



**Agri Innovation Post**

**Edition 11**

Agri-Biotech News & Views

October 2019

A Committee constituted under the Chairmanship of Dr RS Paroda, recently presented a report on 'Policies and Action Plan for Secure and Sustainable Agriculture' to Prof. K. VijayRaghavan, Principal Scientific Advisor to the Government of India. The mandate of the Committee was to suggest policy reorientation and accelerated action plan for achieving sustainable agriculture for improved livelihood of smallholder farmers as well as to address the issues of poverty, hunger and malnutrition.

The report has provided series of recommendations - reviewing existing agricultural policies and forming a new policy on agricultural development, strengthening Indian Council of Agricultural Research (ICAR)/State Agricultural Universities (SAUs)/Krishi Vigyan Kendras (KVKs)/Panchayat Raj Institutions (PRIs) with urgency for doubling current public funding for research, establishment of a new National Agricultural Development and Farmers' Welfare Council (NAD&FWC) under the chairmanship of Prime Minister to ensure effective coordination and convergence. The report also recognised that empowering and motivating women and youth to remain in agriculture can become an important game changer.

The committee also strongly recommended that subsidies in agriculture be rationalised as incentives for good agronomic practices through direct benefit transfer (DBT) mechanism. Further, converting existing subsidies as incentives for both farming efficiency and environmental services at Rs 10,000 per acre per annum up to a maximum of 10 acres (4 ha) per farming family.

The committee is also of the view that in the need of making one national market for e-NAM and for global exports, the Essential Commodities Act (ECA) and Agricultural Produce Marketing Committee (APMC) Act also need to be reviewed for their relevance in the present context. Concerns of seed industry in implementation and harmonization of Biological Diversity Act and Protection of Plant Varieties and Farmers Rights Act (PVP&FRA), unresolved issues relating to access and benefit sharing (ABS) for use of genetic resources, intellectual property (IP) protection on innovation such as genetic modification (GM), genome editing, pricing policy on seeds and long awaited revision of Seed Act should be addressed on priority.

Further, the Seed Bill, Pesticide Management Bill, Biotechnology Regulatory Authority of India (BRAI) Bill, and other important Bills/Acts relating to agriculture and rural development need to be cleared by the Parliament on priority. National Policies on Biotechnology, Livestock Breeding, and Land Utilization should be considered for quick decision and implementation by all the States concerned.

The report has kept farmers at the centre stage while addressing their distress and to enhance their income as well as well-being. It has also provided transformative suggestions encompassing policy, institutions, infrastructure, market, science, technology and innovations, which directly or indirectly contributes to the agricultural output and GDP of the country.



**Shivendra Bajaj**  
**Executive Director**  
**Federation of Seed Industry of India-Alliance for Agri innovation**

### **Consultation Workshop on Gene Editing in Agriculture and its Regulations – October 10-11, 2019**

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Asia - Pacific Association of Agricultural Research Institutions (APAARI), Federation of Seed Industry of India (FSII) along with APCoAB and CGIAR collaborated to conduct the Consultation Workshop on Gene Editing in Agriculture and its Regulations at ICRISAT, Hyderabad. The 2-day expert consultation brought together researchers, representatives of various public institutions and private sector, policy makers and scientists from member countries of Asia-Pacific Association of Agricultural Research Institutions (APAARI), CGIAR centres, government departments and bodies including Department of Biotechnology. Recognized diverse set of experts also delivered presentations and participated in panel discussions. The consultation further highlighted innovations through gene editing and their impact on the agricultural sector, reviewed status of regulatory policies around gene editing globally - particularly in the Asia-Pacific region, discussed the impact of regulatory hurdles, delays and associated high cost on technology adoption. Adopting communication strategies for enabling policies for plant and animal breeding innovations and consumer acceptance around the technology were also widely discussed.



**All the participants of the workshop along with Dr Renu Swarup, Secretary, Department of Biotechnology (DBT), Government of India**



**Dr Renu Swarup, Secretary, Department of Biotechnology (DBT), Government of India while apprising the gathering on the regulatory policies for gene editing in India**



**Mr Ram Kaundinya, Director General, FSII while addressing the audience at the workshop**



**Szabolcs Ruthner, International Seed Federation (ISF), Switzerland addressing the gathering with his presentation on global regulatory status of gene editing products**

### **AgBiotech News**

#### **[Former DU V-C refutes GM crops criticism by MS Swaminathan](#)**

**(Hindustan Times)**

PC Kesavan, the lead author, and Swaminathan in their article in November 2018 had said that processes involved in creating GM crops were not fully understood and could lead to unintended effects. They argued that Bt Cotton, the only GM crop allowed in India, was a failure as it did not result in higher yield and pest resistance and secondary pests led to the use of insecticides as well. Former vice-chancellor of Delhi University Deepak Pental has come out with a rebuttal, he refuted Kesavan and Swaminathan's arguments one by one and said they had distorted the history of plant breeding, rejected the emerging consensus on the safety of such crops. Pental said they suggested solutions that are "grossly inadequate" to meet the challenge of low-input and high-output agriculture needed due to climate change.

#### **[Tatas pad up for genetic research play](#)**

**(The Hindu Business Line)**

As uncertainty continues over the adoption of genetically modified (GM) crops in the country, the Tatas plan to establish a presence in the area of genetic research with a focus on human health and agriculture. The Tata Institute for Genetics and Society (TIGS), funded by a grant from the Tata Trust, has started operations in Bengaluru, where it is building research laboratories. Conceived as a philanthropic project, a chapter of TIGS has been set up at the University of California San Diego (UCSD).

#### **[Report calls for multi-pronged measures to boost farm income](#)**

**(Outlook India)**

The report on "Policies and Action Plan for Secure and Sustainable Agriculture" prepared by a committee headed by R.S Paroda was recently presented to K. Vijay Raghavan, Principal Scientific Advisor. Vijay Raghavan had constituted the committee to review agricultural policies and suggest strategies as well as action plan to achieve faster, secure and sustainable agriculture so as to ensure improved livelihood of smallholder farmers.

#### **[The attack on agroecology](#)**

(The Hindu)

Agroecology is recognised worldwide as a system that enhances fertile landscapes, increases yields, restores soil health and biodiversity, promotes climate resilience and improves farmers' well-being. Its practices are supported by many agricultural scientists, the Food and Agriculture Organization, the Intergovernmental Panel on Climate Change, farmers' groups and several NGOs.

### [Kaveri Seeds strengthens its focus on R&D; sets up advanced Biotechnology lab in Telangana](#)

(India Infoline)

Kaveri Seeds launched its state-of-the-art Biotechnology laboratory at Pamulaparthi in Telangana. The initiative is part of the Company's strong focus on enhancing its R&D and innovation capabilities aimed at improving agricultural productivity. The laboratory named "Centre for Applied Genomics and Seed Technology" will house the latest infrastructure and will focus on developing quality hybrids for all crops.

## Ag Biotech News Around the World

### [US regulators allow genetically modified cotton as human food source](#)

(Gulf News)

US regulators allowed genetically modified cotton to be used for human consumption, paving the way for a protein-packed new food source - edible cottonseed that tastes a bit like chickpeas - that its developers said could help tackle global malnutrition. The Food and Drug Administration's decision on the cotton plant developed by Texas A&M University scientists means it is allowed as food for people and all types of animals. Texas A&M AgriLife Research plant biotechnologist Keerti Rathore said that the scientists are holding discussions with companies and hope to have the plant commercially available within about five years. Rathore said the team also will explore seeking regulatory approval in other countries starting with Mexico.

### [Experts 'overwhelmingly' endorse CRISPR-edited crop safety, but politics could stifle technology's progress](#)

(Genetic Literacy Project)

The paper describes a range of potential issues related to the safety of genome editing as identified through a survey of a consortium of international experts in plant biotechnology. A key finding is that genome edited crops pose marginal risk to the economy, human health and the environment. Yet, regulations governing biotechnology and some advocacy groups tend to discourage the use of new gene technologies in agriculture. In effect, discussions concerning the risks associated with genome editing, and targeted breeding techniques generally, are driven more by socio-political factors than by scientific principles.

### [Brazil dedicates 2,400 scientists for GM food research, wants 'active cooperation' with Gulf: Minister](#)

(Emirates News Agency)

Brazil has dedicated 2,400 scientists for research and development of genetically modified crops. The research of the scientists at Embrapa, Brazil's agricultural research institute under the Ministry of Agriculture, will help further expand the genetically modified, GM, food cultivation in the country. The South American nation, the largest soybean and second-largest corn exporter in the world behind the US, made up 27 percent of the world's entire GM cultivated area in 2018. GM crops in cotton, soybean, and corn represented 93 percent of such crops in Brazil in 2018, which were mostly used as cattle feed. A huge amount of GM sugarcane is also produced. The GM cultivation can be expanded to many other crops such as tomato, carrot and other vegetables, the minister said while mentioning the ongoing research in her country. GM crops minimises use of land, water and chemical pesticide.

### [Cotton producers want GM varieties to boost yields](#)

(The Standard)

Zimbabwe's cotton producers have called upon government to embrace genetically modified (GM) cotton varieties to enhance the country's competitiveness and boost production. Government has, since 2006, banned the import of all genetically modified produce and the use of seeds enhanced with genetically modified organisms, arguing they are harmful to the soil and the environment.

### [Building public trust for gene editing](#)

(Agri News)

Gene editing provides the potential to solve challenges the society is facing in human health, food production and agriculture. It's clear that the full potential of gene editing can only be realized if we can earn public trust said Amy te Plate-Church, Center for Food Integrity Coalition for Responsible Gene Editing in Agriculture. The first gene-edited foods that are introduced in the market will set the stage for all the rest. The initial headlines that come out will be under considerable conversation.

### [Will Kenya lift its GMO ban as its agriculture falters?](#)

(Alliance for Science)

Kenyan scientists and policymakers are viewing the Ministry of Health's recent statement on genetically modified (GM) crops as an opening to completely lift the country's GMO ban. The ministry presented its statement to the Senate Committee on Health in September 2019. It advocated for precautionary measures on the use of GMOs, as recommended by a taskforce appointed in October 2013, which stated that the ban on imports could be lifted on a case-by-case basis upon meeting certain conditions.

### [Anti-GMO EU takes Amazon crisis heat](#)

(The Western Producer)

European environmental organizations were among the first to publicly advocate against the commercial introduction of genetically modified crops more than 20 years ago. Since this time, these environmental groups have intensively lobbied to have GM crop production banned in the EU. Today, they've been successful in that effort, as Portugal and Spain are the only two GM crop producing countries in the EU, with less than 500,000 acres of GM corn. To ensure sufficient livestock feed is available to feed Europe's livestock, the EU imports millions of tons of GM corn and soy each year. Significant volumes of imported animal feed come from Brazil. The EU imports 25 to 30 million tons of GM corn and soy annually due to its own inability to produce enough corn or soy to feed its own livestock. Currently, the EU imports 36 percent of its soybean requirements from Brazil. EU corn imports from Brazil for July and August show a three million percent increase over corn imports from last year.

### [Don't buy organic food if you want to increase farm yields or seriously address climate change](#)

(Genetic Literacy Project)

The inconvenient truth is that organic farming is a terrible option from a climate change perspective. Its dependence on manures and compost involves huge, but rarely recognized, greenhouse gas emissions in the form of very potent methane and nitrous oxide. But perhaps its biggest climate change issue is that organic farms are mostly less productive per unit area than "conventionally" farmed land. With rising food demand driven mostly by rising standards of living in the developing world, there is a need to boost farm production, and that means the very undesirable conversion of forests or grasslands to agriculture in places like Brazil. That leads to major carbon dioxide release from what had been sequestered carbon in the soils, and also the loss of biodiversity and other environmental services provided by those natural lands.

### [Many plants are naturally GMO, research finds](#)

(Alliance for Science)

Though much of the controversy around genetically modified crops is driven by the belief that the process of moving genes from one species to another is "unnatural," new research shows some 1 in 20 flowering plants are naturally transgenic. Dozens of plants, including bananas, peanuts, Surinam cherries, hops, cranberries and tea, contain the Agrobacterium microbe — the very same bacterium that scientists typically use to create GM crops. The research follows on the heels of the 2015 discovery that sweet potatoes are naturally transgenic. Agrobacterium DNA also has been found in tobacco plants.

### [Argentina approved the 60th transgenic seed of its history](#)

(Agrovoz)

The Ministry of Food and Bioeconomy of the Ministry of Production and Labor approved the commercialization of a new genetically modified plant organism (GMO) in Argentina. After passing all the rigorous evaluations carried out by the National Agricultural Biotechnology Advisory Commission (Conabia), the National Service of Agricultural Health and Quality (Senasa) and the Undersecretary of Agricultural Markets of the Ministry of Agriculture, the Government specifically endorsed a new corn Bt developed by Monsanto, with resistance to insects and herbicides (glyphosate and ammonium glufosinate). This is the 60th transgenic seed that is approved in Argentine history, since the first RR soybeans (glyphosate tolerant), which was authorized in 1996, according to Conabia records.

### [Ideological rift brews in anti-GMO movement as Americans embrace Impossible Burger](#)

(Genetic Literacy Project)

For years, anti-biotech activists were primarily focused on labelling foods made with genetically modified ingredients as a way to stigmatize “GMOs” and ultimately get them removed from the marketplace. Their rhetoric was forceful and combative, which made clear that it was a strategy to punish companies who used genetically modified ingredients. The Organic Consumers Association, which provided seed money to establish the anti-biotech advocacy group US Right to Know (USRTK), likewise admitted the labelling push was a way to grab market share.

### [White House looks to clear path for 'bioeconomy'](#)

(Agri Pulse)

Trump administration officials say they are committed to reducing regulatory barriers to agricultural biotechnology as part of a larger strategy to promote the development of a "bioeconomy" based on far-reaching scientific innovations that could revolutionize medicine, nutrition and manufacturing as well as farming. Andrew Olmem, deputy director for the National Economic Council at an all-day White House said that agricultural biotech should be the leading area for the bioeconomy, almost by definition. Farmers are really since day one the cutting edge of American technology. Michael Kratsios, the White House's chief technology officer, noted that the administration issued an executive order in June ordering federal agencies to find ways that they can streamline the regulation of biotech crops and animals to focus the approval process on products that could pose an environmental or health risk.

### [GM safe and we need it: plant biologists](#)

(Newsroom)

A group of scientists belonging to the New Zealand Society of Plant Biologists say it's time to review GM laws. They say new techniques in gene-editing can help ensure a clean green future for New Zealand. There is now clear scientific consensus on the safety of GM crops. An extensive study by the National Academies of Sciences, Engineering and Medicine (USA) in 2016, along with multiple reviews of the literature, have concluded that the process of genetic modification is as safe as any other breeding technique, and that GM crops are safe to eat.

### [South Korea develops 13 GMO crops in 7 years to battle drought, pests](#)

(Genetic Literacy Project)

In South Korea, the National Center for GM Crops (NCGC) aims to enhance national food security and to turn agriculture into a major national leading industry by utilizing technological pipelines. NCGC has been developing GM crops that have been enhanced by agricultural useful traits as well as those that can be used as high value-added industrial materials. The crops are being developed taking into account safety and practical effects to secure future commercially available GM events. 81 GM crop events from 13 crops have been developed based on the above-mentioned considerations and guidelines.

### [Can Vegetarianism Stop Climate Change?](#)

(Reason)

According to the U.S. Environmental Protection Agency, agriculture is responsible for about 10 percent of America's total annual greenhouse gas emissions of 6.5 billion carbon dioxide equivalent metric tons. That breaks down to 302 million tons from nitrogen dioxide, largely in the form of fertilizer; 170 million tons from the methane expelled in ruminant livestock flatulence; 65 million tons from managing livestock manure; 60 million tons of direct emissions from farming; and 40 million tons from

agriculture-related electricity use. Calculations focusing on agriculture ignore 90 percent of emissions that Americans contribute to the atmosphere. Assuming every American adopts a vegan diet and all livestock raising ceases, that change would reduce U.S. greenhouse gas emissions by just 3.6 percent.

## New Research

### [GMO wheat varieties boost crop yields 20-30% in field trial](#)

(Australian Plant Phenomics Facility)

Studies conducted at the Australian Plant Phenomics Facility (APPF) showed experimental genetically modified (GM) wheat lines has the potential to significantly increase yields. These lines 'overexpress' three wild-type plant genes, either individually or in combination, and were developed to test whether targeting individual wheat genes could lead to improvements in yield. In greenhouse studies conducted at the APPF, yield gains from the best performing lines were in the range of 32 to 50 per cent, compared to the same germplasm lacking the GM trait. In a field trial, some of the GM lines still outperformed the controls, delivering yield gains between 20 to 30 percent.

### [South Korea develops 13 GMO crops in 7 years to battle drought, pests](#)

(Genetic Literacy Project)

In South Korea, the National Center for GM Crops (NCGC) aims to enhance national food security and to turn agriculture into a major national leading industry by utilizing technological pipelines. NCGC has been developing GM crops that have been enhanced by agricultural useful traits as well as those that can be used as high value-added industrial materials. The crops are being developed taking into account safety and practical effects to secure future commercially available GM events. 81 GM crop events from 13 crops have been developed based on the above-mentioned considerations and guidelines.

### [CRISPR gene editing protects apples from orchard-destroying fire blight disease](#)

(Wiley Online Library)

The bacterium *Erwinia amylovora*, the causal agent of fire blight disease in apple, triggers its infection through the DspA/E effector which interacts with the apple susceptibility protein MdDIPM4. In this work, an MdDIPM4 knock-out has been produced in two *Malus x domestica* susceptible cultivars using the CRISPR/Cas9 system delivered via *Agrobacterium tumefaciens*. Fifty-seven transgenic lines were screened to identify CRISPR/Cas9-induced mutations. An editing efficiency of 75% was obtained. Seven edited lines with a loss-of-function mutation were inoculated with the pathogen. Highly significant reduction of susceptibility was observed compared to control plants. Sequencing of 5 potential off-target sites revealed no mutation event.

### [New research to boost global date fruit production](#)

(Phys Org)

A team of Plant Scientists from King Abdullah University for Science and Technology (KAUST) has begun a major project to improve global date palm production and protection. This project is the first time that the date palm genome has been studied so comprehensively. Dr. Ikram Blilou, Professor of Plant Science at King Abdullah University for Science and Technology (KAUST) and her research team in Saudi Arabia have collected samples from date palms by the Quba mosque in Madinah, some of the most ancient date palms in the world. Within KAUST's Center for Desert Agriculture Research we are studying date palms using advanced genome sequencing techniques and have begun to develop new breeding strategies to help palms grow faster and healthier as well as making them more resistant to pathogens and pests like the red palm weevil.

### [Scientists Engineer Plants to Make Infant-friendly Fat Molecules for Formula Milk](#)

(PNAS)

Scientists have improved the metabolism of an oilseed plant to mimic the molecular structure of the human milk. Their technique made the oilseed plant accumulate triacylglycerol with most of the fatty acid in the middle of its molecular structure, instead of in the outer parts. This can potentially lead to a new plant-based source of milk fat substitute that infants can easily digest.

### [Semi-dwarf Rice Developed by CRISPR-Cas9-directed Mutagenesis of OsGA20ox2](#)



(Springer Link)

Plant height is one of the most important characteristics of rice because it affects yield potential and lodging resistance. CRISPR-Cas9 was used to edit OsGA20ox2 in rice, leading to generating semi-dwarf mutant lines. The team generated 24 lines with a mutation rate of 73.5 percent in the first generation. Mutations led to a change in the amino acid sequence of mutant plants and lowered levels of gibberellins (GA) and plant height, flag leaf length, and increased yield per plant, while other agronomic traits remained the same. When the mutants were treated with gibberellins, the plant height was restored to normal.

### [Disruption of a Small Non-coding RNA Leads to Better Rice Yield](#)

(National Science Review)

Previous studies have shown the microRNA miR396 prevents rice GROWTH-REGULATING FACTORS (OsGRFs) and regulates rice yields and nitrogen assimilation. When miR396 is overexpressed, it targets OsGRF4 and OsGRF6, improving rice yield. Scientists at Chinese Academy of Sciences used CRISPR-Cas9 to evaluate more functions of miR396 in rice. Based on the findings, rice seed and panicle development are controlled by miR396ef-GRF4/6/8-GIF1/2/3 modules, and that miR396ef are potential targets of genome editing for development of better rice varieties that require less nitrogen fertilization.

### [Researchers Discover How Protein Connecting Calcium and Hormone Regulates Plant Growth](#)

(Tel Aviv University)

A new study conducted by scientists from Tel Aviv University (TAU) finds that a unique mechanism involving calcium, the plant hormone auxin, and a calcium-binding protein is responsible for regulating plant growth. The researchers involved in the study say that a protein that binds to calcium regulates both auxin responses and calcium levels, creating an interface that determines how plants grow. For several decades, it was believed that calcium and auxin interfaced during plant development, but the mechanism behind such process were unclear. Now, the research group led by Prof. Shaul Yalovsky of TAU's George S. Wise Faculty of Life Sciences has discovered that auxin communicates with calcium through a binding protein called CMI1. Auxin levels determine where leaves develop on a plant, how many branches a plant has, and how roots develop.

### [Plant Protein that Triggers Photoprotection Identified](#)

(E Lifesciences)

A team of scientists from the United States announced that they have identified the protein in plants responsible for its cellular defense against excessive light, among other stress factors caused by climate change. Published literature states that photosynthesis occurs in the plant cell's chloroplast. In these chloroplasts, proteins make up the molecular structure that is responsible for the plant's light absorption to produce necessary chemical reactions to support the plant's development. Exposure to too much sunlight causes an overdrive reaction and damages the said proteins. These damaged proteins have to be evaluated, removed and replaced by the plant. The scientists' objective was to know more about the plants' ability to evaluate the healthy and damaged proteins and trigger a protective response, a process in plants that is yet to be thoroughly investigated by researchers.

### [FDA Approves Texas A&M's Ultra-Low Gossypol Cotton for Human and Animal Consumption](#)

(E Lifesciences)

The U.S. Food and Drug Administration (FDA) has approved an ultra-low gossypol cottonseed, ULGCS, to be utilized as human food and animal feed. ULGCS is derived from a transgenic cotton variety TAM66274 developed by plant biotechnologist Keerti Rathore and his team at Texas A&M AgriLife Research. TAM66274 is a unique cotton plant with ultra-low gossypol levels in the seed, which makes the protein from the seeds safe for food use, but also maintains normal plant-protecting gossypol levels in the rest of the plant, making it ideal for the traditional cotton farmer. ULGCS has the potential to make a significant impact on food security especially in poor, cotton-growing countries, according to Rathore.

**Upcoming**

**Events**

**October 2019**

**International Conference on Research of Agricultural and Food Technologies**

**Date:** October 03 – October 05, 2019

**Venue:** Sheraton Grand Adana, Adana, Turkey

**Global Summit on Plant Science**

**Date:** October 07 – October 08, 2019

**Venue:** Hotel Silken Puerta Madrid, Madrid, Spain

**Agriculture, Forest and Aquaculture Sciences Congress**

**Date:** October 13 – October 14, 2019

**Venue:** Mirel Hotel, Ereğli, Turkey

**International Conference on Agricultural Engineering for Sustainable Agriculture Production**

**Date:** October 14 – October 15, 2019

**Venue:** IPB International Convention Center, Bogor, Indonesia

**International Symposium on Agricultural Engineering**

**Date:** October 31 – November 02, 2019

**Venue:** University of Belgrade, Belgrade, Serbia

**November 2019**

**Sustainable Agriculture Conference**

**Date:** November 01 – November 03, 2019

**Venue:** Durham, USA

**International Conference on Sustainable Agriculture Technologies**

**Date:** November 01 – November 03, 2019

**Venue:** Kaohsiung, Taiwan

**Plant Genomics & Gene Editing Congress**

**Date:** November 04 – November 05, 2019

**Venue:** The StateView Hotel, Autograph Collection, Raleigh, USA

**International Society for Biological and Environmental Repositories Regional Meeting**

**Date:** November 04 – November 05, 2019

**Venue:** Renaissance Minneapolis Hotel, The Depot, Minneapolis, USA

**International Conference on Molecular Biology and Genetic Engineering**

**Date:** November 07 – November 08, 2019

**Venue:** Melbourne, Australia

**International Conference Agricultural Engineering**

**Date:** November 08 – November 09, 2019

**Venue:** Deutsche Messe AG, Hanover, Germany

**December 2019**

**Agricultural Excellence Conference**

**Date:** December 02 – December 04, 2019

**Venue:** Fredericton Convention Centre, Fredericton, Canada

**AgriBusiness Global Trade Summit Southeast Asia**

**Date:** December 03 – December 04, 2019

**Venue:** Jakarta, Indonesia

**Women in Food & Agriculture summit**

**Date:** December 03 – December 04, 2019

**Venue:** NH Collection Grand Hotel Krasnapolsky, Amsterdam, Netherlands

**Grow Canada Conference**

**Date:** December 03 – December 05, 2019

**Venue:** Hyatt Regency Calgary, Calgary, Canada

**Global Plant-Based Food Summit Asia**

**Date:** December 05 – December 06, 2019

**Venue:** Crowne Plaza Hotel Fudan Shanghai, Shanghai, China

**International Conference on Agriculture and Biotechnology**

**Date:** December 28 – December 30, 2019

**Venue:** Patong Merlin Hotel, Kathu, Thailand