India-ASEAN News on Agriculture and Forestry

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Message


U. Myint Hlaing

I am pleased to acknowledge that bringing out of the newsletter, *India-ASEAN News on Agriculture and Forestry,* is one of the collaborative activities between the ASEAN member-states and India to strengthen agriculture.

As the Chairman of the ASEAN Ministerial Meeting on Agriculture and Forestry (AMAF), and on my own behalf, I would like to congratulate Mr Radha Mohan Singh, who holds the portfolio of the Minister for Agriculture under the new Government of India, which is the largest democracy, headed by the Hon'ble Prime Minister Narendra Modi.

I do believe and hope that the present Minister for Agriculture of India would further strengthen and promote the existing collaboration and cooperation between the ASEAN and India for food security, poverty eradication and rural development.

Here, I would also like to emphasize that the ASEAN member-states and India through bilateral or multilateral cooperations should be able to point out ways and means to develop in the areas of capacity-building and collaborative research activities for increasing production and productivity in agriculture and related sectors with efficient management of natural resources, and should exchange technologies, expertise and research materials during the ASEAN-India Ministerial meeting. It is utmost important for the ASEAN member-states and India to share their best of the agricultural practices and innovations for developmental activities and for adoption of appropriate state-of-the-art technologies by each member-state.

As the Ministers for Agriculture and Forestry of the ASEAN, we are mainly responsible for food and nutritional security of our people. We have also responsibility towards proper management of environment and natural resources of our country. For this, we need to tune in for sustainable agricultural development in a balanced and harmonized way.

We are aware that all countries in the world are facing challenges of natural disasters and man-made disasters, which would ultimately affect food security. And we all also understand the limitation of further expansion of agricultural land, while population is increasing gradually.

I strongly feel that any challenge can be met with the sharing of the appropriate technical know-how and knowledge and experience among ourselves. For this reason, I deeply believe and trust that we would have the best of best collaborative efforts and cooperation in the forthcoming ASEAN India Ministerial Meeting.

Finally, I wish more success, more happiness, more peacefulness and more pleasantness in 2015 for the people of the ASEAN member-states and India.

U. Myint Hlaing
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Ministry of Agriculture and Irrigation
The Republic of the Union of Myanmar

LAO PDR

National Agriculture and Forestry Research Institute

The National Agriculture and Forestry Research Institute (NAFRI) was established in 1999 to consolidate research activities pertaining to agriculture and forestry, and for developing a system at the national level to carry out research on agriculture and forestry. It is a part of the Ministry of Agriculture and Forestry (MAF), and holds a status equivalent to other technical departments under the Ministry. It was formed by the merger of the earlier existing centres on agriculture, livestock, fisheries and forestry research, located all-over the country. The NAFRI aims to focus on adaptive research to overcome specific problems related to agriculture and forestry. The Institute has grown at a faster pace, and is providing a good research support for alleviating poverty and for sustainable development.

Agriculture and forestry would play a key role in Government's plan to eradicate poverty and to upgrade country from the category of the Least Developed Country by 2020.
For development of agriculture, the Government has given high priority to adaptive and demand-driven agriculture and forestry research.

Mandate

To undertake integrated agricultural, forestry and fisheries research to provide technical information, technical norms and results from agriculture, forestry and fisheries to formulate improved agricultural development strategy in accordance with the Government policies.

NAFRI's main responsibilities are as follows.

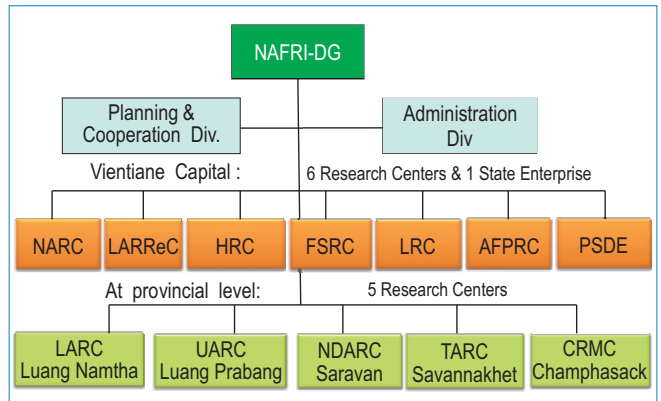
1. To develop specific programmes and projects to implement Government's priority development programmes.
2. To conduct surveys and studies on agriculture and forestry biodiversity for sustainable development and preservation of seeds and breeds.
3. To carry out research and collect, select, multiply plant seeds, animal breeds, fish and aquatic animal species, priority trees and non-timber product species to increase productivity and for adaptation to climate change, and to be market and public demand-driven.
4. Study and submit suitable policies related to agriculture and forestry development for each period of time; aiming to ensure food stability, commercial production, industrialization and modernization.
5. To conduct research on techniques and technologies for utilization of agriculture machinery, irrigated agriculture, post-harvest technologies, effective and highly efficient agricultural production systems, and practices and methods in close collaboration with agriculture extension.
6. To compile, manage, disseminate, exchange and supply agriculture and forestry research information.
7. To coordinate with relevant research and development partners at all levels.
8. To augment contacts and cooperation, seeking and mobilizing domestic and foreign financial sources for its own capacity strengthening and successful implementation of assigned tasks.

Infrastructure

In 2012, the NAFRI restructured itself to commensurate with the changes in the Government policy and also with the rapid economic changes that were taking place in the country. It has following divisions and centres.

I. Administration and Planning Divisions: 1. Administration Division; 2. Planning and Cooperation Division

II. Research Centres and State Enterprise: 1. Agriculture and Forestry Policy Research Centre (AFPRC); 2. Napok



Organizational chart

Rice


Coffee


Forest wealth

Agriculture Research Centre (NARC); 3. Horticulture Research Centre (HRC); 4. Forest Science Research Centre (FSRC); 5. Livestock Research Centre (LRC); 6. Living Aquatic Resources Research Centre (LARReC); 7. Upland Agriculture Research Centre (UARC); 8. Coffee Research and Multiplication Centre (CRMC); 9. Thasano Agriculture Research Centre (TARC); 10. Nong Daeng Agriculture Research Centre (NDARC); 11. Luang Namtha Agriculture Research Centre (LARC); 12. Plant Seed Development State Enterprise (PSDE)

Research Prioritization

In 2010, the NAFRI revised and updated its Strategic Plan as well as developed a research agenda for 2011-2015. The research agenda was based on the situational analysis of the key issues in the agriculture and natural resource management as well as for the four priority goals of the MAF—**Ensuring food security, Commercialization of agriculture, Shifting cultivation stabilization for poverty reduction and Sustainable forest management**.

Local rice seeds have been developed: 14 improved, 20 local rice seeds, and 3 non-glutinous rice

Developed rice for flood resistance (21 days): 5 varieties and drought resistance: 4 varieties

To focus on increasing productivity, especially of cash crops, instead of shifting cultivation, following major techniques are being used.

- System of Rice intensification technique (SRI) – single rice seedling planting
- Rice direct sowing
- Intensification technique
- Irrigated rice production techniques in cold weather areas
- Off-season growing of vegetables
- Intercropping in rubber plantation (fodder and perennial crops)
- Non-timber forest products (NTFPs) cultivation

Four research programmes identified in the institute's strategy are as follows.

1. Management and conservation of biodiversity
2. Improvement of productivity of agriculture and forestry
3. Climate change adaptation on agriculture and forestry
4. Agricultural and forestry policy research and information service

Partner Organizations

The NAFRI works closely with a number of international donors, research organizations and universities.

Funding partners: SDC, Sida, IRD, JICA, AusAid and World Bank

International organizations: ACIAR, AFACI, CIAT, CIFOR, IRRI, IWMI, JIRCAS, FAO, IFAD, RECOFTC and MRC

Regional partners: Yunnan Academy of Agriculture Sciences (YAAS), Gxuangxi Academy of Agriculture Sciences (GXAAS), Chinese Academy of Agriculture Sciences (CAAS), China; Vietnam Academy of Agriculture Sciences (VAAS), Vietnam; Chiang Mai University, Kasetsart University, Khon Kaen University, Thailand; University of the Philippines, Los Banos; Kyoto University, Nagoya University, National Institute of Agro-biological Sciences (NIAS), Japan; Lund University, SLU, Sweden; University of Queensland, Australia

National partners: DAEC, NERI, NUOL, Champasak and Souphanouvong Universities and Medicinal Plant Institute, Ministry of Health

INGOs: IUCN, SNV, WWF

There are also following two support programmes.

Capacity development. It includes institutional, organizational and human-resource development.

Information services. Library services, data management, ICT, packaging and dissemination of research results and improving coordination with key actors in Laos Agriculture Knowledge and Information System.

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INDIA

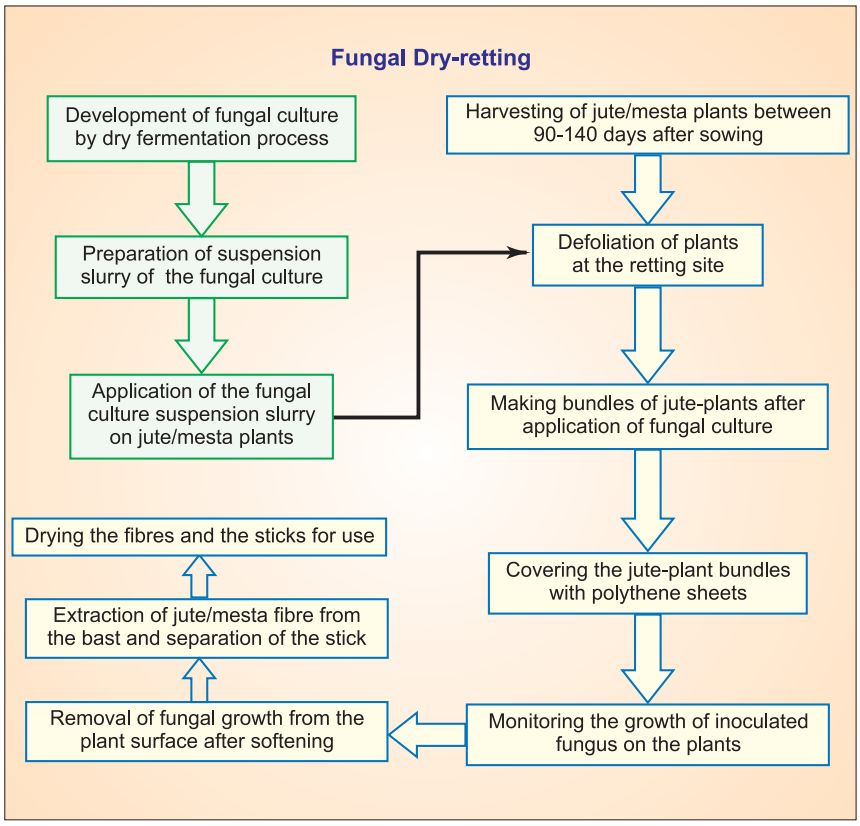
A new dry-retting technology for jute

In India, jute is grown in 9 lakh hectares, and it supports directly or indirectly four million farm-families. Jute-fibres are conventionally extracted by immersing harvested plants in water and allowing microbial action on them for about two weeks. Fibres separate out due to microbial action and are thus extracted. Owing to water scarcity, jute- farmers are practically forced to use the same stagnant or muddy water for 3-4 times for jute-retting. With this fibre quality deteriorates drastically, and farmers face heavy economic losses. In such a situation, need for a good water- saving technology for jute- retting was felt.

First attempt for a water- saving technology was ribbon- retting. The main disadvantage of this was the non-availability of efficient ribboner machine. Fungal dry- retting works on a different principle. For this, fast-growing pectinolytic fungi are used. Four different pectinolytic fungi — *Aspergillus tamarii, Aspergillus flavus, Aspergillus niger* and *Sporotrichum thermophile* — isolated from different habitats, have been used for dry-retting of jute. They are maintained in the laboratory on the Potato Dextrose Agar (PDA) medium, and their mass culture is developed on a mixture of rice-husk and wheat-bran. The slurry is prepared from solid- base mass culture by mixing it with water, and the mixture is then spread on the defoliated green jute-plants (4-5% of solid-base mass culture). Then the fungus-inoculated plants are wrapped in polythene sheets and are incubated for about 10 days. Fungal growth is monitored in intervals for its evenness on the plant surface, and if its not there, plants are over-turned and sprinkled with

Environmental parameters for dry-retting of jute

*p*H during fungal retting	8.74–9.20
Average day temperature	30–34°C
Moisture in retting beds	33–35%
Moisture regain	50–54%
Average atmospheric RH	78%
Average retting time	10–13 days




Fungal cultures grown on the solid-base medium


Fungal dry-retting of jute


Fungal growth on the jute-plants


Fungal growth monitored on the jute-plants


Extraction of jute-fibres after retting


Fungal dry-retted fibres after drying

Fungal dry-retted jute-fibres and yarn parameters

Fibre character	
Fibre strength	20.5–24.8 g/tex
Fibre fineness	2.8–3.0 tex
Average root content	< 5%
Average fibre grade	TD–4
8 lb yarn character	
Average tenacity	10.67 cN/tex
Work of rupture	0.86 mJ/tex M
Average hairiness index	11.90
Average breaking load	23.24 N
Um	24.4–27.8%

water. Inoculated fungus grows fast on the surface of the green plants in a just moist condition, and feed on the inner gummy and pectin matter that facilitates separation of jute-fibres and sticks. After retting, fungal growth is removed by wiping out with a torn- sack piece, and fibres are simply extracted by pulling them out. No water is required for extracting fibres. These fibres may be washed in water for brightness and for removing extra adhering gum, if any. The fibres and sticks are then dried in sun or in shade and preserved.

This technology can save on a lot of water; and is an aerobic process, unlike water- retting.

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MALAYSIA

Soy isoflavones improved egg size and sperm count of the tiger grouper broodstock

Broodstocks of tiger grouper, *Epinephelus fuscoguttatus*, are costly and mostly short of supply. Multiple injections of Human Chroionic Gonadotropin (HCG) or Gonadotrophin-Releasing Hormone (GnRH) increase broodfish stress and injury through handling, and besides this practice requires labour. To avoid stress effects, several types of GnRH analogues can be introduced orally to broodstocks to induce natural spawning.

Tanks used for the feeding trial

Soy isoflavones(SIs) are phytoestrogens known as Selective Estrogen Receptor Modulators (SERMs). SIs block estrogen receptors to stimulate hypothalamus to release GnRH, that in turn stimulates further pituitary gland to release Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) to induce ovulation.

A soy isoflavone tablet inserted into the mouth of a round scad

Anaesthetized tiger broodstock during sample collection

A three-month feeding trial with soy isoflavones was conducted using three 20 m^3 working-capacity tanks (T_1, T_2 and T_3); fish broodstock (10 in a group) was selected and stocked at 2-2.5kg/m^3 in each of the tank. The fish was acclimatized for at least four weeks and was fed manually once every 2 days at 5% body weight prior to isoflavones feeding trial. Soy isoflavones were given to each fresh round scad through mouth in the form of a tablet containing 20 mg of SIs. The level of SIs was: 0 mg/fish/month (Control), 150 mg/fish/month, and 300 mg/fish/month. Then spawning activity was monitored daily. On the third month, the egg and the sperm were collected by stripping method. The eggs were measured and sperms were counted.

One-way ANOVA showed 0.418 ± 0.02 mm egg size (mean ± S.E) in T_1 and 0.432 ± 0.01 mm in T_2 and 0.434 ± 0.00 mm in T_3; no significant difference ($P>0.05$) was observed among the treatments using SPSS (v21). In the sperm count of male broodstock, fed with 300 mg/fish/month, a significant positive response ($r^2=1$) was

observed. There were no significant differences (P>0.05) among treatments. However, no spawning occurred in all treatments even though egg matured and were ready to be spawned. This was probably due to insufficiency of the male fish broodstock(n=1 in T_1 and T_3, n=0 in T_2), with low ♂:♀ broodstock ratio of 1:9; that could probably be the cause of no spawning. A ratio of 1:3 to 1:1 is recommended for tiger grouper (*E. fuscoguttatus*) broodstock for initiation of natural spawning.

Soy isoflavones at 300 mg/fish/month significantly increased (p<0.05) sperm count without any significant response (p>0.05) on egg size of tiger grouper. However, due to biological nature, additional dosages of SIs concentration are recommended to determine possible nonlinear relationship of egg size and sperm count of the fish broodstock.

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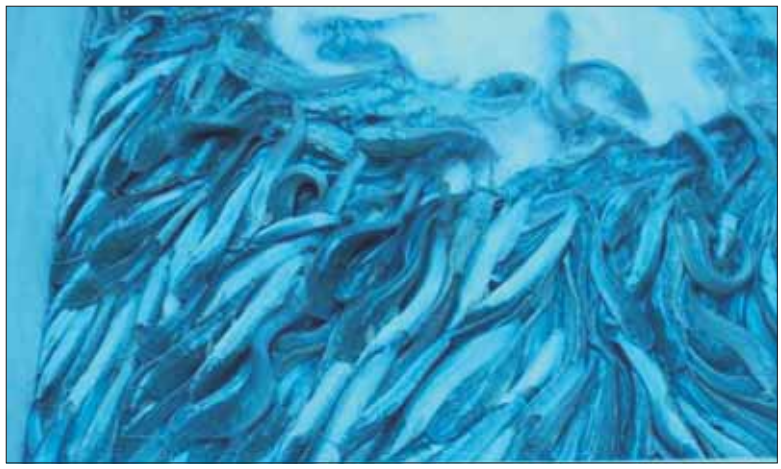
Catfish farming and current practices

African catfish (*Clarias gariepinus*) of family Silurid is one of the most consumed fish worldwide. Lately, Muslim consumers are avoiding it owing to doubts regarding its *halal* status. This is because of its alleged feeding with unclean/impure substances such as wastes from pig, poultry and cattle industry, carcasses of animals and commercial feeds incorporated with animal by-products (blood, meat, fat or bone), including of pigs. Animals fed on unclean/impure substances are categorized as *al-jallâlah*. The *sharia* (Islamic regulation) prohibits consumption of meat and milk of *al-jallâlah*. Jurists from the Syafi'e and Ahmad school of thoughts prohibited consumption of animals that are continuously fed with unclean substances; they are to be quarantined prior to consumption. During this quarantine period, the animals would have undergone a natural purification process or *istihâlah*. However, the scholars of Maliki and Hanafi schools render prohibition as only *makruh* (dislike) to consume such animals, especially if the meat is found to have noticeable offensive odour, or that the taste and the colour of the meat is different from the usual.



The consumers are afraid that feeding fish with unclean substances will alter nutritional content of the fish. To appease Muslim consumers and more importantly to avoid unnecessary deprivation from the consumer a cheap protein source, the Department of Fisheries, Malaysia, through Fisheries Research Institute, Batu Maung, Penang, carried out two studies. The first study was carried out to estimate *istihâlah* period for catfish after feeding with pig offal. This was based on the absence of pig DNA in catfish gut and was used to suggest quarantine period in catfish. The results indicated that the maximum *istihâlah* period could be reached in 36 h in the stomach; in many cases shorter periods were observed. Based on these results, it is estimated that the minimum quarantine period for catfish fed with pig offal is 1.5 days. The second study was attempted to address Muslim consumers' concern regarding alteration of nutritional content of the fish with unclean feeding.The fish were fed with imported feed consisting of 10-15% blood meal (porcine origin), locally produced formulated feed and chicken offal, over 12 weeks. The results demonstrated that incorporation of 10-15% unclean substances did not have any significant (p>0.05) effect on the nutritional value, colour and sensory characteristics (odour and flavour) of catfish fillet; 100% unclean substances may significantly (p<0.05) change properties.

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PHILIPPINES

Nutrient Manager for Rice: Field-specific nutrient recommendations

Adoption of a new technology depends significantly on the dynamics of the innovation, communication channels, time and social system. In the country, to persuade agriculture and fisheries stakeholders to implement new production technologies is the foremost challenge for agricultural extension workers (AEWs), especially so if the new technologies are significantly different from the farmers' practices. The younger, educated, risk-oriented farmers as well as community leaders are comparatively ready to change than the older and the very conservative farmers.

The International Rice Research Institute (IRRI) implemented a project– Nutrient Manager for Rice (NMRice) – through field demonstrations and trials that showed effectiveness of the recommended fertilizers.

NMRice is an ICT-based decision tool designed to provide farmers and AEWs a comprehensive fertilizer guideline, tailored to the specific conditions of the rice fields. It utilizes scientific and knowledge-intensive principles of the Site-Specific Nutrient Management (SSNM) of the IRRI. The NMRice can be accessed through internet, mobile phone, dialing hotline number, or *via* a phone application downloadable in an Android smartphone. It answers a series of questions to be able to recommend for a field a particular fertilizer recommendation. NMRice has particularly been developed to facilitate extension by providing up-to-date information on the field-specific fertilizer management to farmers. It maximizes use of ICT to enhance extension services of the AEWs at the grassroots.

The NMRice project has been an extension of the "*Electronic Extension Services for Agricultural Extension Workers on Proper Nutrient Management for Rice in the Philippines*", a joint endeavour of the IRRI and the Department of Agriculture through the Agricultural Training Institute (DA-ATI). This aims to assess use of smartphones in delivering knowledge from the AEWs to farmers; validate effectiveness of a field-specific fertilizer recommendation, generated from the NMRice; and to improve and convert current form of NMRice into a more user-friendly application. NMRice has proven to be a promising innovation helping farmers increase their production yield and net income.

This application has been further upgraded in November 2013 into Rice Crop Manager (RCM), which recommends not only fertilizers but other crop management practices as well.

Methodology and results: Field trials were conducted during wet season of 2012 and dry season of 2012-2013 in 39 rice-growing *barangays* (viilages), identified from eight municipalities of Cyber Village Project of the DA's Bureau of Agricultural Research (BAR). Orientation and hands-on workshops were also conducted to train AEWs on smartphone use, operation of NMRice, and to train for how to conduct field validation.

During farmers' meeting and *barangay* information campaign, farmers could access NMRice, while being assisted by an AEW or an IRRI staff.

Following points need to be kept in mind for future dissemination activity– at least four people should work together to be able to reach at least 40 farmers in three hours; internet connection varies from one place to another, so internet signal strength needs to be verified of the area beforehand; and it is important for the AEWs to explain printed recommendations to farmers.

Demonstrations were conducted in farmers' fields and the yields using farmers' fertilizer practices were compared with the yield results from the NMRice plots. In general, fertilizer management using NMRice recommendations increased grain yield and added net benefit in all the project sites. However, the total cost of fertilizers used was neither higher nor lower with NMRice to that of farmers' fertilizer practices.

Reaching more farmers is the key in facilitating widespread use of technology. Information caravans, field days, and tapping farmers' associations are just some of the opportunities that could be employed in the implementation of the technology.

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SINGAPORE

Salt-water-tolerant tilapias

Tilapia are one of the most farmed species in the world; with global aquaculture production of 4.5 million tonnes in 2012 (FAO Fisheries and Aquaculture Statistics). Some of the most commonly farmed tilapia species and their hybrids are cultured in freshwater ponds and lakes in many countries.

Besides being fast growers, tilapias are omnivorous, and can thus be fed well on plant-based diets also.

Several of the tilapia species do not tolerate salt-water. They exhibited slow growth rate and high mortality when reared in seawater. And Mozambique tilapia, although salt-tolerant, does not grow fast.

The Agri-Food & Veterinary Authority (AVA) of the Singapore's Marine Aquaculture Centre (MAC) has developed technologies for growing tropical marine food fishes. Many suitable technologies and intensive farming systems are being transferred to local food fish-farms to enhance supply of these fishes. At the MAC, an ongoing project is on the selective breeding of Asian seabass and Mozambique tilapia. Here fast- growing good quality fish-fry are being multiplied for intensive farming in aquaculture industry.

In addition to fast-growing freshwater tilapias, AVA's R&D plans to give local farmers a viable option of growing saline-tolerant tilapias in local seawaters.

In marker-assisted selection, small pieces of fins are clipped from tilapias to look for individuals that have inherited variants of DNA associated with fast growth and salt tolerance

Since 2011, the AVA has been collaborating with Temasek Life Sciences Laboratory Ltd to improve growth rate of Mozambique tilapias in seawater. Advanced molecular biotechnology and marker-assisted selection (MAS) were employed along with classical selective breeding methods to identify faster-growing and salt-tolerant strains of Mozambique tilapia. Through MAS technique, in particular, desired traits without any genetic modification can be selected accurately and effectively.

Growth performance of different batches of saline-tolerant tilapias in full strength seawater was evaluated, and fast-growing ones have been identified and selected for developing future broodstock. Besides faster growth, development of breeding lines for disease resistance and higher nutritional value of meat content have also been initiated; project is targeted to be completed by 2017. With the success of this project, consumers would have an alternative to locally farmed freshwater tilapias.

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VIETNAM

Diseases and insect-pests of dragon fruit, passion fruit, citrus and longan and their management

Dragon fruit, longan, pummelo, rambutan and passion fruit are economically important fruit- crops of the country, contributing many million USD per annum to its GDP. However, due to their intensive cultivation, flower manipulation for year-round fruiting, globalization of planting material and products' exchange, and especially climate change, many dangerous and economically important pests and diseases have led to heavy losses in their yield.

DRAGON FRUIT (pitaya) (*Hylocereus undatus*) is one of the most important tropical fruits, and is a source of income for producers of Binh Thuan, Tien Giang and Long An. It is exported to more than thirty countries and territories all-over the world. This is affected by anthracnose, bacterium fruit soft- rot, yellow cladode-brown spot, fruit-flies, thrips, etc.

Fruit soft- rot. This disease has become serious since past two years; the yield losses increased from 5 to 20%, and

even rose to 70-80% in unmanaged orchards. Red flesh fruit were found more sensitive (30-50%) than white flesh ones (<10%). On red flesh fruit, causal agents are *Erwinia chrysanthemi* and *Rhizopus* sp. While white flesh is affected only by *Erwinia chrysanthemi*. The disease develops and spreads regularly in rainy season. Heavy rains and low temperature favour sporulation and infection. Bacterium may survive in decayed infected organs, debris, soil and water.

Management: Prune and remove infected cladodes, buds and fruits and open-up canopy for allowing better air movement. The bacterium can enter vines via wounds, so disinfect secateurs while pruning to avoid disease spread. Pruning should be followed with an application of a fungicide. Along with remove petals at appropriate time; avoid over irrigation of canopy of infected trees. To suppress infection, balanced nutrients should be given in the orchard.

Biological control: High organic matter content plus antagonist fungi such as *Trichoderma* are strongly recommended.

Chemical treatment: Regular bactericides Kasugamycin, Streptomycin sulfate, Oxolinic acid are recommended during rainy season. Control wounding insects like *Protaetia* sp. through manual picking or use of Cypermethrine and Cyperan.

Yellow cladode - brown spot. It usually occurs in dry season, and initial symptoms appear on the upper stem surface. Scabs are surrounded by yellow halo. *Bipolaris crustacea* and *Fusarium equiseti* are two main causal organisms.

Management: All the test treatments with *Bacillus subtillis, B. megaterium, Pseudomonas* sp. and of SOFRI (Southern Horticultural Research Institute)- *Trichoderma* reduced mycelium growth by 40-80% seven days after inoculation in *Bipolaris crutacea* and *Fusarium equiseti*. In laboratory, Mancozeb (Man 80WP) and Iprodione (Viroval 50WP) were best to inhibit completely mycelial growth of *B. crutacea*. Mancozeb + Metalaxyl (Ridomil 68WP), Fosetyl Aluminium (Aliette 80WP) and Tebuconazole + Trifloxystrobin (Nativo 750WG) showed no fungal growth of *F. equiseti;* showed 100 % inhibition.

Stem canker. In Vietnam, the disease was first found in Binh Thuan in 2011. Stem canker (caused by a fungus, *Neoscytalidium dimiatum*) is known as "white spot", "brown spot" disease which attacks severely at different stages of plant. Initially, many small round pin-pricks appear on the surface of cladodes or fruits, which turn as white spot, yellowish/reddish brown canker. This is a new disease, which has spread very fast. Therefore, a single option may not be effective in controlling it. As soon as the disease is noticed, all infected parts of the plant must be pruned and destroyed, followed by copper fungicide spray. Apply enough NPK, other macro, micro nutrients and organic manure plus *Trichoderma*; avoid excess nitrogen. Avoid unclean water for canopy irrigation to stop dispersion of inoculum. Check *p*H of soil and water in the orchards; add lime when increase in *p*H level is needed. Continue pruning newly diseased branches. Use healthy seedlings; before transplanting them in field, keep them in isolation for 3 to 5 days to notice any symptom development.

At disease appearance (white tiny spots), spray with either Mancozeb, Carbendazim + Hexaconazole, Difenoconazole + Propiconazole at 7-10 days interval.

PASSION FRUIT was introduced into Vietnam for commercialization; in 2007 Tai Nong No.1 variety was introduced.

Woodiness. This disease was recorded from Lam Dong and Dak Nong provinces. Plants affected with passion fruit woodiness virus (PWV) and CWV produce woody and deformed fruits. Severe mosaic, epinasty, defoliation

OTHER TROPICAL FRUIT- CROP DISEASES

Durian Quick decline disease. In Vietnam, *Phytophthora palmivora* caused a wide range of diseases on durian with symptoms of gummosis and trunk- patch canker.
Sometimes the tree, which got infected, showed no symptoms and bore fruits also. And all of a sudden, the tree showed wilting with leaves turning downwards; on the trunk, symptoms appeared as dried rot at the base while the trunk bark appeared still normal or a little brighter than the healthy tree. When bark was removed, xylem tissues were brown with many black stripes.

Phytophthora citricola is the causal organism of this disease. The disease is closely related to beetle *Xyleborus* spp.

Management: Check and control beetles on the field. Try to avoid infection by using limestone paste on the trunk up to 1-1.5 m, using organic fertilizers and *Trichoderma*. There should be good drainage in the orchard, and avoid over flowering.

Gamboge (yellow sap) disorder in Mangosteen. Lately, this disorder has become a major problem limiting market of mangosteen fruit.
No visual symptoms appear on the fruit-skin. But the flesh becomes transparent, translucent and then turns into yellow sap. According to a report, yellow- sap secretory duct breaks when calcium content in the cell wall of the mangosteen-fruit pericarp is low and the cell wall is under pressure due to rapid growth of aril or because of changes in turgor of sap or changes in turgor of epithelial cells of the duct wall.

Management: Spray calcium and B and some other micronutrients on the canopy and also apply directly to soil, which somehow could reduce yellow sap in aril, pericarp and increased calcium in the endocarp.

and premature death of the plants are associated with PWV; Chlorotic spots on the leaves and dappled or faded fruits are also often observed.PWV is the causal agent and is transmitted through *Aphis gossypii* and *Myzus persicae*. Viruses are normally transmitted by two main species of aphids. None of the viruses are found transmitted through seeds.

Management: Cover young trees with white- net for first 2-3 months (widely applied in Taiwan) to minimize woodiness. Use virus-free seedlings from net- house through certified system. Eradicate old and abandoned orchards before starting a new crop. Trim carefully to avoid mechanical transmission of viruses. Avoid leguminous plants near the orchard, which may harbour the virus.

Papaya leaf curl virus (PLCV). It was first reported in Taiwan on passion fruit. In Vietnam, it was observed scattered, but so far there is no official statistical data. Its most prominent symptom is rolling of leaves downward and inward as inverted cup and thickening of veins; leaves and internodes become shorter. The virus vector is silver-leaf whitefly *Bemisia tabaci*; it has a latent period to be viruliferous.

Management: Use disease- free seedlings. Yellow trap is to be used for checking vector population.

***Euphorbia* leaf curl virus.** It was first reported in Taiwan on passion fruit. In Vietnam, the disease was recorded in 2013. In warmer weather most of the diseased plants become symptomless. Its vector, spread and management is same as Papaya leaf curl virus.

CITRUS: Citrus fruit- borer. In Vietnam, among citrus species, pomelo has the largest growing area. There are four major varieties of pomelo— Da Xanh, Nam Roi, Long Co Co and Duong La Cam. In November 2011, pomelo fruit- borer *Citripestis sagittiferella* (Moore) was recorded in some areas. The percentage of infestation varied from 17.4% to 80.1%. It has started spreading into Indonesia, the Philippines, Thailand and Malaysia also.

Management: Illumination with compact fluorescent lamps in the night was reported to prevent entry of *Citripestis sagittiferella* and also egg-laying on the fruit surface. An insect parasite, *Rhoptromeris* sp. (Hymenoptera: Eucoilidae), has played an important role in controlling *C.sagittiferella* on lemon.

Citrus quick decline. The diseased tree looks normal in the morning, and in the noon, leaves wither. Again in the evening these leaves seem to be normal, and this continues for a few days, and then the tree dies.

Mealy bug (*Pseudococcus* sp.) causes spongy layer around the root that blocks water and nutrient uptake. *Clitocybe tabasen* fungus is also reported to infect root and collar root.

Management: Observe the orchard frequently, and when the tree shows symptoms, field needs to be treated with pesticide Nokaph or Regent 0.3 G or with a combination of Sincosin and Agrispon. To control fungus, use organic manure and *Trichoderma*.

Citrus root- rot. Citrus- trees growing in the Mekong river Delta suffer heavily with this. At present, along with greening disease, root- rot causes heavy economic losses.

Fusarium solani is the causal organism of root- rot on sweet orange (*Citrus sinensis*) and Tieu mandarin (*Citrus reticulata*). Waterlogging and nematodes infestation (*Pratylenchus coffeae, Radopholus similes, Tylenchulus semipenetrans, Meloidogyne* sp.) cause heavy invasion by *Fusarium* spp., *Phytophthora* sp. and *Pythium* sp.

Root- rot develops more during rainy season and becomes epidemic in the early dry season from November to December, and the trees die during January to April.

Management: Adopt integrated management, including organic manure, *Trichoderma*, liming of soil and as a paste on the trunk base, and avoid waterlogging. Ridomyl Gold, Nustar or Carbendazim or Actinovate, Actino - Iron, can be repeated 2-3 times with around 10 days interval for control.

LONGAN: Longan Witches Broom. It is a very serious problem, especially on Tieu Da Bo variety. Many studies, including at biological and molecular levels, were conducted to identify causal agent and vector of the disease. Symptoms appear on branches and leaves but not on fruits. Mature leaves get distorted, young leaves do not expand, shoots cluster densely and flowers develop poorly; abnormal development of flowers and panicles result in "broom-like" appearance of inflorescences.

In Vietnam, causal pathogen has not been properly identified yet, but many evidences point out it to be closely related to mite, *Eriopyhes dimocarpi*.

Management: Efficacy of some acaricides against *E. dimocarpi* revealed that Comite (Propargite), Amara (Abamectin+Matrine), Pegasus (Diafenthiuron) plus SK Enspray 99EC were the best.

Longan Die back – Quick decline. This disease was observed widely in the Mekong Delta region on Tieu Da Bo Longan; many trees died suddenly, even when fruits were near harvesting. In the beginning, a few branches died, and then the whole tree died, sometimes full fruit-bearing tree died suddenly. *Ceratocystis* sp.(a fungus) was isolated from diseased branches; identified as *Ceratocystis fimbriata*. Besides, a small beetle related to disease was also observed.

Management: Prune infected branches, and treat them with fungicides. Control bettles also.

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INDIA

CIFT SUN BOAT for reservoir fishing and aquaculture

The annual fuel consumption by mechanized and motorized fishing fleet of India was estimated at 1,220 million litres, that was about 1% of the total fossil fuel consumption of the country in 2000(releasing an estimated 3.17 million tonnes of CO_2 into the atmosphere at an average rate of 1.13 tonnes of CO_2 per tonne of live-weight of marine fish landed). At present, four-fold increase has been noticed in diesel prices compared to 2000. The exhaust gas produced from burning of fuel pollutes atmosphere.

India has around 150,000 motorized and mechanized boats in the marine sector. And the increased fuel cost would cause substantial losses to fishery industry by eating away fisherman's income.

A fishing boat, powered by solar energy, named CIFT SUN BOAT, has been developed. It is ideal for aquaculture, commercial fishing, as well as for recreational fishing in reservoirs and rivers. This boat meets stability and safety requirements of the Kerala Inland Vessel Rules of the Government of Kerala.

The boat can run for 2.5 to 3.0 hours at complete charging, and has a speed of nearly 4.0 knots in calm waters. Its battery is separately placed in a compartment to be protected from water. Its awning protects fishermen/passengers from sun and rain, and is made of aluminium alloy; not requiring any maintenance. Its twin hull construction gives great stability during fishing and it has wider deck area compared to a similarly sized conventional boat. Its navigational lights also run by solar power that facilitates safe fishing during early morning and also during late night. Boat propellers are made of plastic composite and do not corrode; one of the propellers is steerable and is maneuvered. Their height can be changed as per the requirement.

Advantages	Specifications
• No fuel cost	LOA : 3.63 m
• No pollution from fuel burning	Breadth : 1.75 m
• Less carbon footprints	Depth : 0.60 m
• No sound pollution	Power : 500 W
• Clean FRP surface for fish handling	Propulsion : 2 x 0.6 kW
• Twin hull with low rolling	Battery :12 V
• More deck area	Number of persons: 4(Max)
• Suitable for shallow waters	Type of activities:
• Canopy for protection from rain and sun	Aquaculture, gill-netting, lining, transportation and aqua-tourism

The CIFT SUNBOAT is approximately 2 to 2.5 times costlier than the conventional boat. Its additional cost is due to photovoltaic cells, battery bank and control system, and this can be compensated by minimum operational and maintenance cost.

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INDONESIA

Mitigating negative effects of climate change on agriculture

Agriculture has both positive and negative effects on the climate. The main negative issues include inappropriate land-management practices, improper farming technologies/systems, lack of incentives for farming communities to take advantage of environmental services and to adopt sustainable production systems, and inadequate support for soil- and- water conservation practices. Effective policy measures as well as capacity-building and awareness programmes are needed to mitigate negative effects of agricultural activities. This would require concerted efforts of all key stakeholders — farmers, public and private sectors, civil society and NGOs.

In response to the above issues, the Indonesian Agency for Agriculture Research and Development (IAARD) in collaboration with the Asian Productivity Organization (APO) and supported by the ASEAN Secretariat (ASEC), organized a Forum on *Mitigating Negative Effects of Climate Change on Agriculture*, which was held in Bali, Indonesia, from 30 September to 3 October 2014.

The Forum was attended by 13 countries from the ASEAN, India and Asia-Pacific region. Eleven experts from the ASEAN Secretariat, International Federation of Organic Agriculture Movements (IFOAM), International Rice Research Institute (IRRI), Center for International Forestry Research (CIFOR), Economic Research Institute for ASEAN and East Asia (ERIA), Republic of China, Germany, USA, Bogor Agricultural University of Indonesia, Chiba University of Japan, and University of Agriculture, Faisalabad, Pakistan, discussed on innovations in farming systems, best practices, and technologies to mitigate negative effects of climate change.

The Forum explored way forward for agriculture sector in the world where the impact of climate change is becoming increasingly obvious, and adaptation and mitigation measures are the dire need. It aimed at the following.

- Review impact of climate change on agricultural productivity;
- Share good practices of agricultural adaptation and mitigation to tide over climate change; and
- Formulate strategic recommendations for mitigating negative effects of climate change on agriculture.

Director General of the Indonesian Agency for Agricultural Research and Development (IAARD), represented by the Director of Indonesian Center for Agricultural Land Resources Research and Development (ICALRRD), Dr Dedi Nursyamsi, officially declared the event open. The Forum concluded with following recommendations.

1. There is an urgent need to transform agricultural practices for increasing agricultural productivity while reducing Greenhouse Gas (GHG) emissions from agriculture.
2. Comprehensive efforts are considered necessary to build climate resilient agricultural systems to increase agricultural productivity, promote sustainability in agriculture, and ensure food security in the Asia-Pacific region. It is necessary to promote agro-ecological production models such as agroforestry, organic farming and integrated farming to sequester CO_2 and to improve soil productivity.
3. There is an urgency to promote and implement methods and technologies for mitigation of and adaptation to climate change. There are already a range of soil, water and crop management technologies available that can alleviate adverse effects of extreme events, but they need to be tailored to specific and differing needs of each of the Asia-Pacific country.
4. Some farming systems, which are major sources of methane emission, are characterized by low input-use efficiency. Such systems need to be transformed for reducing GHG emissions and for increasing input-use efficiency. For example, growing rice in standing water should be replaced with alternate wet and dry method or aerobic rice cultivation for increasing water-use efficiency with reduction of methane emission. Similarly feeding of livestock must be managed properly to minimize methane emission.
5. The immediate effect of climate change on agriculture is substantial, but scientific knowledge-base to choose different options and strategies is weak. More efforts are required for collection of baseline data, for downscaling system models, and for developing empirical studies to

Field visit to Subak Guamo, Bali

incorporate considerations at the outset of developing plans for increasing productivity and efficiency of agriculture sector.

6. Serious efforts must be made to enhance scientific capacity and to reduce uncertainty about reliability of information and data on the climate change. For this purpose, policy-makers need full access to specific information for predicting probability of climate change at the local level and its potential effects on agriculture and implications on food security and economic development in a long-term.
7. Both Early Warning Systems and Climate Change Forecasting depend on the availability and reliability of the perspective data. Governmental and private-sector organizations are being urged to install and maintain such systems to be able to accurately predict climate change, and especially, its impact at the local level on agriculture sector and farming/rural communities.
8. Climate change adaptation and mitigation in agriculture is a complex issue. Therefore, trans-disciplinary research should be strengthened to generate easy-to-implement solutions for producers and farming communities.
9. There is need to sensitize policy-makers on the ecological and socio-economic implications of the climate change through effective communication.
10. Climate change mitigation and adaptation strategies are largely handled in isolation without integrating them into main development process. To mainstream climate change impacts, mitigation and adaptation into overall planning and development, policies should be integrated at the regional, national, provincial and local levels. Efforts to mainstream mitigation find resistance as they come with additional funding requirements and trade-offs between immediate climate change actions at the farm level and macro-level growth. Local governments are best positioned to have right incentives to ensure needed coordination.
11. Governments must enhance their institutional capacity to make better use of existing funding opportunities. New financing mechanisms to support environment-friendly and climate resilient agricultural and food systems need to be established with broader and more flexible approaches, integrating different funding sources and innovative delivery mechanisms to reach producers. There is also a need to enhance innovative financing schemes through promotion of public-private partnerships.
12. Carbon market for the agriculture sector is underdeveloped because of lack of inclusion in the Clean Development Mechanism (CDM) under the Kyoto Protocol and high cost of verification, monitoring and transactions, especially for small farmers. The mitigation potential of agriculture should be exploited by improving sector's access to carbon markets, by reducing cost of verification, monitoring and transactions, by simplifying and improving such systems, and through building capacity of the key stakeholders.
13. Governments should use payment schemes as incentives for farmers to adopt agricultural practices that mitigate and adapt to climate change. These could be based on direct payments through the Nationally Appropriate Mitigation Actions (NAMAs) and other United Nations Framework Convention on Climate Change (UNFCCC) mechanisms from the proposed Green Climate Fund. They can also be funded by market-based mechanisms such as Cape and Trade schemes or voluntary schemes. Governments need to ensure a Mandated Carbon Price to remove price volatility so that there is a real financial incentive for farmers to participate. Governments also need to ensure bulk of funds going to farmers and not to the money market or scheme administrators. The appropriate schemes can turn agriculture from problem to solution.
14. There is a need for a sustainable, agro-ecological paradigm shift in agriculture for mitigating climate change and halting losses of biodiversity and environment degradation at large. Agriculture and allied organizations including Governments should take appropriate steps to support this paradigm shift for the benefit of farmers and rural communities.
15. The collaboration among relevant ministries such as agriculture, livestock, forestry and fisheries, water resources, rural development, environment, climate change, planning, and finance must be strengthened for effective implementation of the projects and programmes.
16. Governments and International Organizations should join hands to pool resources to create synergies in efforts to combat climate change and promote mitigation of and adaptation to climate change.
17. Concerted efforts must be made by Governments and NGOs to raise awareness and strengthen capacity of all key stakeholders (e.g., policy-makers, scientists, practitioners and producers) to effectively address climate change.
18. There is an urgent need for regional cooperation for implementing integrated approach of climate change adaptation and mitigation.
19. Impacts of climate change involves multiple stakeholders — farmers, rural communities, the state, international organizations, private sector and NGOs. Therefore, overcoming climate change impacts is a joint responsibility. Collective, participatory efforts by all relevant stakeholders are required. One of the greatest challenges is to mobilize support of all relevant stakeholders in an effective manner. To overcome this challenge strong networking among the key stakeholders at various levels must be established and sustained as a priority.
20. International organizations such as APO should continue to organize projects relating to development of sustainable agriculture and food

systems, in particular, climate change, aiming at creating awareness on the socio-economic importance of climate change adaptation and mitigation in agriculture and other sectors, strengthening capacity of key stakeholders, and assessing and monitoring progress among others.

At the end, the Forum resolved that they would do their utmost to contribute to advances in climate change mitigation and adaptation efforts in agriculture and other sectors for mitigating negative effects of climate change on the agriculture and food systems, as well as to impacts of agriculture on climate change, by building climate change resilient agriculture and food production systems for achieving sustainable national food security in their respective countries through utilization and dissemination of lessons and insights learned from the Forum.

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MALAYSIA

High throughput genotyping services at the CMDV

Located at the Biotechnology Research Centre, Malaysian Agricultural Research and Development Institute (MARDI), Serdang, the Centre for Marker Discovery and Validation (CMDV) was established on August 2011 for fast and cost-effective genotyping services for crop, livestock and aquaculture industry.

To provide highest quality services, the CMDV is designed and customized with the latest genotyping platforms supporting current molecular marker technologies — Single Nucleotide Polymorphism (SNP), Simple Sequence Repeat (SSR) and Amplified Fragment Length Polymorphism (AFLP).

CMDV provides the following services

- High throughput DNA extraction
- Discovery and validation of molecular markers and marker-trait associations (SNP/SSR)
- DNA fingerprinting of crops, livestock and aquaculture (SNP/SSR/AFLP)
- Varietal or accession identification, biodiversity protection and pointing variety infringement
- Marker-assisted selection (MAS) and marker-assisted backcrossing (MABC)

SNP panel technology is routinely used for application in rice services and research

Well-trained personnel to operate high throughput equipment at the CMDV

The Centre is equipped with three key genotyping robotic platforms —the ABI 3730XL DNA Analyzer, Sequenom Mass Array and Illumina iScan. This enables Centre to generate 100,000 data points of the SNP per day *via* Sequenom Mass Array and 70,000 data points of the SSR per day through ABI 3730XL.

All valuable samples received are managed and tracked by a dedicated Laboratory Information Management System (LIMS) (Biotracker™ 4.3.) This enables CMDV personnel to track clients and samples information, manage genotyping workflows, organize inventories as well as create documents such as invoices and reports.

The Centre has also developed an in-house database, which stores genotype data, genetic and physical maps in addition to germplasm information. This acts as a tool to facilitate geneticists and breeders in mining important markers, traits and genes.

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PHILIPPINES

Farm Business School as the newest extension modality

Farm Business School (FBS) Project was implemented in two pilot provinces of Nueva Vizcaya and Nueva Ecija, and a total of 1,615 farmers were trained on the entrepreneurship and market access. The trained farmers belonged to a select-few market-oriented farmers, who were experts not only on crop production but also in marketing their products.

Through the collaboration of the Department of Agriculture-Agricultural Training Institute (DA-ATI), DA-Agribusiness and Marketing Assistance Services (AMAS), Department of Agrarian Reform (DAR) and the Food and Agriculture Organization of the United Nations (FAO-UN), the Farm Business School (FBS) was implemented under the project *"Capacity Building of Small Farmers in Entrepreneurship Development and Market Access."*

The National Congress on Farm Business School for Filipino Farmers was held on 1 December 2014 at the Luxent Hotel, Quezon City. Among the guests who attended the Congress were DAR Secretary, Virgilio R. de los Reyes, DA Undersecretary for Operations, Emerson U. Palad, and FAO representative, Aristeo Portugal.

As the Project concluded its two-year implementation in December 2014, a National Congress on the FBS was conducted that served as the platform for presentations of accomplishments, sharing of experiences, and a workshop was also organized. During the activity, Dr Asterio P. Saliot, Director of the DA-ATI and the National Project Coordinator, acknowledged the importance of FBS for the farmers. "Aside from capacitating our farmers in producing crop, they should also be capacitated in terms of negotiating their products in the market," Saliot said. Likewise, Saliot informed the participants that a bill has already been filed in the Congress for strengthening FBS to be institutionalized as one of the extension modalities for agriculture and fisheries.

Training of the facilitators for Farm Business School

FAO Funded Farm Business School Inaugurated 2nd Cycle Implementation

FBS launched in Cagayan

During the Congress, there was sharing of experiences and stories from farmer-participants, facilitators as well as from the local government units (LGU). The FBS Project Team Leader Gomer Tumbali presented accomplishments of the Project, lessons learned and recommendations. He said that the FAO mission has also developed concept notes on cascading Farm Business School in the regions.

Nueva Vizcaya Governor, Ruth Padilla, graced the National Congress and shared her experience in supporting the FBS since her province was one of the pilot areas. "I firmly believe in Farm Business School because our farmers were capacitated in market-oriented approach of farming, "Padilla said.

The National Congress also featured a workshop on cascading FBS in the regions as the "next steps" of the Project to firmly institutionalize Farm Business School as an extension modality. ATI is currently leading cascading of FBS in the regions with 27 regional trainers, and 272 facilitators have been trained.

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MALAYSIA

Organic certification of products ensures quality to consumers

Certified organic products are generally more expensive than conventional ones as the organic food supply is limited compared to the demand, and production cost of the organic foods is specially on the higher side. Retailing of organic products has evolved since 1997; with natural food stores being the main outlets for such products. By 2008, the marketing boom pushed retail sales of organic foods up to $21.1 billion as compared to $3.6 billion in 1997. There were 1.8 million organic producers in 2011. Thirty-four per cent of the world's organic producers are in Asia, followed by Africa (30 %) and Europe (16 %). The countries with most of the organic producers were India (547,591), Uganda (188,625 in 2010) and Mexico (169,570).

Hands-on-making liquid organic fertilizer (fermented plant juice and fruit plant juice)

Hands-on-making bokashi

Organic certification bodies have increased rapidly in some Asian countries, while most certification bodies are in the European Union, Japan, the United States, South Korea, China, Canada, India and Brazil. Legislation and requirement of organic certification varies between a country and the other. Only a few countries have not any certification body; organic producers in these countries can use standards of foreign certification bodies listed as acceptable to local authorities.

Objectives of organic certification

- Protect consumers against deception and fraud in the market
- Protect producers of organic produce by preventing misrepresentation of other agricultural produce as being organic
- Ensure that all stages of organic production, preparation, storage, transport and marketing are subjected to inspection and would comply with organic standards

In Malaysia, a standard for organic agriculture was launched in 2001, and consequently the *Skim Organik Malaysia (SOM)* or Malaysian Organic Scheme was introduced in 2003; administered by the Department of Agriculture under the Ministry of Agriculture and Agro-based Industry. From 2003 to 2014, 142 farms have been certified under the SOM, and this number is expected to increase further.

At present, there is great potential for marketing organic products in Malaysia; however there are not enough organic farms to meet demands for organic produce in the local market. The scenario of free trade in the borderless world is expected to open vast opportunities for the market, and Malaysia, like the other ASEAN member-countries, must avail this opportunity to formulate strategies and action plans to strengthen effective national organic certification schemes to grow rapidly to ensure safe organic products of high quality.

Realizing the importance of organic certification, ASEAN had in 2013 entrusted Malaysia to conduct organic certification courses under the Project for Strengthening Partnership among Japan and ASEAN Countries. These courses are carried out by the Crop Quality Control Division of the Department of Agriculture, which is the Secretariat for organic crop certification in Malaysia, under the Ministry of Agriculture and Agro-based Industry, and funded by the Government of India. One such course was conducted in 2013, and was attended by 20 participants from ASEAN countries — Brunei, Philippines, Indonesia, Thailand, Cambodia, Lao PDR, Myanmar, Vietnam, India—and was hosted by Malaysia.

During the course, participants learnt hands-on how to produce organic fertilizers such as compost, bokashi, and liquid fertilizers from fruit-plant juices, fish amino acids, fermented plant juices, indigenous microorganisms, water-soluble calcium (made from egg shell) and water-soluble calcium phosphate (made from bone). They also learnt to apply organic insect control using oriental herbal nutrients (made from garlic).

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