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for quality produce

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Indonesia's rain-fed lowland areas may switch to corn from paddy, says USDA

INDONESIA MAY HAVE a decline in rice production in 2018/19 as rain-fed lowland areas may switch to corn from paddy and some areas may experience loss during the second crop harvest period and third crop cycle of July-October 2019, according to the United States Department of Agriculture (USDA) report.

A prolonged dry season during the second crop cycle of the 2018/19 on Java, Bali and Nusa Tenggara is set to decrease rice production, said USDA. Harvested area for the 2018/19 is expected to decline to 12.1 million ha from the previous estimate of 12.2 million ha. Motivated by high corn prices, some farmers in main producing areas opted to grow corn over paddy. Stronger demand for industrial use is expected to increase the 2019/20 imports to 510,000 tonnes.

Continued expansion of corn during the last crop cycle of 2018/19 are set to increase 2019/20 harvested area to 3.9mn ha. (Image credit: Adobe Stock)

According to USDA, in line with increased corn production, the 2018/19 feed mills' demand for wheat is estimated to remain stagnant at 2.1 million tonnes and the 2019/20 wheat used for feed is forecast to decline to two million tonnes. Lower demand for feed and depressed purchasing power will lead to slower growth of the 2019/20 wheat imports. Wheat imports in the 2019/20 are estimated to grow modestly to 11.5 million tonnes, lower than the previous estimate of 12 million tonnes.

Continued expansion of corn in North and South Sulawesi and farmers' preference for corn over paddy during the last crop cycle of the 2018/19 are set to increase the 2019/20 harvested area to 3.9 million ha. However, corn production is expected to reduce due to the arrival of Fall Armyworm in Sumatera and recent spread to Java. Corn imports for the 2018/19 are forecast to increase to 800,000 tonnes.

Vientiane pig farmers urge govt to address debt issues

PIG FARMERS IN Vientiane, Laos' national capital, are hopeful that the government will help them to address debt-related issues.

As reported in the *Vientiane Times,* the pig farmers have been struggling with mounting debts for years and the price of pig products are fluctuating, particularly with the ongoing threat of the African Swine Fever (ASF).

Speaking to the source, the Vientiane Pig Farm Group representative said that after the fall of price of pork products in recent years, the members of the group have not been able to repay the government loans or interest.

The debt issue is affecting breeding activities in the farms, said the farmers.

Additionally, these are affecting breeding activities in the farms.

The group is urging the government to take appropriate measures to help the group's mounting debts.

Laos' livestock and fisheries department are monitoring the outbreak of ASF virus in the country and assured that pork products sold in Vientiane markets are safe to eat, reported the source. Inspections were conducted in Saravan province last month, the source further added.

Asia-Pacific important growth driver for global tea market

THE GLOBAL TEA market is expected to reach a value of US$21.33bn by 2024, registering a CAGR of five per cent on an year-on-year basis, with the Asia-Pacific, North America and Europe expecting to record high growth rates between the time periods.

This is published by the Persistence Market Research (PMR), a next-generation consulting and market research firm, in the outlook "Tea Market: Global Industry Analysis and Forecast, 2016–2024."

The market in North America is expected to remain dominant over the forecast period and is expected to account for 37.7 per cent revenue share of the global market by 2024.

The Asia-Pacific is a major market for tea. In Asia-Pacific, increasing consumer demand for non-GMO ingredients is some of the factors driving the tea market over the forecast period. India, China and other countries in the Asia-Pacific region are expected to witness significant growth over the forecast period in the global tea market.

Black tea segment is expected to witness highest revenue share, followed by green tea and oolong tea segment.

Australia-India exchange to tackle agri-climate risk

Image credit: Adobe Stock

The programme is set to bring solutions to the shared challenges of climate change.

T-HUB, ONE OF the leading innovation ecosystems in India, and Beanstalk AgTech, a challenge-led innovation company linking global technology to the food chain system across the Asia-Pacific region, have announced an open call for applications for the inaugural Graft Aus-India AgTech Challenge 2019.

Supported by Australia India Council, Grains Research and Development Corporation, Birchip Cropping Group, FarmLink and Telangana and Australian governments, the challenge seeks to provide Indian and Australian startups to test, validate and scale out-of-the-box solutions to the shared challenges of climate change.

Global AgTech startups with disruptive technologies and the potential to address the challenges faced by the Indian and Australian agricultural sector are eligible for the programme.

"While Australian growers are making the most of developments in farming technology and largely closing the yield gap, Australia's US$18bn grains sector has experienced a drop in yield potential since the 1990s largely due to the effects of climate change," said Birchip Cropping Group's CEO Chris Sounness.

Graft programme manager William Taing said, "India not only faces challenges adapting to climate change, but importantly, the Indian startup ecosystem is tenacious and makes things happen even in the most difficult situations."

Graft and their partners will be selecting a total of 12 participating startups with grassroots industry encounters as well as direct-line access to leading producers, investors, corporate partners and government.

Vietnam in need of new tra fish brands

VIETNAM IS FACING an urgent requirement to develop tra fish brands, as the country's tra fish industry faces numerous challenges in terms of production and export.

Despite being a big foreign currency earner, the purchasing price of tra fish continued to decline in the Mekong Delta region in May 2019, particularly in An Giang and Dong Thap provinces, Vietnam's leading tra fish producers and exporters, said the Ministry of Agriculture and Rural Development (MARD).

As reported in *VietnamPlus*, chairman of the Vietnam Pangasius Association Duong Nghia Quoc said that it is of urgent need for the country to build new brands to develop the sector more sustainably. However, Vietnam's tra fish performed well in terms of export to the ASEAN market. The tra fish exports to the Southeast Asian countries stood at US$87.3mn in the first five months of 2019, up 14.6 per cent compared to the corresponding period in 2018, said the Vietnam Association of Seafood Exporters and Producers (VASEP). Malaysia was the highest importer, with an import value of US$18.8mn in the same time period, up 47.3 per cent from the corresponding time in 2018.

EVENTS 2019

AUGUST

8-10
ICEAE 2019
Jeju Island, South Korea
www.iceae.org

27-28
African Farming's 2nd Edition Agribusiness Summit
Abuja, Nigeria
www.agroinvestmentsummit.com

28-30
INAGRITECH 2019
Jakarta, Indonesia
www.inagritech-exhibition.net

SEPTEMBER

6-8
Dairy Livestock & Poultry Expo-AgroFarm
Gujarat, India
www.ifw-expo.de

19-21
EuroTier China
Qingdao, China
www.eurotierchina.com

26-28
Agri Malaysia
Shah Alam, Selangor, Malaysia
agrimalaysia.com/en

OCTOBER

9-11
Agri Week Tokyo
Chiba, Japan
www.agriexpo-tokyo.jp

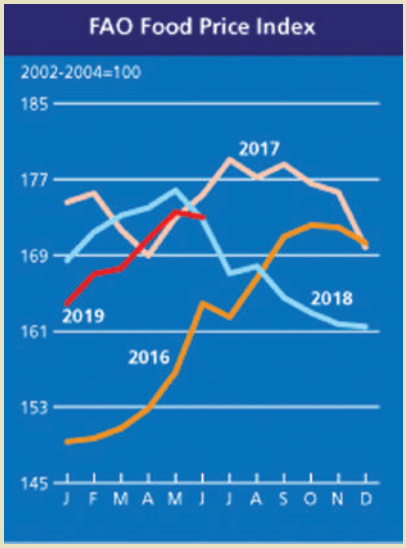
30-31
Agriculture Sciences and Farming Technology
Sydney, Australia
agri-farm.conferenceseries.com

FOOD OUTLOOK

THE FAO FOOD Price Index (FFPI) averaged 173 points in June 2019, down 0.3 per cent from May and very close to its level in June 2018. Lower prices of dairy products and vegetable oils more than offset increases in the prices of cereals, sugar and meat; ending almost five months of uninterrupted rise in the overall value of the FFPI.

The FAO Cereal Price Index averaged 173.2 points in June, up 6.7 per cent from May and 3.8 per cent higher than in June 2018. The latest increase in the value of the Index was driven by a sharp rise in maize export price quotations, for the third consecutive month, mainly due to expectations of much tighter export supplies in the USA. International wheat prices rebounded following two consecutive months of declines. International rice prices extended their stable streak into June, as weak buying interest for Indica and Japonica rice offset the support provided by a further appreciation of the Thai Baht and the strong demand for Basmati rice.

The FAO Vegetable Oil Price Index averaged 125.5 points in June, down 1.6 per cent month-on-month and reaching the lowest level since December 2018. The latest drop mostly reflects weakening palm oil and soy oil prices, whereas sunflower and rapeseed oil values



increased marginally. International palm oil quotations continued to fall, underpinned by sluggish global import demand and the prospects of seasonally rising output in major exporting countries. Price quotations of sunflower and rapeseed oils edged up on respectively, protracted robust import demand and renewed concerns over unfavourable crop conditions in major producing countries.

The FAO Dairy Price Index averaged 199.2 points in June, down 11.9 per cent from May, marking the first monthly decline in five months but still 9.4 per cent higher than its level at the start of the year. Price quotations across all four categories of milk products that constitute the Index dropped, with sharper falls registered for cheese and butter prices.

The FAO Meat Price Index averaged 176.0 points in June, up 1.5 per cent from its revised value for May, further continuing the moderate month-on-month price increases registered over the last five months. Price quotations for ovine, pig and poultry meats rose on strong import demand, especially from East Asia, as the spread of the African Swine Fever (ASF) continued to limit domestic production. While global import demand for bovine meat too was robust, price quotations remained stable due to increased export availabilities from Oceania.

The FAO sugar price index averaged 183.3 points in June, up 4.2 per cent from May. International sugar prices were largely influenced by movements in the Brazilian currency (Real), which gained strength against the US dollar. A stronger Real supports sugar prices by affecting the supply of Brazilian sugar to the world market, as producers prefer to process sugarcane into ethanol for local sale rather than exporting sugar and receiving a lower price. Reports of a decline in exports from the EU provided support to world sugar prices.

Cambodia's rice exports to China up, EU sales down

FOLLOWING THE TARIFFS imposed by the European Union (EU) on Cambodian rice, Cambodia's rice export to EU fell sharply 32 per cent in the first six months, showed data from the Secretariat of One Window Service for Rice Export Formality.

However, the country's rice exports to China rose 66 per cent in the first half of the year to 118,401 tonnes, with the total rice export amounting to 281,538 tonnes, up 3.7 per cent form the same time period last year.

Additionally, Cambodia is looking to expand in other international marketplaces such as Australia. Amru Rice (Cambodia) Co, Ltd, Cambodian grain exporter to foreign markets, has signed a deal with an Australian rice importer to explore further opportunities.

Cambodia is looking to expand new international markets.

Image credit: Adobe Stock

Avocados, coffee and citrus fruit threaten global food security: Research

A STUDY BY researchers at the University of Maryland found how Western appetites for foods like avocados, coffee and citrus fruit are threatening global food security, having looked at 40 years of data.

"The impact of western dietary preferences has started to pose a serious threat to global food security and the environments in which they are grown. This is because the increasing demand for crops such as avocados, citrus and coffee alters the natural cycle of the environment in which they are produced," said Andre Laperrière, executive director of Global Open Data for Agriculture and Nutrition (GODAN).

GODAN is the UK, USA, United Nations and Food and Agriculture Organization (FAO) supported an initiative that backs the proactive sharing of Open Data to make information about agriculture and nutrition available, accessible and usable to deal with the urgent challenge of ensuring world food security.

"If insects and pollinators such as bees are not able to receive year-round nutrition from plants with diverse blooming patterns, they face a serious existential threat which could alter the balance of our global food cycle," Laperrière added.

"If continued at its current rate, this will have devastating consequences to agriculture on a global scale, thus emphasising the need for a significant change to western dietary preferences and crop management. Research has shown a need for more crop diversity and pollinator-friendly methods of farming as a means of restoring a balance to the ecosystems where produce is grown."

Image credit: Adobe Stock

Farmers should impose practices that do not alter the natural environmental cycles while producing avocados, coffee and citrus fruits.

"It is therefore essential that farmers and those who control the process of agriculture impose practices that can work with the environment. All this can only be recognised and actioned if we have the relevant open data and information released by the stakeholders to identify the patterns – supermarket demands, consumption patterns, the food origins, carbon footprint, agricultural output and the environmental reaction," Laperrière concluded.

Future of livestock production in focus at EuroTier China

IN RECENT YEARS, China's animal husbandry sector has transformed significantly, experiencing an evolution from small-scale to large-scale. This sustained and rapid development has been inseparable from international cooperation and exchanges.

EuroTier, one of the global leading brands of trade fairs for animal farming professionals, is coming to China. Organised by the German Agricultural Society (DLG), EuroTier is set to create a platform for the productive exchange of information at a global level with a regional focus.

A wide-ranging technical programme has been announced for the first edition of EuroTier China, to take place in Qingdao from 19-21 September 2019. Specialist conferences have been organised in conjunction with China's Ministry of Agriculture and Rural Affairs. In addition, the events have announced deal with the dairy and swine sectors, animal feed and nutrition, animal health and food safety, animal breeding and biogas.

Taking place at the Qingdao International Convention & Exhibition Centre, in eastern China's Shandong province, EuroTier China 2019 is supported by China's National Animal Husbandry Service (NAHS), China Feed Industry Association and the Beijing Tech Convention and Exhibition Centre.

Image credit: DLG

A range of topics will be in focus.

Overview of global topics

Important topics to be discussed include:

- The 1st Animal Health and Food Safety Alliance Congress
- China Livestock Manure Alliance Annual Conference
- The 1st China Livestock Breeding Summit
- EuroTier China Feed and Animal Nutrition Conference
- EuroTier China Dairy Conference
- EuroTier Biogas Conference

The topic of African Swine Fever (ASF) will be discussed in detail at EuroTier China 2019. An international effort will be required to replace lost breeding stock, and expertise will be needed to help build new swine farms and animal feed production facilities that can meet the high biosecurity standards required to prevent future outbreaks of this devastating disease.

The exhibition and associated technical programme will promote the intensive management of animal husbandry in China, encourage international co-operation and competition and expand the strategy of opening up China's animal husbandry. It will provide a platform for exchanges and co-operation between Chinese and foreign animal husbandry enterprises, bringing advanced experience and technology from the international market to China, and putting it in front of the Chinese livestock industry.

For more details, please visit www.eurotierchina.com/technical-programme

Indonesian farmers ready to accept Industrial 4.0 challenge

INDONESIA IS PREPARING herself to welcome the Industrial Revolution 4.0 in sectors, especially in agriculture. In supporting the realisation of the Industrial Revolution 4.0, the Ministry of Agriculture invites Indonesian Millenial Generation to participate in the growing and development of agriculture with 'The One Million Farmers Programme'. The Minister of Agriculture Amran Sulaiman said that the programme was a strategy from the government to boost the production of export oriented agricultural commodities.

The process of making one million farmers realised among Millenials is not an easy way as it needs to improve in infrastructure and technology. The Ministry of Agriculture is submitting a 2020 budget, with a budget ceiling of US$1.5bn plus another US$850mn for the construction of agricultural infrastructure. The budget will be used for infrastructure development as well as to improve the competence of human resources in agriculture.

Moreover, agricultural sector is one of the sectors which affects Indonesia's economic development. This is seen from agricultural trade which has always been in surplus in the last five years in various countries trading with such as Malaysia, China, Japan, Korea, Philippines and Europe. Surely, this is a positive thing which will attract more foreign investors to invest in the Indonesian market.

This is the reason why the seventh edition of **INAGRITECH 2019** from **28-30 August** at **JIExpo** in **Jakarta** is all set to display modern machines, technology, products and gather suppliers and buyers locally and internationally to promote the country's agricultural sector.

The resounding big success of **INAGRITECH 2018** held along with **INAGRICHEM, SugarMach Indonesia, INAPALM Asia 2018** and **Pump&Valve Indonesia** attracted 268 companies from 22 countries and 7,693 trade attendees from more than 25 countries. **INAGRITECH 2018** was proved as the ASEAN's most comprehensive trade show for agricultural equipment and technologies.

Reflecting on the success of **INAGRITECH 2018** and huge demand for agricultural equipment and technologies in Indonesia,

Image credit: GEM Indonesia

The event is being organised by PT. Global Expo Management (GEM Indonesia).

the **INAGRITECH 2019** will have a larger exhibition area. The expo will be held in conjunction with **HortiTech Indonesia 2019, INAPALM Asia 2019, INAGRICHEM 2019** and **SugarMach Indonesia 2019**. It will definitely become one of Indonesia's most important one-stop exhibitions for agricultural machinery and chemical, horticultural technology, palm oil and sugar processing technology under one roof.

SugarMach Indonesia 2019 gains a strong support from the Indonesian Sugar Association (AGI) and Indonesian Association of Sugarcane Technologist (IKAGI). The event is held in attempt to push Indonesia's infrastructure development in sugar industry as well as supporting the country's effort to achieve sugar self-sufficiency in 2019. For the success of the event, AGI will hold the National Sugar Summit along with SugarMach Indonesia 2019.

INAPALM ASIA 2019 is set to provide a platform for the crucial industry players to network with local and global communities, explore their business and unveil the latest products related to the palm oil and forestry chain and agro-industrial business.

Spotlight on India's dairy and poultry industry growth

DAIRY LIVESTOCK & POULTRY Expo – AgroFarm will be taking place from 6-8 September 2019 in Gandhinagar, India, focusing on the animal husbandry and agricultural technology in India.

Jointly organised by the DLG – German Agricultural Society and the Indian exhibition organiser Radeecal Communications, the event is set to showcase a complete range of state-of-the art solutions in these sectors. The show is organised in parallel with Agri Asia.

With a population of around 1.31 billion people and a GDP of around US$2.3 trillion, India is one of Asia's most attractive marketplaces for animal husbandry and agricultural technologies.

Image credit: Adobe Stock

India is one of the leading milk producers worldwide.

Agriculture employs more than half of India's population, most of which are small-scale and subsistence farmers. India is the second largest producer of rice in the world and other important cash crops include wheat, cotton, cane, turmeric, oilseeds, fruits and vegetables.

India's livestock farming

Livestock provides employment to around 8.8 per cent of Indian population, majority of them are women, according to the organisers of DAIRY LIVESTOCK & POULTRY Expo – AgroFarm.

Being one of the leading cattle herds across the world, India is a leading milk producer worldwide. The output of dairy industry in India is growing at a rate of five per cent per annum. Currently, India produces more than 13 per cent of the world's total milk.

India's poultry sector has emerged as a well-organised and technologically driven industry growing at around 10 per cent per annum.

Cultivating ideas for growth with Agri Malaysia 2019

Organised by Expoglobe Sdn Bhd, the event is dedicated to the local and international industry players to explore business opportunities and gain latest market information in agriculture-related fields.

THE 4TH EDITION of Malaysia International Agriculture Technology Exhibition (Agri Malaysia) shall return to Setia City Convention Centre, Shah Alam, Selangor, Malaysia, from 26-29 September 2019.

Since its launch, the event has received extensive attention and enthusiastic response from the industry players, successfully attracting more than 9,000 local and foreign visitors in 2018.

To cater to the theme of growth and be in line with the Malaysian government's initiative on agriculture transformation, Agri Malaysia focuses on the demand of agricultural machinery in Malaysia's market. The use of agricultural machinery by large-scale growers has increased to deal with the manpower shortage and the rise of labour costs. On top of that, the smaller scale growers are moving forward to adopt new technology and knowledge, under the assistance and subsidy provided by Malaysian government, to improve productivity and modernisation, thus creating a stronger demand on agricultural machinery in the regional market. Agri Malaysia 2019 strives to highlight the agricultural machinery showcase to targeted visitors.

In addition, there will be a wide variety of exhibits, including modern farming tools and equipment, seeds, fertilisers and smart farming technologies. The exhibition will present other agricultural services such as information consultation, human resource management as well as safety and health issues. Visitors can look forward to a huge assortment of agricultural use products, services and technology under one roof.

Image credit: Expoglobe Sdn Bhd

The seminars will focus on the trends and challenges in agriculture sector.

The event is set to feature a variety of agricultural seminars and information sharing sessions. This year, the team will collaborate with the industry experts to conduct more specialised seminars and knowledge talks in collaboration with the Department of Agriculture, Malaysia.

Preferred information platform by durian experts and growers

There is always huge potential for the Malaysian durian industry. The announcement by Chinese customs department that Malaysia has been given the green light to export frozen durian in whole fruit form to China is expected to much widen the market for Malaysian durian growers.

In line with the development of durian cultivation, Agri Malaysia strives to create a powerful information platform for durian experts and growers and effectively connecting them to each other.

> **"The agriculture industry players can interact directly with local and international stakeholders of the agriculture community."**

The first ever Durian Live Forum focuses on featuring well-known durian experts to share their knowledge and experiences and discuss about the various issues and challenges with the durian growers who visited to the exhibition.

On consecutive years, the durian experts from nationwide were invited to share their expertise in the seminars. Agri Malaysia has become the preferred platform where the durian industry stakeholders choose to share and receive the latest information and trends.

Incorporating with aquaculture trade exhibition – Aqua Malaysia

Agri Malaysia will incorporate the Malaysia International Aquaculture Technology Exhibition (Aqua Malaysia) into the three-day exhibition to provide a more complete aspect in agriculture, to share useful market information and ensure a more worthwhile participation.

This exhibition is seen to be the most professional and comprehensive aquaculture trade exhibition dedicated to local and international market players for an exclusive product and technology showcase. The incorporation is expected to help the industry-related stakeholders to capture more market insights and enjoy greater mutual benefits. ■

For further information, please logon www.agrimalaysia.com

Swingtec's High Performance Fog Generators for vector control

The High Performance Fogging Tube has been developed especially for the application of water-based fog liquids and is patented in the USA, China and South Korea.

THE FIRST THERMAL fog generators, developed in the 1940s and 1950s, were designed to apply oil-based fog liquids. Right from the beginning, the machines were widely used for efficient vector control measures, according to the ultralow volume (ULV) application method by fogging oil-based fog liquids.

In G.A. Matthews, Pesticide Application Methods, 3rd Edition, "ULV is defined as the minimum volume per unit area required to achieve economic control (Anon, 1971), and is generally associated with the use of oil-based formulations of low volatility."

The minimum volume per unit area is generally defined between 0.5 up to five litres per ha.

Not too long ago, with thermal fog generators oil-based fog/spray liquids were exclusively used for vector control measures, usually by fogging a volume in the range of one litre up to five litres per ha, which is exactly in the range of the above mentioned definition of the ULV application method. That means relatively small quantities of the chemical agents are mixed with high amounts of oily carrier substances like diesel oil or kerosene to get the total application quantity.

Recently, there is a tendency to shift application of oil-based liquids to water-based fog liquids. Reasons are environmental protection, costs of oily carrier substances, possible traffic hazard by a dense visible fog and oily residues, in particular when treatment is done inside a building.

Things are rather different with water-based fog liquids

Oil-based fog liquids can be fogged in a narrow and homogenous droplet spectrum of below 30 µm volume median diameters (VMD), which is in accordance with the actual World Health Organization (WHO) specification guidelines for vector control equipment.

This is not possible when water-based fog liquids are fogged with thermal fog generators by using water as a carrier substance.

Image credit: Swingtec

Standard fogging tube flow rate 27 litres per hour with nozzle 1.2

Compared with oil, water has a much higher surface tension and cannot as easily be processed in thermal fog generators, no matter which brand is used.

The droplet spectrum is no longer as homogenous and much wider and droplets from 0 µm up to rather big droplets of 200 µm are emitted.

This means that all droplets which are bigger than 40 µm and 50 µm do not float as aerosols in the air and settle down in front of the fog generator, where they cause wet spots and deposits. This can clearly be seen, especially when the machine is operated stationary. All these relatively big droplets do not reach the target, rather get lost and cause pollution. Depending on the flow rate, such losses could be approximately 20 per cent and more. Besides the waste of expensive chemical agents, this has a negative influence on the effectiveness of the treatment because less than the desired quantity of the chemical agent meets the object of application.

Image credit: Swingtec

High performance fogging tube flow rate 27 litres per hour with nozzle 1.2

Swingtec's High Performance Fogging Tube

To solve this problem, Swingtec has launched High Performance Fogging Tube, developed especially for the application of water-based fog liquids. This invention is patented in the USA, China and South Korea. The High Performance Fogging Tube is applicable for all types of swingfog machines.

With the portable machine swingfog SN 50 along with the High Performance Fogging Tube, a droplet spectrum of below 30 µm up to flow rates of 27 litres per hour is achieved. With the company's truck-mountable or stationary used devices swingfog SN 81 and swingfog SN 101, flow rates up to 60 litres per hour in the same ideal droplet spectrum can be applied.

All other brands of thermal fog generators (including swingfog machines with standard fogging tubes) can also fog water-based fog liquids in a somehow narrow droplet spectrum, but by no means can they do this at nearly as high flow rates compared with swingfog equipped with the High Performance Fogging Tube. ■

Commercial rice processing

An efficient rice milling process includes removing all the lighter impurities such as dust, dirt, chaff and straw while producing white rice kernels.

RICE VARIETIES ARE generally composed of around 20 per cent husk layer, 11 per cent bran layers and 69 per cent starchy endosperm. Rice milling is the process of removing these husk and the bran layers and produce edible white rice kernels free of pollutants, with a less amount of broken kernels.

Depending on the requirement, rice milling systems can be a one, two or multistage process. The large-scale commercial production uses multiple-stage rice milling processes while producing white rice from the paddy. The processes include cleaning, de-husking, separation of paddy, whitening or polishing, mixing, grading and weighing.

Pre-cleaners

According to the Mechanisation and Postharvest Cluster of the International Rice Research Institute (IRRI), it is very important to remove foreign materials such as straw, weed seeds and soil when the paddy comes into the mill, otherwise the efficiency of the hulling machines could be reduced.

The first separation is done by removing the objects that are larger than the grain mainly by oscillating sieve pre-cleaners or rotary drums. The second separation allows broken grains, small stones and weed seeds to pass through by an air aspirator which is used to remove the dust while retaining the whole grains.

Husking machines

Paddy rice is fed into the steel huller and passes between a revolving steel shaft and a cylindrical shaped mesh screen, removing the husk and whitening the rice in one-pass.

"The under-runner husker is very common in Asia. This machine has two steel discs, which have an emery coating. The upper disc is stationary and fixed to the cast iron housing. Paddy flows from a centrally located hopper between the abrasive surfaces of the revolving lower disc and the stationary upper disc. Resistance between the emery surface on the discs and the paddy grains removes the husk leaving the brown rice kernel. Brown rice and husks are then discharged circumferentially over the revolving disc and exit through an outlet," IRRI stated in a paper.

Rice is normally passed through two to four whitening and polishing machines connected in series to reduce the number of broken grains.

Paddy separators

According to IRRI, the processing capacity of the compartment separator is dependent on the compartment area. For a two-tonne per hour capacity rice mill, a 45-compartment separator made up of 15 compartments on each of three decks is used. The tray separator uses the differences in specific gravity, grain length and the co-efficient of friction to separate paddy and brown rice, noted IRRI.

Whitening or polishing

The abrasive process applies less pressure on the grain and is better suited for long grain varieties. In the friction whitener, the grain kernels are forced against each other and a metal screen by a steel-ribbed cylinder rotating inside a metal-plated cylinder.

To reduce the number of broken grains and the grain temperature during the whitening process, rice is normally passed through two to four whitening and polishing machines connected in series. Rice temperatures should not exceed 43-44^{0}C during any process, according to IRRI.

Mixing and polishing

"A good rice mill will produce 50-60 per cent head rice, five-10 per cent large broken and 10-15 per cent small broken kernels. Depending on the country's standards, rice grades in the market will contain from five-25 per cent broken kernels," IRRI added.

"A friction type-whitening machine, which delivers a fine mist of water during the final whitening process, is used for 'final' polishing before sale," IRRI commented. ■

Nbiotic: New Age phytogenic solution to antibiotic as growth promoter

With the threat of the human race entering the post-antibiotic era, most parts of the developed world have come up with the regulations to completely ban the use of antibiotics growth promoters (AGPs).

ANTIBIOTICS HAVE BEEN added to livestock in industrial farms since 1946 to help animals to grow faster and put on weight more efficiently. Between 1985 and 2001, the use of antibiotics in feed for industrial livestock production rose 50 per cent. As global demand for animal protein grows, antibiotics are used to raise food-producing animals in intensive production mostly to promote growth rather than treat disease.

Around 75 per cent of all the antibiotics given to the animals are not fully digested and eventually pass through the body to enter the environment. This indiscriminate overuse and misuse of antibiotics cause the development of antibiotic-resistant bacteria 'Superbug.'

Superbugs are a threat to humanity because infection from resistant bacteria is increasingly difficult and expensive to treat. According to a report, a continued rise in resistance by 2050 would lead to 10mn people dying every year and a reduction of two per cent to 3.5 per cent in gross domestic product (GDP), costing the world up to US$100 trillion.

The top three classes by global sales for animal use in 2009 were macrolide (US$600mn), Penicillin (US$600mn) and Tetracycline (US$500mn), all of which are categorised as critically important in human medicine (WHO list of critically important antimicrobials, Geneva, 2011).

Threats to people across the world

Antibiotics are being routinely administered to chicken in poultry farms in small doses to promote growth and keep the disease at bay, almost as a replacement for nutrition and sanitation. The chicken is being popularised day by day with its consumption increasing in all parts of the world, necessitating the need of regulations for judicious use of antibiotics in animal husbandry sector.

There is a threat that the human race will again enter the post-antibiotic era. Most parts of the developed world have already understood the situation and come up with the regulations to completely ban the use of antibiotics growth promoters (AGPs). Now the responsibility is on people to take initiative to keep the environment safe by saying no to antibiotics for use as growth promoters.

> **"Around 75 per cent of antibiotics given to the animals are not fully digested and eventually pass through the body to enter the environment."**

Antibiotics are given to chicken in poultry farms to promote growth, almost as a replacement for nutrition and sanitation.

Image credit: Adobe Stock

Alternatives to AGPs

The ban on antibiotic use as growth promoters and the increased awareness among the consumers have triggered a need for natural and safe feed additives to achieve better production results from farm animals. A possible alternative includes plant-based products (extracts, essential oils, polyphenolic compounds) that may positively affect poultry health and productivity. The use of plant extracts or plant-based substances have the potential as alternative growth promoting feed additives. Feeding natural dietary supplements to animals to enforce their innate defence mechanisms could effectively reduce or prevent the need for therapy of enteric infections. Natural growth promoters usually do not bear any risk regarding bacterial resistance or undesired residues in animal products such as meat, milk or eggs.

Nbiotic successfully replace AGPs

There are many alternatives available and an effective one is a phytogenic noble solution named Nbiotic. It is not only environmentally-friendly and safe for long-term use, but also poses the capability to replace the antibiotic.

Nbiotic is a phytoadditive that is a bacteriostatic herbal growth promoter with essential oils added to feed of poultry and swine. It possesses a number of beneficial effects such as rapid development of a healthy gut microflora, stabilisation of digestion, increased growth performance, stimulation and rapid maturation of the immune system and many more.

Nbiotic contains a wide variety of active components. Most of these stimulate the secretion of saliva. Herbs like ginger, mint, onion and cumin enhance the synthesis of bile acids in the liver and their excretion in the bile, what beneficially affects the digestion and absorption of lipids. Most of the prelisted herbs stimulate the function of pancreatic enzymes (lipases, amylases and proteases). Some increase the activity of digestive enzymes of gastric mucosa.

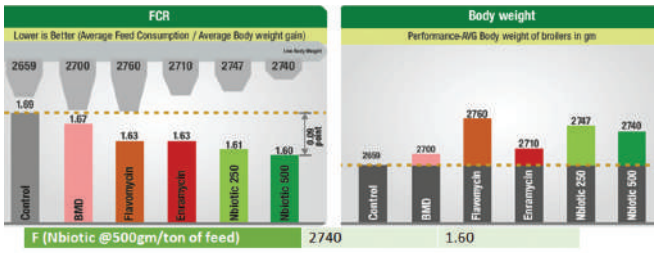
According to a report, allicin from *Allium sativum* protects intestinal cells from increased permeability of membrane in pigs infected with E. coli. It contains active substances, which suppress

the action of fungi and viruses. Essential oils like eucalyptus and thyme have proven antimicrobial activity.

The various field trials show that the herbal constituents present in the Nbiotic cause improvement in digestibility, absorption of nutrients, modification of intestinal microbiota and stimulation of the immune system. They have antibacterial, anti-viral, anti-inflammatory and antioxidant properties.

Nbiotic are found to be more superior than the other antibiotics used in terms of FCR. The improvement in body weight is not significant but Nbiotic treated group show better result. Providing better FCR and final body weight in comparison to few of the mostly used antibiotics proves the efficacy of the Nbiotic and its potency to replace antibiotic as a growth promoter.

FCR and Body weight of the experimental birds after 42 days



Nbiotic supplement gives extra benefit to the farmer by causing increase in the dressing percentage and breast weight percentage of the broiler chicken when compared with control group. In that way, Nbiotic-supplemented group gave 212 gm more edible meat as compared to the control group.

Therefore, the result of the Nbiotic found to be significantly better than other antibiotics and can suitably replace antibiotics as growth promoter in poultry feed with extra benefits. ■

Major findings of the field trials:

- Nbiotic successfully replace antibiotic growth promoter in broiler poultry feed.
- Six per cent additional dressing yield in Nbiotic treated group as compared to control group.
- Eight per cent more breast meat in Nbiotic group as compared to control group.
- Two per cent lesser mortality in treated group as compared to control group.

By Dr Amit Kumar Pandey PhD (VPT). Based on Report of trial conducted by Shabbir A Khan in PATS R&D Farm (Gurgaon, Haryana, India).

Sustainable practices for a healthy flock

As livestock farming is one of the most profitable farm businesses worldwide, there is a persistent need of surveillance for disease outbreaks inside the flock to boost production.

Healthy farm animals accelerate food production.

LIVESTOCK ANIMALS ARE vulnerable to many infectious and non-infectious diseases such as bacterial, viral, rickettsial and mycoplasmal diseases which are prevalent in many Asian countries and can cause enormous economic losses.

Out of many diseases, bovine spongiform encephalopathy (BSE), highly pathogenic avian influenza (HPAI), caprine arthritis/encephalitis, chronic wasting disease (CWD), porcine proliferative enteropathy, foot-and-mouth disease (FMD), canine parvovirus infections, sheep pox, swine fever and others are very important in context to the Asia-Pacific regions.

A paper from Indian Veterinary Research Institute – "Diseases of Animals: Diagnosis and Management," – noted, "Diagnosis at an early stage of the onset of a disease lays the basis of its successful therapy. To have wider applicability of the diagnostic method, they should be cost-effective, simple and easy to perform by semiskilled para-auxillary personnel, have requisite sensitivity, specificity and unambiguous readability."

Common animal diseases and management

FMD: It is an acute, highly communicable viral disease affecting cloven hoofed animals including domesticated and wild. Infection with FMD virus can result in a variety of disease manifestations, depending on the species on animal, the strain of the virus, the route of infection and general health of the host.

A range of laboratory tests is available. Well-equipped central laboratories prefer to perform the highly sensitive latest techniques such as enzyme linked immunosorbent assay (ELISA) using monoclonal and polyclonal antibodies and radio-immunono assay (RIA).

The BHK-21 cell culture-based inactivated FMD vaccines are being used widely as immunoprophylactic agents against FMD. The trivalent vaccine contains O, A and Asia-1 serotypes of FMD virus, inactivated with AEI or BEI and adjuvanted with $Al(OH)_3$ gel or mineral oil or saponin.

Canine parvovirus infections: Canine parvovirus-2 (CPV-2), the causative agent of acute haemorrhagic enteritis and myocarditis in dogs, is one of the most important pathogenic viruses. It is a highly contagious and often fatal disease. CPV-2 infection occurs worldwide in domestic dogs and other members of the dog family.

Haemagglutuion (HA) assay followed by HA inhibition (HI) with a CPV-2 specific antiserum or virus isolation (VI) in cell cultures were generally used for diagnosis. The polymerase chain reaction (PCR) and real time PCR (RT-PCR) have been increasingly used as a tool for the diagnosis of CPV infections.

Modified live and inactivated parvovirus vaccines have been used on fully susceptible sero-negative pups. For parvoviral prophylaxis, modified live virus (MLV) vaccines have proved to be much more effective than inactivated vaccines.

Swine fever: It is an acute highly infectious viral septicaemia of swine of all ages characterised by rapid and sudden onset, high morbidity and mortality and generalised haemorrhages. It is a highly contagious disease and the infection is usually acquired by direct contact with infected pigs, ingestion or inhalation.

"A confirmatory diagnosis is often difficult to make without laboratory examination as the signs and lesions of this disease are similar to that of swine erysipelas, septicaemic salmonellosis, pasteurellosis and streptococcosis. It would have been more complicated if African swine fever (ASF) is present in that country since marked similarity of its lesions to those of hog cholera," the paper remarked.

"All the vehicles, premises and utensils must be disinfected with strong chemical disinfectants. Movement of the pigs should be restricted and in-contact animals must not be sold in the market. Entry to and departure from infected premises must be controlled," according to the study.

Bovine spongiform encephalopathy (BSE): This is a neurodegenerative disease of cattle and according to the paper it is 100 per cent fatal. BSE-affected adult cattle (three to six years old) present clinical signs of apprehensive behaviour, locomotor deficits, lowered head, hyperesthesia and weight loss within six to eight weeks after the onset.

Strict medical treatment, control and surveillance measures are needed to control this disease. In addition, regulation on feeding meat and bone meal to cattle can result in a strong reduction in cases. ■

Keeping chickens away from disease

As the global poultry consumption is rapidly increasing, right health and hygiene procedures at all stages of commercial poultry production becomes highly important.

ACCORDING TO THE World Organisation for Animal Health (OIE), four countries and territories (Cambodia, Chinese Taipei, Malaysia and Russia) in two world regions (Asia and Europe) were affected by highly pathogenic avian influenza (HPAI) epidemic in domestic birds in August 2018. From January 2013 to August 2018, 12 different avian influenza (AI) subtypes were reported, with Asia reporting subtypes H5N1, H5N2, H5N3, H5N6, H5N8 and H7N9. All regions of the world were affected by HPAI outbreaks in domestic birds, with the most affected regions being Asia, Africa and Europe.

HPAI outbreaks in domestic birds resulted in the loss of approximately 122 million birds from January 2013 to August 2018. More than half of the reported losses occurred in Asia (58 per cent), followed by the Americas (23 per cent) and Europe (12 per cent), reported OIE.

In 2017-2018, there have been new and reoccurring outbreaks of HPAI H5N8 and H5N6 in Asia, Europe and the Middle East, said OIE. To combat these outbreaks, OIE has underlined the paramount importance to apply strict health and hygiene measures at all stages of commercial bird production.

Towards a healthy flock

The UN Food and Agriculture Organization (FAO) has highlighted technology-based approaches for the control and prevention of infectious diseases of poultry. These include:

Quarantine: Genetically-based disease resistance is rarely of practical use in the field. This means that isolation is the option. "The new birds being introduced should be kept separate and be the last fed every day for an initial quarantine and observation period of one month," noted FAO.

Hygiene and disinfection: When flocks are being isolated from the entry of microbes, hygiene and cleaning are the first measures used. These must result in the removal of organic material from the surfaces to be decontaminated.

Vaccination: This is one of the easiest and most economical groups of methodologies used for the control and prevention of poultry diseases. Poultry farmers must always consult with the veterinarians before implementing vaccination programme best for the situation.

Eradication: This is a feasible disease control option for some specific poultry pathogens. The criteria to be met are usually that the major mode of transmission is via the egg and that relatively accurate and inexpensive lab tests have been developed for detection of infection. "Although a successful eradication programme requires major investments of resources, significant benefits can flow back to the industry over the longer term," according to FAO.

Good health and hygiene management are crucial for poultry production.

Image credit: Adobe Stock

Immunogenetic resistance: This is promising for Marek's disease. However, it is not yet commercially available, said FAO. The solution may lie in the hands of commercial primary breeding companies, because genetic selection could be applied to disease resistance, if a commercial need create pressure for this, FAO stressed. ■

Sponsored article

NECTRA's chick robotic artificial vision and hatchery automation

With state-of-the-art automation solution, innovations and developments, NECTRA specialises in hatchery and laboratory automation for fertile hatching eggs, embryos and day-old chicks.

NECTRA – NEW EGG Chick Robotic Artificial vision and Automated Technologies – is one of the leading international suppliers of automated equipment and innovative solutions for hatchery and laboratory.

Located in France and created by Dr Ephrem Adjanohoun, who is the founder of ECAT Company, NECTRA has more than 20 years of automation experience in hatchery and laboratory technologies.

NECTRA develops and integrates powerful biomechanical technologies, robotic and artificial vision to build its automation. While most automation companies were integrated within large animal pharmaceutical groups, NECTRA successfully addressed the challenge to remain the leading high-tech company, independently owned by its founders, focused on its market while keeping an open access to automation technology.

NECTRA further offers its R&D development platforms to other partners including its competitors to create new products.

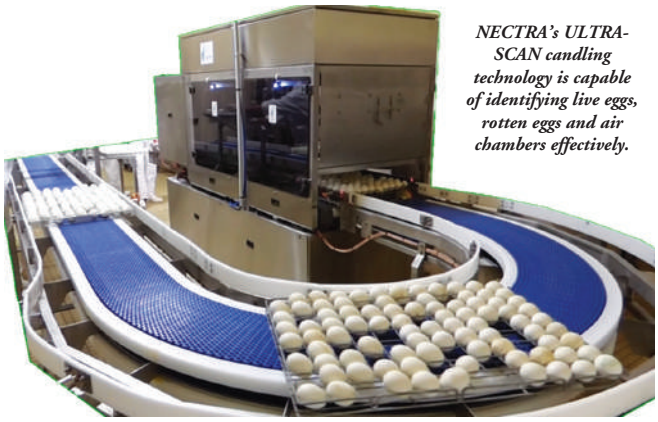
> **"NECTRA's in-ovo vaccination technologies include candling, egg sanitation, egg vaccination and egg transfer"**

Global poultry industry using NECTRA

NECTRA designed and manufactured the automation of the largest and latest prestigious hatchery such as Orvia / France 2018 for 1.5mn chicks per week. At the Shandong Minhe China 2018/2019 hatchery, two million chicks per week are equipped with the latest innovations. In the 2019/2020, NECTRA fulfils its promises with the ongoing automation of several modern poultry hatcheries such as CP in China, Laemthong in Thailand and ORVIA new duck hatchery in France.

Besides hatchery automation innovation, NECTRA provides its R&D development platforms to create new products.

Image credit: NECTRA



NECTRA's ULTRA-SCAN candling technology is capable of identifying live eggs, rotten eggs and air chambers effectively.

Image credit: NECTRA

Significant technical achievements

Staffed with a strong multi-disciplinary team of engineers and veterinaries, NECTRA R&D is well recognised by the industry and rewarded in September 2017 at Innov Space France for its latest ULTRASCAN candling technology. Among its achievements:

- The INOVOVAC, in-ovo vaccination robots, uses patented variable speed technology (VISA technology) which eliminates damages to the shell and the embryo caused by current technologies.
- The NECTRA Scan and NECTRA Life latest egg-candling technologies are able to identify live eggs, rotten eggs or air chambers without contact to the eggs, thus enabling further improvements in hatchability.
- NECTRA "No Rock No Touch" is the latest innovation that processes the eggs right within the incubation tray, eliminating drastically shell micro-cracks and contaminations that are generated by the existing industry processes that roll and rub the eggs on belts and against each other.
- NECTRA is further involved in ongoing development for automated in-ovo as well as feather sexing.

Diversified species and pharmaceutical industry too

While the main development on hatchery automation are traditionally made on poultry, NECTRA is developing technologies for other species such as 12 days early candling for turkey, ducks, game birds etc. NECTRA's technologies are used to fit smaller size hatcheries and to develop products for specific partners.

A specific range of products is developed for the pharmaceutical industry to process live embryo eggs and control bioburden.

Independent and passionate about live egg automation technology, NECTRA is "the team to write your future." ■

For more information, please visit nectra-com.fr/en/home

NECTRA

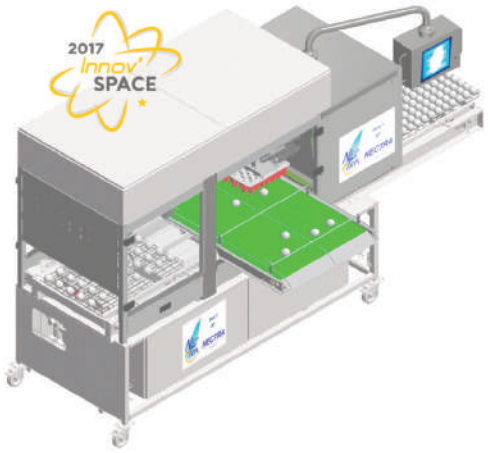
New Egg Chick Robotic Artificial Vision & Automated Technologies

THE REFERENCE IN HATCHERY & LABORATORY AUTOMATION

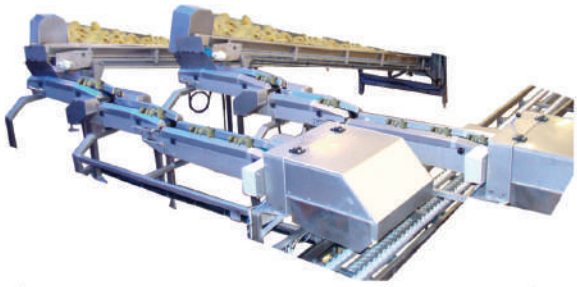
- **Full automation Solutions for Large, Medium, Small Hatcheries**
- **Vaccination & INOVO Technologies** (5.000 through 120.000 eggs/h)
- **ULTRA SCAN & NECTRA LIFE latest Candling technologies**
  detect live embryo, clear and rotten eggs
- **Leader in innovative technologies: Contact our team**
  Egg processing without rolling eggs, sexing... etc

INOVOVAC Selective Automated Egg Vaccination

- Patented VISA technology avoid shell micro-cracks and preserve embryo
- Avoid contaminations
- Optimized hatchability rates

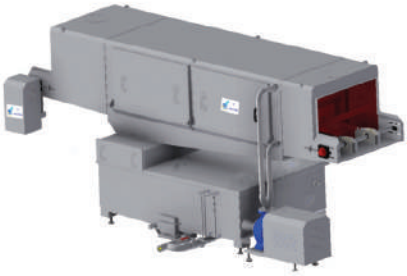


ULTRA SCAN & NECTRA LIFE



Highly Accurate Laser Chick Counting

Chick-Shell Separator



Industrial Washers

Setter Tray Destacker-Restacker

 # A Team to write your future #

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Nutrition and feeding for sustained fish farming

In the past few years, worldwide fish nutrition has advanced dramatically with new and balanced commercial diets to promote optimal fish growth and health.

Proper nutritional diets will play a significant role in quality production and meeting increasing demand for aqua products.

Image credit: Adobe Stock

IN FISH FARMING, feed quality represents around 50 per cent of the variable production cost. High-quality feed in aquaculture production is crucial to ensure economical production of a healthy species.

According to a report by MarketResearch.Biz, the worldwide aquaculture industry was valued at US$170bn in 2017 and is forecast to grow at a significant CAGR of 5.20 per cent until 2026. In line with this, the development of species-specific feeds supports the aquaculture industry to satisfy increasing demand for affordable, safe and high-quality fish and fish-based products.

A paper by Dr Steven Craig, assistant professor, Virginia-Maryland College of Veterinary Medicine, Virginia Tech Louis Helfrich, Fisheries and Wildlife Sciences, Virginia Tech stated that the nutritional content of feed depends on what species of fish is being cultured and at what life stage.

"Supplemental diets are intended to support the natural food normally available to fish in ponds or outdoor raceways. Supplemental diets do not contain a full complement of vitamins or minerals but are typically used to help fortify the naturally available diet with extra protein, carbohydrate and lipids," the paper explained.

Protein

Plant-based protein feeds such as soybean meal are typically low in methionine. Fish feeds manufactured with bacterial or yeast proteins are often deficient in methionine and lysine, essential amino acids for aqua production. Therefore, these amino acids must be supplemented to diets when these sources of proteins are used to replace fishmeal.

Protein requirements are higher for fish reared in high-density systems (recirculating aquaculture) compared to low-density culture (ponds). It is higher for smaller and early life-stage fish. Factors affecting protein requirements are rearing environment, water temperature, water quality, genetic composition and feeding rates of the fish.

Lipids and carbohydrates

According to the paper, lipids have around twice the energy density of proteins and carbohydrates, making up around seven-15 per cent of fish diets, supplying essential fatty acids and serving as transporters for fatsoluble vitamins.

"Simple lipids include fatty acids and triacylglycerols. Fish typically require fatty acids of the omega-3 and -6 families. Marine fish and algal oils are naturally high in omega-3 highly unsaturated fatty acids and are excellent sources of lipids for the manufacture of fish diets. Lipids from these sources can be deposited into fish muscle," noted the source.

Carbohydrates are stored as glycogen that can be mobilised to satisfy energy demands. It reduces feed costs and is used for their binding activity during feed manufacturing.

Vitamins and minerals

As vitamins are often not synthesised by fish, they must be provided in the diet to support normal growth and health.

Water-soluble vitamins include B vitamins (thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folic acid, and cobalamins) and vitamin C (ascorbic acid). Vitamin C enhances immune system of fish and shrimp. Fat-soluble vitamins include vitamins A (retinol, betacarotene), D (cholecalciferol), E (tocopherols) and K (phylloquinone). As a feed ingredient, vitamins E and C inhibit dietary lipid oxidation, improving shelf life.

Common dietary macrominerals such as calcium, sodium, chloride, potassium, chlorine, sulphur, phosphorous, magnesium etc are set to regulate osmotic balance and aid in bone formation and integrity. Microminerals such as iron, copper, chromium, iodine, manganese, zinc and selenium are required in small amounts as components in enzyme and hormone systems.

As further emphasised by the UN Food and Agriculture Organization (FAO), countries in Asia and Africa have witnessed spectacular growth in aquaculture industries. It is also projected that semi-intensive and small-scale pond aquaculture will see a rapid increase in the developing territories, signifying the dominant role of nutrition and feeding resources in sustained aquaculture development. ■

Image credit: Trond Kristiansen, Nordox

Contact protectant fungicide should be applied on a regular basis during periods of fast growth to compensate for deposit 'dilution' caused by rapid leaf and fruit expansion.

The biology behind fungicide spraying of tropical tree crops

Copper fungicides are still the most widely used protectant fungicides for tree crop disease control in the tropics. Dr Terry Mabbett reports.

LEAVES FRUITS AND stems susceptible to infection by fungal pathogens are the targets for fungicide application and, as such, the biology of the crop plant and specifically plant morphology (size, shape and form) are as important as the chemistry of fungicide action. This is especially true for tree crops given the wide variations in size, shape and structure between bush crops such as tea and full-blown tree crops such as rubber, and most crucially so for contact-acting protectant fungicides which will remain as a residue on the plant surface to prevent fungal infection over a long period of time.

A contact protectant fungicide is designed to remain on the plant surface to prevent infection by fungal plant pathogens and in complete contrast to the penetrative systemic fungicide which is designed and developed for its ability to move into the plant as quickly as possible to suppress or eradicate the infection therein.

> **"Contact protectant fungicides are the mainstay for plant disease control, especially in the tropics."**

Spray coverage is always important but most critically so for contact-acting protectant fungicides, because deficiencies in spray coverage are rapidly exploited by plant pathogens. Once the pathogen is inside the plant, 'there is no way back' because the protectant fungicide stays on the plant surface.

Achieving adequate spray coverage may not be as simple as it first appears because:

- Individual pathogens target specific parts of the plant
- Micro-environmental conditions within the crop canopy make some parts more vulnerable to infection and over longer periods of time

These variables must be considered when designing a programme of fungicide application for a specific crop/plant pathogen interaction. They are a function of plant morphology and anatomy of the plant in question, and character of the canopy which is formed when a number of plants are grown in association as a crop. The following account is a practical consideration of plant and crop biology in relation to the application requirements of contact protectant fungicides.

Profile of protectant fungicides

Despite a long history and vintage, contact protectant fungicides are still the mainstay for plant disease control, especially in the tropics.

Most classic are the copper fungicides with their roots in the nineteenth century and are exclusively contact and protectant in action. First systemic, suppressive/eradicant fungicides (the MBC's or benzimidazoles) did not appear until the late 1960s. Ironically, some systemic fungicides are no longer in use because they have succumbed to so-called 'fungicide resistance' whereby the pathogen becomes insensitive to the action of a specific mode of fungicide chemistry.

Fixed copper fungicides such as cuprous oxide, the dithiocarbamates (e.g. mancozeb) and the nitriles (chlorothalonil) are examples of contact protectant fungicides. They are among the best known and most widely used, with copper fungicides occupying top spot for tropical tree crops where the bulk of contemporary fungicide usage takes place.

Spray timing and placement

Citrus and mango are two classic examples of tropical fruit tree crops that undergo marked foliar (leaf) flushing at particular times of the year in response to seasonal changes. Flushes of new leaves are soft and remain so until the leaves are fully expanded and hardened with the formation of a thick waxy cuticle and a covering of wax bloom.

During this flushing period, citrus leaves are highly susceptible to infection by a group of fungal pathogens including *Mycosphaerella citri* (citrus greasy spot), *Elsinöe fawcetti* (sour orange scab) and *Diaporthe citri* (citrus melanose). Not only do these diseases have the capacity to completely destroy new leaf growth but in some cases, such as sour orange scab, provide the 'staging post' and inoculum (spores) for subsequent infection of the young developing fruit.

Citrus trees should be sprayed and the foliage protected as the branches begin to flush using repeated applications of contact protectant fungicide as necessary to compensate for deposit dilution through leaf expansion and loss of deposit loss through the erosive effects of rainfall.

Gloeosporium limetticola (wither-tip of lime) is a perennial problem on new foliar flushes of lime trees, distorting growth pattern and canopy shape. Lime trees respond to the loss of these first foliar flushes with abnormal bursts of growth which destroy canopy shape to make future spray application and coverage more difficult.

> **"Citrus and mango are two classic examples of tropical fruit tree crops that undergo marked foliar (leaf) flushing at particular times of the year in response to seasonal changes"**

Colletotrichum gloeosporioides (anthracnose), the major foliar and fruit disease of mango, hits new flushes of the pendulous pink coloured mango leaves before moving on to infect the blossom and newly formed fruit. Anthracnose is carried right through to fruit maturity often as latent infections which only start to show and spread post-harvest, causing serious damage during the pre-marketing storage period. Long term sustainable control of mango anthracnose requires season-long programmes of copper fungicide sprays starting with the new leaf flushes and continued through to the pre-harvest period.

Cocoa undergoes even more vigorous and sustained foliar flushing but it is the fruit (cocoa pods), and not the leaves, which are susceptible to the economic diseases of cocoa. The most universal and damaging disease is black pod (Phytophthora pod rot) caused by a number of *Phytophthora* species and notably *P. palmivora*. Pods at all stages of development are susceptible to Phytophthora pod rot, from the tiny 'cherelles' formed on flower cushions to full ripe pods ready for harvest. Infection of flower cushions can lead to *Phytophthora* stem canker of the bark and wood which can girdle and kill the tree.

Black pod is probably the most demanding in disease for cocoa farmers in hot humid tropical regions of the world. Farmers face total crop loss in the absence of a rigorously applied programme of copper fungicide sprays, targeted at the vulnerable flower cushions and pods, beginning before the start of the rainy season. Low-hanging cocoa pods are especially at risk because they can be infected by Phytophthora spores splashed up from cocoa debris in the soil as well as Phytophthora spores washed down through the canopy during intense rainfall.

Cocoa pods and especially low hanging ones are the targets for contact protectant fungicide like cuprous oxide to control of Phytophthora pod rot.

Leaf and fruit surfaces as spray targets

Good spray coverage is critical for the control of foliar diseases which develop most easily right inside the tree canopy. Leaves inside the canopy take a longer time to dry out after rainfall and are more difficult to cover with spray.

The abaxial (lower) leaf surface is invariably more susceptible to infection because it lacks the waxy cuticle on the adaxial (upper) leaf surface, and also because it is where most if not all the stomata are found. The abaxial (lower) surface of a leaf stays wetter for longer after rainfall because it is shielded from air movement and direct rays from the sun.

Plants with stomata confined to the abaxial leaf surface and infected by pathogens entering

exclusively via stomatal pores present the most critically difficult targets for spray application. Coffee and citrus are two classic examples in which stomata are confined to the lower (abaxial) leaf surface. Examples of major plant pathogens which enter these plants only via the stomata are *Hemileia vastatrix* (coffee leaf rust) and *Mycosphaeralla citri* (citrus greasy spot). Not surprisingly, these are two of the most difficult-to-control diseases of tropical tree crops.

"Challenges presented by pathogens may be overcome using air-assisted sprayers such as shoulder-mounted low volume knapsack mistblowers and hand-held ULV atomisers."

Potential problems and challenges presented by such pathogens, and related to spray coverage requirements, may be overcome using air-assisted sprayers such as shoulder-mounted low volume knapsack mistblowers and hand-held ultra-low volume (ULV) atomisers.

Tree canopies are surrounded by a layer of still air which presents a barrier to the deposition of spray droplets unless sufficient force and momentum is provided to enable the droplets to 'break through.' Spray droplets delivered by an air-assisted sprayer are preceded by the leading edge of the air stream which flips the leaves in the outer shell of the canopy. This allows the droplets, following close on, to move into the canopy and be deposited on leaves right inside. By flipping the leaves upwards, the undersides are exposed to incoming spray droplets which are deposited on this abaxial surface exactly where they need to be.

Such scenarios were proven by field research on the Caribbean Island of Trinidad using fixed copper fungicides sprayed on grapefruit trees using a low volume knapsack mistblower. Initial deposits on the lower (abaxial) and upper (adaxial) surfaces of citrus leaves of 7.63µg and 5.29µg Cu^{2+}/cm^2 were reduced to 4.01µg and 1.39µg Cu^{2+}/cm^2 respectively, after five months weathering. Thus, the initially higher abaxial or lower-leaf surface deposit was reduced by 48 per cent compared to the 74 per cent loss from the adaxial or upper-leaf surface deposit, after the five months of weathering. Findings were supported by laboratory trials during which initial deposits on abaxial (lower) and adaxial (upper) leaf surface deposits were reduced by 28 per cent and 47 per cent, respectively, after 20 inches of simulated (artificial) rainfall.

Leaf and fruit expansion causing deposit dilution

One factor frequently forgotten when calculating the required dose of fungicide and application frequency is the dilution of the initial fungicide deposit due to rapid increases in surface area of young leaves as they grow and expand towards full size and maturity. If a leaf receives spray on the day after emergence but not again until three weeks later, and by which time it has increased massively in surface area, then the initial fungicide deposit will have been automatically reduced by an equivalent factor (on a µg/cm2 basis), even before any loss from weathering is taken into account.

The same premise applies for young developing fruit. Research carried out in Australia shows how initial fungicide deposits on young citrus fruits (lemons) are reduced by up to a factor of 15 simply through an incremental increase in fruit size and surface area during growth and development from fruit set to harvest.

Image credit: Trond Kristiansen, Nordox

Leaf rust pustules on the abaxial (lower) leaf surface of coffee leaves. This is where the leaf rust pathogen infects via the stomata and is therefore where deposits of contact protectant fungicide like cuprous oxide should be placed.

Protectant fungicide sprays should be applied at a sufficiently high dosage and sufficiently frequently to buffer these effects of deposit dilution, so that all newly formed leaves and fruit receive spray at least once after the main period of leaf and fruit growth and expansion has occurred. ■

ANNUAL AGRICULTURAL BUYERS' GUIDE 2019

Section One - Supplier listings by categories
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Pöttinger's TERRASEM universal mulch drilling

PÖTTINGER HAS INTRODUCED TERRASEM universal seed drills for mulch drilling, conventional drilling as well as direct mulch drilling.

On TERRASEM mulch seed drills, soil preparation is taken care of by a two-gang disc harrow with smooth or scalloped discs. "The rubber-mounted 510mm-diameter discs loosen the soil across the entire working width. At seed level they leave behind a structured layer of tilth," explained Pöttinger.

According to the company, the TERRASEM is a min-till seed drill that is set to drill directly behind the combine harvester and complete the working steps in a single pass.

The first working step is carried out by the fully-fledged compact disc harrow with its disc geometry and disc angle. The second step is the consolidation of the loosened mixture of soil and straw.

"It promotes the capillary effect to make sure the seeds are supplied with water during the germination stage. Then the seeds are sewn into the consolidated soil. The seed is placed in the seed slot by a DUALDISC coulter mounted on a parallel linkage. The coulter has the necessary pressure to place the seed in the right water-bearing layer," Pöttinger noted.

As there is one pass, water evaporation is minimised and an erosion resistant layer is left behind on the surface.

Image credit: Pöttinger

TERRADISC 8001 T and 10001 T for soil preperation

The TERRASEM mulch seed drills follows Pöttinger's TERRADISC 8001 T and 10001 T that focus on providing blockage-free incorporation of harvest residues and reliable operation in different operating conditions.

The central and hydraulic working depth setting with jockey wheels (optional on 8001 T, standard on 10001 T) is set to provide low draft, perfect penetration, good ground tracking, tilth and incorporation of harvest trash into the soil.

The TERRADISC T is raised onto the suspension of the rear roller and its weight is distributed across the whole working width. According to Pöttinger, the TERRADISC T offers the effective working width as specified. "Despite its large working width, the TERRADISC T is compact during transport. The chassis features an integrated folding and transport system for safe road transport with a transport height of four metres and a transport width of three metres. Air brakes or hydraulic brakes are available."

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- 08 Import/Export Agents and Distributors
- 09 Farms and Plantations
- 11 Food Processing: poultry, dairy, cereal, fruit, vegetables, etc
- 12 Aid Organizations
- 13 Agricultural Equipment and Material Manufacturers: irrigation, agro-chemicals
- 16 Others: please specify:

4. Type of produce

- 01 Rice
- 02 Grain
- 03 Fruit
- 04 Cocoa
- 05 Coffee
- 06 Cotton
- 07 Rubber
- 08 Palm Oil
- 09 Palm Kernels
- 10 Sugar Cane
- 11 Feedstuffs
- 12 Groundnuts
- 13 Vegetables
- 14 Cassava
- 15 Dairy Cattle
- 16 Beef Cattle
- 17 Sheep/Goats
- 18 Pigs
- 19 Poultry
- 20 Fisheries

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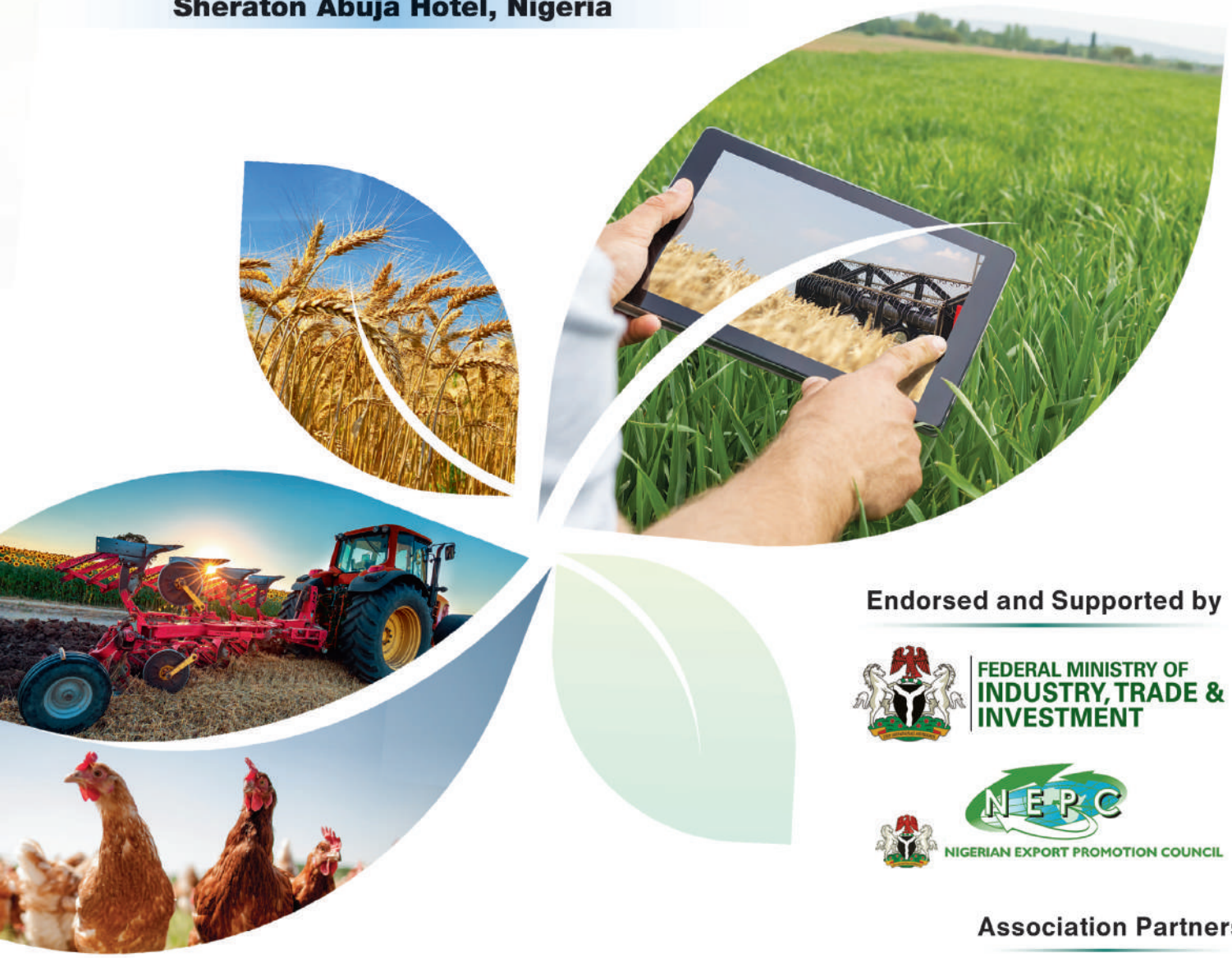

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