ABSTRACT

AGRICULTURAL BIOTECHNOLOGY
CHALLENGES AND OPPORTUNITIES

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MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
VIETNAM NATIONAL UNIVERSITY OF AGRICULTURE

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ABSTRACT

AGRICULTURAL BIOTECHNOLOGY
CHALLENGES AND OPPORTUNITIES

HANOI, 12/2021

PREFACE

The World is facing many difficulties due to the COVID-19 epidemic, the general economic downturn, Vietnam also has overcome many difficulties and achieved the "dual goal" directed by the Vietnamese Government and the Prime Minister: Drastically prevent and combat the epidemic with the spirit of "fighting the epidemic like fighting the enemy", while focusing on socio-economic recovery and development, ensuring people's lives. In this success, science and technology made important contributions when Vietnam's economy grew positively by 2.91% in 2020, being one of the fastest growing countries in the region and in over the World.

On November 20, 2021, President Nguyen Xuan Phuc attended the celebration of Vietnam Teacher's Day and the opening of the school year 2021-2022 of VNUA, affirming that "VNUA is also very active in activities, such as scientific research, technology transfer with many valuable research achievements applied to daily life production, contributing to improving the productivity, quality and value of agricultural products, gradually forming the depicting farmers of the digital transformation era, creating a mark and brand for Vietnamese agricultural products on the World". President Nguyen Xuan Phuc also emphasized "What starts here (VNUA) will change agriculture and rural areas of Vietnam".

The Fourth Industrial Revolution, 4IR, or Industry 4.0 has created many breakthroughs in new technologies in fields such as AI artificial intelligence production, robot manufacturing, internet network development, 3D printing technology, nanotechnology, biotechnology, science, materials science, energy storage and informatics. Biotechnology in general, and agricultural biotechnology in the fields of veterinary medicine, plants, microorganisms, environmental protection and human health care are facing great challenges, especially in the impacts of the Covid 19 pandemic, such as the vaccine race, at the same time, there are opportunities to affirm and develop a key role in the development of sustainable agro-ecosystems./.

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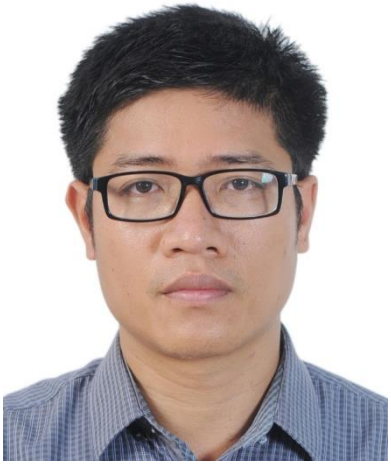

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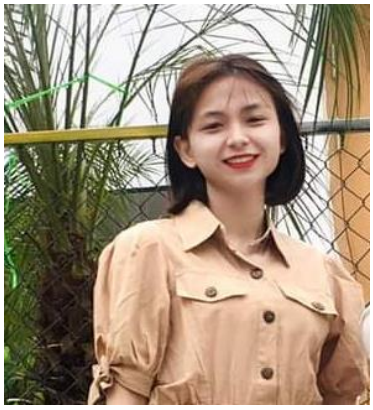

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THE 03rd SYMPOSIUM
AGRICULTURAL BIOTECHNOLOGY: CHALLENGES AND OPPORTUNITIES

1. Date: 18th December 2021 (Saturday, from 7:30-17:00, GMT +7)
2. Place: Offline at PH-1 meeting room (VNUA) and Online via Zoom Meeting
3. Agenda

Time	Subject	Person-in-charge
07:30-07:50	Join Zoom meeting	Organization and participants
07:50-08:00	Introduction of participants	**Dr. Nguyen Thi Thuy Hanh** **Dr. Pham Thi Dung** MC of symposium Faculty of Biotechnology, VNUA
08:00-08:10	Opening speech	**Prof. Dr. Nguyen Thi Lan** President Vietnam National University of Agriculture (VNUA)
MAIN SESSION		
Session 1: Policies on development of biotechnology and research trends in agricultural biotechnology **Chairperson: Dr. Nguyen Thi Thuy Hanh** **Dr. Pham Thi Dung**		
08:10-08:20	Summary report on Agricultural Biotechnology	**Dr. Nguyen Xuan Cuong** Former Minister Ministry of Agriculture and Rural Development (MARD) Senior advisor of VNUA
08:20-08:40	Program to develop bio-industry in agriculture to 2030	**Dr. Pham Hong Hien** Deputy Director, Department of Science and International Cooperation (DOSI) Vietnam Academy of Agricultural Sciences (VAAS)
08:40-09:00	Characterization of CRISRP/Cas9-induced knockout mutations in Gβ subunit gene in tomato	**Dr. Ninh Thi Thao** Lecturer, Researcher Excellent research group: Applied Biotechnology Faculty of Biotechnology Vietnam National University of Agriculture
09:00-09:20	Analysis of mitochondrial DNA and Y chromosome in Vietnamese population	**Dr. Nguyen Thuy Duong** Leader Human Genomics Laboratory Institute of Genomic Research
09:20-09:40	Genetic diversity of underutilized leafy *Amaranthus* genetic resource	**Dr. Ken Hoshikawa** Scientist, Researcher Biological Resources and Post-harvest Division Japan International Research Center for Agricultural Sciences (JIRCAS) Genetic Resources Headquarters, The World Vegetable Center

09:40-10:00	Membrane phospholipids as internal phosphate reserve of plant cells to cope with phosphate starvation	**Dr. Ngo Hai Anh** Research Scholar, Institute of Plant and Microbial Biology, Academia Sinica, Taiwan
10:00-10:20	Plant breeding at the speed of light: the power of Genome Editing Technology	**Dr. Yao Luo** Manager of breeding technology Lark Seeds International
10:20-10:40	Relieve stress for better crop production	**Dr. Yueh Cho** Postdoctoral Fellowship, Institute of Plant and Microbial Biology, Academia Sinica, Taiwan
10:40-11:00	Application of barcoded DNA in identification of fruit varieties in Vietnam	**Dr. Do Tan Khang** Head of Department, Molecular Biotechnology Biotechnology Research and Development Institute Can Tho University
11:00-11:20	Application of biotechnology on the treatment of agricultural solid waste	**Dr. Tran Thi Ngoc Bich** Vice Director, Institute of Environmental Science and Technology Tra Vinh University
11:20-11:40	Application of biotechnology in plant breeding	**Dr. Trinh Ngoc Ai** Vice Dean, School of Agriculture and Aquaculture Tra Vinh University
11:40 -12:00	General discussion	**Dr. Nguyen Thi Thuy Hanh** **Dr. Pham Thi Dung**
12:00-13:00	Lunch Time	
13:10-13:30	Join Zoom meeting	Organization and participants
Session 2: Application of biotechnology in agriculture **Chairperson: Assoc. Prof. Dr. Dong Huy Gioi** **Dr. Dinh Truong Son**		
13:30-13:45	Improved bacterial leaf blight disease resistance in the major elite Vietnamese rice cultivar TBR225 using CRISPR/Cas9 system	**Dr. Nguyen Duy Phuong** Head of Department Molecular Pathology Department Agriculture Genetics Institute
13:45-14:00	Establishment of the digital tools for precious agriculture by machine learning	**Dr. Chu Duc Ha** Research, Lecturer Faculty of Agricultural Technology (FAT) University of Engineering and Technology (UET) Vietnam National University Hanoi (VNU)
14:00-14:15	Study on in vitro culture of triploid hemerocallis (*Hemerocallis spp*) like K1	**Dr. Nguyen Xuan Truong** Director Institute of Agro-biology Vietnam National University of Agriculture
14:15-14:30	The Influence of Conditions on the Antibacterial Properties of	**Dr. Le Thanh Huyen** Head of Department

	Ganoderma aff. brownni, *Ganoderma sinense*, and *Lentinus sajor-caju*	Dept. Toxicology and Environmental Monitoring, Faculty of Environment, Hanoi University of Natural Resources and Environment Collaboration with Strong research group: Edible and Medical Mushrooms
14:30-14:45	The role of biotechnology in plant protection in ensuring food security and sustainable agriculture in Vietnam	**Dr. Trinh Xuan Hoat** Deputy Director General Plant Protection Research Institute (PPRI)
14: 45-15:00	**Tea-break (Video introduction of VNUA)**	
15:00-15:15	Genetic Analysis of Rice Blast Disease in the North of Vietnam	**Dr. Nguyen Thi Thuy Hanh** Vice Dean Faculty of Biotechnology Vietnam National University of Agriculture
15:15-15:30	Agriculture in climate change scenarios: The dawn of microalgae biotechnology in Vietnam	**Assoc. Prof. Nguyen Duc Bach** Leader of research team: Application of microalgae biotechnology and exploitation of biologically active natural compounds Faculty of Biotechnology Vietnam National University of Agriculture
15:30-15:45	Application of Nanobiotechnology on plant tissue culture	**Dr. Bui Thi Thu Huong** Lecturer, researcher Member of strong research group: Nano Biotechnology and Recombinant Gene- Protein Technology Faculty of Biotechnology Vietnam National University of Agriculture
15:45-16:00	Engineering bacterial leaf blight resistant rice using genome editing	**Dr. Luu Thi Van** Rice team group leader Institute for Molecular Physiology Heinrich-Heine University of Düsseldorf Universitätsstraße 1, Germany
16:00-16: 15	Greenhouse and field cassava yield can be altered by different isolates of an agriculturally-relevant fungal symbiont	**Dr. Erica McGale** Postdoc Fellowship Department of Ecology and Evolution, University of Lausanne
16:15-16:45	General discussion	**Assoc. Prof. Dr. Dong Huy Gioi** **Dr. Dinh Truong Son**
16:45-17:00	Closing	**Associate. Prof. Nguyen Xuan Canh** Dean Faculty of Biotechnology Vietnam National University of Agriculture

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SUMMARY REPORT ON AGRICULTURAL BIOTECHNOLOGY

Nguyen Xuan Cuong

Dr. NGUYEN XUAN CUONG

Former Minister

Ministry of Agriculture and Rural Development (MARD)

Senior advisor

Vietnam National University of Agriculture

ESTABLISHMENT OF THE DIGITAL TOOLS FOR PRECISION AGRICULTURE BY MACHINE LEARNING

Ha Duc Chu[1], Trung Quoc Nguyen[2], Hai Van Tong[2], Hong Viet La[3], Linh Hong Ta[4], Huy Quang Vuong[1], Trung Minh Vu[1], Minh Trien Pham[1]

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Abstract

Precision agriculture has been considered as one of the key components of the digital transformation in Vietnam. In the view of information and communications technology, five major cases, including smart-crop monitoring, drone farming, smart-livestock monitoring, autonomous farming machinery, and smart-building and -equipment management have the potential to radically transform many aspects of agriculture. However, the establishment of digital tools used in smart agriculture programs has been still lacking. Of our interest, we reported two out of many cases of Internet-of-Things- (IoT-) based tools for the research in agriculture. In the first case, we investigated an electronic trap for automated monitoring of fall armyworm (FAW). Briefly, FAW (*Spodoptera frugiperda*) has been reported as one of the most devastating pests that can attack maize (*Zea mays*) at all growth stages. Since the first occurrence of FAW in Vietnam has been reported in 2019, this lepidopteran pest had caused huge damage to maize production in the Northern provinces of Vietnam. Thus, monitoring, identification, and management of FAW in the fields become one critical task for sustainable agricultural production. As the result, we introduced an automated FAW (adult moths) counting system based on the traditional pheromone traps. The IoT sensors have been merged into the instrument to count the frequency of adult moths and together record the temperature and humidity data. The general data, including the real-time amount of trapped insects and environmental conditions, has been analyzed based on the machine-learning method, consequently, send to the Internet browser and applications. In the second case, we constructed a cost-effective phenotyping machine for automated seed imaging. Particularly, agronomists have an issue with the estimation of various typical characteristics of seeds, like length, width, mass, the color of the skin, and pubescence. By using the computer vision approach, we generated an easy-to-use tool for automatically measuring the general features of crop seeds. The construction of this tool can significantly replace labors with only simple operations. Taken together, our tools could significantly provide a collection of digital tools for supporting the digital transformation in research and development in the agriculture sector.

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