

Far Eastern Agriculture

Crops

Choosing the right fungicide



Victam Asia preview. p8

Coping with climate-sensitive diseases in livestock

The looming threat of antibiotic resistance

IoT to improve health and safety in agriculture



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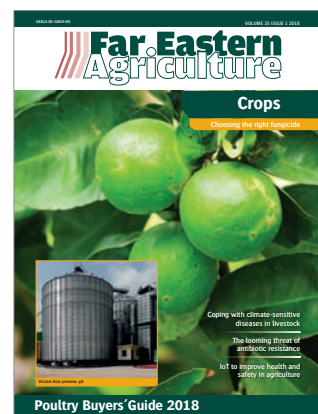


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Photo: Awila



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Serving the world of business

BPI and PIC to modernise pig farming in Philippines

AYALA-LED BANK OF the Philippine Islands (BPI) has extended its partnership deal with PIC, the local unit of world-leading animal genetics company Genus plc, to promote the modernisation of pig farming in the Philippines.

An extension of an initial partnership signed by BPI with PIC in 2013, the new deal was signed in January to extend the partnership for another five years. The partnership was established to help in achieving the United Nations sustainable development goals, such as eradicating hunger and promoting the use of biogas facilities that convert farm waste to energy alongside climate-controlled and -resilient farms.

According to *Philippine Daily Inquirer*, BPI president Cezar Consing said, “A lot of the livestock diseases comes from backyard producers so you have to raise the standards and you have got to raise the output because the amount of land for agriculture is getting smaller as it’s being converted to real estate and commercial areas.”

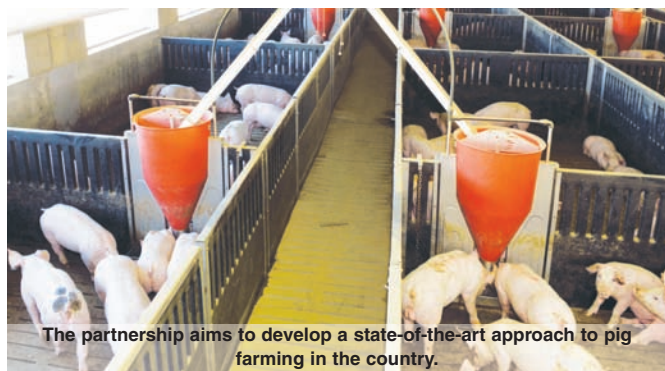


Image Credit: curto/Stock Adobe

The partnership aims to develop a state-of-the-art approach to pig farming in the country.

ADM opens food innovation centre in Singapore

ARCHER DANIELS MIDLAND Company (ADM) has opened a 825 sq m cutting-edge flavour and ingredient creation, application, development and customer innovation centre at the Biopolis research hub in Singapore.

“Consumer tastes and preferences are changing, as people look to balance busy lifestyles with healthy eating habits. Our goal is to be the first-call ingredient and flavour experts for customers working to meet those consumer needs throughout Southeast Asia,” said Donald Chen, ADM’s president, Asia, adding, “Singapore is a critical hub of innovation and growth in the food and beverage world, and we are excited to leverage our technology, expertise and global scale to help Southeast Asian food and beverage customers remain at the forefront, and to offer job creation and talent development opportunities for scientific, technical, marketing and regulatory professionals in the food and beverage industries.”

The Singapore innovation centre will serve as the gateway to consumers in Southeast Asia and beyond, and enable ADM to work closely with customers to create complete flavour and specialty ingredient solutions that meet consumer preferences for taste, nutrition, function and texture.

Cargill unveils first fish feed facility in India

CARGILL OPENED ITS first fish feed plant in the state of Andhra Pradesh. The plant was established at a cost of US\$108,710 to produce high-quality feed to fish species. The new plant produces fish feed products for carp, tilapia, and other warm water species. Cargill currently works with toll millers in the region, selling about 30,000 tonnes of fish feed a year. The new plant, with a capacity of 90,000 tonnes per year, enables Cargill to triple its fish feed capacity

for customers in the region. It marks an important step in Cargill’s work to develop its aquafeed business in India and across Asia.

Managing director of Cargill Aqua Nutrition in South Asia Chad Gauger said that India is an important and fast growing aquaculture market, and they are excited to better serve farmers across Andhra Pradesh, West Bengal, Tamil Nadu, and Odisha. “The new facility positions us to better meet their demand, as the country will soon become the most populous in the world,” he said, adding that the new plant would generate employment to more than 200.

Nutriadi acquires partners’ interest in China

NUTRIAD HAS ACQUIRED the 45 per cent share stake of its Chinese local partner into FFI. Upon completion of the share purchase, Nutriad will own 100 per cent of the Nantong based company, that produces and markets a palatability portfolio in China. The company reconfirmed its ambition to achieve accelerated growth in the Chinese feed market and increase its’ market share across all species. Terms of the deal were not disclosed. China is the leading producer of livestock products and animal feed. Over the past decades the country has continuously increased commercial feed production, reaching an estimated volume of around 200mn metric tonnes. The market trend of consolidation and innovation is backed up by a growing protein demand. Dominant in pork production and with strong developments across other species provides, the market provides opportunities for product offering targeting feed and food safety, gut health, preservation and feed intake.

“Feed Flavour International is a leading local producer that recently moved to a new state of the art facility in Nantong. The supply chain capacity, quality of back office and sales/technical support complements the existing Nutriad business in China,” says Nutriad.

Mitsubishi to launch Thai poultry processing

MITSUBISHI CORP WILL open a plant in Thailand to fry, steam and freeze chicken for export to Japan and elsewhere, under a joint venture with local food company Betagro Group. According to *Nikkei*, the US\$53.2mn poultry processing facility is slated to debut in October this year in an industrial park in the central province of Saraburi. The factory, about 90km north of Bangkok, is expected to produce 30,000 tonnes of processed chicken meat a year. While some of the meat will be sold in Thailand or exported to Singapore, Hong Kong and elsewhere, Japan will be the main market. The Japanese company will take a 50 per cent stake in the joint venture, while group affiliate Itoham Yonekyu Holdings and Betagro each take 25 per cent. A Betagro subsidiary processes 90mn broilers a year north of the planned factory, and Mitsubishi owns 25 per cent of the broiler business as well. This broiler site will be a main supplier of chicken meat for the new processing plant.



Image Credit: nskyr2/Stock Adobe

The factory, about 90km north of Bangkok, is expected to produce 30,000 tonnes of processed chicken meat a year.

Events 2018

MARCH

14-16	ILDEX VIETNAM	Ho Chi Minh City, Vietnam	www.ildex.com.vn
27-29	VICTAM Asia	Bangkok, Thailand	www.victam.com

APRIL

08-10	CIMAE China International Modern Agricultural Exhibition	Beijing, China	www.cimae.com.cn
19-21	Livestock Asia Expo & Forum	Kuala Lumpur, Malaysia	www.livestockasia.com

MAY

16-18	Feed Additives Asia 2018	Bangkok, Thailand	www.feedadditives-global.com
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JUNE

06-08	SIMA ASEAN	Bangkok, Thailand	www.sima-asean.com
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JULY

04-06	INDO LIVESTOCK Expo & Forum	Jakarta, Indonesia	www.indolivestock.com
25-27	INAGRITTECH 2018	Jakarta, Indonesia	www.inagritech-exhibition.net
26-28	Livestock Taiwan Expo	Taipei	www.livestocktaiwan.com
26-28	Aquaculture Taiwan	Taipei	www.aquaculturetaiwan.com
26-28	Asia Agri-Tech Expo	Taipei	www.agritechtaiwan.com

AUGUST

22-24	AGRITECTNICA ASIA	Bangkok	www.agritechnica-asia.com
22-24	HORTI ASIA	Bangkok	www.horti-asia.com

Methane from Indian livestock adds to global warming

A NEW STUDY has found that methane produced by India's livestock population, considered the world's largest, can significantly raise global temperatures. The new study is designed to help predict climate change linked to greenhouse gas (GhG) emissions from farm animals and was carried out by the Indian Institute of Technology Delhi and the Deenbandhu Chhotu Ram University of Science and Technology, Murthal.

The study was published in *Ecotoxicology and Environmental Safety* and show that the Indian livestock emitted 15.3mn tonnes of methane in 2012. Globally, the livestock sector is a major source of anthropogenic (human-induced causes) methane emission with annual global contribution of 14.5 per cent.

Shilpi Kumari, corresponding author of the study, told *SciDev.Net* that the livestock sector in India has the potential to cause surface temperatures to surge up to 0.69 millikelvin over 20-year time period which is roughly 14 per cent of the total increase caused by the global livestock sector.

"The impact on climate change is global in result, so the negative impact due to livestock emission is not restricted to India," said Kumari. India, with a livestock population of more than 500 million head, leads livestock-dominant countries such as Brazil, China and the US.



India has a livestock population of more than 500mn head. (Nullplus/AdobeStock)

Cattle and buffalo were found by the study to be the major sources of methane among India's livestock accounting for 98 per cent.

Better livestock rearing practices such as using suitable feed types and improving livestock productivity can achieve reduction in methane emission, she added.

Growth of livestock population is the key factor influencing levels of atmospheric methane. However, environmental risk management through improved livestock productivity, population stabilisation, better feed and manure use could reduce methane levels.

Food Outlook

THE FAO FOOD Price Index (FFPI) averaged 169.8 points in December 2017, down 5.8 points (3.3 per cent) from November with the steepest declines registered in the prices of dairy, vegetable oils and sugar while those of cereals and meat also fell but only slightly. For the whole of 2017, the FFPI averaged 174.6 points, up 8.2 per cent from 2016 and representing the highest annual average since 2014 although still 24 per cent below the 2011 high of almost 230 points. While sugar values plummeted in 2017, dairy and meat prices registered sharp year-on-year increases and those of cereals and oils rose too, albeit more modestly.

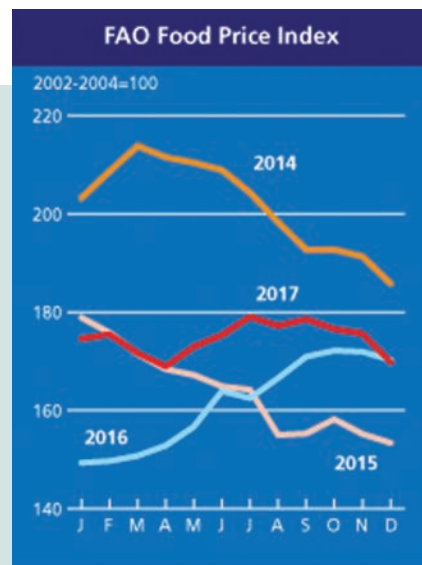
The FAO Cereal Price Index averaged 152.7 points in December, down marginally from November but still up 7.4 per cent from December 2016. Ample supplies and slower sales contributed to weaker wheat prices. However, international maize prices firmed slightly, mostly reflecting weather concerns in Argentina, while those of rice also inched up further, amid continued firm demand and currency appreciations in some leading

exporting countries. The FAO Vegetable Oil Price Index averaged 162.6 points in December, down 9.6 points (5.6 per cent) from November, marking a five month low. The drop mainly reflects lower quotations for palm, rapeseed and soybean oils. International palm oil prices tumbled, as stocks in Malaysia and Indonesia swelled to two-year highs on the back of relatively strong production and weak export demand.

The FAO Meat Price Index averaged 171.6 points in December, marginally below its slightly revised value of November. International price quotations for bovine meat fell, pressured by increased offerings in both domestic and international markets. However, pig, poultry and ovine meat quotations changed only little, reflecting an overall balanced supply and demand situation. The FAO Dairy Price Index averaged 184.4 points in December, down 19.8 points (9.7 per cent) from November, marking the third successive month of decline. High export supplies in the face of subdued demand weighed on the international prices of all the four milk

products that constitute the Index.

The FAO Sugar Price Index averaged 204 points in December, down 8.6 points (4.1 per cent) from November. After a relatively strong rebound in November, international sugar quotations fell back in December due to seasonal pressure, subdued demand and expectations of a large surplus in 2018. Over the year, the FAO Sugar Price Index averaged 227.3 points in 2017, down 11.2 per cent from 2016 and as much as 38 per cent from its 2011 peak of 369 points.



Bühler builds the world's first ultra-low-emission coffee processing plant

BÜHLER IS BUILDING the world's most advanced coffee processing plant for the Norwegian coffee producer Joh Johansson. It combines innovative roasting technology with record low greenhouse gas emissions. The coffee roasting biogas is close to carbon neutral, making the processing plant with the lowest emissions globally possible. "With Bühler, we have found a solution partner that fully understands our sustainability concerns and is capable of putting them to practice," said Espen Gjerde, CEO of Joh Johansson.

Bühler was awarded the contract for building the world's most efficient climate- and environmental-friendly coffee processing plant in June 2017.

Coffee continues to be a growth market with growth rates of about three per cent worldwide. After the considerable efforts of processors to achieve sustainable sourcing of green coffee, the focus is now being increasingly set on the manufacturing process in the coffee factory. This is because this process consumes a lot of energy: a factory with an annual processing capacity of 10,000 tonnes consumes roughly 870 kW – about as much as 100 Norwegian households.

For this low-carbon production plant, Bühler will supply the complete process



Image Credit: Bühler

Bühler's infinity roast technology for the coffee industry.

technology – from green coffee intake to cleaning, blending, roasting, and grinding.

For the roasting process, Bühler has fitted its Infinity Roaster with a unique preheating unit and a novel energy recovery system. The system operates on the basis of collecting heat by multiple heat exchangers allowing centralised intermediate storage of the energy released by the process in temperature-

stratified water tanks. The energy stored is largely used for powering the same roasting process and preheating of green coffee, but may also be reused – say – for raising the temperature of the incoming cold air. Some of the energy will also be used to heat the offices and laboratories. This technology reduces the energy consumption of the roasting process by 50 per cent, which accounts for as much as 80 per cent of the entire energy consumption. The total balance of electric power required by the factory is covered by huge solar cells. Moreover, the planned facility will boast one of the most advanced off-gas purification units for roasting systems: regenerative thermal oxidation (RTO) allows smart control of the air currents, which in turn enables heat to be stored and returned to the process.

The entire plant is operated by a highly complex, smart, and automated process control system, which measures the product temperature inside the roasting chamber at intervals of a second and fine-tunes the process in the presence of even the slightest changes. This produces maximum profile accuracy, which has a direct impact on the quality consistency of the coffee's taste and on flexibility.

Media urged to raise awareness about climate change

WITH THE EFFECTS of climate change and extreme weather events disproportionately affecting people in Asia and the Pacific, the Food and Agriculture Organisation of the United Nations (FAO), has urged the region's media to focus more attention on raising awareness of the need for all stakeholders to scale up adaptation and mitigation efforts to protect Asia-Pacific's agriculture and food systems for current and future generations.

The call was made at a meeting of broadcasters from across the region during the Asia-Pacific Broadcasting Union's 4th Media Summit on Climate Change and Disaster Risk Reduction in Fiji, a country on the front line in experiencing some of the worst effects of climate change and increasingly severe weather patterns.

In welcoming remarks, Fiji's Prime Minister Frank Bainimarama told the ABU's 160 delegates from 22 countries, "The threat that climate change poses to the entire world is undoubtedly the greatest collective challenge humanity has ever faced." His speech was delivered by Aiyaz Sayed-Khaiyum, Fiji's attorney-general and minister for finance, who

is also responsible for policy and actions to respond to the effects of climate change.

Fiji currently holds the presidency of COP23, the ongoing round of UN negotiations to reduce the emissions of carbon dioxide in the atmosphere. This month, Fiji also marks the second anniversary of the devastation caused by Tropical Cyclone Winston, the biggest storm to ever make landfall in the Southern Hemisphere. Forty-four people died and infrastructure was destroyed or badly damaged.

"We are at a crossroad for humanity – climate change and its impacts will make or break the world," the secretary-general of ABU, Javad Mottaghi, told delegates. "We at the ABU and our membership want to put the media at service of people and use it for constructive dialogue to face together the greatest challenge of our time – climate change."

ABU is the biggest broadcasting union in the world with 270 members in 69 countries and the ability to reach a collective audience of more than 3.5bn people.

The conference discussed ways for its

media membership to increase its 'climate change' news coverage, beyond reporting about disasters, and to include more about the challenges and work already being done across the region to adapt and mitigate the effects of climate change.

"More attention and visibility need to be given to climate action on agriculture," said Allan Dow, FAO regional communication officer for Asia-Pacific. "Countries of this region have signed up to the Paris Agreement and committed themselves to take action on climate change. Addressing the current and future risks of climate change to agriculture is a clear priority. Therefore, it's up to national media to monitor progress toward those nationally determined contributions (NDCs) and report on it."

As part of its commitment to help governments achieve the world's sustainable development goals (SDGs), especially relating to food security and zero hunger, FAO and partners are promoting many good practices such as conservation agriculture and 'climate smart agriculture' techniques in countries of Asia-Pacific.

Solar bubble dryer to aid paddy drying in Nepal

PADDY DRYING IS a big problem during the onset of the rainy season in Nepal. During springtime, rice harvested amounts to 10 per cent of the country's total rice production. However, farmers may lose 10 to 30 per cent of the rice produced when they are not able to dry it properly.


The collaboration between IRRI and Gesellschaft für Internationale Zusammenarbeit (GIZ) in Nepal has been initiated in order to provide a solution to the challenges faced by farmers in drying rice during spring. In a postharvest situation assessment of spring rice, Martin Gummert, head of IRRI's mechanisation and postharvest cluster, suggested the use of a Solar Bubble Dryer (SBD). This is a low-cost drying technology option for solving the drying problems by providing a simple and flexible alternative to sun drying, that offers protection of the grains from rain. It is also a climate smart technology as it does not require an external energy source.

As a part of the piloting strategy of this technology, a three-day training and demonstration of the SDB was conducted at the station of Nepal Agricultural Research Council in Khumaltar, Lalitpur District, Nepal. Participants were researchers, extensions agents, members of NGOs or of the private sector. The trainees actively participated in the discussion and hands-on exercises in the setting-up, operating, and troubleshooting the SDB. In addition, they were also presented with the basic principles on drying to further strengthen the participants' technical knowledge. There were also discussions on developing a business model for a drying service provision as a way forward to disseminate and promote adoption of the technology for farmers and end-users in the villages.


The executive director of National Agricultural Research Council (NARC), Dr Tek B Gurung cited in his message that farmers face a big problem on drying especially when the monsoon season starts. "As I see it, the SDB is not so expensive because it utilises the solar energy and farmers can maximise the use of this technology."

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Spotlight on the Asian feed and grain industry

With over 215 companies from more than 35 countries, Victam Asia 2018, to be held at BITEC in Bangkok from 27 – 29 March 2018, promises to throw the spotlight on the Asian feed and grain industry.

VICTAM ASIA IS one of the largest events dedicated to the animal feed processing, grain processing, ingredients & additives, aqua feed and pet food industries within Asia. The 2018 edition of the show will display the latest technology, ingredients and additives available to manufacture and process feed for animals, pets and aquatics, together with a wide range of necessary ancillary equipment – silos, conveyors, bagging, elevators, etc. The exhibition will also showcase the newest equipment for grain, rice and flour milling. VICTAM Asia 2018 is designed to give visitors a unique overview of the industry.

VICTAM Asia consists of three main profiles

Processing technology: VICTAM is the premier event for the sophisticated technology that is required in the processing and manufacture for the animal feed industry. The show also covers the important and very necessary ancillary equipment and systems that are utilised in a feed mill, rice mill and flour mill.

Ingredients and additives: FIAAP is the event for ingredients and additives that are used within the formulation of safe and cost effective animal feeds.

Milling (flour and rice): The GRAPAS event also displays ancillary equipment that is found within a mill, but its main coverage is for specialist systems and technology used within rice & flour mills, together with additional exhibits for grain storage, preservation and transportation. The show also profiles noodle, breakfast cereals and extruded snack production.

Each of the shows is complimented by a number of conferences on various current topics within the above mentioned industries.

The 2018 edition of the show will display the latest technology, ingredients and additives available to manufacture and process feed for animals, pets and aquatics, together with a wide range of necessary ancillary equipment – silos, conveyors, bagging, elevators, etc.

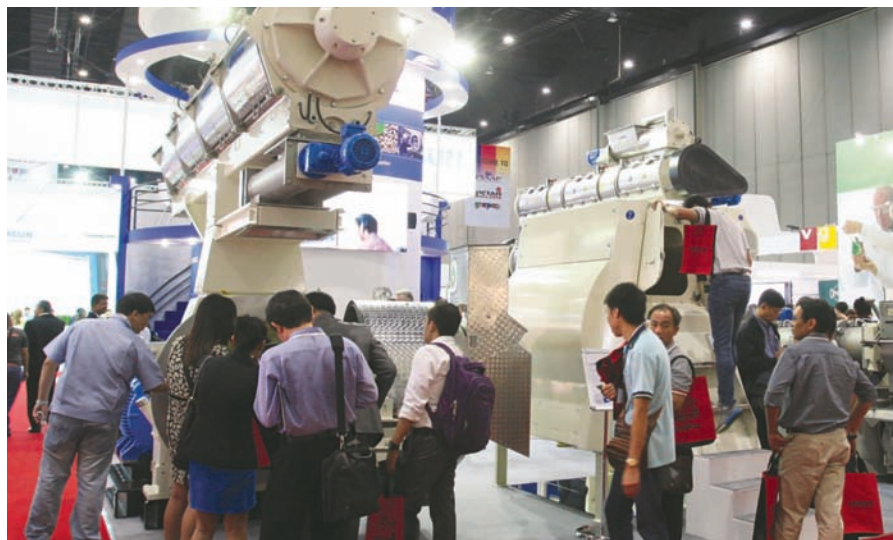


Image Credit: Victam Asia

One of the highlights of VICTAM Asia 2018 is its business matchmaking programme.

New features

An exciting addition to VICTAM Asia 2018 is a business matchmaking programme. This programme focuses on high quality meetings and will consist of a combination of an online tool, which allows exhibitors and visitors to plan their appointments very efficiently and a personal approach by our matchmaking consultants. They will help exhibitors and visitors get the most out of their participation and support them in finding their match.

The other new feature at the show is the VICTAM News Room. The VICTAM newsroom will report semi-live from the show floor to allow those that can't attend to still be part of the action. Furthermore, speakers, visitors and exhibitors will be interviewed about their expertise and the news crew will make running

reports about the event through Victam's social media channels.

Conference programme

VICTAM Asia also presents a series of high quality industry conferences this year. These include Petfood Forum Asia 2018, Aquafeed Horizons Asia 2018, FIAAP Animal Nutrition Conference Asia 2018, GRAPAS and Global Milling Conference Asia 2018, Proagricra Feed Efficiency Conference 2018, GMP+ seminar and the World Feed Industry Perspectives Conference. Exhibitors will also be given the opportunity to present technical seminars. More detailed information about the 2018 conferences and technical seminars can be found on www.victam-asia.com.

Industry support

Victam Asia has the support of many organisations in the industry. These include the Feedstuff Users Promotion Association, the Thai Feed Mill Association, Animal Husbandry Association of Thailand, Animal Health Products Association, Department of Fisheries, Ministry of Industry, Thai Chamber of Commerce and Thailand Convention and Exhibition Bureau. ■



VICTAM Asia 2018

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- Feed production technology • Packaging • Energy efficiency
- Auxiliary equipment

●●● What's on show at FIAAP Asia 2018?

- Ingredients • Additives • Formulation • Laboratory equipment
- Quality control

●●● What's on show at GRAPAS Asia 2018?

- Rice milling and sorting technology • Flour milling technology
- Flakers, extruders • Grain processing systems • Additives

●●● Industry conferences

- The FIAAP Asia Animal Nutrition Conference 2018
- Petfood Forum Asia 2018 • Aquafeed Horizons Asia 2018
- Proagricra Feed Efficiency Conference Asia 2018
- GRAPAS & Global Milling Conference Asia 2018 • GMP+ Seminar

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Coping with climate-sensitive diseases

The Pestforecast project is pioneering the use of surveillance and early-warning systems to deal with growing threat of climate-sensitive diseases in Vietnam and Laos.

ON 22 DECEMBER 2017 animal and human health experts gathered in Hanoi, Vietnam to discuss ways of disseminating the findings and recommendations of a 'Surveillance and early-warning systems for climate-sensitive diseases in Vietnam and Laos', or Pestforecast project.

More than 35 experts from the livestock, animal health, public health and agriculture sectors in the country, representing funders, national institutes, government at both central and provincial levels, embassies, civil society, research academia and the private sector attended the meeting.

In opening remarks, Hung Nguyen, regional representative for the International Livestock Research Institute (ILRI) in East and Southeast Asia, said that the climate-sensitive diseases (CSDs) such as Japanese encephalitis (a viral disease), leptospirosis (a bacterial disease), aflatoxins-related diseases (fungal) and dengue which the project focuses on affect the poor, including smallholder farmers, in rural communities and addressing them can enhance social equity in the country by improving agricultural productivity, and human and animal health.

The Pestforecast project

With global warming, the world is growing warmer and wetter and consequently more susceptible to diseases. Research shows that the Mekong is a hotspot for human, animal and plant disease, and most of which are highly sensitive to climate and climate changes. These diseases impose enormous burdens on human health and the agricultural sector and hinder broader development. Facing the growing challenge of climate-sensitive disease requires better information and tools.

Established in 2015, Pestforecast is a three-year project in Southeast Asia supported by the CGIAR research programmes on Climate



Researchers at the closing workshop of Pestforecast project.

Change, Agriculture and Food Security (CCAFS) and A4NH and coordinated by ILRI in collaboration with a wide range of partners including the Vietnam National Institute of Veterinary Research, the Plant Protection Research Institute, the Institute of Meteorology, Hydrology and Environment, the Plant Protection Department, the Hanoi University of Public Health and the National Institute of Hygiene and Epidemiology.

This project aims to use surveillance and early-warning systems to deal with important climate-sensitive diseases in Vietnam and Laos by developing and disseminating maps of hotspots of climate-sensitive diseases and piloting a real-time prediction system for encephalitis and leptospirosis. The project is exploring the potential of weather-based forecasting for aflatoxin mitigation, providing climate service and early-warning system for rubber plantations in northern Laos and disseminating and applying developed tools of pest forecast.

The Pestforecast project identifies a portfolio of climate-based information systems that target important diseases and are used successfully in other countries and propose action research to adapt them for Vietnam/Laos and ensuring delivery through partnerships. The outcome allows farming communities to take practical action to reduce disease risk and/or benefit from risk-mitigating action by health providers. The impacts are better health, reduced economic loss from disease, increased food security and ecosystems protected from disease

spillover and misuse of agricultural chemicals.

Key tools

Hu Suk Lee, a researcher at ILRI and the project's postdoctoral, said Pestforecast has come up with evidence-based tools such as risk maps, and seasonality and climate-associated models for use in assessing CSD's in the country. More importantly, the project has established an active One Health research partnership in Vietnam. However, he said, challenges such as lack of surveillance systems and the shortage of resources for implementing/sharing tools need to be addressed to enable farmers to better manage these diseases to improve their lives and the welfare of their farms and animals.

At the meeting, findings from the project's research on Japanese encephalitis, leptospirosis, aflatoxins in maize and pigs and dengue which are sensitive to climate as well as public health concerns were discussed. Evidence from the project will inform policy and on-going climate change resilience research by partners.

The project team will finalise, in collaboration with the team of CGIAR research programmes on Agriculture for Nutrition and Health (A4NH), two key tools that will be used in identifying CSD hotspots, prediction and target interventions in Vietnam. These include a set of risk maps of CSD and a web-based tool for forecasting disease incidences considering meteorological and environmental factors that influence CSD risks. ■

Image Credit: Photo: ILRI

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The increasing threat of antibiotic resistance

Zoonotic diseases and misuse of antibiotics in animals and humans resulting in antimicrobial resistance (AMR) are converging in Asia-Pacific countries with potential deadly effects, the Food and Agriculture Organisation of the United Nations (FAO) has warned.

'SUPERBUGS', OTHERWISE KNOWN as multiple-drug resistant bacteria, are on the rise worldwide, threatening the last lines of defence in treating humans and endangering food production systems because of the indiscriminate use of antimicrobials in livestock, including use of 'last hope' antibiotics such as Colistin in clinics, food and farming.

"We need to take action on AMR now because it affects us all," said Dr Juan Lubroth, FAO's chief veterinarian and coordinator of the organisation's fight against AMR. He acknowledged that while antimicrobial agents such as antibiotics improved quality of life, wellbeing and welfare, their overuse and misuse in both humans and animals are resulting in the spread of AMR, which is complicating management of many infectious diseases.

The link between animal and human AMR is important. Studies have shown that nearly all emerging infectious diseases reported during the second half of the 20th century (95 per cent) were zoonotic related – in other words, they originated in animals.

Managing antimicrobial agents

More than half the world's population is concentrated in Asia where levels of antimicrobial resistance are particularly high and the transboundary threat of AMR is of particular concern. FAO and other organisations are calling for greater surveillance of antimicrobial agents, their residues and the reporting of the detection of resistant bacteria, and to reduce imprudent reliance on antimicrobials across sectors to keep existing antibiotics effective by improving good agricultural practices – in terrestrial or aquatic environments.

"Antibiotics and other antimicrobials are vital to treat sick animals and to protect public health by preventing the spread of disease and by keeping pathogens off our plates," Lubroth told delegates at the Prince Mahidol Awards Conference (PMAC) in Bangkok, where the theme of this year's annual conference is AMR and emerging infectious diseases.

Boosting vaccine access will help farmers tackle superbugs in Asia

Part of the problem of AMR in agriculture is that farmers overuse antibiotics in their livestock as a misguided 'insurance policy' to keep the animals healthy long enough to get them to market. But eventually the bacteria and microbes can become resistant to the antibiotic.

"The inappropriate use of antimicrobials in food and agriculture – in all sectors – is a problem contributing to the AMR crisis because every time we use these medicines we risk blunting their effectiveness for the future," said Lubroth.

Poor access to quality and affordable vaccines, and expert veterinary advice in many places, is an impediment to reducing antimicrobial use, especially for the rural poor, while antibiotics are relatively cheap and easy to access from market stalls without prescription. Of additional concern, is the quality of what is available outside regulated stores – as substandard or falsified medicines are available to an uninformed buyer. This is true in veterinary medicine as it is for human use.



Overuse of antibiotics in livestock is a major contributor the AMR crisis.

Image Credit: SGR/AdobeStock

"Governments have a responsibility to their country and to the global community to step-up and ensure that adequate regulations for antimicrobial use and distribution are in-place and enforced," said Lubroth, "This responsibility extends to providing incentive programmes and enabling mechanisms to help farmers transition away from an unsustainable dependency on antibiotics."

As many as five million deaths per year in Asia may be attributed to resistant infections by 2050, as countries carrying a heavier burden of infectious disease are especially vulnerable to AMR. In developing countries, the risk of AMR transmission through food and water is considered high by the World Health Organization (WHO).

"What history has taught us is that when faced with a global crisis of this magnitude, collaboration and support for marginalised communities will help us find our way through it, but we have to act now," Lubroth emphasised.

FAO working with countries to address AMR

FAO is fully committed to the need of a multi-sectoral approach to address the spread of zoonotic and other high impact threats of animal origin, including AMR. "We also need to protect human, animal, plant and environmental health from AMR through improved communication to all sectors. This applies to rich and poor producers, poultry, beef, shrimp or wheat farmers, as well as physicians, veterinarians and agronomists so as to better manage AMR through basic good practices in agriculture production as this can contribute to a reduction of risk of disease and need for antimicrobials," Lubroth said.

FAO is working with countries in the Asia-Pacific region including Bangladesh, Cambodia, Lao PDR, Philippines and Viet Nam to develop and implement National Action Plans on AMR to raise awareness, promote good practices and legislation, and boost surveillance, with support from donors like the UK's Fleming Fund and the United States Agency for International Development (USAID).

FAO has also developed and piloted the Assessment Tool for Laboratories and Antimicrobial Surveillance Systems (ATLASS) in five Asian countries (Cambodia, Indonesia, Lao PDR, Thailand and Viet Nam) to help them assess their national AMR surveillance systems and laboratories to identify gaps for investment and improvement. ■

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Choosing the right fungicide

Dr Terry Mabbett studies the development and effectiveness of contact protectant and systemic curative fungicides and explains how to provide the best protection for your crops.

PLANT PATHOGENS ARE the most difficult of all biotic crop-damaging agents to control. Usually the fungal or bacterial pathogen is not visible to the naked eye only the symptoms of the diseases. And at this stage of infection, disease development and spread it may well be too late to achieve any worthwhile control.

First fungicide discovered and commercially developed was a copper-containing compound with the active principle identified as the divalent copper cation (Cu^{2+}). A French academic called Professor Pierre-Marie-Alexis Millardet is credited with discovery and development of copper as a fungicide in 1882 using hydrated blue copper sulphate.

However, credit should also go to another Frenchman called Benedict Prevost who inadvertently unveiled the fungicidal action of copper in green oxchlorides of copper some seventy years earlier in 1807. In both cases discovery of the fungicidal activity of copper was by sheer accident.

Professor Millardet had applied a gelatinous concoction of blue copper sulphate mixed with slaked lime (calcium hydroxide) to his grapevines in the Bordeaux region of France to prevent pilfering of the grapes. Prevost inadvertently left some wheat grains in a copper panier (basket) over the winter period before sowing the seed grain in spring.

Whether or not Millardet's mixture stopped thieves taking his grapes is not clear but it did control a fungus-like pathogen called *Plasmopara viticola* causing downy mildew disease of grapevines. The mixture was named Bordeaux Mixture and sold commercially to control downy mildew of grapevines and subsequently other diseases on a whole host of agricultural and horticultural crops.

The wheat seed in Prevost's copper basket were covered with oxchlorides of copper formed when metallic copper is oxidised in air. It remained on the seed after planting to control a seed-borne fungal pathogen called *Tilletia caries* causing 'bunt' disease in wheat.

These Frenchmen had laid the groundwork for future commercial use of contact protectant fungicides. The terminology used to describe



Image Credit: Micron Sprayers Limited

Sprays of protectant fungicide require deposits to be in place on the crop surface before the pathogen arrives. Greenhouse tomato being sprayed using an air-assisted ULV sprayer.

these fungicides means they act by coming into contact with the plant pathogen on the surface of the crop plant to protect the plant against infection by germinating fungal spores.

The world of the 1880's thus had its very first contact protectant fungicide to be followed over the years by a large number of others. These included more powerful copper-containing fungicides like cuprous oxide and organic chemical fungicides such as captan (a mercaptan fungicide) and dithiocarbamate fungicides (e.g. mancozeb). Some eighty years after Professor Millardet's work and now in the 1960's new contact protectant fungicides such as chlorothalonil (a chloronitrile fungicide) based on even more complicated organic chemistry were still coming onto the market.

Rise and fall of systemic fungicides

By the time the agrochemical industry moved into the 1970s a milestone had been achieved with discovery and development of the first systemic curative fungicides so called because the chemical was able to move into the plant

tissues, either by penetrating through the leaf surface and/or absorbed by the roots. Some of the very first systemic fungicides to gain fame and acclaim were the benzimidazole fungicides – benlate, carbendazim, thiabendazole and thiophanate-methyl. Once inside the plant these chemicals were able to move around to act upon fungal mycelium, destroy established infections and thereby cure the plant of disease.

As more and more systemic fungicides came onto the market scientists differentiated between those which could only move within the leaf into which they had penetrated (quasi-systemic or translaminar fungicide activity) and those which moved freely around the plant (true systemic fungicide activity), in the xylem (water conducting tissue) or in the phloem (food translocation tissue) and more rarely in both.

The industry believed these more versatile, targeted and potent systemic curative fungicides would make contact protectant fungicides redundant. But it did not work out that way essentially because these new systemic curative fungicides proved too 'powerful' for their own good.

Multi-site action versus single-site action

Protectant fungicides have a broad spectrum of activity and as such control a wide range of fungal and fungus-like pathogens right across the classification spectrum including the Oomycota (eg *Phytophthora* sp – downy mildews), Ascomycota (eg *Erysiphe* sp – powdery mildews) and Basidiomycota (eg *Puccinia* sp – leaf rusts). Copper containing fungicides take broad spectrum activity to another level by also controlling plant pathogenic bacteria (eg *Pseudomonas syringae* pv. *mors prunorum* – bacterial canker of cherry), algal diseases (eg *Cephaleuros virescens* – an algal pathogen causing leaf diseases on tea, coffee and other evergreen tropical tree crops) and lichens.

The broad spectrum activity possessed by contact-acting protectant fungicides is achieved by so-called multi-site action in which the active fungicide targets a whole range of sites in the metabolism of the fungal pathogen. In the case of copper fungicide and the divalent copper cation this is potentially every enzyme in pathogen's metabolism. The divalent copper ion causes protein denaturation which results in a proteinaceous



Image Credit: Dr. Terry Mabbett

Black spot of roses (*Diplocarpon rosae*) can be controlled using protectant fungicide provided the rose bushes are sprayed before the symptoms appear.

enzyme losing its uniquely specific shape which is vital for enzyme activity.

Systemic fungicides on the other hand tend to be much more targeted but as a consequence are only able to control a limited spectrum of fungal pathogens, albeit with a higher potency. They exert 'single site action' in

which only a single specific enzyme in the fungal metabolism is targeted. This initially appeared to be one of the great strengths of systemic curative fungicides, although it ultimately led to a loss of fungicide activity for many with consequences for farmers and manufacturers.

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Fungicide resistance

Many systemic curative fungicides have never reached full commercial potential due to 'fungicide resistance'. This is development of strains or biotypes of the fungal pathogen able to circumvent a specific fungicide's mode of action by avoidance or neutralisation. Because fungi possess prolific rates of reproduction the chance of a resistant strain developing by genetic mutation during asexual spore production or genetic recombination during sexual spore production is relatively high.

If a strain resistant to the mode of action of a specific fungicide appears in the population then that fungicide (and others having the same chemistry and therefore the same mode of action) will kill and destroy everything except the resistant strain. The resistant strain survives to reproduce and produce a population unaffected by that fungicide. In essence systemic curative fungicides seal their own fate by exerting a selection pressure on the fungal population.

Such risks and outcomes do not generally occur when contact protectant fungicides are used due to their multi-site action and ability to kill and destroy fungal pathogens by targeting and hitting many different sites in the fungal metabolism. For copper fungicides in particular the chances of fungicide resistance happening are very remote. Indeed there has never been a recorded case of fungal pathogen resistance to copper fungicide and the divalent copper cation, although copper containing fungicides have been used worldwide and on virtually every single crop for well over 100 years.

So how have systemic fungicides fared since the first ones hit the market nearly 50 years ago? Not as well as originally hoped for but they still provide a crucially important part of the disease control armoury. A considerable number of systemic curative fungicide products, representing



Image Credit: Dr Terry Mabbutt

Vegetable crops like cucumber which produce new leaves throughout the life of the crop will need to sprayed on a weekly basis.

an increasingly wide range of chemical groupings, have been developed for commercial use over the last half century with new ones hitting the market all of the time.

However just as important, if not more important are measures to protect existing fungicides from pathogen resistance to their action. This is achieved in a number of key crops and notably bananas to preserve and conserve existing fungicide activity against black Sigatoka disease of banana caused by the fungus *Mycosphaerella fijiensis*. 'Fungicide Resistance Action' programmes are drawn up and supervised by plant pathologists and pesticide scientists who advise farmers and growers to:

- Restrict the frequency at which they use fungicides having the same chemistry and mode of action
- Stay within the dosage recommendations for a specific fungicide product
- Alternate the use of fungicides so that two products with the same chemistry and mode of action are not used sequentially in a spray application programme
- Tank mix and apply fungicides having completely different chemistries and therefore different modes of action against a plant pathogen
- Use systemic fungicides and protectant fungicides simultaneously so that the broad spectrum multi-site action of the protectant fungicide 'covers' and protects the single-site action systemic fungicide from development of fungicide resistance to its action within the plant pathogen population.

Systemic curative fungicides – strengths and weaknesses

Twin strengths of systemic fungicides are versatility and targeted potency, ie, the ability to enter the plant and move around to target and destroy established infection and disease at relatively low concentrations of active fungicide. However, there is speculation that systemic curative fungicides do not destroy the infection inside the plant but simply suppress the infection and disease so that it does not spread further into the plant.

Established weakness of systemic fungicides is clearly the lack of broad spectrum activity and failure to control the wide range of pathogens which many crops including vegetables (eg tomato) and tree crops (eg citrus) suffer from. For instance the MBC fungicides provide good control of fungal pathogens belonging to the Ascomycota (eg *Botrytis cinerea* causing grey mould on a range of greenhouse crops including tomato, lettuce, cucumber and strawberry), but offer virtually no control of Oomycota including *Phytophthora infestans* causing late blight of potato and tomato, while remaining vulnerable to development of fungicide resistance in the plant pathogen population.



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Contact protectant fungicides - strengths and weaknesses

Contact-acting protectant fungicides and especially copper-containing products have proved their worth by still being in widespread use today some 130 years after discovery. Main strength is the ability to control a very wide range of plant pathogens with virtually no risk of selecting out strains or biotypes that are resistant to their action.

Drawbacks in comparison with systemic fungicides are that protectant fungicides must be deposited on the surface of the plant before fungal spores arrive and conditions of temperature, atmospheric humidity and leaf surface wetness conducive to spore germination and germ tube penetration into the leaf to establish an infection inside the plant. Application timing is critical. For this reason protectant fungicides are traditionally used in conjunction with 'Disease Forecasting Systems' based on prevailing weather conditions. Farmers can predict when crops are most vulnerable to infection and apply protectant fungicide in good time. 'Disease Forecasting Systems' have been developed for a number of crop/disease situations including late blight of potato and tomato, blister blight of tea and downy mildew of cucumber.

There must be sufficient time for contact protectant fungicide deposits to harden and dry to resist weathering and wash off by rainfall.

Increased deposit tenacity is achieved by paying attention to particle size and particle size distribution in the formulation. Smaller particles adhere

more strongly to leaf surfaces.

This was shown by Centrilab in Netherlands where scientists subjected deposits of Nordox cuprous oxide (mean particle size $1.2\mu\text{m}$) and copper hydroxide and copper oxychloride (mean particle size of around $3.0\mu\text{m}$) to a deposit tenacity test.

Simulated rainfall at intensities of 10 mm/hour was delivered onto three batches of plants each sprayed with one of the three copper fungicides.

Simulated rainfall removed 60% per cent of the copper hydroxide and copper oxychloride deposits but only 20% of the Nordox cuprous oxide deposit.



Image Credit: Dr Terry Mabbutt

Deposits of protectant fungicide should have sufficient time to harden and dry before they are subject to rainfall. This recently sprayed capsicum pepper received a sharp shower of rainfall.



Image Credit: Dr Terry Mabbutt

Disease Forecasting Systems are used by farmers and growers to ensure the timely application of fungicide and prevent decimation of crops by disease, such as the tomato seen here which has been terminally damaged by late blight.

Timing and frequency of protectant fungicide spray must take account new foliar growth. For tree crops like citrus and mango which produce leaves in flushes at particular times of the year then spray applications made once or month or even longer may suffice. However, for fast growing vegetable crops like tomato and cucumber producing new growth throughout the growing season then a once/week spray application is usually required. Good spray coverage is critically important for contact-acting protectant fungicides because they are required to provide complete cover and protection of the crop.

Contact protectant or systemic curative fungicide – the choice

In practice it is not a choice of one at the expense of other because each performs a completely different function in the overall chemical control of plant disease. As such farmers use all fungicide tools at their disposal and will apply contact-acting protectant fungicide and systemic curative fungicide in relation to pathogen threat and established disease. ■



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Case IH Autonomous Concept Tractor receives Good Design Award

THE CHICAGO ATHENAEUM Museum of Architecture and Design and Metropolitan Arts Press Ltd has announced the Case IH Autonomous Concept Tractor as one of the winners of this year's prestigious Good Design Award. The Museum's annual GOOD DESIGN Awards recognise the most innovative and cutting-edge industrial, product, and graphic designs produced around the world.

Case IH first unveiled the world's first high horsepower, cabless autonomous concept tractor at the Farm Progress Show in 2016, marking a revolutionary step forward in tractor design. The tractor

was designed by CNH Industrial's in-house Industrial Design Centre and based on the current Case IH Magnum row crop tractor. The concept's design was focused on both form and function, reimagining the tractor for a future autonomous era by eliminating the traditional operator cab.

"This award marks a satisfying conclusion to the celebration of our 175th anniversary," said Andreas Klauser, Case IH brand president. "The



Case IH's autonomous concept tractor.

Image Credit: Case IH

autonomous concept tractor is perhaps the best illustration of how we are living up to the anniversary's tagline – celebrating the past by looking toward the future."

After the reveal at the Farm Progress Show in August of 2016, the tractor was shown at trade fairs in France, Brazil, Argentina, and Australia. "Over the past year, we have used this concept tractor as a way to kick off a dialogue with

our customers as to what the future of farming will look like in five or ten years' time," explained Klauser.

"From talking to customers in different countries, we see that for the near term, they want to have the flexibility of still having a cab on the tractor. This is the direction we are taking because we want our customers to feel comfortable as they begin to delegate more tasks to the machines themselves," Klauser added.

"We have already begun to see some of the applications of this concept study being applied in our current lineup – such as AccuTurn™ and there are more

introductions on the horizon."

AccuTurn takes the guesswork out of turning on headlands with automated headland-turning technology powered by software logic from the autonomous concept tractor. This next-generation Advanced Farming Systems (AFS) autoguidance technology provides hands-free, automatic and repeatable turns for increased productivity, improved accuracy and reduced operator fatigue.

New Holland and the Climate Corporation partner to deliver two-way data sharing

NEW HOLLAND AGRICULTURE and The Climate Corporation, a subsidiary of Monsanto Company, has announced a new partnership that will extend and develop a portfolio of data sharing capabilities to help farmers with real-time agronomic visualisation and decision-making solutions.

Thanks to this agreement, New Holland Agriculture will provide its customers two-way data connectivity between its PLM Precision Land Management system and The Climate Corporation's industry-leading Climate FieldView digital agriculture platform.

This partnership offers New Holland customers unique functionality due to the depth and breadth of real-time machine and field data, including agronomic prescriptions, which can be both received and transmitted to Climate FieldView using the New Holland brand's PLM precision land management platform. To date, this integration with Climate FieldView provides one of the most extensive data sets available. This additional level of real-time data connectivity will enable agribusinesses to fine-tune field operations to further enhance their in-field productivity and efficiency across their existing machinery fleets.

"New Holland's partnership with The Climate Corporation will provide our customers with a powerful tool to drive productivity, efficiency and profitability in their



Image Credit: New Holland

New Holland is one of the leading manufacturers of agri-machinery in the world.

businesses," said Carlo Lambro, New Holland Agriculture brand president.

In addition to the in-field benefits, this partnership foresees further development to provide those New Holland dealers offering Climate FieldView additional tools to proactively support their customers. Both companies are working to enable farmers the ability to share real-time machine information with their local New Holland dealer, in order for them to receive support even more quickly.

"Through this partnership, which focuses on opt-in two way data sharing through the

Climate FieldView platform, New Holland is offering its customers one of the highest levels of integration and interaction in the market today. It is the most recent example of how we are investing in our precision land management solutions, a driving principal of our agricultural innovation program," said Dan Halliday, precision land management product manager.

Customers who use Climate FieldView provided through New Holland dealers can look forward to additional features within their Climate FieldView Cab application throughout the course of 2018.

IoT to play a leading role in protecting agricultural workers

THE FARM OF the future will leverage Internet of Things (IoT) technologies to create safer working environments and drive down risks to the workforce. This is according to an independent study commissioned by global mobile satellite company Inmarsat, which found that half of agritech companies will strengthen the sector's health and safety practices through IoT adoption.

Market research specialist Vanson Bourne interviewed 100 agritech companies from across the world as part of Inmarsat's The Future of IoT in Enterprise study. It found that 49 per cent of agritech companies rate improving health and safety as one of their primary motivations for developing IoT solutions, ahead of monitoring environmental changes (48 per cent), and identifying efficiency gains and cost saving opportunities (45 per cent). In a similar vein, 40 per cent expect IoT to bring significant improvements to health and safety practices in the near future.

Commenting on the findings, Chris Harry-Thomas, director of agritech strategy at Inmarsat Enterprise said, "Despite industry efforts to improve health and safety in agriculture, research from the International Labour Organisation reveals that the rate of fatal accidents has remained high, and that it continues to be the world's most dangerous industry. It estimates that 170,000 agricultural workers are killed each year, and that millions more suffer injuries from accidents with agricultural machinery or negative long-term health effects from exposure to agrochemicals and pesticides."

"With the Fourth Agricultural Revolution under way, IoT can present agritech businesses with a wealth of solutions to these challenges. Automated systems, enabled by IoT, can reduce risk by removing workers from the most dangerous procedures, such as lifting heavy materials or operating dangerous machinery. Automated machinery can also typically respond quicker to emergencies, monitoring and stopping equipment before there is a threat to worker safety. The industry is also leveraging the Internet of Things through the form of wearable technologies. These devices, integrated into watches, helmets and clothing, can detect falls and monitor staff health through heart rate and temperature, enabling agricultural businesses to react more quickly to emergencies and bring rapid response medical attention to injured staff."



Image Credit: Belymishka/AdobeStock

IoT is expected to bring significant improvements to health and safety practices in the near future.

Harry-Thomas added, "As agriculture expands into new and more remote land, terrestrial connectivity becomes increasingly limited. Workers are also exposed to greater risk, as they are more isolated and further away from emergency services. Satellite communication therefore has an integral role to play as it enables cutting edge technologies to be accessed in the most remote areas of the planet, equipping farms with networks of automated devices and sensors to protect workers." "We are passionate about driving the momentum behind the Internet of Things and creating safer and more productive working environments across the world. It's encouraging to see that the sector is taking steps to develop and deploy these technologies and safeguard the health, safety and welfare of their staff."

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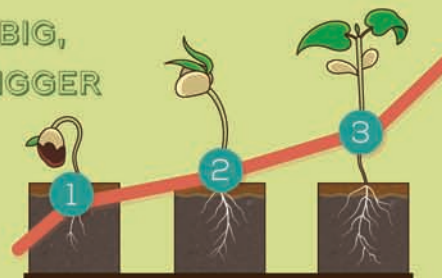
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Socorex Isba S.A.

Veterinary - Vaccinators

Henke-Sass, Wolf GmbH

Watering Equipment

AGCO GSI (Malaysia) Sdn. Bhd.
Impex Barneveld b.v
Lubing Maschinenfabrik GmbH & Co. KG
Plasson Ltd.

Section Two



AGCO GSI (Malaysia) Sdn. Bhd.

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E-mail: james.yaowu@agcocorp.com
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Ayurvet Ltd.

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Agents:

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Malaysia - Yenher Agro Products Sdn
Myanmar - Yin Yin Kyaw Int'l Trading Co., Ltd.
Taiwan - J. John Industry Co. Ltd.
United Arab Emirates - Salsabeel Veterinary Medicines LLC

Format Solutions Ltd.

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Henke-Sass, Wolf GmbH

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Impex Barneveld b.v

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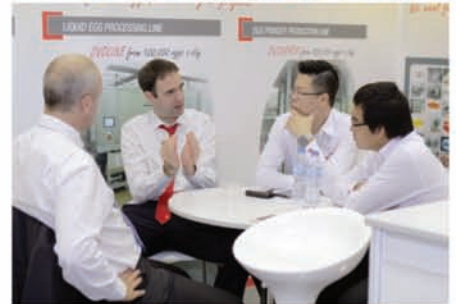


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