

## AGRICULTURE AND FOOD CLUSTER

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RESEARCH CLUSTER CODE	AF
NO. OF PROGRAMME	19
NO. OF GROUP	51
NO. OF RESEARCH CENTRE	2
SYNOPSIS	<p><i>Malaysia is a net importer of food and feed. Food deficit increased from RM1billion (1990) to RM14 billion (2011). In the light of the recent global energy and financial crises the earlier national food security policy which was based on self-reliance (as opposed to self-sufficiency) is no longer tenable. To meet the challenge of food security, agriculture R &amp; D are and will continue to be prerequisites for increasing agricultural productivity and generating income for farmers and the rural work force. Given the critical mass and strong agriculture footing, UPM is ready to spearhead food security R&amp;D in Malaysia. The Food and Agriculture research cluster is multidisciplinary in scope with “farm-to-fork” systems approach. The cluster encompasses research and innovation on sustainable production technologies, agricultural productivity, animal and aquaculture production, food science and technology, and end-consumer products that can effectively enhance national food and nutrition security. Environmental and socio-economic aspects of food and agriculture will be also emphasized.</i></p>
DESCRIPTION (with NABC elements)	<p><b>Need</b></p> <ul style="list-style-type: none"> <li>• Address the change in food consumption patterns and a growth in demand for safe and nutritious agricultural products.</li> <li>• Commitment to a high level of self-sufficiency in some food products, especially rice.</li> <li>• Agricultural practices are in harmony with the environment.</li> <li>• Safeguard the health and welfare of animals</li> <li>• Conserve natural resources and unlocking the richness of biodiversity</li> </ul> <p><b>Approach</b></p> <ul style="list-style-type: none"> <li>• Multi- and trans-disciplinary research programmes.</li> <li>• Farm-to-fork systems.</li> <li>• Leverage on agri-biotechnology expertise to value-add and create more high value products.</li> <li>• Enhancing internationalization, and networking and linkages with the industry.</li> <li>• Emphasis on sustainable agriculture.</li> <li>• Production of safe and nutritious food</li> </ul> <p><b>Benefit</b></p> <ul style="list-style-type: none"> <li>• Adequacy in safe and nutritious food production.</li> <li>• Stability in food supplies.</li> <li>• UPM as a centre of excellence in food and agriculture at both national and international levels.</li> <li>• Promotion of sustainable agriculture.</li> </ul> <p><b>Competitor</b></p> <ul style="list-style-type: none"> <li>• Other public universities are building their capacity in food and agriculture R&amp;D.</li> <li>• Public research institutions in food and agriculture are getting huge R&amp;D funding from the Government and their synergy with UPM is weak.</li> </ul>

Code	Research Programme	Synopsis	Leader of Research Programme	Research Groups
AF01	Agriculture and the Environment	<p>The environmental issues related to agriculture include climate change, surface and ground water pollution, natural resource degradation, waste management and agro chemical contamination. These issues are threatening the sustainability of the agricultural sector. The general objective of this research is to provide approaches to mitigate climate change and environmental degradation and to enhance natural resource conservation for agriculture. The specific objectives are: to assess environmental degradation in agriculture; to sustain agricultural productivity with climate change; to minimize the effect of agricultural waste on the environment; to develop green technology for crop and animal production. Due to the concern on the climate change and environmental degradation, Malaysia should have a strong research in this area. The outcome will provide a deeper understanding on the role of agriculture in climate change and the environment. An assessment of the environmental degradation is essential for development of sustainable agricultural development policy and useful for articulation at the international forum. The research also will provide technology and policy option for “green agriculture”. The outcome of the research will ensure minimum environmental degradation, food security and food safety for the population. Universiti Putra Malaysia houses most of the human resource and facilities in agricultural research is in the best position to perform this research. The on-going research projects related to the theme projects have secured research fund.</p> <p><b>Keywords:</b> Climate change, global warming, agricultural pollution, natural resource management</p>	<p>Prof. Dr. Mohd Khanif Yusof (FP)</p> <p>khanif@agri.upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Sustainable Use of Agricultural Resources – Assoc. Prof. Dr. Ahmed Osumanu Haruna (UPMKB)</li> <li>2. Mitigation of Climate Change and Environmental Degradation in Agriculture - Prof. Dr. Mohd. Khanif Yusof (FP)</li> <li>3. Sustainable Animal Production Through Enhanced Environmental and Welfare - Dr. Liang Juan Boo (ITA)</li> <li>4. Utilization By Product and Waste for Sustainable Agriculture - Prof. Dr. Zulkifli Hj. Shamsuddin (FP)</li> <li>5. Agro-Based by Product Utilization – Assoc. Prof. Dr. Mazlina bt. Mustapa Kamal (FK)</li> </ol>
AF02	Animal Diseases and Health Management	<p>Health animals are essential for food security and healthy human life. Therefore, understanding and control of animal diseases are important. This research program aimed at understanding important diseases of livestock and companion animals for better disease diagnosis and control. There are adequate laboratory and farm facilities, and established groups of researchers on animal diseases that enables better understanding, diagnosis and control of animal diseases. This would significantly reduce the country’s dependency on importation of livestock products while enhancing human livelihood via healthy pets.</p> <p><b>Keywords:</b> Disease diagnosis and control, healthy animals</p>	<p>Prof. Dr. Mohd Zamri Saad (Vet)</p> <p>zamri@vet.upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Ruminant Diseases and Herd Health Management - Prof. Dr. Mohd Zamri Saad (FPV)</li> <li>2. Non-Ruminant Diseases of Economic Importance - Dr. Ooi Peck Toung (FPV)</li> <li>3. Companion Animal Health and Welfare – Assoc. Prof. Dr. Gurmeet K Dhaliwal (FPV)</li> </ol>
AF03	Competitiveness of Food and Agriculture Sectors	<p>Competitiveness at the national level may be sought in order to maximise welfare of the population while the private sectors may strive to be more competitive by enhancing value added, profits, market share or return on investment in a sustainable manner that simultaneously protect the environment. A country’s competitiveness in food and agriculture sectors can be assessed in many different ways. Unfortunately, there is no agreed method of competitiveness analysis but the most common has been stipulated in The Canadian Task Force definition. The determinants of competitiveness are not confined to market share and profitability only: there are other non-price factors that affect competitiveness such as product differentiation, levels of processing, value added, sustainability, environment and food security. (118 words)</p> <p><b>Keywords:</b> Comparative Advantage, Productivity, Market Share</p>	<p>Prof. Dr. Mohd Mansor Ismail (IKDPM)</p> <p>mmi@agri.upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Competitiveness of Food and Agricultural Products - Prof. Dr. Mohd Mansor Ismail (IKDPM)</li> </ol>

AF04	Crop and Animal Breeding	<p>Superior crop varieties and livestock are essential components of highly productive agriculture system. Several breeding programs focus on conventional and molecular approaches to enhance yield and quality of food crops, industrial crops and silage crops. Similarly, breeding programs will be developed to produce better quality animal products via genomics and proteomics approaches. The laboratory and farm facilities, and genetic resources available are adequate for conducting these research activities. This group consists of established plant and animal breeders and geneticists, molecular biologists, a botanist and a plant pathologist. The crop varieties and livestock developed and produced will be released for utilisation by farmers and practitioners. This would significantly reduce the country's dependency on importation of seeds and animal genetic resources to support the industry.</p> <p><b>Keywords:</b> Breeding, crop varieties, livestock</p>	<p>Assoc. Prof. Dr. Mohd Rafii Yusop (FP)</p> <p><a href="mailto:mrafi@upm.edu.my">mrafi@upm.edu.my</a></p>	<ol style="list-style-type: none"> <li>1. Superior Crop Varieties and Livestock Through Modern Breeding Strategies - Assoc. Prof. Dr. Mohd Rafii Yusop (FP)</li> <li>2. Livestock and Veterinary Reproductive Biotechnology – Prof. Dr. Abd Wahid Haron (FPV)</li> <li>3. Functional Genomics for Yield and Quality Improvement – Assoc. Prof. Dr. Siti Nor Akmar Abdullah (ITA)</li> </ol>
AF05	Economics of Agriculture, Environment and Natural Resources	<p>Research in agricultural economics has primarily focused on seven main topics: agriculture, environment and resources; risk and uncertainty; consumption and food supply chains; prices and incomes; market structures; trade and development; and technical change and human capital. Research projects may relate to individual efficiency in production and individual and group efficiencies in marketing, international trade or to general welfare. Research in agricultural and resource economics today includes a variety of applied areas, including tools for policy analyses which have considerable overlap with conventional micro- and macro-economics.</p> <p>1. The Economics of the Agricultural Marketing and Trade Policy The marketing of most of the agricultural and food commodities is beset with serious structural setback and inefficiencies in that it hampers future growth and development. The international trade scenarios are characterized by continuous instability and volatility, growing demand for liberalization from WTO, stricter quality control, numerous tariffs and non-tariff barriers and stiff competition from new emerging economies. This research programme aims at examining firstly; the implications of marketing policies and instruments on the performance of the sector in terms of growth, efficiency, competitiveness and welfare. Secondly, to examine the welfare and economic impact of trade variables on the said sector. Thirdly, to forecast the future trends of the commodity and food sector under a changing environment.</p> <p>2. The Prospect and Sustainability of Food Security in Malaysia (IKDPM) Malaysia's stance on food security is largely translated in terms of achieving self-sufficiency in rice production at about 65-70% of the local consumption. Since Malaysia does not have the comparative advantage in rice production, it implements a wide range of market interventions to achieve the intended level of rice production. The policy instruments include among others: guaranteed minimum price for paddy, price control, price and input subsidies and import monopoly. These interventionist instruments may not be sustainable in the long term as they incur high budgetary burden to the government, misallocation of resources and liberalization demand from WTO. The industry faces challenges in terms of land competition for urbanization and industrial uses and declining soil fertility due to heavy use of chemical fertilizer. This research program examines the sustainability of the food security in Malaysia under a changing macro-economic environment as well as trade scenarios. The program covers food commodities such as rice, livestock and fisheries.</p> <p>3. System Dynamics Analysis of the Malaysian Agricultural Sector (IKDPM) This research programme aims at examining the sustainability of the Malaysian agriculture sector under a challenging future on all fronts. Domestically, it faces declining water quality and soil degradation, competition with urbanization, better returns to non-agricultural ventures, limited R&amp;D and innovations, underinvestment and increasing input prices. At the international market, commodity</p>	<p>Prof. Dr. Khalid Abdul Rahim (IKDPM)</p> <p><a href="mailto:khalid@econ.upm.edu.my">khalid@econ.upm.edu.my</a></p>	<ol style="list-style-type: none"> <li>1. The Economics of the Agricultural Marketing and Trade Policy - Dr. Shafiqe Fahmi Ahmad Sidique (IKDPM)</li> <li>2. The Prospect and Sustainability of Food Security in Malaysia - Prof. Dr. Mohd Mansor Ismail (IKDPM)</li> <li>3. System Dynamics Analysis of the Malaysian Agricultural Sector - Prof. Dr. Fatimah Mohamed Arshad (IKDPM)</li> <li>4. Resource, Environmental and Ecological Economics Research Programme - Prof. Dr. Mohd Shahwahid Haji Othman (FEP)</li> <li>5. Natural Resources and Environmental Policy for Sustainable Development – Prof. Dr. Khalid Abdul Rahim (IKDPM)</li> </ol>

	<p>prices have become much more volatile, food is competing with biofuel for resources, demand is chasing supply and so on. Will the sector survive sustainably under such a complex matrix of variables? What kind of interventions required to ensure sustainable growth? The study will utilize the system dynamics approach to illustrate the complexity of relationship between structural and behavioral variables as well as feedback interactions or circular causation among them.</p> <p>4.Natural Resources and Environmental Policy for Sustainable Development          Research in the natural resources and environmental policy for sustainable development covers the economics and management of specific areas such as Agriculture and the Environment, Water Management, Fisheries, Forestry, Biodiversity Conservation, Tourism and the Environment, Greenhouse Gas Management, Energy and Environmental Economics. Contemporary research topics and problems include sustainable agriculture, water quality issues, overexploitation of fisheries, coastal resources and wetlands, depletion and economic valuation of natural resources, eco-tourism, local, regional and global environmental pollution, carbon trading, and low carbon energy economics.</p> <p>NABC Elements</p> <p>Needs</p> <p>Agriculture affects all of us, directly and indirectly. It affects us directly through the food we eat and it affects us indirectly through its relationship with the environment, the use of natural resources and the global economy. The world doesn't just need more food because the world's population is growing. It also needs better food that's more nutritious. And it needs to find ways to make the process of growing food more efficient and aligned with our environmental needs, farming methods need to be reformed and farmers need to be educated in sustainable techniques.</p> <p>Approach</p> <p>Agriculture should be improved for the same basic reasons that medicine, engineering, architecture and computers should be improved: because human innovation is at the center of human progress.          Research in the economics of agriculture, resource and the environment is multidisciplinary, using research tools and methodologies that are dynamic and contemporary with current issues such as climate change and food security.</p> <p>Benefits</p> <p>Benefits from research in the economics of agriculture, natural resources and the environment are multi-fold: for the university, the nation and global.</p> <p>Improving agriculture to produce more food while producing less greenhouse gas emissions then we deliver benefits in terms of climate change as well – reducing emissions and increasing food security.</p> <p>As much as half of the food produced is wasted before it reaches market in some developing countries. Thus, another vital factor in improving food security is to reduce waste and improve food distribution systems.</p> <p>Benefits from growth in food production will depend largely on finding ways to increase the productivity of existing agricultural land and natural resources.</p> <p>Benefits from sustainable development: conserves land, water, plant and animal genetic resources; environmentally non-degrading, technically appropriate, economically viable and socially acceptable.</p>		
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AF06	Edible Bird Nest Swiftlet: Production, Health and Product Quality	<p>The edible bird nest (EBN) swiftlet industry in Malaysia is rapidly growing due to the demand for EBNs nests world-wide. The <i>Aerodramus fuciphagus</i> species that is found only in the South East Asian region is the main target for the industry. There are limited scientific publications on the EBN swiftlet in Malaysia such as their genetics and subspecies delineations, various aspects of quality control, variability of diet of this special species, health status and susceptibility to important avian viruses and other important aspects. Ongoing research in various areas will benefit the industry and economic importance for Malaysia. Many issues related to the industry and government has been addressed especially on the export of the raw nests, product quality, nitrite issues and market surveys by this group and research collaborators from University National Malaysia, University Malaysia Perlis, SIRIM, University Malaysia Kelantan and University Science Malaysia. Therefore, with regards on the above issues and current and future challenges, UPM has been elected as the Center of Excellence on Swiftlet in 2011 by Ministry of Agriculture and Agro Based Industry.</p> <p><b>Keywords:</b> edible bird nest swiftlet, health, quality control</p>	<p>Prof. Datin Paduka Dr. Aini Ideris (Vet)</p> <p>aini@vet.upm.edu.my</p>	<p>1. Edible Bird Nest Swiftlet: Production, Health and Product Quality - Prof. Datin Paduka Dr. Aini Ideris (FPV)</p>
AF07	Fats and Oils	<p>In Malaysia, the advancement and sustainability of palm oil industry has been driven by strong R&amp;D activities and world demand for food especially fats and oils. Research program in fats and oils technology is responsible to conduct research in the area of edible oil processing, oil quality characterization and safety, new product development, lipid extraction, food emulsion, lipid nanotechnology and lipid functional ingredients. This research program has strong linkages with various government agencies and stakeholders, e.g. Ministry of Health, MPOB, MARDI, Sime Darby Bhd, FELDA. The Fats and Oils Laboratory is a Ministry of Health's gazetted lab for quality and safety testing related edible oils and fats products. The research laboratory is equipped with modern processing equipment and analytical instrumentation.</p> <p><b>Keywords:</b> Palm Oil, Lipid Chemistry and Technology, Lipid Nanotechnology.</p>	<p>Prof. Dr. Tan Chin Ping (FSTM)</p> <p>tancp@upm.edu.my</p>	<p>1. Fats and Oils Technology – Prof. Dr. Tan Chin Ping (FSTM)</p>
AF08	Food Bioprocessing	<p>Food bioprocessing is a green technology that offers an alternative means of food and food ingredient extraction, purification and production using processes that involve the application of enzymes and/or microorganisms. It is one the earliest forms of food modifying method used by early Egyptians in the production of wine, beer, and bread. Studies on the properties, production and applications of food enzymes and microorganisms have led to innovative and value-added products to be marketed such as low-lactose milk, probiotics dairy produce, clarified fruit juices, bioactive peptide-rich food and beverages, and many more. A relatively new concept in enzyme application is in situ modulation or transformation of the physico-chemical and sensory properties, and stability of local food agricultural produce and commodities including fats and oils. In the same light, food microorganisms can be used to modify the properties of food through fermentation, serve as starter cultures for better quality and consistent food products, and to produce industrial food ingredients. Thus, the adoption of bioprocessing can bring about the opening of new channels for a wider usage of local commodities especially those that are underutilised and for better consumer acceptance since bioprocessing is environmentally friendly (green).</p> <p><b>Keywords:</b> Food bioprocessing; Green technology; Food innovation and modification; Food enzymes, Food fermentation, food microorganisms; biotransformation</p>	<p>Prof. Dr. Hasanah Mohd Ghazali (FSTM)</p> <p>hasanah@upm.edu.my</p>	<p>1. Food Enzymes - Prof. Dr. Hasanah Mohd Ghazali (FSTM)</p> <p>2. Microbial Technology – Dr. Anis Shobirin Meor Hussin (FSTM)</p>

AF9	Food Management	<p>The food industry is complex, consisting of diverse businesses that supply food to be consumed by the world population. Food wholesaling for example consists of that part of food marketing in which goods are assembled, stored, and transported to retailers, foodservice operators, other wholesalers, government, and other types of businesses. The retail food industry has changed significantly over the past decades, as many megastores and other non-traditional food stores have increased their share of food sales. Changes in consumer food choices are also reflected in food retailing, including the introduction of products innovation to meet new consumer demands.</p> <p>Hence, the food management research group is dedicated to a broad spectrum of roles within the food industry. Its covers food marketing system that links farms to consumers via food manufacturing, wholesaling, and retailing activities which includes food stores and to certain extent covering foodservice and hospitality facilities. This group conducts research into consumer and organisational behaviours, food marketing, policy issues in the food chain, innovation and the development of new products as well as maintaining food safety and nutritional quality throughout the food supply chain in the food industries that eventually lead to enhanced performance in both for small and large firms including SMEs competing in all sectors of the hospitality and food industry.</p> <p>The group members' expertise is diverse covering marketing, service management, operational research employing both quantitative and qualitative research approaches. In lieu of UPM role as a Research University, the food management research group in the near future will have collaborative efforts with food industry and this effort will lead to more pragmatic research activities and useful applications. The research group aims to be a leading proponent of research and technological advancement for the food industry in Malaysia. In terms of research methods, the group is multidisciplinary, adopting a wide range of approaches. These include data envelopment analysis, structural equation modeling, conjoint modeling, small and large-scale qualitative and quantitative surveys, factor analysis, repertory grid, protocol analysis, content analysis and grounded theory and case study based research. The group is not only builds on the existing expertise but also carried out interdisciplinary research with other disciplines such food science technology group.</p>	<p>Assoc. Prof. Dr. Mohhidin Othman (FSTM) mohhidin@upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Food Management - Assoc. Prof. Dr. Mohhidin Othman (FSTM)</li> </ol>
AF10	Food Processing	<p>The Food Processing Research Program is focused on adding value to local food commodities. These include cereals and legumes, fruits and vegetables, roots and tubers, fish and other seafoods, and their byproducts. Value adding to the food commodities can be achieved by enhancement of their nutritional content, extension of their shelf-life, and increasing their market accessibility. Extraction and separation methods are also employed to obtain higher value product or food ingredients from these commodities. The program is committed to helping the processor with limited access to capital who must meet food processing and quality standards, and cost competitiveness to gain and increase access to local and international markets. Problem solving research under this program is carried out by multidisciplinary teams involving food technologists, chemists, biochemists, microbiologists and engineers.</p> <p><b>Keywords:</b> Food processing, food commodities, food standards</p>	<p>Assoc. Prof. Dr. Sharifah Kharidah Syed Muhammad (FSTM) kharidah@upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Carbohydrate Technology – Assoc. Prof. Dr. Roselina Karim (FSTM)</li> <li>2. Protein Technology – Dr. Chong Gun Hean (FSTM)</li> <li>3. Fruits and Beverage Technology – Prof. Dr. Azizah Osman (FSTM)</li> </ol>
AF11	Food Safety and Quality	<p>Food safety is an integral part and contributor to food security. It has received heightened attention worldwide as it is associated with death and suffering caused by unhealthy diet. The aims of the programme is to reduce food safety risk of human beings and live stocks along the food value-chain from farm to table, and to develop related analytical methods and detection tools. The research programme is multidisciplinary, dedicated to the generation of new knowledge through basic and applied research. The research focuses on the current and emerging pathogens, contaminants, adulterants, naturally occurring toxins, allergens, and also toxicology and risk assessment. The research could save the nation billions through cost reduction in people health care and social welfare, and increase market access of food, locally and for export. This research programme would be the only one in Malaysia and Southeast Asia focusing research in food safety and quality.</p>	<p>Prof. Dr. Jinap Selamat (FSTM) sjinap@food.upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Food Safety and Quality - Prof. Dr. Jinap Selamat (RC / FSTM)</li> <li>2. Microbiology Food Safety – Assoc. Prof. Dr. Farinazleen Mohamad Ghazali (FSTM)</li> <li>3. Mycology – Dr. Nor Ainy Mahyudin (FSTM)</li> </ol>

		<p><b>Keywords:</b> Food safety, pathogen, chemical contaminant, toxin, allergen, toxicology, risk assessment</p>		
AF12	Food Service	<p>Malaysia has abundance of heritage that would require preservation for the future. Food heritage is one of the most tangible assets that the country has to maintain. The research is focused on analysing the current status of the Malaysia's food heritage. The government has officially registered more than 100 types of heritage food. However the efforts to safeguard the skills in preparing and savouring the traditional dishes have to continue. Presently, some of the authentic foods have diminished from the Malaysian household, only the older generations are familiar with the traditional food. The younger generations are not familiar with Malaysia traditional food and thus have made them to develop new eating habits. Sustaining the traditional food will provide continuous legacy of the food culture of this country as well as the platform to promote these foods to the international visitors.</p> <p><b>Keywords:</b> Heritage Food, traditional food, sustainable, eating habits</p>	<p>Assoc. Prof. Dr. Muhammad Shahrin Ab. Karim (FSTM)</p> <p>shahrin@upm.edu.my</p>	<p>1. Heritage Foods – Assoc. Prof. Dr. Muhammad Shahrin Ab. Karim (FSTM)</p>
AF13	Functional Food	<p>Functional foods refer to foods and beverages that have beneficial effects beyond that of basic nutrition. The specialization encompass research on physiological effects of food and food components and their consequent health benefits, development of assay system to study the effects, and development of innovative food products and ingredients for the improvement of key body functions and health. The research also focused on chemical profiling and fingerprinting of ingredients used in functional food for standardization purpose, evaluation of the food safety of functional foods, understanding of the mechanisms of actions and the discovery of bioactive compounds.</p> <p><b>Keywords:</b> Functional Food, Health, Nutrition</p>	<p>Prof. Dr. Nazamid Saari (FSTM)</p> <p>nazamid@upm.edu.my</p>	<p>1. Functional Food – Assoc. Prof. Dr. Azizah Abd. Hamid (FSTM)</p>
AF14	Pest Management	<p>About 20-40% of the world's total agricultural crop is destroyed yearly by pests and diseases. The conventional method of controlling plant pests and diseases using pesticides is not sustainable and environmental friendly. The promising alternative technique is using combination of compatible techniques particularly natural enemies of the pests and pathogens, normally known as integrated pest control or pest management. The research program on pest management is proposed to be one of the research disciples in agriculture for sustainable food and industrial crops production. The research will focus on development of biocontrol agents and biopesticides as the alternative to the conventional synthetic petroleum based pesticides to suppress the pest population and diseases below economic injury level. The diagnosis of the pest and diseases will also be emphasized. The use of pest management is safe, environmental friendly and sustainable.</p> <p><b>Keywords:</b> Pest, Management, Biological control.</p>	<p>Prof. Dr. Dzolkifli Omar (FP)</p> <p>zolkifli@agri.upm.edu.my</p>	<p>1. Biological Control of Pests and Diseases - Prof. Dr. Dzolkifli Omar (FP)</p> <p>2. Molecular Disease Diagnosis - Dr. Ganesan A/L Vadamalai (ITA)</p> <p>3. Enhanced Weed Management Strategies for Sustainable Cropping Systems – Prof. Dr. Abdul Shukur Juraimi (FP)</p>
AF15	Strategic Feed Technology and Nutrigenomics	<p>The main objective of the programme is to conduct research on all aspects of animal production including animal husbandry, physiology of reproduction, breeding and genetics, nutrition and feed technology, leading towards establishing the scientific basis of efficient livestock production and sustainable animal agriculture.</p> <p><b>Keywords:</b> Biology, Bioprocess Technology, Feed Technology</p>	<p>Prof. Dr. Norhani Abdullah (ITA)</p> <p>norhani@biotech.upm.edu.my</p>	<p>1. Strategic Feed Technology and Nutrigenomics - Prof. Dr. Norhani Abdullah (ITA)</p> <p>2. Physio-Biochemical Manipulation for Enhancing Ruminant Production – Prof. Dr. Abdul Razak Alimon (FP)</p> <p>3. Impacts of Animal Metabolism in Disease and Production – Assoc. Prof. Dr. Goh Yong Meng (FPV)</p>
AF16	Supply Chain Management for Food and Agriculture	<p>The Supply Chain Management research programme (SCMRP) addresses the spectrum of Management, Marketing, Operation Management, Logistics, and Costing activities from the point of origin until the product reaches the consumers. Organizations manage and coordinate the flow of resources to maximise customer</p>	<p>Prof. Dr. Zainal Abidin Mohamed (FP)</p> <p>zam@agri.upm.edu.my</p>	<p>1. Supply Chain Management for Food and Agriculture - Prof. Dr. Zainal Abidin Mohamed (FP)</p>

		<p>value which is the highest degree of customers' satisfaction and lowest possible cost. Organizations with excellent supply chain management are some of the world's most successful organizations. SCMRP aims to promote high quality research by utilizing team members whose expertise and research interest cover strategic and behavioural aspects of sustainable logistics, supply chain design and strategies, green supply chain management, management of logistics services, work place management, e-supply chain, costing, consumer behaviour and customer service. By being actively involved in case study research, SCMRP is committed to exploring and understanding how strategic and behavioural issues in various organizations in the supply chain can provide insights and create opportunities within research, education and practice.</p> <p><b>Keywords:</b> Supply chain, strategies, behavior</p>		
AF17	Sustainable Aquaculture Production	<p>The research program is established to spearhead the rapid development of aquaculture research in UPM and to provide the industry with informative findings and technological advancement in aquaculture related activities. The program will focus on prioritized research plan that has been formulated to enhance aquaculture production systems, improving health and welfare of aquaculture species and to increase outputs. These research activities will include the use of genetic resources, including genetic and genomic databases and bioinformatic tools that later make it available to the industry. Research will also extends to the understanding of the physiology of aquatic animals, especially pertaining to growth, nutrient utilization and reproduction. Our strength in fish nutrition research will be channelled to identify and exploit alternative protein and lipid sources and feeding strategies to optimize the use of sustainable materials and quality of products. The program would also embark on the development of new products and information, tools, and technologies that can be used to improve production system sustainability and environmental compatibility, while improving production efficiency and animal performance.</p> <p><b>Keywords:</b> Aquaculture system, fish breeding, fish nutrition, fisheries ecology</p>	<p>Prof. Dr. Aziz Arshad (FP)</p> <p>azizarshad@upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Sustainable Aquaculture Production – Prof. Dr. Aziz Arshad (FP)</li> <li>2. Fish Health Management – Prof. Dato' Dr. Shariff Mohd. Din (FPV)</li> </ol>
AF18	Sustainable Food Crops Production for Food Security	<p>The research program is establish to ensure sustainable, profitability and stability in the production of important food crops in Malaysia for food security. The fundamental issue in this program is laid down based on the looming dangers of food insecurity wrought by increasing population, coupled with decrease in the availability of arable land and climate changes. The strategies for increasing crop productivity will encompass on three main approaches, the genetic improvement, advancement in crop management practices and narrowing gap for yield potential. The need to utilize available tools in automation and control system is essential for precision crop management. To enable the precision agriculture, crop-electronics integration will be enhanced. The adoption of conventional and the powerful set of biotechnology tools in crop improvement program will enhance crop productivity of plant subjected to climate changes. The genetic potential of new plant species will be exploited for commercial food production.</p> <p><b>Keywords:</b> sustainable food production, crop improvement program, precision agriculture, genetic and yield potential, food security.</p>	<p>Prof. Dr. Mohd Razi Ismail (ITA)</p> <p>razi@upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Improvement and Sustainable Rice Production for Food Security – Prof. Dr. Mohd Razi Ismail (ITA)</li> <li>2. Sustainable Soil Management - Prof. Dr. Shamshuddin Jusop (FP)</li> <li>3. Agriculture and Food Mechanization – Prof. Dr. Wan Ishak Wan Ismail (FK)</li> <li>4. Crops for The Future – Assoc. Prof. Dr. Izham Ahmad (FP)</li> <li>5. Production of High Value Vegetables under Protected Cultivation in Tropics – Assoc. Prof. Dr. Mohd Rafii Yusop (ITA)</li> <li>6. Biotechnology of Plant Stress and Development – Prof. Dr. Maziah Mahmood (FBSB)</li> <li>7. Smart Farming Technology - Prof. Ir. Dr. Mohd. Amin Mohd. Soom (RC / FK)</li> <li>8. Engineering for Food Security – Assoc. Prof. Ir. Dr. Johari Endan (FK)</li> <li>9. Postharvest for Food Security - Prof. Dr. Mahmud Tengku Muda Mohamed (FP)</li> </ol>

AF19	Zoonotic and Emerging Diseases	<p>The complexity of zoonotic and emerging diseases warranted an effective preparedness in handling an outbreak. The factors that contribute to their occurrences include microbial, environmental, host and population dynamics as well as ease of worldwide travel and breakdown in control measures. Moreover, the changes in transmission dynamics bring into a closer and a more frequent contact with zoonotic pathogens, which are involved in 75% of the outbreaks. Thus, with respect to the changes observed, four major areas need to be explored, which are rapid detection, improved surveillance, good early warning and appropriate response. Investigation on emergent pandemic infection threat and pathogen discovery are also emphasised as the pro-active phase in predicting and controlling/eradicating an outbreak of a zoonotic and/or emerging disease.</p> <p><b>Keywords:</b> zoonotic, emerging, preparedness</p>	<p>Prof. Dr. Noordin Mohamed Mustapha (Vet)</p> <p>noordin@vet.upm.edu.my</p>	<ol style="list-style-type: none"> <li>1. Zoonotic and Emerging Diseases – Prof. Dr. Noordin Mohamed Mustapha (FPV)</li> <li>2. Diagnostic Technology on Animal Diseases – Assoc. Prof. Dr. Siti Khairani Bejo (FPV)</li> <li>3. Veterinary Biologics and Pharmaceuticals- Prof. Dr. Mohd Azmi Mohd Lila (FPV)</li> </ol>
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Tarikh Kemaskini: 18 Jun 2013