without leaving anyone behind. During her visit in

"In March 2022, districts of Soroti and Katakwi received 24 tractors from Uganda's Vice President Jessica Alupo."

November, a representative of the Teso Widows' Development Association emphasised that the tractors would greatly contribute to boosting food security both at the household and commercial level by solving pressing issues involving ploughing and on-time cultivation.

However, during the Teso youths NRM leaders' summit which took place on 28 October 2022, the National Youth chairperson, Jacob Eyeru mentioned that the tractors were not affordable by the youth since they had high maintenance and operation costs. He suggested that receiving hand operated tractors, also called walking tractors or power tillers, would be cost and fuel efficient and hence provide better yield. However, Jenifer Ayo, the MP of Kalaki District, argued that it would be better off requesting the government to provide more number of tractors to each district. Hand tractors, although useful would not be as helpful, especially at a time when the country was transitioning into commercialised agriculture.

Looking closely into hand tractors, it can be found that they in fact, have their fair share of pros and cons. For instance, given

their small size and light weight, one of the major advantages of these types of tractors includes their ability of being operable even in hilly regions, which is something that large tractors do not allow. They are also comparatively more affordable, while being easy to operate, handle and maintain. Their drawbacks however include being less powerful and having a limited number of functions compared to big tractors. This means that they would require attachments in order to perform certain functions.

Tractors entering the digital space

Hello Tractor is the best example of how agricultural machines entering the digital space can benefit African farmers. Smallholder farmers often have no or very little access to equipment, technology and other agricultural inputs that are required for boosting productivity. Hello Tractor has managed to address these issues by using IoT and location tech to help connect farmers with equipment owners, dealers and financiers. This has enabled farmers to gain easy access to tractors at the time of most need. Besides this, there are also other digital platforms like the TROTRO Tractor Limited that work in a similar way. TROTRO allows farmers to lease tractors through SMS and additionally provides training to the youth to operate as online booking agents to help offer tractor services to farmers. Moreover, they are also allowed to collect telemetry data for cultivated land,



Hand tractors are light weight, affordable and have the ability of being operable even in hilly regions.

Image Credit: Adobe Stock

wherever applicable. The platform also connects farmers and tractor operators, thus improving accountability, in turn reducing equipment loss and misuse.

In August 2022, Deere & Company, known by the brand name 'John Deere', made a minority investment in Hello Tractor to support the company's innovative work to provide technologies and solutions to agricultural entrepreneurs in Africa and Asia. "Hello Tractor's work also aligns with the John Deere Strategy and the Ag & Turf Division's Leap Ambitions to ensure 100% of new Small Ag equipment is connectivity-enabled by 2026," said Jason Brantley, director, Ag & Turf sales & marketing – Africa and Asia, at John Deere. Hello Tractor was among the first group of

“TROTRO allows farmers to lease tractors through SMS and additionally provides training to the youth to operate as online booking agents to help offer tractor services to farmers.”



Image Credit: Adobe Stock

companies to participate in John Deere's Startup Collaborator programme, launched in 2019 to enhance and deepen Deere's interaction with startup companies whose technology could add value for customers.

On the path towards sustainable mechanisation

In an effort to support agricultural progress in Africa, the FAO has been promoting sustainable agricultural mechanisation

throughout the continent to help boost productivity and stop hunger. Moreover, upon request from the African Union and FAO member countries, the FAO has developed a framework for Africa along with the Department of Rural Economy and Agriculture of the African Union Commission called 'Sustainable Agricultural Mechanisation', which serves as a common long-term vision on policy and strategy for African countries. **1**

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There is an urgent need to reduce post-harvest losses, which can have a negative impact not only on individual farmers' livelihoods, but also on national economies and food security.

Tackling post-harvest losses

POST HARVEST LOSSES can occur at various stages of the post-harvest system. Such losses, whether in quantity or quality of product, inevitably incur financial losses, and may also result in other negative impacts.

The FAO outlines a number of factors that can lead to post-harvest losses. "A late harvest, for example, can bring about losses from attacks by birds and other pests. Insufficient drying of grain can cause losses from the development of moulds and insects. Threshing can cause losses from broken grains and encourage the development of insects. Poor storage conditions can bring about losses caused by the combined action of moulds, insects, rodents and other pests. Transport conditions or defective packaging of grain can lead to quantitative losses of product. Finally, in addition to these factors, there are others which can often be partly responsible for post-harvest losses, such as for example: marketing practices, sectoral policies and other socio-economic aspects."

The FAO points out that in many developing countries, overall post-harvest losses of cereals and grain legumes of around 10-15% are fairly common, and in some regions of Africa and Latin America it can be up to 50% of the quantities harvested. According to the African Union Development Agency (AUDA), it has been estimated that around 1.3 billion metric tonnes of food in Africa are lost immediately after harvesting and do not reach consumers. This is estimated to range between 30% and 40% of the food produced by African farmers. However, if the appropriate measures and mechanisms were established to curb post-harvest food losses, the food saved could feed approximately 1.6 billion people across the continent, it says.

"Significant drivers of post-harvest losses in Africa include poor handling

"In many developing countries, overall post-harvest losses of cereals and grain legumes of around 10-15% are fairly common."



Image Credit: Adobe Stock

Good storage conditions are essential to minimise the chance of post-harvest losses.

mechanisms of farm produce between harvesting, storage, and distribution," says AUDA in a blog. "Furthermore, post-harvest losses are caused by the decomposition of the food due to high temperatures and humidity. Some of the fields are inadequately harvested, with limited drying methods before threshing. In addition, most African farmers have limited storage facilities. Due to the inappropriately built roads, it becomes lengthy, tedious, and difficult to transport crops and produce to the available markets."

The FAO recommends that to tackle post-harvest losses, it is necessary to know the nature and number of manipulations the product undergoes, as well as the causes and incidents of losses during each stage in the process.

Losses in weight

A loss in weight can indicate a reduction of the product. (However loss in weight can also be caused by a decrease in moisture content, which is not necessarily a food loss). Losses in weight are due mainly to pests or leakage of products, which can occur especially during the harvest, storage and transport or handling stages. To check for weight losses caused by pests, the FAO recommends that samples of the cereals

can be ground and the flour obtained weighed. The damaged sample will produce less flour. The FAO recommends that this method can also be useful for avoiding weight frauds, as weight can be increased by adding foreign bodies or moisture to the grains.

Losses in quality

Losses in quality are mainly the result of mechanical constraints, the action of pests and micro-organisms, or environmental conditions, which can again occur at any stage of production. Losses in quality will result in a decrease in market value of the product. Product quality can be evaluated by test, measurement and laboratory analysis. Many of the criteria adopted are based on evaluation of standards related to the physical condition of the grain and to its food, nutritive and germinative values, the FAO points out. The main criteria for evaluating the quality of grain include moisture content, colour, odour, cleanness, and infestation.

The definition of quality can vary from country to country, with cultural aspects playing a role. For example, in Senegal, broken rice is highly valued and is not viewed as a loss of quality.

A reduction in the quality or quantity of grain will inevitably incur financial losses. In addition, the FAO points out “an evaluation of losses should also take account of some factors within the post-harvest system that can hamper the growth of production and of income. These include production systems, work schedules and methods, infrastructure, organisation models, credit mechanisms etc. The consequences of such situations often go beyond individual losses of money: they affect production and the entire national economy.”

Initiatives to tackle post-harvest losses

The importance of tackling post-harvest losses is increasingly recognised, with a number of new initiatives being launched. In Nigeria, for example, AFEX, Nigeria’s leading commodities exchange, which has built a network of warehouses across Nigeria, has launched a new 100,000 MT per year Grain Quality Enhancement Centre and 30,000 MT storage capacity warehouse in Kaduna state. The move addresses Nigeria’s lack of storage capacity which currently stands at less than 5% and results in excessive post-harvest losses. It represents AFEX’s renewed commitment to infrastructure investments that cut post-harvest losses, strengthen quality and standardisation criteria in grain value chains and improve the livelihoods of farmers, who are able to earn higher income with better quality grains. The plant provides cleaning, grinding, heating, drying, packaging and storage services for grains such as maize,

“The activities in the processing plant will include quality and quantity checks, packaging, storage, and other processes in the value chain.”



Image Credit: Adobe Stock

The adoption of digital technologies can help reduce post-harvest losses.

paddy rice and soybean.

“Over the years, we have seen a growing demand for grain commodities in the animal feed, food, and drink industries,” said Ayodeji Balogun, CEO of AFEX. “However, 3.5 trillion naira is lost annually after harvest because the national storage capacity can only accommodate 5-7% of agricultural produce. At AFEX, we believe that the grain quality enhancement centre will help meet that demand, support the closure of quality and quantity gaps, maximise income returns for smallholder farmers, and increase access to markets that will benefit key players in the value chain and society at large. The activities in the processing plant will include quality and quantity checks, packaging, storage, and other processes in the value chain.”

He added that the partnership with the Kaduna State Government and the USAID-funded West Africa Trade & investment Hub has been instrumental in moving the project forwards.

The African Union Development Agency

(AUDA) notes that the adoption of digital technologies can help reduce post-harvest losses.

“For example, in Zimbabwe, smallholder farmers use digital technologies to meet timely market demands and avoid market congestions. Such timely market information enables smallholder farmers to avoid post-harvest losses due to evidence-based decision-making capacities on their farming activities. Furthermore, through smartphone applications such as WhatsApp and Facebook, African farmers can access market information on inputs and produce advisory services and weather data. In addition, mobile phone money transfers and crops insurance have enabled African smallholder farmers’ decision-making processes when selling their crops and produce.”

African governments should create awareness platforms and engagements with farmers on post-harvest losses and the applicability of relevant technologies, the AUDA adds. **B**

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JOSKIN unveils new-generation muck spreader range

ONE OF THE best sellers in the JOSKIN muck spreader range, the 'new generation' Tornado has been given a number of improvements, as well as an upgraded design. Since its creation in the late 1990s, the Tornado muck spreader has continued to evolve and the basics on which it has built its reputation have continued to be improved: a narrow, lowered body which, combined with large-diameter wheels (max. 2,060 mm), allows for easier traction and a reduced ground pressure, thanks to an increased contact area, regardless of the terrain.

Compared to its predecessor, the body of the new generation Tornado is now more tapered and the side walls are smooth in order to make emptying and cleaning easier. The rear side has also been widened to increase the spreading regularity. The hydraulic pipes are now integrated into the upper body edge strip, and therefore protected from any contact with the material. Finally, the mudguard has been redesigned with a 45° inclination to avoid material heaps on the machine.

Whether it is the body or some of the components, such as the drawbar or beater frame, the Tornado is manufactured in high



Image Credit: Joskin

The new Tornado muck spreader allows for easier traction and a reduced ground pressure.

tensile steel. This steel is characterised by its resistance and dynamic properties. It is thereby not necessary to add any body side reinforcements, which considerably reduces the machine empty weight. As for the beaters, they are designed to minimise the vibrations of the machine.

The front wall of the body is perforated for a better visibility from the tractor cab, and a headboard prevents the material from

falling onto the drawbar. The moving floor is made of steel tubes and two shipping chains (16 mm), the tension of which can be adjusted by means of two easily accessible mechanical side tensioners.

The single-axle Tornado has an oversized axle bolted under the body. It can be moved easily, which allows a perfect balance, with sufficient weight on the eyelet, regardless of the chosen tyre configuration.

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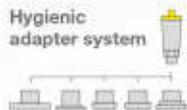
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