

African Farming

and Food Processing

Crops

Foliar feeding along the rice crop cycle

Poultry

Enriching poultry feed with biofortified BSF larvae

Livestock

Achieving thermotolerance in dairy cattle



VIV Africa 2024 preview. p6

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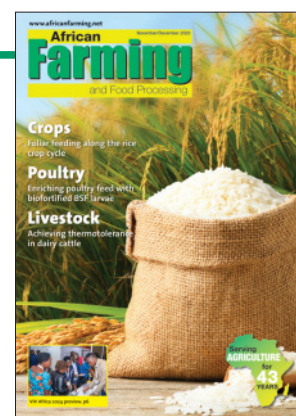
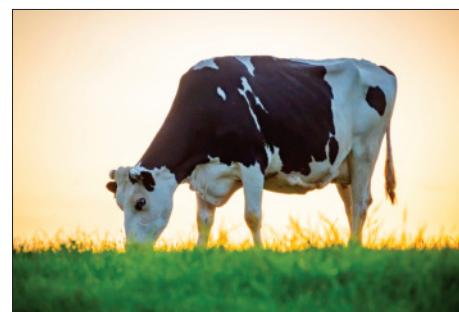


Image credit: Adobe Stock



The FAO has predicted world sugar production to experience a 2% decline, for the 2023-24 period.



Dairy cattle identified as high immune responders may be more thermotolerant than those identified as average or low.



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Farming Calendar 2023/24

DECEMBER

12-14 **Food Africa 2023** CAIRO
<https://foodafrica-expo.com/>

JANUARY

23-26 **IPM Essen** ESSEN
<https://www.ipm-essen.de/world-trade-fair/>

FEBRUARY

19-20 **Africa Agri Expo** NAIROBI
<https://africa-agriexpo.com/index.html>

MARCH

19-21 **Agritech West Africa** ACCRA
<https://www.agritechwestafrica.com/>

26-28 **agrofood Nigeria** LAGOS
<https://www.agrofood-nigeria.com/>

MAY

16-18 **agrofood Ethiopia** ADDIS ABABA
<https://www.agrofood-ethiopia.com/>

OCTOBER

02-03 **VIV Africa 2024** KIGALI
<https://www.vivafrica.nl/>

08-10 **agrofood West Africa** ABIDJAN
<https://www.vivafrica.nl/>

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

VIV MEA and HAN MEA concludes in Abu Dhabi

THE FOURTH EDITION of VIV MEA 2023, the International feed-to-food trade show for the Middle East and African region, returned to Abu Dhabi from 20-22 November 2023 two years after its previous edition.

For this year, VIV MEA joined forces with Horti Agri Next (HAN) MEA, expanding the value chain from seed to food and the industry's response to reconnect in person and nurture valuable business relationships.

The co-location of VIV MEA and HAN MEA 2023 offered a unique opportunity to explore the entire agribusiness industry's spectrum. The events emphasised the interconnectedness of animal production, precision farming, rural cultivation, and advanced horticultural techniques. By showcasing how advancements in one sector can catalyse innovations across the entire food production supply chain, the two trade shows hold particular significance in a region striving to enhance food self-sufficiency.

The FoodTech Transition Square, an all new addition to the event, was a particular highlight. A series of sessions, including the AgritectureXchange panel discussions as well as speed networking with roundtable session on the first day contributed to vibrant sessions across the three days.

Also of visitor interest was the Aquafeed Extrusion & Nutrition Conference. The one-day conference with the theme 'Aquafeed development and investment' focused on the topics of the production and extrusion of aquatic feed along with the nutrition and farming for fish and shrimps.

The Poultry Marketing Round Table also returned for its third edition. MEAP, WATT Global Media and VIV gathered academics, technicians, poultry producers, governors, and end consumers in a roundtable to discuss and come up with solutions and clarifications to anticipate future uncertainties.

Appetising opportunities at Food Africa

FOOD AFRICA, AN international trade exhibition for food & beverages, has established itself as a global brand across the last seven editions.

From 12-14 December 2023 at the Egypt International Exhibition Center, Cairo, organisers will be looking to continue this success and are gearing up to deliver another efficient networking space for international traders and vendors to connect with their counterparts from Egypt, the MENA and the African region.

In 2022, the show attracted around 740 exhibitors representing 30 countries and welcomed more than 25,000 visitors from over 70 countries. Once again, Food Africa 2023 is expected to attract wholesalers, distributors, retailers, and other industry professionals for a three-day showcase aiming to address the different needs of buyers and importers as well as serving markets in Egypt and Africa.

Special features of the eighth edition include the hosted buyers programme to assist exhibitors in networking; the specialised conference to bring together international industry experts to explore numerous agrofood related



Food Africa will enable food and beverage decision makers to uncover the business potential of Egypt, Africa and the wider MENA region.

topics; a live cooking show as a dynamic culinary demonstration powered by the Egyptian Chefs Association; and the barista show as a pre-eminent coffee competition.

Concurrent events also include pacprocess, the fourth international Exhibition for Processing & Packaging in the Middle East and Africa; Fresh Africa, establishing a

marketplace for producers, buyers and suppliers of fresh vegetables and fruits in Africa, the Middle East and Europe; Seafood Africa, the fifth special addition dedicated to fish and seafood; and Dates Africa, another addition to Food Africa constituting a highly targeted business platform for local and international date producers.

Image Credit: Food Africa

Inspiring innovations at Agritechnica

AGRITECHNICA, A LEADING global trade fair for agricultural machinery, has run its course with a record number of visitors taking the time to attend the conference in Hanover, Germany.

Running from 12 to 18 of November, around 470,000 visitors arrived from 149 countries, discovering the solutions on display from the 1,812 exhibitors who were displaying their equipment across 24 halls.

The environment was the particular focus of this year's Agritechnica with the German Agricultural Society (DLG), the organisers of the event, hosting the show under the theme of 'Green Productivity'. This was reflected in both the innovations on display and the technical programme which had some 400 experts taking part across 300 professional events.

Timo Zipf, Agritechnica project manager, remarked, "As the world's leading trade fair for agricultural machinery, Agritechnica 2023 has demonstrated how highly innovative the industry is. After four years, exhibitors were finally able to present their wealth of innovations to the world here in Hanover once again. Everyone appreciated the opportunity for face-to-face discussions, exchanges and networking opportunities, also to make new business contacts."

Some highlights of this year's event included:

- Numerous product launches and updated solutions. 251 products were registered for the 'Agritechnica Innovation Award' with others promoted in the 'DLG-Agrifuture Concept Winner 2023'.
- Young Farmer's Day and the Campus & Career area presented a comprehensive programme of information to young industry professionals.
- A spotlight on Smart Farming and the current state of automation and connectivity in agriculture.



Image Credit: DLG

The Agritechnica exhibition presents the full palette of farm equipment and services.

- The 'Agrifood start-ups' venue for company founders in the agricultural and food sectors.
- A 'Drive Experience' offering the opportunity for visitors to test drive tractors fitted with alternative power systems.
- 'Inhouse Farming' which attracted many farmers exploring new branches in farming, including self-contained food systems.

Tobias Eichberg, managing director of DLG Service GmbH, commented, "The heart of the international agricultural machinery industry beats to the rhythm of Agritechnica, and 2023 has shown manufacturers the ideal pulse rate for offering their developments to the market, which is two years."

With the 2023 edition now concluded, the industry is already looking ahead to 2025 when Agritechnica will return from 9-15 November.

Africa Agri Expo to unleash potential of African agribusiness

THE SEVENTH EDITION of Africa Agri Expo (AAE) will arrive in 2024 in Nairobi, Kenya, on 19 and 20 of February to connect the continent's rich agribusiness to the rest of the world.

With Africa's agribusiness anticipated to reach US\$1 trillion by 2030, the leading platform will offer the opportunity for businesses and professionals to expand into the blossoming sector.

The 2023 edition was held under the endorsement of Kenya's Ministry of Agriculture and Livestock Development and served as an influential gathering. Policymakers, industry professionals and

farmers all participated to exchange ideas, expand business, share knowledge and discover technologies to drive sustainable growth in the agri sector of Africa.

AAE 2024 is looking to build on previous years and will once again provide a unique space for showcasing the latest products, services and innovations through its expansive exhibition space, networking lounges, strategic conferences, panel discussions and seminars.

The show will pay a particular focus to the opportunities offered by the Kenyan market. According to organisers, the country offers multiple advantages and identifiable

prospects including favourable weather conditions and diverse agro-ecological zones; huge market access due to its strategic location in East Africa; a strategic Government pursuing its Vision 2030; and the technologically driven nature of its people.

The parallel conference programme across the two days is expected to cover a wide range of topics including innovative farming techniques, data-driven agriculture, best practices for sustainable agriculture, financing and investment opportunities.

In addition to benefitting from this knowledge source, attendees will also have the opportunity to introduce themselves to and discover the technology and services offered by the event's exhibitors and event partners. These include the likes of DVA, My Irigacio World, Draminski, A&S Thai Works, Agro City, AGI, Biotech International, Agrotunnel International Limited, Natural Storage Solutions, PDRL, VV Agro, SAB S.p.A., Barrix Agro Sciences, Yayu Crop Protection, Arbuda Agrochemicals, ALFRED H KNIGHT, DeHaat, Bioseed, ROKOSAN, Kalash, Euro Fert Fertilizer, Borregaard, and many more.



Some of the most innovative technologies and techniques for enhancing Africa's agriculture sector will be on display.

Image Credit: AAE

Poultry Africa returns with increased diversity as VIV Africa in 2024

VIV AFRICA, A prominent trade show for agriculture, dairy, and poultry professionals in sub-Saharan Africa, has announced its transformation from Poultry Africa. The fourth edition of the show is set to take place on 2-3 October 2024, at the prestigious Kigali Convention Centre (KCC), welcoming global stakeholders and industry leaders from across the value chain.

VIV Africa 2024 is introducing the sectors: Agriculture and Dairy, with the Horti Agri Next (HAN) Pavilion and the Dairy Pavilion respectively, bringing together an even more diverse range of industry players.

Preceding the main expo, VIV Africa 2024 will feature the Leadership Conference on 1 October at the KCC. This conference will gather thought leaders, industry and knowledge experts, to engage in insightful discussions, exploring the latest trends,

challenges, and opportunities in Agriculture, Dairy, and Poultry.

The third edition of Poultry Africa in 2022 drew 1,571 professional visitors, 129 Industry Leaders, and representatives from 53 countries. The international presence underscored the event's pivotal role as a gathering point for the animal protein industry. The participation of 123 exhibitors, representing an extensive range of 30 nations, further emphasised the event's global reach.

The main priority of VIV Africa 2024 is the development of a robust business platform that creates value for both visitors and exhibitors. That is naturally complemented by a knowledge-sharing content programme that encompasses the core sectors of poultry, agriculture, and dairy, with a focus on technical best practices, market outlooks, and pertinent themes such as water management. Break-out sessions will ensure that every sector receives dedicated attention, providing attendees with valuable insights and knowledge.

The show is supported by some of the most important bodies and organisations from within the industry – Ministry of Agriculture in Rwanda (MINAGRI), the Embassy of the Kingdom of the Netherlands, the Rwanda Poultry Industry Association, the Rwanda Development Board, Dutch Poultry Centre (DPC), Global Dairy Farmers, TRAIDE, Networks and World Poultry Science Association (WPSA) among others.

VIV Africa 2024 aims to be the connecting bridge between the African and global players, taking the industry forward by sharing knowledge, showcasing innovations, strengthening partnerships and building on new business relations.

Organised by VNU Europe and powered by VIV worldwide, the business network linking professionals from Feed to Food, VIV Africa is a wholesome trade show for industry professionals in Sub-Saharan Africa.



Image Credit: VIV Africa

VIV Africa 2024 will feature a leadership conference to engage in exchanges on agriculture, dairy and poultry.

AAII Indaba highlights need for banking industry to support food security initiatives

THE SIXTH ANNUAL African Agri Investment Indaba (AAII) took place this year from 20-22 November. The event brought together more than 1,200 high level decision makers from across the food and agri value chain, making it the most effective place to conduct business in the sector. Over 65 industry experts explored game-changing trends, access to new markets, and promoting and facilitating investment in African food and agriculture.

Commercial banks, Microfinance institutions, Cooperative Financial Institutions (CFIs), Donors, Development partners, Small & medium sized farmers, and Agribusinesses attended the event.

The Investment Discovery Sessions (IDS) are developed for accredited investors and agrifood executives and entrepreneurs from the entire value chain looking for financing and investment opportunities. The IDS is the African Agri Investment Indaba hunting ground for investment ready agri projects – featuring opportunities in inputs, primary agriculture, agro-processing, logistics, and agritech etc. IDS focuses on match-making and deal-making within the entire agri value chain, and brings together start-ups and established companies looking for investment. These sessions take place in a private setting with a preselected panel of investors. Investors will receive access to detailed briefings on companies and their projects directed toward their specific interests.

On the first day, the event focused on banking and microfinance in Agribusiness Forum. One of the panel sessions asked the question, "Are non-banking financial institutions a better alternative to traditional banks in funding trade finance, and does this have a



Image Credit: AAII Indaba

greater impact on achieving food security?" which highlighted the importance of a stable food security sector.

On the second day, the AAII23 Plenary, the DFI Forum and the Investment Discovery Sessions were the highlight, apart from banking as well. On the last day, the AAII hosted both open and closed forums, which were part of the Investment Discovery Sessions. They included the DFI Forum: Private Equity (IDS), Funds and Agribusiness, Project Presentation, Spotlight on Special AgroIndustrial Processing Zones, Spotlight on Western Cape, and Agribusinesses.



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West Africa agrofood to take place in Côte d'Ivoire from 8-10 October next year

AFTER THE LAST agrofood & plastprintpack West Africa, which took place in Abidjan in 2018, fairtrade and their local Ivorian partners 2A are coming back to Côte d'Ivoire and Francophone West Africa with agrofood West Africa 2024. agrofood West Africa will take place in conjunction with plastprintpack West Africa in the brand-new Abidjan Parc des Expositions. In addition to Côte d'Ivoire, fairtrade in West Africa serves Nigeria with the agrofood Nigeria, and Ghana with agrofood Ghana.

The three-day conference will be held in parallel with the exhibition, much like the last edition of agrofood & plastprintpack in

Abidjan when more than 50 speakers from around the world participated.

Côte d'Ivoire is in a process of structural transformation of its economy through industrialisation. As part of its industrialisation policy, the Ivorian government has defined seven priority clusters around which to develop industrial dynamism. The Ministry of Commerce, Industry and SME Promotion of Côte d'Ivoire, and the embassies of Austria, France, Germany, Italy, the Netherlands and Türkiye are supporting the event. The show will be the highlight of the region, given that from US\$541mn in 2015 to US\$818mn in 2022, West Africa's imports of

food & beverage technology show an annual increase of 6.1% between 2015 and 2022. Côte d'Ivoire's food tec imports increased by 6.5% annually, from US\$74mn in 2017 to US\$106mn in 2022.

Demand for F&B ingredients is also rising continuously. With already well over 420 million inhabitants (2022), which according to the World Bank will rise to 800 million by 2050, West Africa is a huge food market.

Expenditure in the F&B sector is growing steadily, and F&B production is by far the largest segment of the West African processing industry. Accordingly, the demand for food and beverage ingredients is rising continuously. According to the World Trade Organisation WTO, West African food imports have reached around US\$19bn in 2021. West Africa's largest food importers, behind Nigeria, were Côte d'Ivoire with US\$3.1bn, followed by Senegal with US\$2.1bn, Ghana and Benin with US\$1.2bn each, and Cameroon with US\$1.0bn. West African food exports made up for US\$21bn in 2021. West Africa's largest food exporting countries were Côte d'Ivoire with US\$8.2bn, followed by Ghana with US\$7.3bn, Senegal with US\$1.6bn, and Nigeria with US\$1.5bn.

Thus, food trade with West Africa is a US\$40bn business.



The last West Africa agrofood trade show was held in 2018.

Image Credit: West Africa agrofood

Ethiopia agrofood aims to break last year's benchmark with sixth instalment

INDUSTRY EXPERTS AND exhibitors are ready to grace the stage next year as Ethiopia's leading trade show and conference for agriculture, food and beverage technology and ingredients will return from 16-18 May, 2024.

Ethiopia agrofood will return for its sixth instalment at Millennium Hall in Addis Ababa to welcome thousands of trade visitors from all over the country and neighbouring countries. Last year, the event saw 138 exhibitors from 16 countries showcase their technology and expertise. Following the success of last year's edition, the organisers of this year's agrifood conference are committed to raising the standards even higher.

Exhibitors at the event can expect to participate in an array of engaging meetings with key line ministries, authorities and associations from across the country, a Hosted Buyers Programme for VIP investors from Rwanda, Tanzania and Uganda which has been organised in cooperation between Italian Trade Agency ITA in Addis Ababa and the show organisers, key workshops and teachings from exclusive sessions and overall a great opportunity to network and advance business propositions.



Last year, the event saw 138 exhibitors from 16 countries and welcomed thousands of trade visitors to view their offerings.

Image Credit: Ethiopia agrofood

Some of the exhibitor profiles who will showcase at agrofood 2024 include agricultural machines, farming tractors, harvesting equipment and analytical equipment; dryers, cleaners, silos and storage systems; feeding equipment and fish farming equipment; grain systems, greenhouse plastics and equipment; irrigation systems; livestock and poultry

breeding; milk processing equipment, milling and mixing installations; pesticides and fertilisers and poultry equipment; and veterinary syringes.

Ethiopia is one of East and central Africa's largest importers of food and beverage process and packaging technology, with annual reports of between EUR64-171 million over the past few years.

Côte d'Ivoire welcomes new Better Cotton programme to boost sustainability

ONE OF THE world's largest cotton sustainability initiatives, Better Cotton, has announced a new programme in Côte d'Ivoire with the aim of supporting 200,000 domestic cotton farmers in its first five years of launch.

The new field-level programme will offer training and resources to farming communities across the country, committing to the first steps needed towards helping them produce more sustainable cotton.

The Professional Association of Cotton Companies of Côte d'Ivoire (APROCOT-CI) will serve as Better Cotton's Strategic Partner for Côte d'Ivoire, and will oversee the efforts which are put into improving climate resilience and economic outlook of the farming communities.

APROCOT-CI represents the interests of cotton companies across the country, comprising six member organisations: CIDT, Ivoire Coton, Global Cotton SA, CO.I.C-SA, SICOSA 2.0 and Seco SA. This collective of organisations will serve as Better Cotton Programme Partners by providing training and resources to cotton communities to improve social and environmental factors.



The programme will help support 200,00 domestic cotton farmers in the first five years.

Image Credit: Adobe Stock

Jean François Toure, President of APROCOT-CI, said, "The partnership underscores our organisations shared commitment to creating a positive impact in the cotton industry, with a primary focus on improving the livelihoods of smallholder cotton farmers. By integrating Better Cotton's sustainable farming practices and APROCOT-CI's local expertise we aim to enhance cotton yields, reduce environmental impact, and improve social and economic outcomes for farmers in the region."

Alan McClay, chief executive officer at Better Cotton, commented, "Opening a new programme in Côte d'Ivoire is an exciting step as Better Cotton bolsters its

presence across the continent. Our partnership with APROCOT-CI will be fundamental to the delivery of our work in the country, helping domestic cotton farmers to reap the environmental and economic rewards of more sustainable cotton production.

"We are grateful for APROCOT-CI's support and the commitment they have shown to this cause."

APROCOT-CI submitted a Declaration of Interest to Better Cotton last year, outlining national interest in starting a Better Cotton programme. Earlier this year, Better Cotton hosted a multi-stakeholder event in Abidjan to further understand the scope for impact ahead of opening the programme.

AU-IBAR addresses Kenya's feed and fodder challenges with RAFFS Project

THE AFRICAN UNION-InterAfrican Bureau for Animal Resources (AU-IBAR) launched its Inception Workshop and assessments for the Resilient African Feed and Fodder Systems Project (RAFFS) in Naivasha, Kenya, on 31 October as the region grapples with a 60% feed deficit that is resulting in a significant shortfall of approximately 2.6 billion bales of feed.

The RAFFS Project aims to respond to the challenges posed by the Triple C Crisis: Covid-19, climate change and the conflict between Russia and the Ukraine.

The project also focusses on four key objectives including establishing a knowledge and analytical ecosystem for evidence-based solutions; supporting business models and partnerships to address short-term feed and fodder shortages; empowering women in feed and fodder systems; and reforming policies and regulations to build a sustainable feed and fodder industry.

The Inception Project in Kenya was the fourth to be held in the RAFFS Project core AU member states – Uganda, Nigeria, Somalia, Zimbabwe and Cameroon.

Key stakeholders presented their preliminary findings from surveys, launching the project officially and introducing the African Women in Animal Resources Farming and Agribusiness Network (AWARFA-N) to enhance women's participation in the feed and fodder sector.

The country-level assessments provided insights into the impact of crises on feed and fodder systems, digital capacities, women's inclusion, and policy frameworks. National Assessment teams were also trained on field assessment tasks and data compilation.

Training on financial inclusion and business formalisation was also part of the meetings.

Effective participation of AWARFA-N in the RAFFS Project was a key highlight of the week-long event. These meetings were held with high level stakeholders from the public and private sector and Ministers in charge of livestock took charge of the government discussions.



The region is struggling with a 60% feed deficit, and the Project aims to help bridge that gap.

Image Credit: Adobe Stock

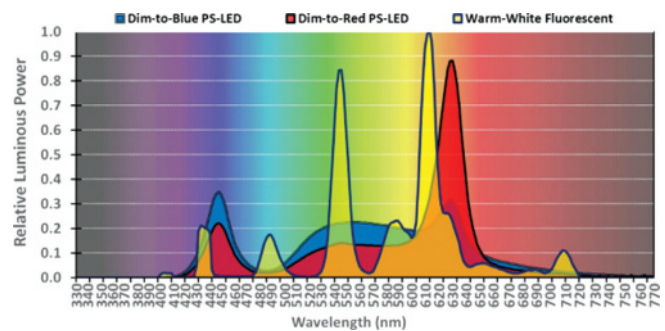
Sunbird Lighting: Elevating poultry welfare, productivity and sustainability through innovative, ethical lighting solutions.

Revolutionising poultry welfare, boosting sustainable productivity

LIGHT PLAYS A crucial role in regulating the reproductive cycle of chickens, stimulating hormone production crucial for egg laying. The wavelengths, specifically in the red spectrum, activate the brain's photoreceptors, encouraging egg production. Adequate light, preferably around 16 hours per day, boosts egg laying. Supplemental lighting in the orange-red spectrum is advised for darker months. Various light types like incandescent, fluorescent, mercury vapour, and compact fluorescent serve different energy and durability needs. Proper installation and maintenance of bulbs impact light efficiency, influencing bird behaviour and egg production.

According to Michigan State University's (MSU) Ag Extension, "Hens will begin laying when the amount of daylight reaches 14 hours per day during early spring. Maximum egg laying will occur when the day length reaches 16 hours per day."

But how does light, particularly within the red spectrum, influence the reproductive cycle of chickens and enhance egg laying?



Spectral characteristics of the warm-white fluorescent light, dim-to-blue PS-LED, and dim-to-red PS-LED involved in this study.

Image Credit: Science Direct

LED bulbs offer a comprehensive light spectrum, high energy efficiency, and extended durability. They can be adjusted for various colour spectrums and have a longer lifespan. However, their initial cost is often high, they require appropriate dimming mechanisms,

Hens will begin laying when the amount of daylight reaches 14 hours per day during early spring. Maximum egg laying will occur when the day length reaches 16 hours per day.

and some models may lose efficiency due to dust build-up or inadequate ventilation. LED types range from poultry-specific, engineered for durability and poultry vision, to general agriculture-grade LEDs, and standard household LEDs. Each type varies in cost, resilience and suitability for poultry settings. Poultry-specific LEDs withstand rigorous cleaning, while general-grade LEDs suit the environment but may lack specific poultry features. Household LEDs, though economical, may not endure the poultry house conditions.

A study compared dim-to-red poultry-specific LED lights (PS-LED) and warm-white fluorescent lights (FL) on Hy-Line W-36 hens from 17 to 41 weeks. Both lights had similar impacts on sexual maturity timing, egg production, quality, and yolk cholesterol. However, at 41 weeks, eggs from PS-LED-treated hens had lower shell thickness and strength compared to FL-treated hens. Rearing light sources (dim-to-blue PS-LED or warm-white FL) didn't notably influence laying performance, except PS-LED-reared hens showed reduced shell thickness at 32 weeks. While both light types yielded comparable performance and egg quality, differences in shell characteristics were observed, suggesting a need for careful consideration when selecting lighting sources for poultry production, particularly concerning eggshell integrity and strength, despite their overall similar effects on laying performance and quality.

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variant, boasting a 100,000-hour lifespan, facilitates rapid installation without conduit or junction boxes, ensuring an IP69K rating against corrosion. It delivers 160 lumens per watt using Osram Duris chipset, providing optimal performance in highly corrosive environments. Meanwhile, the Standard 10W lights suit farmers preferring conduit installations, maintaining the same durability and resilience with a design compatible with European and American junction boxes. These lights are engineered for poultry and pig lighting applications, assuring unparalleled longevity and performance for customers.

Sunbird Aviary Lighting stands as an instrumental factor in enhancing poultry welfare and productivity within cage-free aviary systems.

Do you know about the distinctive features and benefits offered by Sunbird Aviary Lighting in enhancing poultry welfare and productivity within cage-free aviary systems?

Sunbird Aviary Lighting stands as an instrumental factor in enhancing poultry welfare and productivity within cage-free aviary systems. Its benefits encompass stress reduction through natural sunlight emulation, effectively minimising aggressive behaviour among hens. Specifically designed red-wavelength peaks serve to disguise blood, significantly reducing incidents of feather pecking. Furthermore, by effectively guiding hens to designated nesting areas, it minimises floor eggs, ensuring cleaner, higher-quality egg production.



Image Credit: Sunbird

The Sunbird Aviary Lighting system is designed with energy efficiency in mind, utilising the most advanced LED lighting technologies.

This specialised lighting system optimises egg production and quality by regulating laying cycles, promoting healthy reproductive behaviours, and maintaining egg integrity. Moreover, its energy-efficient LED technology not only cuts operational costs but also aligns with sustainable practices, addressing welfare concerns while meeting consumer demands for ethical and sustainable egg production.

In the transition from conventional cages to cage-free aviary systems, Sunbird Aviary Lighting plays a pivotal role in ensuring a harmonious balance between productivity, animal welfare and environmental responsibility in modern poultry practices. **B**

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Since poultry health directly affects the quality of products we consume, using optimally mixed, nutritious feeds is crucial for producing healthy, disease-free chickens.

Getting feed mixes right

POULTRY FARMING CONTINUES to be the key source of protein and revenue generation for a majority of smallholder farmers in developing countries. Moreover, with the rapid growth of human population and individual consumption, the overall demand for poultry products is on the rise. Delivering high quality products is one of the primary objectives of poultry production, and since poultry health directly affects the quality of products we consume, using nutritious feeds in the right quantity and composition is crucial for producing healthy, disease-free chickens.

It is important to remember that while nutrition is an important requirement for the growth of chickens, it is however not the only factor that needs to be considered while choosing poultry feeds. There are a wide variety of feeds offering a range of benefits that are available in the market today. These feeds are unique to certain types of poultry based on their utilisation. Mixing of feed ingredients is also a key part of the feed manufacturing process. Batch mixer,



Image Credit: Adobe Stock

There are a wide variety of feeds offering a range of benefits that are available in the market today, which are unique to certain types of poultry based on their utilisation.

grinder, screw conveyer, pellet making machine and packing machine are few among the many equipments that are used as part of the process.

Self-made chicken feed

Feed mixing mainly involves two methods, namely, manual and mechanical mixing. While mechanical mixing is often the go-to method for feed preparation, some smallholder farmers still prefer the traditional method of preparing their own chicken feed. While this appears to be an organic and cost effective option, the feeds produced are however not always balanced. Improper mixing may be detrimental to chicken health, resulting in poisoning. In addition, other diseases may also occur. It is therefore important for the feed to be continuously stirred during the preparation process. While mixing feed manually, it is also important to ensure that no trace ingredients are piled up or agglomerated. This is because the presence of some small ingredients such as table salt and various additives can seriously impact the feeding effect. For instance, uneven mixing can cause the lighter ingredients to interfere with the feeding effect, causing disease, poisoning and even death in severe cases.

While mixing feed manually, it is important to ensure that no trace ingredients are piled up or agglomerated since they can seriously impact the feeding effect.

Trace ingredients if present, need to be first crushed completely during mixing to ensure that there is no agglomeration. This is because the lumps cannot be uniformly mixed and can cause poisoning after being ingested by the chickens. Furthermore, due to the presence of these ingredients, it should be kept in mind to first pre-mix the mixture before adding it to the bulk feed. Pre-mixing usually takes around 10-20% of concentrate as a carrier and piles

The FeedMixer appacts allows users to choose the type of chickens they are feeding, and select the available ingredients, in the proportions they intend to blend.

up the feed successively. This causes the feed to flow around the centre point to become conical, thus allowing all kinds of feed to mix. Repeating this process three to four times helps to achieve uniform mixing. Similarly, once the pre-mix is ready, it can then be added to the bulk feed and again mixed three to four more times to obtain the final feedproduct.

Although the process might seem lengthy and repetitive, multi-level mixing is the only way by which the quality of the combined diet can be guaranteed.

Optimising chicken feed with new FeedMixer mobile app

Farmers can now optimise chicken nutrition with the new mobile app, FeedMixer, that helps them save money and improve profits. Designed by poultry nutrition experts at the Poultry Science Department at the University of Georgia in the US, the new FeedMixer app aims to achieve the right nutrient balance in chicken feed, thereby addressing a major challenge that chicken farmers face. Rising commercial feed costs coupled with limited supply of certain grains often causes farmers to self-mix their chicken feed, thus making it difficult to achieve the right balance.

The FeedMixer app therefore, acts as a perfect solution by allowing users to choose the type of chickens they are feeding, and select the available ingredients, in the proportions they intend to blend. The app will indicate whether their chosen mix delivers adequate energy, protein, fibre, vitamins and minerals to nourish the birds without wastage. In addition, the app also allows users to calculate whether their feed mix is cost effective by putting in the cost of the ingredients they use.



The FeedMixer app allows farmers to achieve the right nutrient balance in their chicken feed.

Maureen Stickel, director of International Programme Development at the World Poultry Foundation, emphasised that the FeedMixer app includes a large library of feed ingredients, along with their nutritional values to guide farmers on feed mixes for layers, broilers, and dual-purpose birds at various ages.

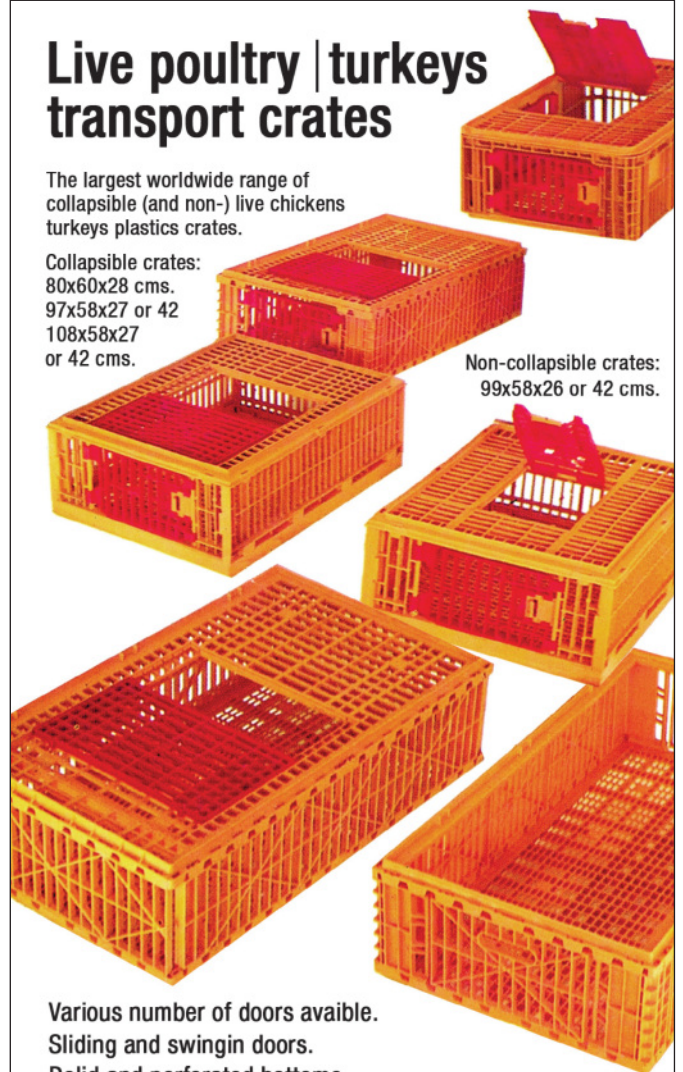
“The FeedMixer app is designed for ease of use by people with a basic poultry background – including backyard and emerging chicken farmers. With the app, we are trying to make it simple for farmers to use local ingredients to formulate a diet that meets basic poultry nutrition requirements and achieve their basic production goals,” said assistant professor/extension specialist at the University of Georgia's Department of Poultry Science, Sean Chen. 

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In the livestock and poultry sector, nanotechnology can be exploited for efficient uptake of nutrients, thus enabling better utilisation of feedstuff and other supplements.

Transforming the poultry sector through nanotechnology



Image Credit: Adobe Stock

Broiler diet enriched with silver nanoparticles showed lower levels of haemoglobin, RBC and WBC counts, along with a significant improvement in feed intake, weight gain and feed efficiency.

NANOTECHNOLOGY IS AN emerging field which shows tremendous promise in revolutionising the agriculture and livestock sector globally. This technology mainly involves the process of converting larger molecules into smaller sizes, thus bringing about changes in the innate physical and chemical nature of the base material. These include changes in solubility, absorption, transport mechanism, excretion and antagonisms.

In livestock intestines or cellular level, mineral antagonisms often lead to mineral imbalances at absorption, transportation and excretion. The final product obtained through this technology possesses special properties such as greater penetrability, reactivity, surface area and quantum properties, which prove to be useful in various fields such as nutrition, diagnostics, therapeutics, biotechnology, vaccine production and

chemical industries among others.

According to a review article published in the International Journal of Pharmacology, the application of nanotechnology in livestock/ poultry feeding is mainly in the form

Organic nanoparticles such as proteins, fats and sugar molecules have the ability to alter feed functionality and improve nutritional value.

of nanoparticles. The importance of this area lies in its ability to enhance the absorption of trace minerals by reducing the antagonistic effect among the bi-valent cations. In the livestock and poultry sector, this novel strategy can be exploited for efficient uptake of nutrients, thus enabling better utilisation of feedstuff and other supplements.

Moreover, organic nanoparticles such as proteins, fats and sugar molecules have the ability to alter feed functionality and improve nutritional value. These nanoparticles work by encapsulating nutrients and transporting them to the bloodstream through the gastrointestinal tract, and are often referred to as nano capsules. With increased bioavailability, these capsules deliver nutrients without altering their taste or appearance. As such encapsulated nano-materials, they are incorporated into feeds as micelles, liposomes and in feed packaging systems as biosensors, identification markers, shelf-life extenders and antimicrobials.

Advantages of nanoparticle supplementation in the poultry sector

A study on nano zinc supplementation showed that including 0.06 ppm of supplements in the basal diet of broiler birds

showed improved immune status and bioavailability compared to inorganic zinc. Moreover, different concentrations of ZnO-nano-particles were found to inhibit the growth of mycotoxic fungi. This meant that the method could be effectively used for feed treatment to reduce the potential hazards of mycotoxicosis.

Similarly, using nanosilver as a microbical preparation was found to reduce the number of *Escherichia coli*, *Streptococcus* bacteria, harmful *Salmonella* and total number of mesophilic bacteria in the litter. Furthermore, using nanosilver as a feed additive had positive selective impact on the bacterial count in the digestive tract of poultry. Broiler diet enriched with silver nanoparticles also showed lower levels of haemoglobin, RBC and WBC counts, along with a significant improvement in feed intake, weight gain and feed efficiency.

BSF larvae: A sustainable protein alternative

Being a highly nutritious source of protein, fat, and other essential nutrients, the black soldier fly larvae (BSFL) are increasingly being used as feed for a wide variety of farm animals including poultry. Their ability to efficiently convert organic waste into a plethora of useful minerals like zinc, iron, calcium and selenium makes BSFL a promising candidate for livestock feed.

Moreover, with protein shortage being a pressing global issue, current sources of protein such as soybean oil are no longer feasible both financially and environmentally. Chicken feed prices have also increased by half in the past two years and are expected to double by 2050. In addition, animal feed sources such as

soybean protein, which primarily originates from Latin America, needs to be shipped around the world, causing it to be a major contributor of greenhouse gas (GHG) emissions. Animal feed currently makes up around 80% of chickens' carbon footprint. Therefore, BSFL which is seen as a more sustainable option, is fast replacing soybean oil as the primary source of protein in poultry feed.

Enriching poultry feed with biofortified BSF larvae

In an attempt to increase the nutritional value of chickens and significantly bring down the carbon footprint of feed ingredients, scientists from Nottingham Trent University along with agri-tech company Flybox recently conducted a feasibility study which involved biofortifying BSFL with essential minerals for nutrition.


The project involves setting up a Flybox modular insect farm on the university's Brackenhurst Campus, which would be used for feeding food waste and nanomaterial to BSF larvae. Researchers from Nottingham Trent University's School of Science and Technology and School of Animal, Rural and Environmental Sciences have assured that the study will add value to poultry and livestock feed and reduce

The project involves setting up a Flybox modular insect farm which would be used for feeding food waste and nanomaterial to BSF larvae.

production cost, thus enabling the adoption of an alternative, hyper-local, low emission protein source.

Researchers have begun using nanotechnology to improve the metabolic efficiency of both birds and insects. They are currently in the process of developing a nano-enhanced substrate containing naturally occurring minerals and amino acids essential for poultry health. Substrates like these comprise of elements that are combined together and can grow uniformly into a nanometre size. Utilising minerals at this size enables birds and insects to metabolise them more effectively. However, despite its ability to be a sustainable and low-emission protein source for the livestock industry, restrictions in the production of BSFL meal have prevented it from reaching its full potential.

Emily Burton, professor in Sustainable Food Production in the university's School of Animal, Rural and Environmental Sciences sees insect larvae as the key to circularising food production. Dr Gareth Cave, a researcher in Nottingham Trent University's School of Science and Technology also highlighted that insects that are essentially loaded with nutrition from waste products become a natural diet for poultry, thus making them a hyper-local, circular and low-carbon way to address a pressing challenge in the animal feed sector.

"This is an exciting route to positively influence unit economics for the entire insect protein industry," said co-founder & CEO of Flybox, Andrea Jagodic. "It is the right time to start integrating a precision agriculture approach when integrating insect meal into commercial feed." 



The larvae will be added to grain for poultry as part of the study.

Image Credit: Flybox

Cutting-edge genomic research is being used to combat the detrimental effects of heat stress by significantly improving thermotolerance in dairy cattle.



Heat stress can increase the risk of disease and mortality, thus emphasising the need to choose thermotolerant cattle breeds.

Achieving thermotolerance in dairy cattle

Image Credit: Adobe Stock

AS CLIMATE CHANGE continues to tighten its grip on the world, the detrimental effects of heat stress loom large over the livestock sector. The high metabolic heat load of dairy cattle makes them highly susceptible to heat stress, thus negatively impacting milk production and resulting in large economic consequences. Moreover, studies have shown that heat stress not only impacts the overall milk yield, but also impacts milk quality. In addition, it also reduces fat and protein yield and increases somatic cell count. Metabolic processes have also been found to be affected, thus increasing the amino acid content in circulation.

Reduction in milk production generally occurs as a result of one among the many psychological and cellular mechanisms employed by dairy cattle to divert energy, thus prioritising protection over biological processes like reproduction and milk production. In severe cases, heat stress can increase the risk of disease and mortality, thus emphasising the need to choose thermotolerant cattle breeds.

Selection strategies to achieve thermotolerance

Some of the strategies that have been proposed to address the issue of heat stress include:

- **Selecting for lower milk production:**

Studies have shown that temperature humidity indexes (THI) thresholds are directly related to milk production. Higher producing cattle have often been found to have lower THI thresholds compared to lower producing cattle. Moreover, genomic breeding values related to production traits have also been established as indicators of heat tolerance. However, one of the major drawbacks of this selection strategy is that although heat tolerant cattle generally have lower yield reductions during times of heat stress, their overall 305-day milk yield would be comparatively lower than heat susceptible cattle.

Studies have shown that heat stress not only impacts milk yield, but also impacts milk quality.

- **Crossbreeding with thermotolerant breeds:**

Bos indicus breeds, found in tropical regions, have shown a greater ability to adapt to thermal stress compared to *Bos taurus* breeds. Hence, crossbreeding these two breeds is another potential strategy for thermotol-

erance. However, *Bos indicus* breeds have shown lower milk production despite possessing several traits associated with thermotolerance, resulting in lower overall yields. Crossbreeding these two may also produce offspring that are at a greater risk for cold stress.

- **Gene editing to introduce the SLICK gene:**

Genetic strategies involving the incorporation of specific genes such as the SLICK haplotype helps cattle develop resilience to heat stress. Introducing the SLICK mutation has been found to increase cattle's sweating ability, thereby enhancing their capacity to regulate body temperature, while also maintaining production levels during heat stress. While introducing this mutation in *Bos taurus* helps them produce a coat that enables enhanced heat dissipation, it also makes these breeds more vulnerable to cold stress.

- **Selecting for physiological and cellular traits:**

Respiration rate and rectal temperature are both physiological traits that have been discussed to be included in selection programmes to confer thermotolerance. Studies have shown heritability estimates for rectal temperature to be ranging from 0.06 to 0.17, while estimates for respiration rate was found to be 0.04. Although genetic

gains in thermotolerance may be slow when selecting for both these traits, the fact that milk production remains unaffected is a major plus point of this approach. In regard to cellular traits, nitric oxide synthesis has been identified as being associated with thermotolerance. Moreover, heat shock proteins (HSP) are also involved in the protection and repair of cells during heat stress. Reports regarding the heritability estimates of HSP are however limited.

● Selecting for high immune response:

Over the course of several years, a number of animals including mice, chickens, pigs and cattle have been studied, following which researchers have finally been able to develop the ability to select dairy cattle that can mount a high immune response. The correlation between thermotolerance and immune response has also been determined. The most recent pedigree based estimates for Holstein cattle were reported to be 0.45 and 0.18 for antibody-mediated immune response (AMIR) and cell-mediated immune response (CMIR) respectively. These heritability estimates being moderate to high indicated the ability of the genes encoding these immune

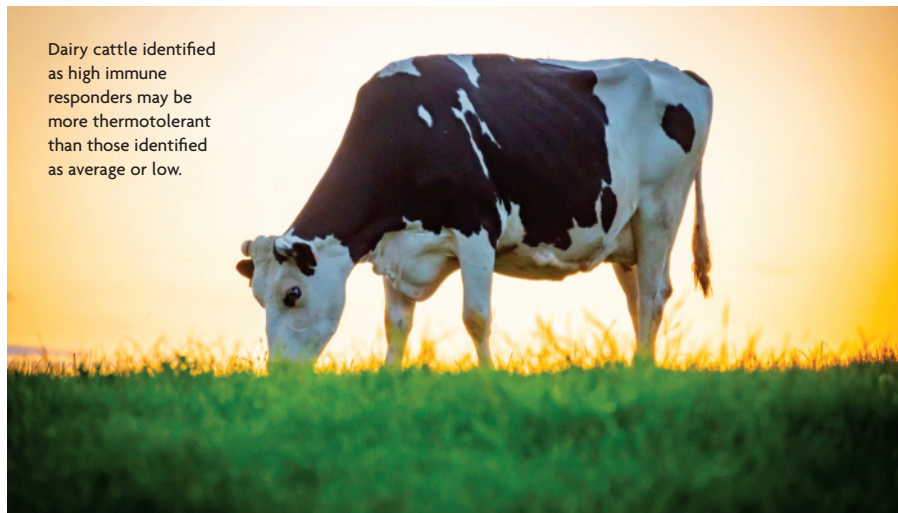


Image Credit: Adobe Stock

Heat stressed Holstein cows that possessed desirable markers had the ability to reduce their respiratory rate and rectal temperature, thereby maintaining adequate levels of milk production.

response phenotypes to be passed on to the next generation. Moreover, recent evidence has shown that dairy cattle identified as high immune responders may be more thermotolerant than those identified as average and low. Overall, high immune responding dairy cattle have been found to have lower respiration rate and rectal temperatures along with higher THI values compared to average and low performing dairy cattle. Most importantly, no changes in milk production were found in high performing cattle and their fellow herd mates, which meant that this strategy could be efficiently adopted in conferring thermotolerance, while at the same time maintaining production and minimising cold stress.

production losses. However, obtaining the data is too expensive and labour intensive, making it difficult to be collected on a larger scale. In both tropical and temperate countries, selecting for high immune response is therefore the most ideal solution for dairy cattle.

Validating genetic markers

A genome-wide association study published in May 2023 identified six candidate single nucleotide polymorphisms (SNPs) as predictors for milk production in heat-stressed Holstein cows. Out of these, only three SNPs were further validated in the genes TLR4, GRM8 and SMAD3 as molecular markers for milk production and thermotolerance. These genes helped in the regulation of metabolic function responsible for achieving minimal heat production and other energy demands. It was therefore inferred from the study that Holstein cows that were heat stressed, but possessed desirable markers had the ability to reduce their respiratory rate and rectal temperature, thereby maintaining adequate levels of milk production.

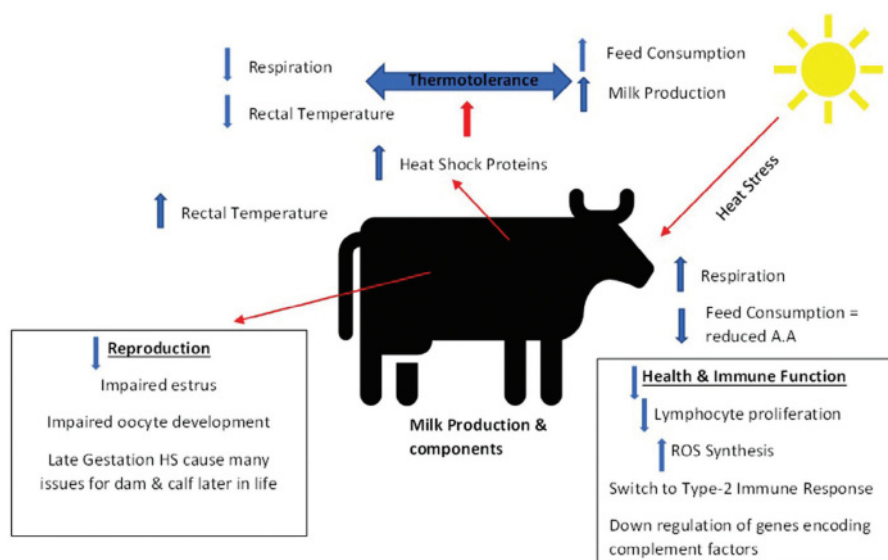
Other notable drawbacks

While the first three strategies might seem promising, they are however, not suitable for cattle living in countries with varying seasons throughout the year. Looking at the fourth selection strategy, physiological and cellular traits can greatly help in reducing

Identifying the best cow genetics

According to an article published by the University of Connecticut, Breno Fragomeni, assistant professor of animal science in the College of Agriculture, Health and Natural Resources is using cutting-edge genomic research to improve thermotolerance in dairy cattle. Fragomeni and his team are using a sophisticated statistical model to estimate the amount of milk expected to be lost by a cow relative to the national average based on their sire. This information when passed on to farmers, can help them decide which bulls to pick as sires to ensure that they produce calves that are best suited at handling heat. Fragomeni is also currently working on a study that aims to develop better, non-invasive methods of measuring heat stress that can be applied to large farms.

Image Credit: Frontiers in Veterinary Science



Summary of impacts of heat stress on dairy cattle.

Dr Terry Mabbett in conversation with Omex Agrifluids' technical sales manager for Africa, Dr Ben Odunlami provides insight into how foliar feeding works, while also highlighting Omex product applications for rice.

The Omex foliar feeding programme for rice

RICE IS ESSENTIAL in sustaining food security within more than half of the world's population, and is the primary crop and main staple. While rice is traditionally associated with Asia the small-grain, tropical cereal remains the predominant dietary energy source in Sub-Saharan West Africa and the second most important source of calories for Africa as a whole.

Rice is the fastest growing food staple, with demand increasing at over 6% per annum, fuelled by population growth, urbanisation, and changes in consumer preferences. Rice is grown in 40 out of 54 African countries with the crop's cultivation being the principle activity and income source for over 35 million small farmers. That said, local production only satisfies around 60% of current demand for rice in Sub-Saharan Africa, with 15 million tonnes having to be imported every year at a cost of US\$6bn, thereby swallowing up a significant amount of Africa's foreign exchange reserves.

Africa accounts for only 15% of the world population, but 32% of rice imports worldwide. However, rice is the least internationally traded



Image Credit: Nick Ashton Jones

High-yielding hybrid varieties are now cultivated in countries along the coastal region of West Africa as pictured here in Edo State, Nigeria.

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of all the main cereal crops which makes self-sufficiency all the more important. This was seen in the 'Rice Crisis' of 2008 when big importers of rice were 'stung' with huge import bills due to rice reaching prices of US\$1000 per tonne, and in the worst case scenario not being able to access the food staple for their populations.

That said, Africa has the human, physical and economic resources to produce enough quality rice in a sustainable manner to feed itself and export to other regions in the long run. This can only be achieved by innovation to get the rice agronomy right. Rice crop nutrition and fertilisation is the centrepiece in this scenario with foliar feeding driving the innovation needed.

Rice requires the full gambit of essential plant nutrients in measured amounts with application timing in relation to stage of rice plant development as the key to success. Only foliar feeding using soluble nutrient products can realistically deliver so many nutrient requirements in exact amounts and with the precision timings required.

Rice requires a full gambit of essential plant nutrients, and only foliar feeding using soluble nutrient products can realistically deliver these nutrient requirements in exact amounts and with the precision timings required.

To get an insight into how foliar feeding works, I visited Omex Agrifluids at Kings Lynn, located in the east of England to speak with Dr Ben Odunlami, technical sales manager for Africa. Omex Agrifluids is an R&D based company specialising in the development of soluble plant nutrient products in liquid and powder delivery systems. Omex has a truly global experience of foliar feeding in the widest range of crops including rice.

Foliar feeding along the rice crop cycle

Foliar feeding is all about timing in relation to stage of crop development, so I asked Dr Ben Odunlami to start at the beginning and take me through the sequence of Omex product applications as the rice crop grows, develops and matures.

Seed dressings to start with

“Rice seeding stage is when we apply zinc as our Omex Primer Zinc Bio delivered as a seed dressing at 3 ml product/kg rice seed,” said Odunlami. Application at this earliest stage in the crop cycle will ensure sufficient zinc is delivered for a high quality rice grain harvest. Rice grain should contain 40-60 mg Zn per kg for enhanced human nutrition. Omex Primer Zinc Bio is a high concentration suspension seed treatment containing 700 g/l (70% w/v) Zn with a natural biostimulant sourced from a specific marine alga (seaweed).

Giving a spurt to seedling growth

Natural biostimulant sourced from seaweed also features in Omex Bio 20 used to boost the growth of rice seedlings in the nursery beds. “Omex recommends Omex Bio 20 for nursery rice seedlings as a foliar spray at 1.0 l/ha,” said Odunlami. “The beauty of our Bio 20 is the broad-spectrum complement of essential plant nutrients. This includes all three macronutrients (nitrogen, phosphorous and potassium) each one at 20% w/v, magnesium, a full complement of chelated micronutrients and all boosted by a natural biostimulant sourced from seaweed,” Odunlami told African Farming. He further explained how Omex Bio 20 is custom-designed to furnish rice seedlings with a complement of nutrients and a biostimulant boost to promote and energise greater root biomass for maximum uptake and utilisation of water and nutrients.

Second boost and shot of zinc

When transplanted rice seedlings are at the tillering stage, it is time for a second boost from Omex Bio 20 (1.0 – 2.0 l/ha foliar spray) and a second shot of zinc, this time from Omex Kingfol Zn, which

is also applied as a foliar spray. “Omex Kingfol Zn is a stand-alone zinc-nutrient product in a flowable formulation containing 700 g/l (70% w/v) zinc. Small particles of zinc oxide are formulated with enhancers to maximise foliar uptake,” said Odunlami.

Sulphur and copper

Sulphur and copper are not widely talked nutrients but essential nevertheless and none more so than in rice cultivation. Sulphur is a crucially-important component of plant proteins, both structural and enzyme proteins, and now more important than ever as ‘greening of the environment’ removes the high levels of pollutant sulphur which cereal crops used to use as a source of sulphur. Another compounding factor is how deficiency symptoms in cereals including rice are difficult to distinguish from symptoms caused by nitrogen deficiency.

That apart, Omex has the answer for rice with a product called Omex Sulphomex. Ben Odunlami told African Farming how this novel liquid product containing 87.50% w/v sulphur is quickly absorbed by the rice leaves, thus avoiding the unpleasant dust particles and caking characteristics of many elemental sulphur products sold in powder form.

As a micronutrient, copper is only required in trace amounts but deficiencies can have severe consequences for rice. Metabolic functions of copper include being a co-factor for the activation of enzymes and for phenolic compounds which assist in the suppression of the many microbial pathogens which attack rice. Copper requirements in rice are satisfied by the application of Omex Zynergy, containing 2.66% w/v copper and which also provides additional boosts of zinc (4.72% w/v) and sulphur (9.10% w/v).

Panicle initiation and spike emergence stages

Vegetative growth continues but is now over-shadowed by the all-important reproductive stage including initiation of the rice panicle and emergence of the spike. This requires a whole new set of nutrient priorities while keeping vegetative growth in tandem with this new reproductive development. Calcium and boron are key



A lowland rice crop which has benefitted from a range of soluble nutrient products applied by foliar feeding, and is on the approach to maturity.

Image Credit: Dr. Terry Mabbett

nutrients in reproductive development. Calcium minimises the occurrence of split rice grains, while boron controls the synthesis of cell wall material and also plays a role in the transport of soluble sugars across cell walls.

Breadth and balance in nutrient provision at this critically demanding time is satisfied by a cluster of Omex products:

- Omex CalmaxB (calcium 22.5% w/v; boron 1.53% w/v plus chelated micronutrients, nitrogen and magnesium applied as a foliar spray at 2.0 l/ha)
- Omex K41, a water soluble emulsion with a super-high (41% w/v) potassium content
- Omex Bio 20 and Omex Kingfol Zn as foliar sprays
- Omex Sequential 2 with a full complement of nutrients including potassium at 40% w/v. This product is recommended for rice farmers in countries where Omex K41 may not be available.

Potassium improves root growth and vigour, assists in the prevention of lodging and enhances rice plant resistance to pests and diseases. Moreover, it also controls water relations in the plant and is therefore called the 'gatekeeper' nutrient.

Potassium is usually the most limiting nutrient after nitrogen in the high yielding rice systems which increasingly typify African rice cultivation. Breakthroughs came with the use of high yielding varieties developed by hybridising *Oryzae sativa* and *Oryzae glaberrima*. A classic example is 'NERICA' rice, appropriately translating into 'New Rice for Africa'.

Potassium is required throughout the life cycle of the rice plant. However, given its importance in grain filling, prevention of lodging and rice plant resistance, the most important intervention is at the

Omex Bio 20 is custom-designed to furnish rice seedlings with a complement of nutrients and a biostimulant boost to promote and energise greater root biomass.

panicle initiation and spike emergence stages.

Shortfalls of potassium cause a wide range of deficiency symptoms including leaf discoloration, unhealthy black roots, more unfilled grains, reduced grain weight and greater lodging. Foliar feeding is ideal for potassium because the cations are highly mobile, both into and within the rice leaves.

There are clearly great demands for potassium in rice cultivation, so I asked Ben which Omex products would satisfy rice requirements for this nutrient. "Our key product is Omex K41 with super-high potassium at 41% w/v and applied at 3.0 l/ha as a foliar spray. The soluble emulsion product also contains nitrogen, magnesium and sulphur. For countries where Omex K41 may not be available, we offer rice farmers Omex Sequential 2 containing 40% w/v potassium," said Odunlami.

Complete package

Attending to and satisfying the needs of a crop like rice with nursery, transplanting and paddy water requirement considerations is no easy task, but made much easier to control and with assured success using the soluble nutrient product package from Omex to foliar feed rice crops. **B**



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The El Nino phenomenon leaves hunger in its wake, as dry spells in India and Thailand cause sugar prices to skyrocket around the world, largely impacting developing countries in sub-Saharan Africa that are already struggling with food insecurity.

El Nino fallout causes sugar prices to soar worldwide

INDIA AND THAILAND have faced their driest months as the El Nino weather patterns have taken a massive toll on crop harvests. This is especially the case for crops like sugar that have seen a major downfall in production globally, with prices skyrocketing since 2011.

India and Thailand are two of the world's major sugar exporters, ranking among the top countries in sugar production and trade. During the 2021-22 period, India emerged as the world's largest producer and consumer of sugar and the world's second largest exporter, after Brazil. The United Nations Food and Agriculture Organisation (FAO) has predicted world sugar production to experience a 2% decline, for the 2023-24 period.

Sugar production holds significant importance in developing countries for several reasons. Firstly, it is a major source of employment, providing jobs in cultivation, harvesting, and processing. Additionally, sugar exports contribute to foreign exchange earnings, aiding economic stability. Moreover, domestically produced sugar can enhance food security by reducing reliance on imports.

The FAO has predicted world sugar production to experience a 2% decline, for the 2023-24 period.

Countries in sub-Saharan Africa that are already struggling with food insecurity are likely to face the hardest blow. For example Nigeria, where sugar is used to produce bread – a cheap source of calories – will face shortages of both bread and bakers due to the alarming spike in sugar prices.

Moreover, along with the rise in sugar prices comes a fall in exports. As a result, both India and Thailand have decided to restrict their sugar exports. According to a report by IFPRI, the Indian government recently extended the curb on exports beyond its original 31 October end date. Also, in order to ensure domestic supplies



Image Credit: Adobe Stock

With sugar prices being well above mill production costs, diverting to ethanol production from sugarcane products helps sugar mills to maintain a steady income.

and keep inflation in check, the Thailand government on 28 October, listed sugar as a controlled commodity.

While the future of these export restrictions remain uncertain, it is interesting to note that high and low income countries will have large differences in demand. For example, while affluent nations having high obesity rates may take this in a positive light, the already poor households in developing nations that are largely dependent on sugar as a source of their daily nutrition, will continue to face larger food costs and increasing burden.

Ethanol production

Changing global markets have increased the demand for alternative energy sources such as ethanol. According to the OECD, out of the total ethanol produced globally, about 20% is produced from sugarcane and 7% from molasses, a by-product obtained from processing sugarcane or sugarbeets into sugar. Many sugar producing countries like India have decided

to increase their production of biofuels such as ethanol-blended petrol, since it not only helps utilise sugar that is not domestically consumed, but also enables the country to achieve energy independence.

According to a report by Money Control, the drop in sugarcane production is pushing mills to produce more ethanol to be supplied to oil marketing companies. Moreover, with sugar prices being well above mill production costs, diverting to ethanol production from sugarcane products helps sugar mills to maintain a steady income.

However, the downside to ethanol – as indicated by experts – is that it is almost as carbon intensive as petroleum fuels. Results from a biofuel research conducted in 2022, showed that a number of factors including changes in land use and increase in fertiliser use have resulted in ethanol intensity being comparatively 24% higher than petrol, which therefore signifies increased greenhouse gas (GHG) emissions in the ethanol supply chain. **B**

Industries have effectively adopted a wide variety of new technology in factory production operations, enhancing cost reduction processes as a result.

Automation takes over Kenya's tea sector

Automated tea processing systems have almost entirely eliminated human intervention by successfully performing a series of tasks with minimum to no operator involvement.

WITH THE ADVENT of new technologies, the tea sector is gradually undergoing a transition into mechanisation. Increasing customers' demand for high quality products has prompted industries to effectively adopt a wide variety of new technology in factory production operations, enhancing cost reduction processes as a result. Process and organisational innovations have mostly been adopted to tackle rising operational costs among tea farmers.

New and improved delivery and production methods have been implemented, along with the adoption of the continuous fermentation unit (CFU) as part of the automated tea processing innovation undertaken by factories. Automated tea processing systems have almost entirely eliminated human intervention, by successfully performing a series of tasks with minimal to no operator involvement. Besides speeding up activities, automation also helps minimise mistakes caused by human error.

Among the several steps involved in tea processing, sorting, drying and fermentation are most important to determine shelf stability, flavour and overall quality of the tea produced.

TEMEC launches automated tea processing technology in Kenya

The Tea Machinery and Engineering Company Limited (TEMEC) recently unveiled an innovative technology featuring ultra-modern solutions that would transform

key areas of tea processing including tea drying, pre-sorting and continuous fermentation units, through automation.

TEMEC recently unveiled an innovative technology featuring state-of-the-art solutions that would transform key areas of tea processing.

Tea drying

Drying is an important step in tea processing which involves minimising moisture content to ensure long-term preservation. Excess moisture content, generally above 5%, can be detrimental to tea quality, thereby promoting bacterial growth and reducing the product's overall shelf life.

In a report published by The Star, TEMEC's general manager, Eng Michael Cherutich, stated that TEMEC's automated tea dryer, which is equipped with a cutting-edge screw conveyer, combines intelligent technology with precision engineering to create the ideal drying environment for tea leaves. Ensuring perfection in the drying process is key to retaining their natural flavours and aromas, while also avoiding the risk of over- or under-drying. Cherutich further mentioned that the automated dryer showed a remarkable improvement in speed and production efficiency.

Pre-sorting

Known to be one of the crucial steps in tea

processing, pre-sorting sets the foundation for a more streamlined, quality-focused, and resource-efficient tea processing workflow. Processing of tea leaves early in the chain improves the efficiency of subsequent steps as they deal with more uniform batches, thereby reducing the processing time. Moreover, damaged or inferior leaves can be removed at an early stage, thus minimising waste and preventing them from compromising the overall quality of the product. Besides these advantages, pre-sorting helps in the efficient allocation of resources by directing specific grades or types of tea leaves to appropriate processing lines, thereby maximising productivity.

The pre-sorting automation system by TEMEC utilises advanced algorithms to swiftly and precisely identify and segregate tea leaves based on their intrinsic quality and size characteristics. By significantly reducing the risk of inconsistent blends, the technology ensures that the final tea product obtained is of superior quality.

Continuous fermentation units (CFUs)

CFUs are advanced processing systems designed to provide a controlled and continuous environment for fermenting tea leaves, thus reducing variations in tea flavour and quality. Moreover, by reducing downtime between batches, they improve the overall tea processing efficiency. Fermentation conditions such as temperature, duration and humidity are also monitored and maintained, aiding the production of distinctly flavoured high quality teas. A major

advantage includes CFU's flexibility in allowing producers to adjust parameters to experiment with different fermentation levels. This in turn enables the creation of new tea varieties or the consistent replication of specific taste profiles.

TEMEC's automated CFU maintains a consistent fermentation process, enhancing the flavour and aroma of tea leaves, while at the same time minimising chances of spoilage. Automation of these units also enables monitoring and adjustments to be performed in real-time, thus ensuring precise fermentation of tea leaves.

Through its state-of-the-art automation solutions, TEMEC has also helped KTDA-managed tea factories to gain global recognition by scaling up production processes and helping them meet stringent quality standards.

As part of an initiative to boost farmers' income, the Tea Board of Kenya has planned to diversify into niche varieties such as white and purple tea.



Tea plantations near Kericho, Kenya.

Image Credit: Adobe Stock

Kenya expands into specialty tea production

As part of an initiative to boost farmers' income, the Tea Board of Kenya (TBK) has planned to diversify into niche varieties such as white and purple tea, which helps farmers earn premium returns and also boosts employment opportunities. Compared to the commonly-known black tea, purple tea which remains unfermented during processing, contains anthocyanin, which is known to offer a plethora of health benefits. The KTDA has already installed orthodox tea processing plants in 11 of its factories and will be installing Sh10bn

(US\$65.8mn) specialty tea processing units across an additional 32 factories.

Besides these new factory lines, the TBK, in collaboration with the Tea Research Institute in Kericho, has undertaken an incubation project to set up an incubation centre for value-added tea products in Kericho. According to a report by Nation Africa, this would help in providing a framework for the establishment of tea cottage industries where small and medium enterprises (SMEs) can acquire the necessary skills required to cater to the requirements of the diverse specialty tea markets. **B**



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The introduction of new and advanced farming technology, particularly tractor innovations, have significantly improved yields and reduced manual labour, massively boosting crop production as a result.

Climbing the productivity ladder

AS FARM MECHANISATION is becoming more and more widespread across Africa, the continent's agricultural landscape is undergoing a steady transformation, particularly in terms of yield and labour. The application of modern technology in countries such as Nigeria, Ghana and Kenya, among others – that have so far been largely dependent on manual labour – has vast socioeconomic, agronomic and environmental impacts, both positive and negative.

Some of the most notable positive effects observed include significant increase in yields owing mainly to the improved timeliness of farming, along with an expansion of cultivated land size and reduction in manual labour. All of these have together contributed to a massive boost in crop production. These positive agronomic impacts further translate to positive socioeconomic effects such as an increase in financial security and income, thus allowing farmers to have more time to spend on non-farm activities such as family, education and off-farm work. Moreover, the creation of new jobs for tractor operators and technicians drives rural employment, while simultaneously reducing the incidence of crimes and violence in villages.

Mechanisation has some negative effects, however, especially when applied inappropriately. These include a long term decline in soil fertility, as well as the acceleration of soil erosion and compaction, thus leaving the soils vulnerable to rain and wind erosion, and waterlogging. Improper farm mechanisation can therefore lead to lower yields in the long term. This calls for the need to create awareness and educate farmers regarding the appropriate and efficient use of new and upcoming farm technology.

Among the diverse varieties of technology available to farmers today, tractor automation and innovation has proved to be the most useful. A number of

new and existing tractor companies have come forward to collaborate with the government as well as local African companies and smallholders, with the aim of boosting farmers' incomes and the continent's economy as a whole.

Afrak's solar and battery powered tractor project

Loughborough University's groundbreaking initiative, Afrak, combines solar microgrids and tailored tractors to empower smallholder farmers across Africa. The US\$338.1mn project created in collaboration between the Consortium for Battery Innovation (CBI), UK- and Malawi-based charity Tiyeni, and Loughborough University is funded by Innovate UK as part of its Energy Catalyst Round 9 programme, which officially kicked off in London on 20 April this year. Tractors being developed at Loughborough University are low-cost,

hand-operated, and offer a solution for farming in hardpan, a compacted layer of rock-hard earth found under a few centimetres of topsoil, in many areas of Malawi.

Tiyeni has also created an innovative agricultural method called Deep Bed Farming (DBF), a three-stage process that combats the devastating impacts of hardpan. The proposed Afrak system which was trialled in Malawi, is a micro electric tractor capable of mechanising land preparation in line with Tiyeni's Deep Bed Farming to prepare the soil to a depth of 400 mm. The objective of the initiative is to provide sub-Saharan Africa with green energy solutions that are both socially inclusive and affordable, while also creating a self-sustaining model for decentralised energy access.

Afrak has also managed to move one step closer to helping improve the lives of billions of people across Africa after being shortlisted for the Milken-Motsepe Prize in



Loughborough University's groundbreaking initiative, Afrak, combines solar microgrids and tailored tractors to empower smallholder farmers across Africa.

The objective of the Afrak initiative is to provide sub-Saharan Africa with green energy solutions, while also creating a self-sustaining model for decentralised energy access.

Green Energy and a US\$1mn funding boost on 2 November. More than 800 million people have no reliable access to electricity, primarily in sub-Saharan Africa, and rural regions of Asia. Aftrak helps address this issue by allowing energy access and increasing crop yields, thereby helping farmers' boost their income.

Tiyeni's executive director, Alex Gerrard expressed great delight in winning the prestigious prize. "As a small charity working in rural Africa for the last 18 years, we have seen the transformation our Deep Bed Farming has on the communities we service by doubling crops yields. Aftrak has the potential to take this to the next level, speeding up land preparation and making it more accessible, while also providing green energy to even the most remote communities. Creating a productive and strong foundation to empower communities

Aftrak has been shortlisted for the Milken-Motsepe Prize in Green Energy and a US\$1mn funding boost on 2 November 2023.




Image Credit: Adobe Stock

Tiyeni has created an innovative agricultural method called Deep Bed Farming (DBF), which is a three-stage process that combats the devastating impacts of hardpan.

to thrive is at the heart of Tiyeni's mission, and combining Deep Bed Farming and Aftrak can truly turn the tide on food and energy insecurity."

Country director for Tiyeni, Isaac Monjo Chavula further stated that their work would have a huge impact on people in Malawi. He also confirmed their commitment to use the resources of this prize to improve the livelihoods of smallholder rural farmers. "The role of the Aftrak is so significant as it completely reduces drudgery in breaking the compacted soils, making of beds, and creating furrows for rainwater harvesting, leading to more than doubling crops yields. The clean power that comes with it is so transformational to the off-grid communities whose lives shall never remain the same."

Following successful tests at Loughborough University, the Aftrak system will be tested in Malawi next year. In addition, the system will also be tested in South Africa in February 2024, prior to the announcement of the award winner at the Milken Institute Conference in May.

"We've already been hugely successful in reaching this stage of the award process and we are very proud to have created two prototype Aftrak tractors and two solar microgrids," said project lead and lecturer in Sustainable Energy Systems at Loughborough University, Dr Jonathan Wilson. "This has allowed us to demonstrate our system here in Loughborough with the first system due to arrive in Malawi. We are poised to make a significant impact in Africa." 

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With Nigeria's wheat imports costing the foreign reserve more than US\$2bn annually, a number of strategies are now underway to help the country achieve self-sufficiency in this critically important cereal crop.

Nigeria's journey towards wheat self-sufficiency

SURGING LOCAL DEMAND has caused wheat to become a strategic crop to Nigeria. Despite this, wheat imports in the East African nation have been on a steady rise, resulting in the crop becoming the second largest contributor to the country's food import bill. A decline in production is clearly to blame. According to the Journal of Agriculture and Environment, as of 2021, the importation of more than five million metric tonnes of wheat has cost Nigeria's foreign reserve more than US\$2bn annually. To turn things around, a number of strategies are now underway to help the country achieve self-sufficiency in this critically important cereal crop.

Nigeria has been constantly trying to navigate a plethora of difficulties facing wheat production, ranging from unfavourable climatic conditions, lack of mechanised farming techniques, limited access to improved seed varieties, inadequate irrigation infrastructure, and high cost of production, among others.

Ukraine lends a hand

Standing by their goal of raising up to US\$1bn to meet the urgent humanitarian needs of countries struggling with massive food shortages, Ukrainian President, Volodymyr Zelenskyy on 26 November 2022, launched the humanitarian food programme 'Grain from Ukraine,' with special focus on countries including Ethiopia, Somalia, Nigeria, Kenya, Tanzania, Mozambique and Zimbabwe among others. Moreover, in January this year, Ukraine expressed interest in supporting Nigeria through its journey towards self-sufficiency by

Vice president, Kashim Shettima highlighted Nigeria's target towards achieving 50% self-sufficiency in the next three cycles and becoming 100% self-sufficient by 2027.



Image Credit: Adobe Stock

Nigeria has been constantly trying to navigate a plethora of difficulties facing wheat production, ranging from unfavourable climatic conditions, lack of mechanised farming techniques and high cost of production, among others.

establishing grain hubs in the country.

Following the war with Russia however, grain exports from Ukraine have sadly come to a halt. According to a report by AP news, Kremlin spokesperson, Dmitry Peskov on 17 July stated that the Black Sea Grain initiative – a breakthrough wartime deal that allowed the flow of grain from Ukraine to hunger-stricken countries in Asia, Africa and the Middle East – would be suspended until the Russian demands to get food and fertiliser to the world are met. The deal has since not been renewed after its third term in July 2023, causing grain prices to hit the roof.

AfDB's efforts to scale up wheat production

The African Development Bank (AfDB) Group through the issue and approval of high-value grants, has extended its support to Nigeria during these pressing times. Along with the partnership of the Islamic Development Bank (IDB) and the International Fund for Agricultural Development, the AfDB has agreed to grant US\$1bn to deliver special Agro-Industrial Processing Zones (SAPZs) in 24 states of Nigeria. While addressing the gathering of stakeholders and investors at the Norman Borlaug International Dialogue, Nigeria's vice president, Kashim Shettima highlighted Nigeria's target towards achieving 50% self-sufficiency in wheat production in the next

three cycles and becoming 100% self-sufficient by 2027.

According to a report by allAfrica, Shettima also mentioned the launch of the wheat project on 10 November. As part of its wheat self-sufficiency drive, the government has planned to cultivate 250,000 ha of wheat during the 2023-24 cropping season.

Bühler to launch new grain processing centre in Kano

Swiss industrial equipment company, Bühler is providing technology to meet Nigeria's grain production needs, with its new Grain Processing and Innovation Centre (GPIC), scheduled to open in early 2024 in the northern Nigerian region of Kano. This region is also known to be the trading and processing hub for agricultural commodities reaching West Africa, with many climate-resilient local grain varieties being traded here. Local grains play a key role in addressing food security due to their nutritional value and ability to cope with climate-change related stresses such as drought, heat, salinity, and shorter growing seasons.

Based in a three-floor building spanning an area of 480 sq m, the GPIC will help to bridge the gap between the test bench and industrial-scale production without the requirement of large investments by

producers. Its grain cleaning, optical sorting, dehulling, preparation, tempering, and milling sections will ensure process validation, while also optimising the production process, and acting as a centre for developing new products.

Population growth, unstable supply chains, and an unsustainable model of grain import are the main drivers in the search for a more efficient food supply, with the high cost of food and tradable goods accounting for the bulk of rising inflation in sub-Saharan Africa. The region is therefore seeking to reduce its dependence on wheat imports, particularly from Russia and Ukraine, through local grain production and processing. Bühler, with the establishment of the GPIC, is contributing its techno-

Bühler is providing technology to meet Nigeria's grain production needs, with its new Grain Processing and Innovation Centre (GPIC), scheduled to open in early 2024 in Kano.



Bühler's Grain Processing and Innovation Centre (GPIC) will support local producers in the development of safe and affordable food.

Image Credit: Bühler

logical expertise to this vision.

According to the World Health Organisation (WHO), by the end of this century, Nigeria – Africa's biggest economy – will be the world's second most populous country after India. This rapid growth, driven by a high fertility rate, will place enormous strain on the price of available food and the already fragile social services and infrastructure. In the journey to sustainable food security, the first hurdle is for Nigeria to feed itself and then for it to feed the rest of Africa.

"Achieving food sovereignty and security requires a plan: 60% of the world's uncultivated arable land is in Africa, and Nigeria has the most arable land on the continent, at 34 million hectares. Nigeria must grow and process what it eats," said Bühler Nigeria's head of the Grain Processing and Innovation Centre, Ali Hmayed. "Bühler and our food processing partners understand this need and share the belief that the empowerment of Africa starts by adding value to its natural resources in their country of origin." **B**



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Adopting precision irrigation techniques such as subsurface drip irrigation helps in maintaining optimal soil moisture and nutrient levels in all conditions, while also ensuring consistently high, top-quality yields every season, enabling farmers to make bigger profits.

Subsurface drip irrigation promises bright future for alfalfa



Image Credit: Adobe Stock

Alfalfa is well known for its deep root system that can extend to 8-15 ft, enabling it to be remarkably resistant in severe drought conditions.

THE AGRICULTURE SECTOR contributes immensely to the economy of Ethiopia, accounting for 40% of the gross domestic product (GDP) and offering employment to nearly 75% of the country's population. One of the major components of Ethiopia's agriculture includes livestock production, which primarily depends on the quality and availability of feed resources. For maximum productivity, high-yielding forages that are adaptive and tolerant to drought are often cultivated.

An example of one such crop is *Medicago sativa*, popularly known as alfalfa. Besides its remarkable productivity and quality of herbage, the plant is also characterised by its ability to withstand long periods of water deficit and enrich the soil through symbiotic nitrogen fixation. These properties make alfalfa one of the most widely grown forage crops in the world. When fed to cattle, the crop is found to significantly increase animal productivity, particularly milk yield. Moreover, alfalfa comprises a number of genotypes that need to be kept in mind during selection. Environmental adaptation, herbage dry

matter yield potential and seed bearing ability of the genotypes are some of the important factors that need to be considered while selecting alfalfa genotypes in Ethiopia.

Based on these factors, a study performed in 2021 evaluated six alfalfa genotypes, namely FGI-9001, FGI-5282, FGI-8091, FGI-1011, FGI-3054 and FGI-0916, that were found to be competent for quality supply in the Ethiopian crop livestock farming system, both in terms of feed requirement and nutritional demand of animals in the country. Among these six genotypes, the FGI-9001 genotype was found to be superior in all parameters of the study, and was recommended to be

Besides its remarkable productivity and quality of herbage, alfalfa is also characterised by its ability to withstand long periods of water deficit and enrich the soil through symbiotic nitrogen fixation.

produced in testing environments and similar agro-ecologies.

Ethiopia water crisis

With Ethiopia's economy being largely reliant on agriculture, water availability is crucial for the country's progress. The Awash River basin is one of Ethiopia's most economically and socially important basins, representing about 10% of the country's land and 17% of its total population. However, the high frequency of droughts and floods experienced in the basin, along with the region's uneven terrain, makes it extremely vulnerable, especially with the threat of climate change looming over the world. According to an article published by the University of Oxford, a modest 5% decrease in rainfall could cause a 10% decrease in agricultural productivity, reducing the GDP derived by the basin by 5%.

According to research conducted by the University of Oxford, water availability is expected to continue declining progressively until the end of the century, with the findings being particularly critical for the key irrigation period from April to June.

Ethiopia's water issue also greatly affects the growth of perennial crops such as alfalfa, that are uniquely demanding and water intensive. The crop is well known for its deep root system that can extend to 8-15 ft, enabling it to be remarkably resistant in severe drought conditions. However, the crop does require a consistent water supply to thrive. Even a little stress caused by too much or too little water will likely have a negative effect on its growth, development and overall quality. This is why unpredictable climates and wasteful irrigation methods are generally unsuitable for the growth of alfalfa.

Precision irrigation to the rescue

Adopting precision irrigation techniques such as subsurface drip irrigation (SDI) help in maintaining optimal soil moisture and nutrient levels in all conditions across the entire alfalfa field. Techniques like these give the farmer total control over the alfalfa root zones, thus enabling direct delivery of water and nutrients to the roots of each plant. Furthermore, digital controls added to the system help in monitoring and optimising crop yield, thus helping farmers obtain data about every aspect of their field and local climate. Most importantly, techniques like these ensure consistently high, top-quality yields every season irrespective of where and how the crops are grown, thereby enabling farmers to make

SDI systems deliver water with an efficiency of 95% or higher, while also minimising water loss due to evaporation and runoff, making them suitable for regions with minimum irrigation water.



SDI driplines are installed in such a way that they only wet a fraction of the soil volume, thus leaving space in the soil to store rainwater.

Image Credit: Adobe Stock

even bigger profits.

Among all the irrigation methods, precision irrigation is best suited for alfalfa growth. Although not cheap, this method ensures higher yields of better quality, every season. Moreover, unlike other methods such as flood or pivot irrigation, precision irrigation techniques ensure uniformity of crops, offering farmers a chance to do an additional harvest, since irrigation can be carried out immediately after the previous harvest. Another notable advantage of precision irrigation is its ability to work well even on uneven terrains. By installing pressure-compensated (PC) dripper lines to the system, water and nutrients can be delivered to each plant with uniform flow rates across the entire field.

Subsurface drip irrigation

Compared to on-surface systems, subsurface drip irrigation (SDI) systems are found to be more suitable for alfalfa field operations, given the plethora of additional benefits that they deliver such as:

- **Lower labour requirements:** The amount of manual labour required to operate SDI systems is much less when

compared to surface irrigation systems. Moreover, these systems can be easily automated, indicating their potential to significantly reduce labour.

- **Enhanced water-use efficiency:** In the SDI system, driplines are generally installed in the soil in such a way that they only wet a fraction of the soil volume when compared to other systems, thus leaving space in the soil to store rainwater. This in turn reduces the net irrigation requirements. Furthermore, these systems deliver water with an efficiency of 95% or higher, making them suitable for regions with minimum irrigation water. Water loss due to evaporation and runoff can also be minimised.
- **Significant improvements in crop yield:** Fertilisers along with numerous chemicals including acids, chlorine and pesticides can be injected into the irrigation water through the SDI system. The quantity of water and other inputs can also be regulated to match the crop requirements. Moreover, SDI can also be automated, which enables frequent water applications. The system therefore increases yields, while at the same time



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decreasing nutrient losses.

- **Low energy consumption:** Significant energy savings have been reported through the use of SDI systems, mainly due to the relatively low pressure that they operate at, and the small flow rates delivered. This enables SDI systems to operate with smaller pumps than will be required for a centre pivot or furrow system.

Moreover, these systems also prefer modern tillage practices such as no-till and minimum tillage. However, according to a report published by the University of Nebraska, farmers who have used SDI in their fields have experienced issues due to:

- **Bad design or installation:** Design, installation, operation and maintenance phases are critical to SDI systems. Among these, the design phase is most important, since the system once installed, cannot be modified easily. The recovery value of an abandoned SDI system is also very low. Therefore, working with an experienced designer is a good investment. Installation of the SDI system is also crucial for the system to function adequately. Following installation, water needs to run through the driplines to help detect leaks and open the flow path. Any defects would cause the soil to consolidate around the collapsed dripline, thereby restricting the flow of water.
- **Rodent problems:** Rodents appear to be one of the leading causes of unsuccessful SDI systems. Although leaks can be detected either through field inspection, pressure drop measurements or high flow rates in the system, locating and detecting single or multiple leaks caused by rodents is a difficult task since it requires exposing the tape through

Water consumption, water consumption intensity and water use efficiency (WUE) are important criteria for determining whether the irrigation application amounts are reasonable.

digging. To avoid rodent-related issues, the potential for rodent infestation in the area should be carefully evaluated prior to installation, and rodent control and prevention programmes should be implemented accordingly.

- **Improper system maintenance:** Proper maintenance is absolutely necessary for SDI systems to be successful. One of the main issues that these systems often face is emitter clogging. To avoid this, a water quality test should be performed prior to designing the system, to figure out the potential problems that influence the system design, performance and maintenance needs. Moreover, operating an SDI system requires special periodic maintenance operations such as chlorination and acid injection, which are not required for other systems. This is why management time requirements for SDI can be higher than for other irrigation systems.

Impact of SDI on Alfalfa yields and water consumption

A 2021 study published in the Journal of Sensors examined the effects of varying combinations of water and fertiliser applications on the water consumption and yields of alfalfa under the SDI system.

Water consumption, water consumption intensity, and water use efficiency (WUE) are

important criteria for determining whether the irrigation application amounts are reasonable, especially WUE, which is considered to describe the physiological indicators of alfalfa growth, especially the relationship between harvest yield and crop water consumption. From this study, an increasing trend in water consumption levels of alfalfa was observed with the increase of irrigation.

Moreover, fertiliser application was found to have a profound effect on the water consumption levels during different stages of alfalfa growth, thereby indicating that fertilisation, having an obvious water regulating effect, was indeed a sensitive factor. Proper fertilisation could therefore significantly improve water consumption and WUE. Furthermore, alfalfa's water consumption during each growth stage under low, medium and high water treatment conditions showed a trend of initial increase, followed by decrease.

A positive link was noticed between WUE and hay yield and the synergistic effects between water and fertiliser. The irrigation amount and nitrogen application rate were also found to have significant effects on the total hay yield of alfalfa. Given its obvious water regulating effect, an appropriate N-supply could effectively stimulate plant growth, while improving WUE and alleviating the effects of drought stress. Presence of excess water can also reduce alfalfa hay yield by causing soil nutrient leaching to occur, thereby reducing soil permeability and hindering root respiration and nutrient uptake by the crop.

It could therefore be concluded that when SDI was within an appropriate amount of water and nitrogen fertiliser, it proved to be a promising irrigation method which could effectively increase the WUE and hay yield of alfalfa. **E**



Fertiliser application was found to have a profound effect on water consumption levels during different stages of alfalfa growth.

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Enhancing weather forecasting accuracy and communication can help strengthen Sub-Saharan Africa's agriculture sector, thus contributing to poverty reduction and food security goals in line with SDGs 1 and 2.

Weatherproofing Malawi's agriculture sector

ACCORDING TO A study reported by Frontiers, emphasis is placed on the crucial role of weather forecast information in mitigating climate change risks for the agriculture sector in East and West Africa. The review reveals that weather information studies primarily focus on agriculture, highlighting its vulnerability to extreme weather events such as floods, droughts, and storms. The agriculture sector, employing 65-70% of the labour force and supporting 90% of household livelihoods in East and West Africa, is highly susceptible to climate variability and change.

Improved weather forecasting and communication of weather warnings are identified as essential tools to minimise the impact of extreme weather on agriculture. The study underscores the need for accurate and timely weather forecasts, accessible through various channels like radio, mobile phones, and television, to empower farmers in making informed decisions. However, challenges such as poor communication, technical understanding, and limited access hinder the effective use of weather information.

The review stresses the urgency of assessing high-impact weather forecasting in Sub-Saharan Africa to safeguard economies and livelihoods. By enhancing weather forecasting accuracy and communication, the agricultural sector's resilience can be strengthened, contributing to poverty reduction and food security goals in line with Sustainable Development Goals 1 and 2. The importance

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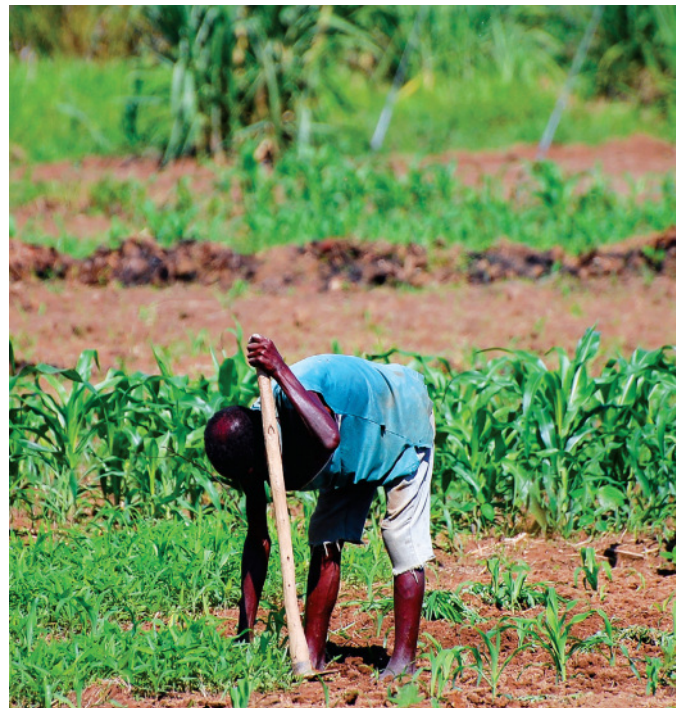


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Improved weather forecasting and communication of weather warnings are identified as essential tools to minimise the impact of extreme weather on agriculture.

of mainstreaming capacity-building for key stakeholders is certainly highlighted to ensure the effective adoption and strengthening of climate information services.

PICSA induces positive impact

The implementation of PICSA (Participatory Integrated Climate Services for Agriculture) in Malawi, under the GCF-funded UNDP-supported project "Saving Lives and Protecting Agriculture Based Livelihoods in Malawi: Scaling Up the Use of Modernised Climate Information and Early Warning Systems" (M-Climes), has significantly benefited the country's agriculture sector. PICSA operates on the principle of 'the farmer decides' and 'options by context,' ensuring a bottom-up approach that considers farmers' specific needs.

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Implemented in 14 food-insecure districts, PICSA collaborated with existing farmer groups using the lead farmer extension model. The project involved the co-development of tailored weather and climate-based agricultural advisories disseminated through ICT/mobile, print, and radio channels. Extensive data collection in 2018 and 2020 revealed that PICSA successfully modified farmers' use of seasonal forecasts, leading to improved crop varieties and increased crop yield. Beneficiary farmers were also less reliant on alternative income sources, indicating a positive impact on poverty indicators, particularly for women engaged in such activities.

The on-the-ground assessment demonstrated that PICSA induced positive changes in farmers' practices, resulting in tangible gains in yields and income. While addressing challenges like illiteracy and ensuring long-term sustainability through regular trainings remains crucial, PICSA emerges as a powerful approach for policymakers to help farmers cope with climate uncertainty and enhance their overall well-being. The project's integration into the national extension strategy further enhances its potential for long-term impact.

OpenHarvest: A transformative step to shaping Malawi's agriculture future

Building on the positive strides made by initiatives like PICSA, the introduction of the digital tool 'OpenHarvest' by IBM and Heifer International marks a transformative step towards shaping the future of agriculture in Malawi. As highlighted earlier, Malawian smallholder farmers face challenges due to unpredictable weather patterns, outdated agronomy practices, and limited access to crucial information. OpenHarvest addresses these challenges by providing advanced technology, AI-driven recommendations, and

Besides weather-related recommendations, OpenHarvest seeks to connect farmers to affordable capital and formal markets.

aspects but also building trust and facilitating hands-on support.

OpenHarvest goes beyond weather-related recommendations; it seeks to break the cycle of poverty by connecting farmers to affordable capital and formal markets. The digital extension solution incentivises farmers to adopt best practices, fostering long-term profitability and success in the face of a changing environment and economy.

The initial impact in the district of Mchinji has been promising, with increased yields and improved outcomes for participating farmers. The plan to expand into Kasungu and onboard additional farmers reflects the scalability and potential for broader positive change. The programme's commitment to continuous innovation, such as building robust AI models, ensures its relevance and effectiveness in the dynamic agricultural landscape of Malawi.

Certainly, initiatives like OpenHarvest, coupled with the lessons learned from PICSA, exemplify the transformative power of technology in shaping sustainable and resilient agricultural practices. By addressing the specific challenges faced by smallholder farmers in Malawi, these initiatives not only enhance productivity and income but also contribute to long-term environmental sustainability and economic growth. The collaboration between NGOs, technology companies, and local communities demonstrates a powerful model for creating positive change and building a more resilient future for agriculture in Malawi. **E**

Image Credit: Adobe Stock



OpenHarvest empowers farmers with tools needed to make informed decisions.

specialised weather forecasts, empowering farmers with the tools needed to make informed decisions.


OpenHarvest's innovative approach utilises an open-source platform and a mobile application to offer visual agricultural data, AI-driven recommendations, and better farm and field management. The model assigns latitude-longitude points to each farmer's field, triggering personalised recommendations based on local weather and crop growth stages. The tool also monitors soil composition data, optimising fertiliser application.

Recognising the constraints of smartphone ownership among farmers, OpenHarvest cleverly employs SMS text messages for information sharing. This ensures accessibility and affordability for end-users who may not own smartphones. The collaborative effort between Heifer International and IBM, supported by community facilitators and volunteers, demonstrates a holistic approach to technology implementation, addressing not only the technical

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BeCrop technology to receive new upgrades

BIOME MAKERS INC. will be announcing new updates to its BeCrop technology in an exclusive webinar scheduled to take place on 29 November. This latest version transforms agricultural decision-making with advanced, user-friendly features, providing agronomists and ag retailers with critical insights for identifying biological bottlenecks and choosing which biological product is the right fit. These insights enable industry professionals to anticipate potential yield losses, gauge disease susceptibility, and gain multifaceted insights crucial for effective agricultural management. Stakeholders can utilise this technology to proactively monitor and manage soil conditions and accomplish company goals with data-driven soil health and sustainability insights.

CNH brands emerge as medallists at Farm Machine 2024 awards

CNH ON 12 November, announced that its brands had won the most medals at the Farm Machine 2024 awards which took place at the Agritechnica show in Hanover, Germany.

Standing first in the Combine Harvesters category, is the New Holland CR11, the brand's latest and most advanced combine harvester that has been developed to provide higher productivity with minimal grain loss, improved residue management, and more automation.

Sweeping in second is the New Holland T7.270 Methane Power CNG tractor, that was awarded in the Upper Class Tractor category. The tractor features an evolution of the existing methane-fueled engine for the T6 line-up to match the higher horsepower and performance of the T7 range. Its production is set to begin in the second half of 2024.

Coming third is the Case IH Farmall 75C Electric, that was named best Utility Tractor at the awards. This model is part of CNH's first electric drive tractor platform where the industry's first fully electric tractor with autonomous features, was introduced.

These three medals join five other awards picked up by the CNH brands at the Agritechnica Innovation Awards, raising the company's total Agritechnica medal count to eight.

"These continued industry recognitions confirm that our R&D investments and commitment to 'Be the Best' are delivering customer inspired innovations that make farming easier, more efficient, and more sustainable for our customers," said Scott W. Wine, CEO at CNH.

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