

INSTITUTE OF **TROPICAL AGRICULTURE AND FOOD SECURITY**

Prioritising food security for Malaysians



AVAILABLE | WHOLESOME | AFFORDABLE

THE INSTITUTE OF TROPICAL AGRICULTURE AND FOOD SECURITY (ITAFoS), ESTABLISHED IN 2007, FOCUSSES ON TROPICAL AGRIFOOD RESEARCH AND TRAINING OF POSTGRADUATE STUDENTS.



VISION

To be a focal point for impactful multidisciplinary research to achieve food security.



MISSION

To enhance sustainable tropical agriculture production and food security through effective, innovative and high impact research.

DIRECTOR'S MESSAGE



Professor Dr Zulkifli Idrus

Director
Institute of Tropical Agriculture and Food Security
Universiti Putra Malaysia



Welcome to the Institute of Tropical Agriculture and Food Security (ITA FoS). On 1st January 2017, the Malaysian Ministry of Higher Education officially declared ITA FoS a Higher Institution Centre of Excellence (HiCoE). Our vision is to be a focal point for impactful multidisciplinary research to achieve food security. With this vision as our guide, we bring together committed researchers and students to put agriculture science into practice in innovative ways. With Universiti Putra Malaysia's (UPM) long and proud tradition as a distinguished provider of education and research in tropical agriculture, ITA FoS is well positioned to contribute to the national food security agenda.

Climate change is resulting in emerging challenges such as rising temperature, water shortage and diseases that are adversely affecting tropical agrifood production. To deal with these challenges,

we have established three laboratories, the Laboratory of Climate-Smart Food Crop Production, the Laboratory of Sustainable Animal Production and Biodiversity, and the Laboratory of Food Safety and Food Integrity. The Institute emphasises on multidisciplinary learning and discovery in adapting to these new challenges of the 21st century to attain sustainable and safe food production.

Our strong links with national and international universities, research institutions and industry players are yielding success in achieving our goal as a premier institute for tropical agrifood and food security. I am very proud of our researchers and students' embrace of game-changing discoveries, which continue to make great impact on the availability, wholesomeness and affordability of food in the country and across the region.



OUR

MANAGEMENT TEAM

PROF. DR MOHD RAFII YUSOP

Head of the Laboratory of Climate-Smart Food Crop Production
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PROF. DR ZULKIFLI IDRUS

Director
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SARAH SALWAH ADNAN

Senior Assistant Registrar
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ASSOC. PROF. DR AWIS QURNI SAZILI

Head of the Laboratory of Sustainable Animal Production and Biodiversity
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PROF. DR MOHD RAZI ISMAIL

Deputy Director
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PROF. DR JINAP SELAMAT

Head of the Laboratory of Food Safety and Food Integrity
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KEY

PROJECTS

1

ENHANCING SUSTAINABLE RICE PRODUCTION THROUGH INNOVATIVE RESEARCH

This project is sponsored by the Ministry of Higher Education, Malaysia under the Long-Term Research Grant Scheme and Translational Research Programme. The goal of the project is to ascertain sustainable rice production, thus ensuring food and nutritional security of the present and future population of Malaysia. This project develops and disseminates eco-friendly rice production technologies to enhance productivity and profitability of rice cultivation.

2

ENHANCING COMPETITIVENESS AND SUSTAINABILITY OF POULTRY INDUSTRY THROUGH IMPROVED FEEDSTOCK

The main objective of this project, funded by the Ministry of Higher Education, Malaysia under the Long-Term Research Grant Scheme, is to improve the nutritive value, availability and safety of local feedstock in order to reduce importation of grains. This project enhances the competitiveness and sustainability of the local poultry industry.

3

NUTRITIONAL AND MILK QUALITY AND SOCIO-ECONOMIC DETERMINANTS FOR SUSTAINABLE GOAT'S MILK PRODUCTION

Funded by the Ministry of Higher Education, this research aims to improve goat's milk production, safety and quality and to determine the important socio-economic factors for sustainable goat's milk production in Malaysia. This project also contributes to the transformation of the Malaysian farming community in line with the government's goal of creating a high-income nation.

4

SELECTION OF RICE MUTANTS/VARIETIES TO INCREASE RICE YIELD AND FOR FODDER PRODUCTION

This project is funded by the International Atomic Energy Agency (IAEA) in collaboration with the Malaysian Nuclear Agency. It is aimed at achieving self-sufficiency in rice production as well as producing quality fodder for ruminants. The rice seeds used were first irradiated in Japan and the best mutant lines for high grain yield and fodder quality were then selected.

5

PRODUCTION OF HIGH-VALUE VEGETABLES AND FRUIT THROUGH CLIMATE-SMART CULTIVATION IN THE TROPICS

This project is jointly funded by Malaysian government agencies and Syngenta, a private company. Climate-smart crop production contributes to the sustainable production of vegetables and fruit by addressing climate change impacts through adaptation and mitigation actions.

6

ANIMAL WELFARE STANDARDS FOR TRANSPORTATION AND SLAUGHTER

The Institute teamed up with the Australian and New Zealand World Animal Health Organisation Collaborating Centre for Animal Welfare and Bioethical Standards in a project to increase awareness of standards for slaughter and transportation via land, sea and air in Southeast Asia. The project is funded by the New Zealand, Australian and Malaysian governments, World Animal Protection and UPM, with contributions from the Humane Slaughter Association and the lead organisation, the University of Queensland in Australia.

8

NOVEL WELL-BEING BIOMARKERS IN POULTRY

This project, funded by the Malaysian Ministry of Science, Technology and Innovation, investigates the responses of acute-phase proteins and heat shock proteins to thermal and non-thermal stressors in poultry. Elucidating the roles of these proteins opens up new avenues in the molecular and cellular mechanisms of adaptation and coping with environmental insults.



11

ANALYTICAL METHOD FOR MYCOTOXIN AND ACRYLAMIDE DETECTION

We develop accurate and reliable methods for the detection of mycotoxins and acrylamide for use by the Ministry of Health, Malaysia in its routine analysis and surveillance programme. We have also developed an analytical method for the determination of heterocyclic amines and polycyclic aromatic hydrocarbon in chicken, beef and lamb meat.

12

BIOSENSOR KIT FOR FOOD CONTAMINANTS

An electrochemical biosensor was developed based on formaldehyde dehydrogenase immobilised with Nafion membrane for determination of formaldehyde in fish. An electrochemical DNA biosensor for sensitive detection of specific microbial genes was also developed.

7

WELFARE OF BEEF CATTLE DURING TRANSPORT AND SLAUGHTER FROM THE ISLAMIC PERSPECTIVE

This is a multidisciplinary research project aimed at providing new knowledge and insight into the issues of beef cattle welfare from the Islamic perspective. The Institute is collaborating closely with the Malaysian Department of Veterinary Services (DVS) and the Malaysian Department of Islamic Development (JAKIM) to ascertain cattle welfare as affected by sea and road transportation as well as halal slaughtering. The project is funded by the DVS and UPM.



9

MITIGATION OF ENTERIC METHANE EMISSION USING NATURALLY PRODUCED LOVASTATIN

This project, jointly sponsored by the Ministry of Primary Industry, New Zealand and UPM, employs a technology developed by researchers of the Institute that produces natural lovastatin from agricultural byproducts as a mitigation agent for enteric methane (a potent greenhouse gas) emission in ruminants.

10

ORGANIC ACIDS AND PALM FAT IN DIET OF BROILER CHICKENS

This research investigates the use of organic acid and palm fat in the diet of broiler chickens. Organic acid and palm fat are used as substitutes for in-feed antibiotics to promote growth. This research is funded by Sunzen Corporation Sdn. Bhd. Malaysia.

13

RISK ASSESSMENT OF FOOD SAFETY

This research contributes findings on occurrence and prevalence of chemical food contaminants including mycotoxins, heavy metals, biogenic amines, acrylamide and polycyclic aromatic hydrocarbon in food. The findings are used by the Malaysian Food Safety Authority to set national standards and guidelines and to contribute to codex regulations. The findings also create awareness of food safety among consumers, farmers and traders.

14

HAZARD CONTROL OF FOOD CONTAMINANTS

This research focusses on reducing chemical food contaminants, including polycyclic aromatic hydrocarbons, heavy metals, heterocyclic amines, mycotoxins and acrylamide. Significant findings include the reduction of mercury from fish using a combined solution of cysteine, EDTA and sodium chloride. The reduction of polycyclic aromatic hydrocarbons in beef samples treated with the acidic marinade and the reduction of microbial flora uses different packaging atmosphere in fish products.

OUR

FACILITIES



CROP BREEDING HOUSE

For developing new crop varieties



CROP GREENHOUSES

For climate-smart research activities



HUMIDITY/TEMPERATURE CHAMBER FOR FOOD AND FEED

For testing the effects of specific environmental conditions on food and feed



MECHANICAL STUNNER AND MARK IV RESTRAINING BOX

For humane slaughtering of cattle



MOLECULAR LABORATORY

For DNA and molecular genetic analysis



OPEN-CIRCUIT RESPIRATION CHAMBERS

For measurement of enteric methane production in animals



POULTRY AND RUMINANT RESEARCH FARM INCLUDING FEED MILL

For sustainable animal production studies



SUPERCritical FLUID EXTRACTOR

For extracting components from solid and liquid matrices using supercritical carbon dioxide and environmentally-friendly solvents



TEMPERATURE CONTROL CHAMBERS FOR ANIMAL STUDIES

For thermal-environment studies in poultry and small ruminants

OUR

CORE TEAM

PROF. DR ZULKIFLI IDRUS

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Zulkifli has over 27 years of experience in animal stress biology and welfare. His research interests include nutritional requirements of poultry under stressful environments, adaptation of poultry to hot climate, understanding the role of stress and fear in animal welfare and welfare during stunning and slaughter in poultry and livestock.

PROF. DR MOHD RAZI ISMAIL

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Mohd Razi is Professor of Plant Ecophysiology. His main research interest is environmental stress impact on tropical crops, in particular, the rice plant. He is also conducting research into protected environment agriculture.

PROF. DR JINAP SELAMAT

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Jinap is Professor of Food Safety. Her research focus is strategies for reducing chemical hazards in food and feed including mycotoxins and heat-generated toxicants and heavy metals. She is also developing analytical procedures to determine mycotoxins in food and feed and is researching food authentication and management of food safety hazards.

PROF. DR MOHD RAFII YUSOP

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Mohd Rafii is Professor of Crop Breeding. His research activities include crop breeding through conventional and molecular approaches to enhance yield, quality and tolerance to biotic and abiotic stresses.

ASSOC. PROF. DR AWIS QURNI SAZILI

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As a meat scientist, Awis is involved in research to determine how meat quality is influenced by slaughter management.

DR ABDOREZA SOLEIMANI FARJAM

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Abdoreza is a Research Fellow of Nutritional and Adaptive Physiology. He uses nutritional and epigenetic interventions to reduce stress in animals and enhance animal welfare and well-being.

DR FATMA AZWANI ABDUL AZIZ

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Fatma Azwani is a Senior Research Officer. Her research interests include plant physiology and phytochemical content and environmental effect on plant growth. Her expertise also extends to microbial community structure and interactions in natural and engineered environments.

DR LIANG JUAN BOO

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Juan Boo is a Senior Research Fellow whose research interests include animal nutrition, development of prebiotics and probiotics from local resources and nutritional manipulation to mitigate enteric methane production.

DR MOHD HUZAIRI MOHD ZAINUDIN

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Mohd Huzairi is a Research Officer whose research interests include microbial community structure in natural and engineered environments, biological treatment of waste, waste treatment microbiology, bioenergy and alternative fuel production.

DR NOORDIANA NORDIN

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Noordiana, a Research Officer, conducts research in quantification of chemical and microbiological contamination in food and application of sensor technology to detect food contaminants.

DR NORHANI ABDULLAH

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Norhani is a Senior Research Fellow. Her research interests include biological and physical treatments of feed, focussing on palm kernel cake (PKC), probiotics and nutrigenomics in poultry.

DR SURIYA KUMARI RAMIAH

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Suriya Kumari is a Research Officer at ITAFoS, and her research interest is animal nutrition and its relation to genetic factors. Her areas of expertise include meat science, animal welfare and nanoparticles as an animal feed additive.

DR ZULKARAMI BERAHIM
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Zulkarami, a Senior Research Officer, is pursuing research into environmental biotechnology, plant physiology and crop production, among other interests. Currently, his research focus is water stress effects on rice grain filling through growth regulators.

ANNA ARYANI AMIR
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Anna Aryani Amir is a Research Officer at ITAFoS who works primarily on animal reproduction and embryo biotechnology. Currently, she is studying the effects of plant secondary compounds on the maturation and development of ruminant embryos.

MOHAMAD HUSNI OMAR
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Mohamad Husni is a Research Officer, and his research interests include microbiology, soil management and precision agriculture. Presently, his research areas are climate change effects on food legumes and improvement of yield production.

OUR TEAM

OF ASSOCIATE RESEARCHERS

PROF. DR ABDUL SHUKOR JURAIMI
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Abdul Shukor is Dean of the Faculty of Agriculture and a Research Associate at ITAFoS. His research interest is weed management in food crops.

PROF. DR AHMED OSMANU HARUNA
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Ahmed Osumanu is Professor of Soil Fertility and Management. His research interests include biological agriculture, waste management and utilisation, fertiliser technology and environmental quality management.

PROF. DR LOH TECK CHWEN
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Teck Chwen is Professor of Monogastric Animal Nutrition and Head of the Department of Animal Science, Faculty of Agriculture. His research interests include animal nutrition, feed additives and fat nutrition in animal feeding.

PROF. DR SON RADU
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Son Radu is Professor of Food Safety. His research interests include microbiological risk assessment of foodborne pathogens, antimicrobial resistance, molecular biology and biotechnology.

ASSOC. PROF. DR FAEZ FIRDAUS JESSE ABDULLAH
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Jesse is a field veterinarian for livestock, particularly small and large ruminants. His research focus is discovering biomarkers for early detection of disease in ruminants. He also studies the pathophysiology of important ruminant diseases in Malaysia. He has developed a vaccine against an important small ruminant disease (Caseous Lymphadenitis) in Malaysia.

ASSOC. PROF. DR GOH YONG MENG
ymgoh@upm.edu.my

Yong Meng is investigating how fat metabolism affects cellular functions in animals. His areas of expertise include nutrigenomics, ruminant methanogenesis and electroencephalography and its application in animal welfare studies.

**DR NOOR AZIRA ABDUL
MUTALIB**

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Noor Azira focusses on microbial community analysis of samples from the food service industry. Her current research interests are food safety, food microbiology, hygiene and sanitation.

DR NORIDA MAZLAN

noridamz@upm.edu.my

Norida has been working on pesticide risk management of food crops and precision farming.

DR NUZUL NOORAHYA JAMBARI

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Nuzul Noorahya's current research interests include the impact of food allergy in food safety and quality, allergen management and risk mitigation in the food supply chain.

**PROF. DR MAHMUD TENGKU
MUDA MOHAMED**

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Mahmud is Head of the Crop Science Department and a Research Associate at ITAFoS. His research areas are various aspects of postharvest such as postharvest physiology and postharvest biocontrol and food safety.

**PROF. DATO' DR MOHD AZMI
MOHD LILA**

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Mohd Azmi is a senior Professor whose research includes animal diseases specifically in the area of virology and microbiology, immunity against disease agents. He is also actively helping industries for intellectual property evaluation and commercialisation and nurturing start-up entities.

**PROF. DR MOHAMED HANAFI
MUSA**

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Mohamed Hanafi is Professor of Soil Science. His research focus is the relationships between plant nutrition for growth and yield promotion and disease incidence on food crops such as flooded and specialty rice.

**DR AHMAD FAIZAL ABDULL
RAZIS**

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Ahmad Faizal is Associate Professor of Food Toxicology. His research interests include bio-accessibility of chemical contaminants in food, food irradiation, cancer-causing foods and functional foods.

DR MAIMUNAH SANNY

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Maimunah has been investigating various mitigation strategies to reduce heat-generated toxicants and heterocyclic amines in food. She is currently evaluating the magnitude and significance of the migration of chemical contaminants from plastic to food.

**DR NIK ISKANDAR PUTRA
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Nik Iskandar Putra's current research includes the effects of climate change on patterns of mycological proliferation and mycotoxin contamination in food crops as well as ecophysiology and the control of mycotoxigenic fungi.

DR RASHIDAH SUKOR

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Rashidah is a Research Associate at the Institute. Her research focusses on chemical food safety. She specialises in the development of analytical methods, including both immunodiagnosics and instrumental analysis of food contaminants, food allergy and chemical risk assessment.

DR YASMEEN SIDDIQUI

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Yasmeen's research activities concentrate on plant pathology and biological control. She is also working on biological intensive integrated disease management strategies for plant pathogens.



COLLABORATORS & FUNDING PARTNERS

- 01** **AGRESEARCH NEW ZEALAND**
Mitigation of enteric methane emission
- 02** **ANIMINE, FRANCE**
Feed supplement for poultry
- 03** **BANGLADESH RICE RESEARCH INSTITUTE**
Rice research
- 04** **CJ BIO, MALAYSIA AND KOREA**
Amino acids for poultry
- 05** **FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, THAILAND**
Asian-Australasian Dairy Goat Network
- 06** **FAO/WHO**
Southeast Asian Regional Network on Microbiological Risk Assessment
- 07** **FOOD SAFETY CONSORTIUM (SELAMAT), MALAYSIA**
Conferences and training
- 08** **HAINAN UNIVERSITY, CHINA**
Chinese herbs as feed supplement to mitigate heat stress in chickens
- 09** **INSTITUTE OF FOOD SAFETY (RIKILT), THE NETHERLANDS**
Modification of mycotoxin analysis
- 10** **INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), AUSTRIA**
Rice mutation breeding
- 11** **INTERNATIONAL RICE RESEARCH INSTITUTE (IRRI)**
Rice research
- 12** **KASETSART UNIVERSITY, THAILAND**
Food safety research relating to mycotoxins



- 13** **LANCASTER UNIVERSITY, UNITED KINGDOM**
Rice research
- 14** **NUKAMEL, THE NETHERLANDS**
Feed supplement for poultry
- 15** **SOUTH CHINA AGRICULTURE UNIVERSITY, CHINA**
Livestock ecology and environment
- 16** **SYNGENTA, MALAYSIA AND SINGAPORE**
Crop pest and disease management
- 17** **TOKYO UNIVERSITY, JAPAN**
Emerging infectious diseases in the Pacific Rim
- 18** **UNIVERSITY OF CRANFIELD, UNITED KINGDOM**
Food safety research relating to mycotoxins
- 19** **UNIVERSITY OF GLASGOW, UNITED KINGDOM**
Animal health and welfare
- 20** **UNIVERSITY OF QUEENSLAND, AUSTRALIA**
Animal welfare
- 21** **WORLD ORGANISATION FOR ANIMAL HEALTH (OIE), FRANCE**
Animal welfare
- 22** **FEDERAL, STATE AND LOCAL GOVERNMENT AGENCIES**
- 23** **RICE RESEARCH & TRAINING CENTRE, EGYPT**
Rice research
- 24** **UNIVERSITY OF ARKANSAS, UNITED STATES OF AMERICA**
Poultry production

POSTGRADUATE

STUDIES AT ITAFoS

We are a multidisciplinary institute, and we welcome students from around the world who are engaged in a range of scientific studies. Scholarships are available for deserving students. For more information on scholarships, visit www.sgs.upm.edu.my/financialassistancesgs. To enrol in a MS or PhD programme at ITAFoS, visit www.sgs.upm.edu.my.

WHAT OUR STUDENTS ARE SAYING

I'M GRATEFUL TO BE AT ITAFoS. I HAVE LEARNT A LOT FROM THE EXPERTS, AND THE RESEARCH FACILITIES ENABLED ME TO DO MORE THAN AT OTHER RESEARCH INSTITUTES.

Akhmal Hakim (Malaysia) – Animal nutrition



... INSPIRATIONAL AND ENERGISING... ITAFoS PROVIDES THE OPPORTUNITY FOR THE EXCHANGE OF IDEAS WITH FELLOW STUDENTS AND RESEARCHERS, AND THE SHARING OF OUTPUT WITH THE REST OF THE WORLD.

Oladosu Yusuff Abisola (Nigeria) – Rice mutation breeding

THE INSTITUTE PROVIDES EXCELLENT FACILITIES AND EQUIPMENT TO CONDUCT RESEARCH. RESEARCHERS ARE FRIENDLY AND HELPFUL, AND STAFF ARE ATTENTIVE.

Candyrine Su Chui Len (Malaysia) – Nutrigenomics of fatty acids in small ruminants



...EXTREMELY REWARDING AND ENJOYABLE [EXPERIENCE]. THIS IS THE RIGHT PLACE TO GROW IN KNOWLEDGE ON FOOD SAFETY...

Atena Abbasi Pirouz (Iran) – Animal feed additive

OUR

FIELD OF STUDY



Agronomy



Animal Biotechnology



Animal Nutrition



Animal Physiology



Animal Production



Animal Waste Management



Animal Welfare



Bioinformatics and
Systems Biology



Food Safety



Food Security and
Climate Change



Genetics and Plant
Breeding



Horticulture



Microbial Biotechnology



Pesticide Risk
Management



Plant Physiology



Post Harvest Technology



Soil Science



Weed Science



TECHNOLOGY

TRANSFER

1. TRANSFER OF PADI U PUTRA TECHNOLOGY TO PADDY FARMERS

Padi U Putra, unique to ITAFoS, encompasses the following technologies: foliar fertiliser formulation, pest and disease control, a high-yield and blast-resistant rice variety, precision farming, humic acid activated for soil enhancement and a decision-support system for forecasting insect pests. Launched by the Minister of Higher Education, Malaysia in 2017, this package of technologies will provide sustainable agronomic practices to enhance rice productivity and farmers' incomes.

2. ANIMAL WELFARE PROJECT

We worked with the University of Queensland, Australia and our partners in China, Vietnam and Thailand to increase awareness of international animal welfare guidelines set out by the World Animal Health Organisation (OIE) on animal transport and slaughter in Asia. The project included high-level workshops with government officials, senior veterinarians and university lecturers in each country and workshops with key industry stakeholders. The project has contributed to building a better future for farm animals and improving animal welfare in agriculture.

3. ZERO DISCHARGE PIG FARMING

Discharge of huge amounts of waste water is an obstacle to the development of sustainable pig farming in developing Asian countries, which are experiencing rapid expansion in this industry. Developed together with our Japanese partner and local farmers, this technology reduces water usage and employs a combined chlorella culture and wetland technology to reduce waste-water pollutants.

4. FOOD SAFETY INTEGRATED PROJECT

ITAFoS and the Ministry of Health are involved in projects to improve food security through food safety enhancement. The project identifies technical and socioeconomic factors, and sustainable interventions to control food contaminants such as mycotoxins, heavy metals and acrylamide along the food supply chain. The Ministry uses the findings as risk assessment data and input in the preparation of guidelines to protect public health by ensuring that food is safe and suitable for human consumption.



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<https://www.instagram.com/uniputramalaysia>



<https://www.youtube.com/universitiputramalaysia>