

Far Eastern Agriculture

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How to improve the feed intake in dairy cows

**New tractors for Thailand from
New Holland Agriculture**

Oil palm cultivation
Striking the perfect nutrient balance

Poultry probiotics:
Understanding the basics



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Buyers' Guide
2018**



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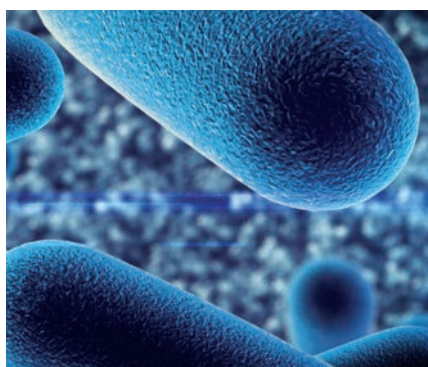
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Bayer closes Monsanto acquisition

BAYER SUCCESSFULLY COMPLETED the acquisition of Monsanto on 7 June. Shares in the US company will no longer be traded on the New York Stock Exchange, with Bayer now the sole owner of Monsanto Company. Monsanto shareholders are being paid US\$128 per share. JP Morgan assisted Bayer with processing the purchase price payment for the largest acquisition in the company's history. According to the conditional approval from the United States Department of Justice, the integration of Monsanto into Bayer can take place as soon as the divestments to BASF have been completed. This integration process is expected to commence in approximately two months. "Today is a great day for our customers – farmers around the world whom we will be able to help secure and improve their harvests even better; for our shareholders, because this transaction has the potential to create significant value; and for consumers and broader society, because we will be even better placed to help the world's farmers grow more healthy and affordable food in a sustainable manner. As a leading innovation engine in agriculture, we offer employees around the world attractive jobs and development opportunities," said Werner Baumann, chairman of the Bayer Board of Management. "Our sustainability targets are as important to us as our financial targets. We aim to live up to the heightened responsibility that a leadership position in agriculture entails and to deepen our dialogue with society." "Today's closing represents an important milestone toward the vision of creating a leading agricultural company, supporting growers in their efforts to be more productive and sustainable for the benefit of our planet and consumers," said Hugh Grant, outgoing chairman and CEO of Monsanto. "I am proud of the path we have paved as Monsanto and look forward to the combined company helping move modern agriculture forward". Liam Condon, member of the Bayer Board of Management, will lead the combined Crop Science Division when the integration commences. Until that time, Monsanto will operate independently from Bayer.



Until the integration commences, Monsanto will operate independently from Bayer.

ADB finances utility-scale solar PV plants in Indonesia

THE ASIAN DEVELOPMENT Bank (ADB) has announced a private sector financing package totalling approximately US\$40mn to invest in Indonesia's first utility-scale solar photovoltaic (PV) plants on a project-finance basis. The loan package is part of a two-phased portfolio financing totalling approximately US\$160mn for new renewable energy investments in the country. ADB will invest in two phases in renewable energy assets developed by Vena Energy, formerly known as Equis Energy — the largest renewable energy independent power producer (IPP) in the Asia and Pacific region, with 11 GW in operation, under construction, and in development.

The investment will help construct, operate, and maintain a portfolio of energy projects, including a wind farm and four solar PV plants in eastern Indonesia. The first phase, which was signed in December 2017, consisted of a 72 megawatt (MW) wind power plant in Jenepono, South Sulawesi. ADB's financing package to PT Energi Bayu Jenepono, a subsidiary of Vena Energy, totaled US\$120.8mn, including financing from two trust funds administered by ADB, namely, the Leading Asia's Private Infrastructure Fund and the Canadian Climate Fund for the Private Sector in AsiaII.



Investment will help construct, operate, and maintain a portfolio of energy projects.

Novel technologies in Rice Technology Transfer Systems

IRRI EDUCATION, IN collaboration with the Rural Development Administration (RDA) of the Republic of Korea, has trained a new batch of agricultural technicians and extension agents at the International Technology Cooperation Center (ITCC) in Jeonju, South Korea. The group, which consisted of 17 participants from nine Asian countries: Cambodia, Indonesia, Lao PDR, Mongolia, Myanmar, Philippines, Thailand, Sri Lanka and Vietnam, included a strong representation of women (15 females out of 17 participants). The participants learned novel and major technologies in rice cultivation, including topics on rice breeding, disease and pest control in rice, and the agricultural extension system of South Korea. They were also exposed to the Korean culture by visiting cultural heritage sites. They also experienced an overnight stay in a farm that gave them exposure to traditional farmers' practices in crop cultivation. The visits to the technology centre and research facilities also provided new insights to the participants on modern trends and development in rice research.



The participants learned novel and important technologies in rice cultivation.

'Algae are the second lung of the planet'

CONGRÈS ALGASCIENCES, OLMIX'S scientific seminar on how algae can improve current animal farming and plant growth techniques and strategies was held on May 29. In her address, Maria Matard-Mann, research projects manager, Olmix Group highlighted the extraordinary properties of marine algae and their potential for animal and plant health.

"After the Amazon rainforest, algae are the second lung of the planet. Macro-algae are rich in many unique components and have very diverse nutritional and biological properties. In plant growth, for example, some algae extracts contribute to both plant nutrition and health thanks to their biostimulant effects on one hand, and their eliciting properties on the other, leading to the stimulation of plant defences. On the other hand, marine sulphated polysaccharides possess diverse biological properties such as immunity enhancement that can be used to improve animal health and welfare. Their potential is huge! Olmix Group has developed innovative and unique technologies to extract several active components from macro-algae and develop a full range of algae-based solutions at the service of animals, plants and humans," Dr Matard-Mann said.

Drawing the attention to Animal Care, the plenary session started with the lecture of Dr Delphine Le Roux (ENVA Maison-Alfort), who focused her speech on the actors of immunity at the intestinal level and the potential influence of nutrition on it. The immune system is a very complex organisation, known as "GALT" (Gut Associated Lymphoid Tissue) in the intestine:

"The immune system is very complex and involves many mechanisms of maturation and communication between cells, particularly at the level of the intestine. Some dietary compounds have the capacity to interact with it and be used as a very potent tool to better and safer raise animals. A targeted use of specific polysaccharides can activate the immune response; algae extracts are good candidates with their content in unique active polysaccharides. We count on the research work of Olmix Group to gain some more knowledge in this area."

Dr Le Roux concluded her speech highlighting that the "GALT guarantees intestinal homeostasis, but cannot be



Image credit: Olmix

Olmix CEO Hervé Balusson welcomes delegates at the first edition of Congrès AlgaSciences.

dissociated from the intestinal microbiota and vice versa".

To underscore Le Roux's speech, Mrs Danièle Marzin (Marketing & Innovation Director, Olmix Group), contributed to the programme through an overview of Olmix's new alternative to reinforce animal's natural defences, 'Algimun'.

"Algimun brings together two unique specific Olmix marine algae extracts: MSP® BARRIER (patent pending) and MSP®IMMUNITY (patented by Olmix), acting respectively on intestinal mucosa integrity and immune response modulation, properties which were scientifically proven in collaboration with INRA among others and that work in synergy in the intestine," she said.

Included in the animal's feed, Algimun allows to support animals' natural defences, helping them to face daily challenges to secure and optimise their growth while improving farm benefits!"

If immunity was the topic to discuss during the first half of the session, the second one was focused on the still challenging subject of mycotoxin risk. In this context, Dr Isabelle Oswald (INRA Toxalim Toulouse) was the next to go on stage to deliver a presentation entitled 'Fusariotoxins and intestinal health', where she shed light on the main challenges related to the presence of mycotoxins in feeds.

EVENTS 2018

JULY

04-06

Indo Livestock 2018 Expo & Forum-
Jakarta, Indonesia
www.indolivestock.com

25-27

Inagritech
Jakarta, Indonesia
www.inagritech-exhibition.net

26-28

Asia Agri-Tech Expo & Forum
Taipei, Taiwan
www.agritechtaiwan.com

26-28

Livestock Taiwan Expo & Forum
Taipei, Taiwan
www.livestocktaiwan.com

AUGUST

22-24

Agritechnica Asia
Bangkok, Thailand
www.agritechnica-asia.com

SEPTEMBER

17 - 19

VIV China
Nanjing, China
www.vivchina.nl

20-22

BANGLALIVESTOCK'18
Dhaka, Bangladesh
www.banglalivestock.com

OCTOBER

17 - 19

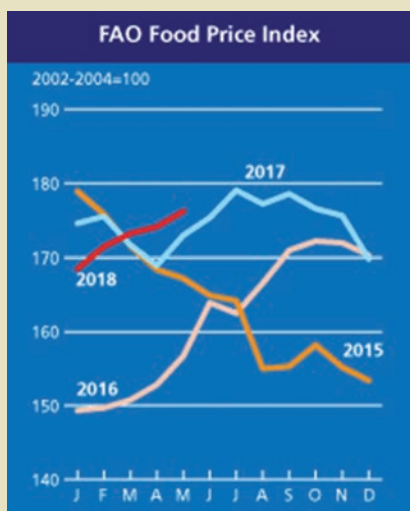
Vietstock 2018 Expo & Forum
Ho Chi Minh City, Vietnam
www.vietstock.org

FOOD OUTLOOK

THE FAO FOOD Price Index (FFPI) averaged 176.2 points in May 2018, up 2.2 points (1.2 per cent) from April level and hitting its highest level since October 2017. The increase in May reflected a continued steep rise in dairy price quotations, while those of cereals also rose, albeit at a slower pace. By contrast, vegetable oil and sugar markets remained under downward pressure whereas meat values changed little.

The FAO Cereal Price Index averaged 172.9 points in May, 4.1 points (2.4 per cent) above its April level. The index continued on an upward path since the start of this year, standing in May at almost 17 per cent above its corresponding value a year ago and reaching the highest level since January 2015. Wheat values gained largely on concerns over production prospects in a number of major exporting countries.

The FAO Vegetable Oil Price Index averaged 150.6 points in May, down by 4 points (2.6 per cent) month-on-month, marking a fourth consecutive decline and a 27-month low. The slide mainly reflects



weakening values of palm, soy and sunflower oils, whereas rapeseed oil prices rebounded from their April's multi-month low. As for palm oil, despite prospective production slowdowns in Southeast Asia, international prices fell due to sluggish global import demand.

The FAO Dairy Price Index averaged 215.2 points in May, up 11 points (5.5

per cent) from April and marks the fourth month in a row for the index to rise. The index value stood at 11.5 per cent higher than in May 2017, yet still 22 per cent below the peak reached in February 2014.

The FAO Meat Price Index averaged 169.6 points in May, marginally lower than in April. The small decline in the index in May reflected the easing of pig meat and ovine meat prices, while those of poultry meat rose slightly. International price quotations for pigmeat and ovine meat weakened, on lower imports by China in the case of pigmeat and on a stronger US dollar for ovine meat.

The FAO Sugar Price Index averaged 175.3 points in May, down slightly (0.5 per cent) from April, marking the sixth consecutive monthly decline. The latest decrease in international sugar prices mostly reflects expectations of a large sugarcane output as a result of favourable harvesting conditions that prevail in the Centre South region of Brazil. Concerns over a prolonged dryness affecting cane yields in some part of that region lacked strength to reverse the market trend.

Hypor Magnus: Maximised throughput for minimal cost

EXCELLENCE IN PORK production is all about raising the bar, whether it's heavier weights, higher production or hardier pigs, and that's what the Hypor Magnus is all about. As packers move to heavier weights, producers must provide heavier carcasses with more meat, without using more resources to do it. Since the number of finishing spaces is limited, getting the most meat from each pig and each pig space in your barn is vital.

"When variation is high, your slow growing pigs will reduce the number of turns per year [days to market + days to wash] for that barn," said Carl Esau, key account manager, Canada with Hypor. "By increasing daily gain and reducing variation, the Magnus gives you more consistency and more turns per year, so you always know what you can get out of your barn on a regular basis."

In side-by-side trials with other leading



Hypor is a leading supplier of pig genetics.

competitors, the Hypor Magnus has fewer days to market, more turns per year and a greater number of potential pigs placed. As well, since a faster growing pig spends fewer days in the barn, it lowers overall rearing costs. This can mean more than US\$2.10 per pig cost savings in rearing costs alone. If you multiply that by the number of pigs that move through your barn each year, it adds up to huge savings and a big boost to your bottom line.

"A big part of TSP (Total System Profitability) is how much meat you can produce per sow from the pigs she weans," said Esau. "To maximise that, you need high daily gain and a minimum number of low value pigs, and the Hypor Magnus gives you both. Of course, such a strong performing sire line isn't created overnight. The Hypor Magnus stems from a huge investment of time and resources, but the results are worth it. It's exciting to see how the Hypor Magnus has evolved and advanced over the years," said Esau.

"Being able to produce pigs to heavier weights and with high average daily gain that doesn't slow as the weight increases, is a real testament to the geneticists who made it happen."

Hypor is one of the world's leading suppliers of pig genetics committed to providing superior genetics that supports profitability in the pork value chain.

What is a poultry probiotic?

Probiotics can speed up the maturation of day-old chicks' developing immune systems and can be applied throughout a bird's life to support gut health.

POULTRY PROBIOTICS OR direct-fed microbials (DFM) are live microorganisms that can be incorporated in diets in order to: Populate the intestine with beneficial bacteria; modulate the conditions within the gastrointestinal tract.

By adding probiotics to feed or water, the intestine is populated with beneficial bacteria avoiding or decreasing the extent of pathogen colonisation (Nurmi and Rantala, 1973). The efficacy of different probiotics has been demonstrated in modern poultry systems. Because antibiotics are being removed from the routine practices of animal husbandry, probiotics are now considered a promising tool to prevent pathogens from causing health and disease challenges.

Probiotic, prebiotic and synbiotic

Probiotics can be combined with prebiotics to nourish the beneficial bacteria and achieve better results. The probiotic plus prebiotic combination is known as a synbiotic.

A prebiotic is a non-digestible additive often consisting of natural dietary fibres such as fructooligosaccharides (FOS) that stimulate the growth and activity of beneficial bacteria in the colon, thus improving host health (Gibson and Roberfroid, 1995).

A synbiotic is a combination of probiotic and prebiotic products (Patterson and Burkholder, 2003), often with the aim of improving efficacy. PoultryStar is an EU-authorized synbiotic (probiotic plus prebiotic).

How probiotics work against pathogens

Several proposed mechanisms explain the mode of action of probiotics against pathogens, namely:

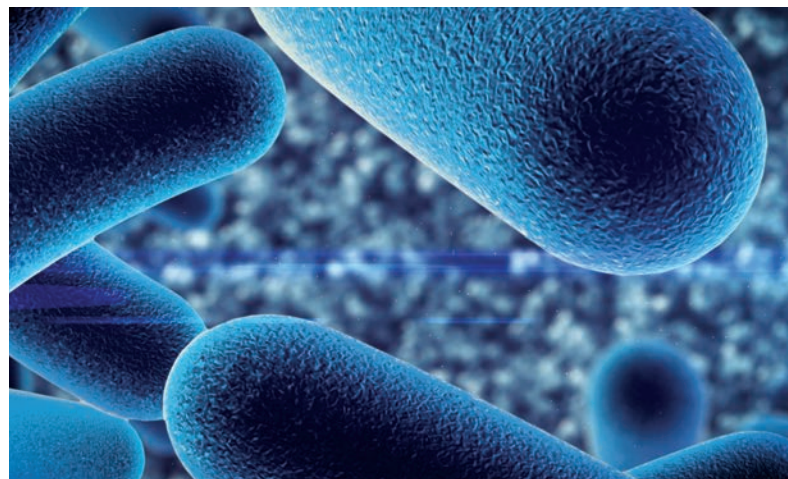
1. Competitive exclusion
2. Bacteriocin production
3. Immune stimulation
4. Improvement on gut health and integrity

Probiotics can be combined with prebiotics to nourish the beneficial bacteria and achieve better results."

Probiotics competitively exclude pathogens

Competitive exclusion refers to the blockage of cellular receptors on the luminal surface of epithelial cells, mechanically avoiding the entrance of pathogens. This can be supported by in vitro assays that show the capacity of selected probiotic bacteria to adhere to intestinal cells (Pascual et al., 1999; Ibnou-Zekri et al., 2002).

Remarkably, the ability to attach to the surface of intestinal cells varies among different strains of the same species of bacteria (Ibnou-Zekri et al., 2002). Competitive exclusion also considers the



Evidence indicate probiotics exert selective activation of certain epithelial genes

consumption of available nutrients by beneficial bacteria limiting resources and space for pathogenic bacteria.

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Probiotics produce bacteriocins that target pathogens

Another mechanism that reduces bacterial viability is the production of harmful substances that specifically target pathogens, like H₂O₂ and bacteriocins (Oh et al., 2000; Gillor et al., 2008).

Bacteriocins are amino acidic molecules that have bactericidal properties on genetically related organisms. Several bacteriocins have been identified. Small bacteriocins tend to be heat-stable whereas large bacteriocins tend to be heat-labile.

While described bacteriocins are mostly effective against Gram-positive bacteria, there are some bacteriocins already described which are effective against Gram-negative organisms (Ralph et al., 1995; Servin, 2004).

Because of their amino acidic origin, bacteriocins are susceptible to proteolytic enzymes. There is another group of non-acid substances that are resistant to heat and proteolytic enzymes and thus belong to a different category of inhibitory compounds produced by commensal bacteria. Most of these are not fully identified compounds but with established inhibitory activity against *Clostridium*, *Bacteroides*, *Enterobacteriaceae*, *Pseudomonas*, *Staphylococcus*, and *Streptococcus* (Silva et al., 1987).

The right probiotics support the immune system

Stimulation of the immune system, or immunomodulation, is another theory that explains the efficacy of probiotics. The intestinal tract of newborns is basically sterile. Bacteria that first colonise the gut influence the gene expression of epithelial cells influencing in turn the subsequent bacterial colonisation of the intestine.

As an immune organ, the intestine has a large component of lymphoid tissue (GALT, or gut-associated lymphoid tissue) which also needs proper stimulation from commensal microorganisms for maturation.

Chickens that have been immune stimulated with probiotics in the diet have shown increased secretion of anti-clostridial IgA antibodies (Hamid et al., 2006). On the other hand, the intestine must peacefully coexist with commensal bacteria and antigens of alimentary origin (oral tolerance). In addition, non pathogenic bacteria are able to send stimulatory signals to the enterocytes which limit the production of pro-inflammatory cytokines while promoting the production of anti-inflammatory cytokines (Neish et al., 2000). This observation can be supported by germ-free mice that show continuous inflammation and inadequate immune responses against normal dietary antigens (Servin, 2004).

Stimulation of the immune system, or immunomodulation, is another theory that explains the efficacy of probiotics."

It should be noted that the immune-stimulatory function of commensal bacteria is strain specific and even closely related bacteria stimulate the immune system in different ways (Ibnou-Zekri et al., 2002). Theoretically, probiotics could achieve benefits by either pro- or anti-inflammatory effects. For example, in human medicine it could be desired to reduce inflammation in patients undergoing chronic inflammation (Crohn's disease). On the other hand, enhanced inflammation and direction of the immune system towards



Image credit: Adobe Stock

The effects of poultry probiotics are particularly important for young animals in which stable intestinal bacteria have not yet been established

the cellular component of the immune response may help fighting coccidia in poultry.

Probiotics support epithelial cells

In addition to the anti-pathogenic activity that probiotics have, it has been demonstrated that indigenous bacteria of the intestine also contribute to the healthy development of epithelial cells. Actually, indigenous bacteria can stimulate enterocytes to produce and release active gastrointestinal peptides that impact the regulation of epithelial structure and intestinal endocrine cells (Servin, 2004). It is also becoming clear that commensal bacteria modulate gene expression of epithelial cells influencing nutrient absorption, intestinal maturation and improvement of the mucosal barrier (Servin, 2004).

Some strains of *Lactobacillus* are able to reduce the epithelial invasion of enterohemorrhagic *E. coli* (EHEC) without decreasing the viability of the pathogen. Since this effect is only observed with live *Lactobacillus*, it is thought that it is the result of the interaction of commensal bacteria and intestinal epithelium that induces protective changes on the enterocytes interfering with the internalisation process of EHEC (Hirano et al., 2003). There is increasing evidence indicating that probiotics exert selective activation of certain epithelial genes. Similarly, the modulation of immune response obtained with probiotics seems to be strain-dependent (Didierlaurent et al., 2002).

Probiotics may do even more

Other mechanisms for the probiotic-induced inhibition of pathogens have been studied. This is the case of intestinal pH reduction by the production and secretion of metabolites such as lactic acid (Fayol-Messaoudi et al., 2005). It has been suggested that lactic acid produced by probiotic strains increases permeability in the outer membrane of gram-negative bacteria facilitating the diffusion of antimicrobial compounds produced by probiotics and by the host's epithelium (Alakomi et al., 2000). In addition, production and release of other endogenous metabolites that may bring positive benefits yet to discover. ■

Source: *biomin.net*

INDO LIVESTOCK Expo from 4 July

INDO LIVESTOCK 2018 is the preferred venue for buyers to source new technology and equipment.

INDO LIVESTOCK EXPO & Forum is Indonesia's number one event bringing together international livestock, feed, dairy and fisheries industries under one roof. The expo, scheduled to take place on 4-6 July 2018 at Jakarta Convention Center, Jakarta, is the go-to event for decision makers and buyers from multiple industries across Asia.

The exhibition is anticipating a footfall to the tune of 15,000 in 2018. The expo has also lined up 500 exhibitors from 40 countries and 10 country pavilions including China, Europe, South Korea, Taiwan, Thailand, The Netherlands, United Kingdom, United States of America, Turkey and Indonesia.

INDO LIVESTOCK Expo Forum attracts professionals working across livestock, feed, dairy and fisheries industries."

Indo Livestock Expo is South East Asia's most important trade show incorporating the animal feed industry (Indo Feed Expo & Forum), the dairy industry (Indo Dairy Expo & Forum) and the fisheries industry (Indo Fisheries Expo & Forum).

The expo will hold 95 technical presentations and 12 seminars designed to provide in-depth knowledge and innovative solutions to tackle the pain points crippling the above sectors.

With over 15 years of nurturing important industry relationships to deliver high-value leads, Indo Livestock Expo & Forum attracts professionals working across livestock, feed, dairy and fisheries industries.

Why INDO LIVESTOCK Expo & Forum

- The expo is the most complete Biennial industry event covering livestock, feed and meat processing industries
- High-end players from Indonesia and the ASEAN region including regulators and decision makers
- INDO LIVESTOCK is a strictly business-to-business trade show focusing on the livestock and feed industry.
- Participants include the who's who of livestock, feed and meat processing industries
- 15,000 delegates including veterinarians, feed millers, farmers, meat processors, consultants, retailers, distributors and agents
- Unstinting support from the Indonesian authorities, institutions and international publications
- More than 95 technical presentations and 12 seminars
- INDO LIVESTOCK is perfectly timed to capitalise on growing business opportunities in Indonesia



Indo Livestock 2017 Expo & Forum in Surabaya.

Image credit: PT Napindo

INDO LIVESTOCK Expo & Forum highlights

- Targeted audience
- Wide reach
- Regional buyers
- End users

A total of 10,479 trade visitors registered for Indo Livestock 2017 Surabaya and 14,890 trade visitors registered for Indo Livestock 2016 Jakarta. ■

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Demand for tractors is particularly strong as they can be used for multiple purposes on Thai farms.

Image credit: Adobe Stock

Horti Asia, AGRITECHNICA ASIA aim to boost productivity in agri sector

Horti ASIA and AGRITECHNICA ASIA will take place at Bangkok's International Trade & Exhibition Centre (BITEC) from 22-24 August 2018.

'SOLUTIONS FOR HORTICULTURE and Agricultural Industries' is the theme of co-located expos, Horti ASIA and AGRITECHNICA ASIA, set to take place at Hall 98A-B, Bangkok's International Trade & Exhibition Centre (BITEC) from 22-24 August. The events are powerful platforms for global experts from manufacturing, research and academia to share knowledge and advice on new techniques and technology to boost productivity in Asian agribusiness.

Ministry of Agriculture and Cooperatives of Thailand is focusing on improving agricultural production and promoting agricultural mechanisation to reduce the labour requirement and increase efficiency in the sector.

As rice is by far the country's most important crop, rice transplanters is a promising segment in the country's agricultural equipment market. Greenhouses and greenhouse technology, meanwhile, is in demand from specialist horticultural businesses as they compete for a share in the growing global food market.

Systems & Components

This year, AGRITECHNICA ASIA will include the Systems & Components Asia exhibition – an international platform to showcase the latest developments in engines, hydraulics, axles, gearboxes, cabins

and other components of agricultural machinery and related industries. Systems & Components Asia will be a meeting point for visitors involved with research and development, procurement and purchasing from the original equipment manufacturers in the off-highway sector.

Horti ASIA is the region's leading event for horticultural professionals, and for 2018 the organisers have joined forces with the International Society for Horticultural Science (ISHS) to pave the way for collaborative education and to build a knowledge platform for the horticultural sector in Asia.

International governments and associations that already confirmed as participants in the exhibitions this year include: the Thailand Ministry of Agriculture and Cooperatives; International Society for Horticultural Science (ISHS); Thai Society of Agricultural Engineering (TSAE); Regional Council of Agricultural Machinery Associations in Asia and the Pacific (ReCAMA); International Rice

Research Institute (IRRI); Horticulture Science Society of Thailand; South Korea's Foundation of Agriculture Technology Commercialization and Transfer; Embassy of The Netherlands; and Embassy of the Federal Republic of Germany.

Top companies that confirmed participation in AGRITECHNICA ASIA include: AGCO Holding (Singapore) Pte. Limited; Röhren- und Pumpenwerk Bauer GmbH; Celikel Tarım Makineleri San. Ve Tic. Ltd. Sti.; FLIEGL Agrartechnik GmbH; KUHN S.A.; Maschio Gaspardo S.p.A.; Minos Agricultural Machinery; PÖTTINGER Landtechnik GmbH; and Jiangsu World Agricultural Machinery. And at Horti ASIA, visitors will meet: Yara Thailand; Priva International Beijing Ltd.; East-West Seed International Limited; Xarvio (Bayer AG); and Richel Group.

"It is a great opportunity to bring end-users, manufacturers and potential suppliers from the Asian region together at one venue," said TC Truesdell, director of global marketing communications at PÖTTINGER Landtechnik GmbH.

The managing director of Yara Thailand, Mehdi Saint-André, agreed. "We are very excited to join this year to play an active role towards Thailand 4.0 agricultural sector modernisation, and collaborate with other value chain players to improve farmers' efficiency and sustainability through knowledge, innovation and digital solutions," he said. ■

More info: www.agritechnica-asia.com and www.horti-asia.com. Ph: 662-670-0900

AGRITECHNICA ASIA has established itself as 'the trade fair' for agricultural machinery in the Asia-Pacific region."

AGRI TECHNICA^{DLG} ASIA

22-24 August 2018

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PRE - REGISTRATION

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In-line real time dry matter compensation during batching



During the feed formulation process, nutritionists typically assign a moisture value to each ingredient to express the nutritional content

Image credit: Adobe Stock

Moisture content influences nutrient density, operational throughput, feed quality and profitability. Yiannis Christodoulou and Erfan Shahkar write.

MOISTURE LOSS OR “shrinkage” is a persisting problem plaguing the livestock and aqua feed industries. The raw materials used in the feed milling have different moisture profile and it varies during storage and processing.

Nutrient giveaway

During the feed formulation process, nutritionists typically assign a moisture value to each ingredient to express the nutritional content. This in turn will determine the relative value of the raw materials used in cost-effective feed formulation. Usually, the moisture value is arrived at by running analytical tests during the receiving of raw material, storage and/or prior to the manufacturing process. However, such testing is typically done offline, i.e., by taking samples to the lab. This poses two major concerns: 1) The accuracy of the result is suspect as sampling, sample storage and sample preparation are

prone to human error as well as to environment-induced changes in the sample's physical state during the process. 2) It is also hard to determine how representative the sample is. In addition, moisture loss happens during grinding and before the grains are prepared for batching. The “real” moisture value at the threshold of production process is frequently lower than the one determined by lab tests and assigned to the material during the formulation process. This discrepancy results in the quantity of dry matter weighed during the batching process being

Raw materials used in feed milling have different moisture profile and it varies during storage & processing.”

higher than the quantity dictated by the formula. The process is referred as nutrient giveaway and directly impacts the nutrient density of the finished feed resulting in stock losses and higher feed costs.

In-line moisture measurement

The first step to address this problem is to have the ability to monitor moisture in real time with high precision in the process line. Unfortunately, traditional methods of in-line testing for moisture are not suitable for three main reasons. First, the difficulty to collect umpteen number of samples required throughout the process on a continual basis. Second, the sampling method and time delay before analysis and third, the speed and accuracy of the analytical methods being used.

Agentis Innovations has joined hands with a leading Thai feed manufacturer to develop unique in-line technologies to find a way around these issues. The new technology can generate moisture data in real time and also capture and process data to activate automated process control systems with the ability to make real time

changes within the feed production process.

One of the systems the Agentis Innovations has developed is commercially known as the M007 Dry Matter Compensation System. The system uses advanced algorithms and the latest in computer technology, intelligent programming, and microwave resonator sensor technology to deliver real time and in-line dry matter adjustments during batching.

In-line real time dry matter compensation

Using the real time moisture data generated by the sensor component of the M007 Dry Matter Compensation system, the M007 software directs the batching logic controller to automatically correct the dosing weights in real time. This compensates any moisture variation that may exist prior to mixing and results in a consistent feed. Compensation for the dry matter that is spared is achieved through the automatic addition of water or other materials in real time. This sophisticated



M007 Dry Matter Compensation System

and intelligent system identifies each formulation and its original dry matter target for each specified raw material. The auto corrections are real time, meaning the system will perform this action for every batch of feed produced. More importantly, any auto weight corrections are completed without any delay to the usual batching process. All changes made to the raw material by the system are captured, stored and reported for verification, traceability and stock reconciliation purposes.

Image credit: Agentis Innovations

Other applications

As the M007 Dry Matter Compensation system is suitable for pre-grind feed mill configurations, other similar M007 Systems have also been developed for post-grind mills. One such system is the M007 Mixer system which is programmed to achieve the target moisture level before conditioning. It does this by monitoring the moisture level of mash post mixer, or immediately before conditioning, and applying an automated control function to add the appropriate amounts of water to the mixer or steam to the conditioner.

The M007 system and technology now provides the feed industry with a new innovative feed processing solution for the control of moisture loss in process. It not only allows for in-line real time accurate moisture measurement but also, through its software component, the means to automate processes for optimisations of feed moisture for the betterment of feed quality, stock control, process efficiency and overall feed mill economics. ■



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Balancing act for nutrients in oil palm cultivation



Image credit: Omex

Oil palm carries large quantities of potassium particularly in the stalks, fibres and shells.

Insufficient amount of nutrients will stop growth, reduce yield and in acute circumstances cause deficiency symptoms. Dr Terry Mabbett writes.

EVERY CROP HAS essential nutrient requirements for proper growth and development and oil palm is no exception. Plant nutrition is all about balance. A specific nutrient needs to be supplied at a particular level, not only in its own right but also in relation to other nutrients. For instance soils with an excess of iron may limit the availability of sulphur.

Oil palm clearly requires more nitrogen than aluminium but if aluminium becomes available in just moderate amounts then phytotoxic effects causing crop damage may ensue. The other aspect of balance relates to replenishment of nutrients lost from the soil by run off and leaching, but also through biomass removal during agronomic practices such as leaf pruning and particularly harvesting of the fruit bunches. This avenue of nutrient loss can be

kept to a minimum by recycling as much of the oil palm debris and tissue as possible. For instance, if shed male flowers and pruned old leaves are left on top of the soil they are quickly broken down and the nutrients within recycled. Similarly bunch stalks should be left behind at harvest, but removal of the fruits for processing clearly removes a huge store of nutrients. That loss must be re-introduced into the oil palm ecosystem by measured fertiliser application based on requirements as determined by soil testing and foliar (leaf) analysis.

Oil palm along with all other green plants has nutrient requirements as follows:

Phosphorus specifically promotes root development and is closely involved in the whole reproductive process.”

- **Macronutrients** – nitrogen (N), phosphorous (P), potassium (K). These three which are generally required in the greatest amounts are applied as 'single source' fertilisers (e.g. urea and calcium phosphate) or as NPK composites, the exact ratio of N, P and K depend on crop requirement as related to stage of growth and development.
- **Mesonutrients** (or secondary nutrients) include sulphur (S), calcium (Ca), magnesium (Mg). They are required in substantial amounts but nowhere near as large as N, P and K and therefore may warrant a separate category.
- **Micronutrients** – iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), aluminium (Al), boron (B), molybdenum (Mo), chlorine (Cl). Alternatively called trace elements because they are only required in the tiniest quantities.

Other soil-sourced elements which are not essential but which may be beneficial are sodium (Na), silicon (Si) and cobalt (Co). Carbon and oxygen are derived from carbon dioxide and hydrogen and more oxygen directly from the water molecule.

Macronutrients

Nitrogen - Nitrogen, which mostly enters the plant as the soluble nitrate ion (NO₃⁻) is a building block for tissue growth. Nitrogen is an integral part of every amino acid, and therefore plant proteins, and a core component of key molecules including chlorophyll and nucleic acids. Without nitrogen there is no growth and no yield. Deficiency in nitrogen first shows as a discolouration of young oil palm fronds, which lose their healthy dark green colour and start to yellow (chlorosis). As the deficiency takes hold, older leaves start to yellow as well, and reduced growth and production becomes apparent. Deficiency in nitrogen is caused by a number of factors, which include:

- poor drainage and waterlogged soil
- inherently infertile soils exhausted by previous agricultural activity,
- failure to properly establish leguminous cover crops (e.g. Pueraria phaseoloides and Centrosema pubescens) which boost supplies through nitrogen fixation as well as preventing soil erosion
- excessive competition from aggressive weeds like the grass Imperata cylindrica

If correction or alleviation of the above constraints has no effect, application of nitrogen fertiliser as urea or ammonium sulphate is required.

Potassium - Oil palm carries large quantities of potassium particularly in the stalks, fibres and shells and therefore correspondingly large amounts are removed at harvest. Potassium has a crucial role to play in oil palm metabolism with a direct effect on the functioning of the chlorophyll molecule in photosynthesis. In addition, potassium ions control the stomatal opening and therefore the controlled entry of carbon dioxide for photosynthesis and the controlled loss of water. For this reason the potassium ion is commonly called the 'gatekeeper' and plays a key role in tolerance to drought and the effects of wilt disease caused by fungal pathogens such as fusarium oxysporum var elaeidis.

Potassium deficits show up quickly as loss of yield but severe shortfalls also cause deficiency symptoms in the leaves. These show firstly as a slight but perceptible loss of green leaf colour turning pale yellow with time or the development of orange coloured spots, which gradually coalesce. Symptoms appear on the lower and intermediate leaves and indicate a potassium content which has dipped below the critical level of 0.6 per cent. Cause of potassium deficiency is inadequate soil potassium concentration, a perpetual problem in

Oil palm carries large quantities of potassium particularly in the stalks, fibres and shells and therefore correspondingly large amounts are removed at harvest."

tropical soils exhausted by continual cropping and leaching by heavy rainfall. Supplementation with potassium fertiliser is the answer, but some soils are vulnerable to compaction at quite shallow depths from the addition of potassium as a single high dose.

Phosphorus

Phosphorus is a key component in many of the biochemicals involved in cellular respiration and nutrition (e.g. ATP – Adenosine triphosphate). Phosphorous deficiencies have a rapid and fundamental effect on plant growth and yield. Phosphorus specifically promotes root development and is closely involved in the whole reproductive process including fertilisation, seed set and fruit development. Low soil availability is usually the cause of phosphorus deficiency, which can be corrected by applying a quick-acting fast-release fertiliser like triple super-phosphate, or one with a slow-release profile depending on the structure and demands of different soils.

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Mesonutrients

Magnesium

Magnesium forms the structural framework of the chlorophyll molecule and any deficiency is seen long before yield begins to suffer. Yellowing of the leaf is most acute and obvious at the margins of the plot where leaves are exposed to the most sunshine.

In addition to deficiencies caused by a primary lack of magnesium in the soil, secondary deficiencies occur after excessive applications of potassium, which affects the availability of magnesium to oil palm.

Chlorine

In most crops chlorine is one of the least important nutrients but in oil palm it has a particularly important role in proper maturation of the palm fruits. Deficiencies reduce production by affecting the weight and numbers of fruit available for harvest as well as the weight of the kernel. Chlorine deficiency only becomes a real problem in land away from sea salt (sodium chloride) which is carried in the air. Often there is enough chlorine in potassium fertiliser (potassium chloride) to prevent problems occurring.

Sulphur and calcium

Sulphur is an important component of several essential amino acids (methionine and cysteine) but is rarely deficient except in young plants in sulphur-exhausted ferrallite soils having high iron content. Calcium is important for root development and meristem (the growing point) activity but deficiencies have never been documented.

Micronutrients

Aluminium, copper and boron

Aluminium is required in trace amounts but can become a problem in acid soils. Low pH increases solubility causing aluminium ions to build up in the roots with phytotoxic and growth arresting result consequences. Alleviate the problem by liming the soil (adding calcium carbonate) to raise pH.

Copper is essential for the proper working of enzymes involved in photosynthesis. Though only needed in small amounts, deficiencies

The only way to determine whether your oil palms have the correct levels of nutrients is to carry out foliar analysis."

rapidly show as reduced growth and chlorosis of the middle part of the crown. The problem can be corrected with sprays of blue copper sulphate but strictly at an appropriate concentration because copper sulphate is highly soluble and therefore toxic to many plants when applied above a certain level.

Although boron is the least well understood of the trace elements a deficiency will have marked effects including deformed young leaves commonly called 'fishbone' leaf or 'little' leaf. They become elongated, shaped like bayonets or corrugated, with the petiole, rachis and leaflets grossly shortened. Untreated deficiency will progress into bud rot and tree mortality. Correct with Borax at a dose of 30g around the base of each young tree.

Iron, zinc and manganese

Iron has a vital role in respiration as a co-factor for enzymes in the Krebs cycle but deficiencies are rarely a problem even though typical tropical soils are not over-endowed with iron. Similarly manganese is a co-factor for enzymes that drive photosynthesis but field problems have yet to be recorded. Zinc has an important role in auxin (a plant hormone) metabolism and if deficiency occurs it can be corrected with applications of zinc sulphate, which is rapidly absorbed and utilised by young oil palm

Foliar analysis

Deficiency symptoms are only an indication of nutrient shortfall. Soil testing will tell you the concentration of nutrient in the soil but much of this may not be available to the plant. The only way to determine whether your oil palms have the correct levels of nutrients is to carry out foliar analysis.

Foliar analysis is not usually employed until the trees are three years old. Samples should be taken at the beginning of the dry season or during periods of low rainfall, and not for 48 hours after rainfall. Reliable results require a sampling size of up to four trees per 100, depending on age, uniformity of the area with regard to soil type and fertility, and the varieties of palm that have been planted.

In order to make meaningful comparisons throughout the life of the trees, leaf samples should always be taken from the same trees. Select trees of the same variety and age, and take leaves from the same position on each.

Generally speaking, the sample should comprise at least 100 leaflets – four from each of 25 trees with the same number leaf sampled on all 25 trees.

The exact position of the leaf to be sampled will depend on age of tree with leaf nine, and leaf 17 for, respectively, trees at two-three years and three years and older. Leaflets are selected from a position one third back from the tip of the frond (leaf). Four leaflets per leaf/tree are picked by taking two lower tier (ranked) leaflets and two upper tier leaflets. The two-tier ranking of leaflets on the palm leaf, in which adjacent leaflets are attached at slightly different levels on the rachis gives the oil palm frond its ragged appearance which is not seen in other palms like coconut. ■



Image credit: KC Lee, Malaysia

Considerable amounts of nutrient are removed from the oil palm monoculture when fruit bunches are harvested and taken off site for processing.

Intake in dairy cows: The influence of palatability and fibre digestion

Feed intake in ruminants is controlled by both physical and physiological factors.



Image credit: Adobe Stock

Cattle have been shown to be sensitive to the same principal flavours (sweet, sour, salt and bitter) as humans, but they have different sensation thresholds

THE GOAL OF all dairy operations in the world is to maximise milk production in a cost-effective manner while sustaining the health and welfare of the animals. To minimise production costs, it is important to maximise feed efficiency and nutrient utilisation with less toll on the environment, especially during early lactation. The intense genetic selection for higher milk production during the past decades has resulted in increased genetic potential for milk yield in the modern dairy cow. But high producing dairy cows in early lactation fail to consume enough feed to fulfill their energy requirements and consequently suffer from nutritional and

metabolic disorders that compromise their health, fertility and longevity.

In ruminants, DMI (dry matter intake) is, in addition to metabolic constraints, a function of the balance between eating motivation, which is strongly related to palatability, on one hand and rumen capacity

Palatability is mainly a function of flavour and taste, which arise from certain compounds in the feed.”

on the other. Therefore, increasing DMI could be achieved by either improving palatability or increasing rumen capacity or both. Rumen capacity is related to the rate of clearance of material, mainly fibre from the rumen, which is the summation of both rates of degradation and passage. A fast rate of removal of fibre from the rumen increases its capacity to hold more material and delays rumen fill signals, encouraging the animals to consume more and thus have a higher DMI. Palatability is mainly a function of flavour and taste, which arise from certain compounds in the feed, especially water-soluble carbohydrates (WSC).

Feed intake in ruminants is controlled by both physical and physiological factors. Physical factors include the cow's rumen holding capacity (rumen fill) for dry matter or fibre. Physiological factors include end

products of rumen fermentation and intestinal digestion, rumen pH and osmolality, hormones secreted by the endocrine system such as insulin and glucagon, or secreted by the gastrointestinal tract such as gastrin and cholecystokinin. As energy density in the ration increases and fibre content decreases, physical factors pose less of a constraint on feed intake and physiological factors become more important in regulating feed intake. Therefore, the intake of low to medium quality ration may be limited mainly by distension and fill of the rumen, but when high quality ration is fed, additional factors, mainly physiological, may become important in signalling satiety and consequently limit intake.

Sweeteners have potential to enhance palatability at high concentrations and thus increase DMI."

Within this framework, many factors related to rumen function could influence DMI. Anything that increases the rate of breakdown of fibre in the rumen would be expected to increase the throughput. Moreover, anything that contributes to the dilution of fermentation end products in the rumen would also be expected to increase intake at a given concentration level that would signal satiety. Improving microbial activity in the rumen, loosening plant cell wall structure, increasing saliva flow and the frequency and strength of rumen contractions could positively influence DMI.

Palatability is a major determinant of what and how much a healthy non-starved ruminant will eat. Palatability includes all oral pharyngeal and olfactory sensations arising from the feed such as flavour, taste, smell and texture but does not include any of its post-ingestive effects. Flavour and taste provide the primary information for food preference, tolerance or rejection, while visual and olfactory messages function as secondary re-inforcers. Cattle have been shown to be sensitive to the same principal flavours (sweet, sour, salt and bitter) as humans, but they have different sensation thresholds. Feeds with strong bitter, salty and sour flavours were avoided by cattle or had reduced intakes, indicating that these flavours negatively influenced the



Ruminant animals also have the ability to associate flavours with post-ingestive consequences.

Image credit: Adobe Stock

palatability of the feed. Numerous authors have reported the relation between sweet feedstuffs and increased intake in ruminants.

Ruminant animals have the ability to associate flavours with post-ingestive consequences. Such associations with a certain flavour can ultimately cause the formation of feed preference or aversions. In many studies, when feed was flavoured and paired with a toxin, animals rejected the flavour even when it was no longer paired with the toxin. In one study, sheep were fed feed flavoured with orange or aniseed with or without a toxin. Aversion to the flavour paired with toxin persisted up to 60 days after the final administration of the toxin. In another study, sheep that had previously been administered LiCl, a non-lethal poison, with a feed containing a specific flavour avoided that flavour even when it was no longer paired with LiCl. On the other hand, when a certain flavour was infused with additional energy, lambs consumed more of the same feed even when it was no longer laced with the additional energy. Similarly, when paired with a certain flavour with a positive nutritional consequence, such as a large amount of starch, lambs would consume high amounts and that preference for that flavour persisted even when there was no longer a nutritional benefit and the starch content had decreased.

Based on the above studies, combining palatability additives with rumen modifying additives could offer a great opportunity to modulate and improve DMI in dairy cows and other ruminants. Palatability additives would provide improvement in the sensory characteristics of the ration, while rumen modifiers would improve and optimise

rumen function and fibre digestion sending positive post-ingestive signals and re-enforcing the positive effect on DMI. This idea of working simultaneously on palatability using flavour enhancers or GIT modifiers can contribute greatly to improving intake when changes in the ration are introduced or when novel feeds and/or relatively unpalatable feeds are used.

In a recent study, the effect of adding Aroma Fruity or Gusti-Plus (Nutriad's specialty flavours for dairy cows) to pelleted compound feed fed in the milking robot at three farms was evaluated. The experiment consisted of three phases, the first phase of four weeks was considered as the blank measurement with no flavour added to the pellet, the second phase of eight weeks, flavour additive was added (at 350 g/tonne feed) to the pelleted feed fed in the robot, and the third phase of four weeks was considered as the post aroma period. Average 305 milk yield at those farm ranged from 9,000 to 10,000 kg/cow, and cows were fed a maize-based ration (>60 per cent maize silage in the basal ration). The results showed that in phase two, when Aroma Fruity or Gusti-Plus were added to the compound feed fed in the robot, the number of milkings per cow increased from 2.4 to 2.8 times per day. This 15 per cent increase in milking number led to 0.9 kg increase in milk yield per cow per day and 6 per cent improvement in feed efficiency. In another study, the effect of adding Nutri-Ferm Prime (Nutriad's specialty DFM) to different rations based on alfalfa and grass hay or grass and maize silage led to seven to ten per cent improvement in NDF and OM digestibility and six per cent improvement in feed efficiency. ■

New Holland introduces TC5.50 combine & T6050 tractor in Thailand



The new TC5.30 combine is the first multi-crop combine of its kind to be offered in Thailand.

Image credit: New Holland Agriculture

New Holland Agriculture showcased two new machines at the SIMA ASEAN 2018 exhibition held in Bangkok.

THE TC5.30 COMBINE and the T6050 tractor are the newest additions to New Holland's product offering for Thai customers. The two machines are being showcased in response to the growing needs of local customers in the market. Duanghathai Phongsaphan, country manager at CNH Industrial Thailand, commented: "New Holland's presence at SIMA ASEAN is a reminder that productivity can only be maximised if farmers have the best equipment to work with. The latest additions to our product range show that New Holland is able to meet the needs of every kind

By expanding its line-up, New Holland aims to meet the growing needs of customers and promote agricultural mechanisation in Thailand."

of farm and that we are committed to being a long-term partner in the development of the country's agricultural mechanisation."

TC5.30 combine delivers high profitability

The new TC5.30 combine is the first multi-crop combine of its kind to be offered in Thailand. This machine is designed for impressive performance with a wide variety of crops (including paddy rice, with tracks-ready version available) in even the toughest working conditions. The TC5.30 delivers best in-class capacity, premium grain quality, plus outstanding fuel efficiency and low ownership costs for high profitability. When combined with the 15-foot high-capacity grain header, the TC5.30 maintains high daily output with first-class harvesting performance. The combine's optional three-drum technology, with Rotary Separator and Multi-Thresh™ concave, increases separation capacity even in difficult crops with long and green straw, and the standard double-cascade cleaning shoe ensures extraordinary cleaning capacity and excellent grain samples in all crops. For convenient operation, the large, 3000-litre graintank extends in-field autonomy.

T6000 Series tractor: perfect for heavy-duty operations

T6000 Series tractors offer proven performance in a value package and are a natural choice for both arable and livestock farming. They are perfect for heavy-duty jobs, such as tillage ploughing on dry land for crops such as sugar, cassava, potatoes, and maize, as well as being well-suited to pulling balers. The T6000 Series complements raw power with superior control, with the latest electronic conveniences and push-button simplicity. The model being introduced to Thailand, the T6050, has a 128 hp 6.7-litre six-cylinder diesel engine with intercooled turbocharger.

New Holland Agriculture's heritage stretches back to 1895. Since then, its history has been one marked by continuous innovation and dedication to making agriculture easier and more productive for the world's farmers. Founders include Henry Ford, the man who mechanised global agriculture and brought agricultural tractors to the masses. More than 100 years have passed since the first Ford tractor, the Fordson Model F, entered production in 1917. This represents an important milestone for the entire history of farm tractor development. New Holland Agriculture has collected, passed on and developed Henry Ford's revolutionary ideas in agricultural mechanisation and today farmers around the world continue to benefit from more than a century of agricultural machinery knowledge and expertise. New Holland Agriculture can trace its origins in South East Asian markets back to 1927, when the first



Image credit: New Holland Agriculture

T6050 has a 128 hp 6.7-litre six-cylinder diesel engine with intercooled turbocharger.

Fordson tractor was imported to Malaysia, and first entered the Thai market in 1952. Since then, New Holland has established a positive brand presence in the region by ensuring its machines are efficient, productive and serve the growing needs of South East Asian farmers who can benefit from a century of tractor knowhow, put at the service of modern agriculture.

In 2017, New Holland further strengthened its presence in Thailand with the opening of the new CNH Industrial legal entity in Bangkok's Bang Na district. ■

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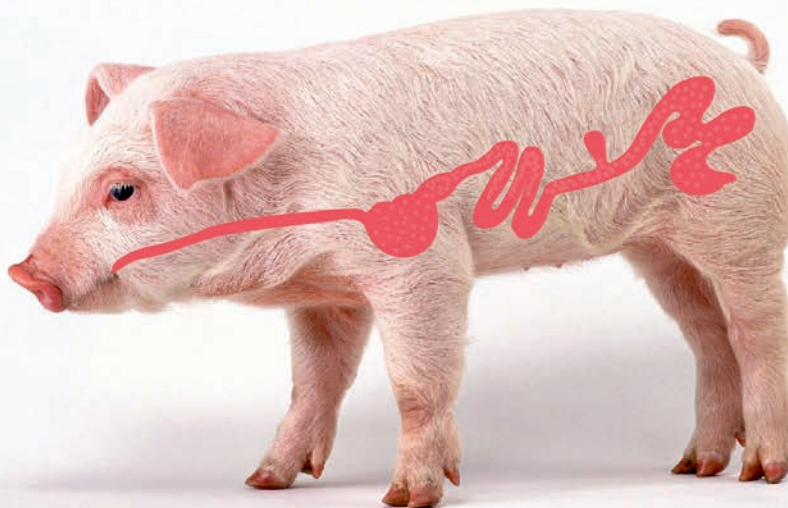
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