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PROGRESS & PROSPERITY

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India-ASEAN News on Agriculture and Forestry

Volume 2 No. 2 March 2014

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Message

Ismail Sabri

ON behalf of the Government of Malaysia, I am pleased to acknowledge that bringing out this newsletter, *India-ASEAN News on Agriculture and Forestry,* is giving a knowledge-sharing platform to all the member-countries of the ASEAN, and has also given me an opportunity to write a few words to share my experience as the Chair of the ASEAN.

As one of the activities under the ASEAN-India collaboration, timely publication of the newsletter underscores its important role in sharing of information and knowledge on agriculture and forestry development among the ASEAN member-states and India. The newsletter is acting as a facilitator in dissemination of information, and is also helping to achieve the objectives outlined in the Medium-Term Programme of Action for the ASEAN-India Cooperation in Agriculture and Forestry (2011- 2015).

I am very pleased to inform that since the formation of the ASEAN-India Working Group on Agriculture and Forestry (AIWGAF) in 2011, we, all ASEAN member-countries, have progressed significantly in capacity-building, exchange of information and in optimizing growth in agricultural research and development. I hope that in all future AIWGAF meets, we would continue to discuss and deliberate on the ways and means for enhancing cooperation in food, agriculture and forestry based proposals; as has been agreed by all in the 3rd AIMMAF meeting, concluded on 29 September 2013 in Kuala Lumpur, Malaysia.

Considering ever-changing environment and the variety of other challenges faced by the agriculture sector worldwide, I would like to suggest that we shall focus on leveraging existing resources and technologies for advancement and betterment of agriculture and forestry sectors in the region. In view of this, enhanced cooperation in key areas of mutual interest of reducing post-harvest losses, adaptation and mitigation technologies for climate change, and of enhancing use of Information Technology for agricultural extension programmes for better dissemination of technologies is vital and needs to be given proper attention.

In this respect, the focus and attention should be more on the game changer of agriculture sector—the younger generation. Thus, there is a need to attract, nurture and train our youth towards agriculture through making it remunerative and interesting, suiting to the present scenario. Our youth is our future, our hope, and we all know that!

The 4th AIWGAF meeting is in March in Putrajaya, Malaysia. I would like to take this opportunity to welcome all the delegates to this meeting, and I wish everyone to have an interactive and a fruitful session and a wonderful and pleasant stay in Malaysia.

Ismail Sabri
Minister of Agriculture and Agro-based Industry
Malaysia

सत्यमेव जयते

Message

Sharad Pawar

AGRICULTURE is a cultural practice that transforms natural resources into bountiful food that nourishes the humankind in this planet. For a thickly populated country like India, agriculture has been recorded as a success story of resilient bounce- back from the ship-to-mouth existence of the sixties to the lately being exporter of different agricultural products. The country, at present, is one of the largest producers of milk, rice, wheat, sugar, cotton, fruits and vegetables and a variety of spices, plantation crops, poultry and fishery products.

The biggest challenge in the present world scenario of agriculture is of utilizing available natural resources in an eco-friendly manner; minimizing degradation of the environment with optimum utility of available novel technologies, policies, infrastructure and customs of the region.

Natural resources and their management are, therefore, the key components for agriculture, which are critically affected by different socio-economic pressures and growing population. In India, recent developments in the geographical information systems, acquisition of data by remote sensing and increasing quality and spatial coverage of the global resources database have enabled in developing robust models for sustainable crop production at the national and at the regional level. To take these models to the farmers, the potential of the Information and Communication Technology (ICT) needs to be explored fully along with the extension and advisory services.

High level of heterogeneity among farmers, in terms of land ownership, resource constraints, agro-ecological conditions, etc., increases the complexity for developing an all-round extension system to reach farmers as per their needs. Strong ICT and extension services would enable faster dissemination of appropriate knowledge to farmers. This newsletter can also be made as an interactive platform for sharing knowledge on technologies, policies and also of the traditional information reservoir from each of the ASEAN member-countries.

Dynamism in the agriculture sector can be brought out by faster updating of the knowledge of our farmers; and also by involving our younger generation through the development of agriculture as a sought- after profession for livelihood security.

Sharad Pawar
Minister of Agriculture and
Food Processing Industries
Government of India

INDONESIA

Indonesian Agency for Agricultural Research and Development

Founded in 1974, the Indonesian Agency for Agricultural Research and Development (IAARD) is a top-level unit under the Ministry of Agriculture. It has eleven research centres to manage research and development on food crops, horticulture, estate crops, livestock, veterinary, soil and agroclimates, agro-socio economics, machinery development, post-harvest, biotechnology and agricultural technology assessment.

The IAARD has five institutions, focusing on the estate crops; grouped under the Indonesian Research Institute for Estate Crops (IRIEC), covering oilpalm, rubber, tea and cinchona, coffee, and cacao and sugar. While the IRIEC is not formally a part of the IAARD, it is being managed by the Agency, and the head of the IAARD is an *ex-officio* member of the IRIEC board.

The national research centres and institutes of the IAARD undertake strategic research to develop policy alternatives and technology components. Their findings are disseminated through the Agency's Assessment Institutes for Agricultural Technology (AIATs) in each province for testing. Since the AIATs are closer to the areas they serve, technologies suitable to farmers reach them faster. There are 31 AIATs located throughout the country.

VISION

The vision of the IAARD is to be a world- class research and development institution by 2014; producing and developing agricultural innovations to support realization of the industrial agriculture system.

The IAARD strives to foresee and respond to changes in the strategic environment. It has reoriented its research and development as follows.

- From the centralized to the decentralized management
- From a focus on commodities to a resource-oriented approach based on the farming systems and agribusiness
- From a focus on the production techniques to one based on a balance between strategic and adaptive technologies
- From a general approach to the one based on the needs of the specific areas, within an agribusiness framework
- From production to one based on the market demand

MISSION

- Producing and developing technological innovations and policy recommendations in the agriculture sector in supporting realization of the industrial agriculture system.
- Improving quality of agricultural research resources as well as the efficiency and effectiveness of their uses.
- Developing national and international networks to master science and technologies and improving role of the IAARD in agricultural development.

REORGANIZATION OF THE INSTITUTE

Since its establishment in 1974, the Indonesian Agency for Agricultural Research and Development (IAARD) re-oriented many times to adapt to changing demands of the country's agriculture sector and national development programmes.

1974 -1980

Through the Presidential Decree in 1974 and 1979, the IAARD was established as the first echelon, which had 12 second-level echelon units to provide direct technical support and services to Director General of the IAARD. It consisted of: Secretariat, 4 Centres (Centre for Agricultural Research Programming, Centre for Agricultural Statistic and Data Processing, National Library for Agricultural Sciences and Centre for Agricultural Quarantine), 2 Research Centres (Centre for Soil Research and Centre for Agro-Economic Research) and 5 Central Research Institutes (Central Research Institute for Food Crops, Central Research Institute for Industrial Crops, Central Research Institute for Forestry,

Focused Commodities

Research and development efforts focus on the following major commodities.

- **Food Crops:** rice, maize, soybean, cassava, sweet-potato, greengram and peanut
- **Vegetables:** chilli, tomato, shallot, string-bean and potato
- **Fruits:** banana, mango, citrus, mangosteen, melon, papaya and durian
- **Ornamental plants:** roses, orchids, gladioli, chrysanthemums, carnations, lilies and anthuriums
- **Estate crops:** oilpalm, rubber, coffee, cacao, tea, cinchona, sugarcane, coconut, black pepper, cashew, clove, tobacco, cotton, ginger, greater galingale, turmeric, patchouli, nutmeg, vanilla, kapok, kenaf, jute and sago
- **Livestock:** beef cattle, sheep, goat, native chicken, duck and dairy cattle

RESEARCH AND DEVELOPMENT CENTRES

Research Centres	Location
Indonesian Centre for Food Crops Research and Development(ICFORD)	Bogor, West Java
Indonesian Centre for Rice Research	Subang, West Java
Indonesian Centre for Horticulture Research and Development(ICHORD)	Jakarta
Indonesian Centre for Estate Crops Research and Development(ICECRD)	Bogor, West Java
Indonesian Centre for Animal Science Research and Development(ICARD)	Bogor, West Java
Indonesian Centre for Agricultural Land Resources Research and Development (ICALRRD)	Bogor, West Java
Indonesian Centre for Agricultural Socio- Economic and Policy Studies(ICAESEP)	Bogor, West Java
Indonesian Centre for Agricultural Engineering Research and Development (ICAERD)	Serpong
Indonesian Centre for Agricultural Biotechnology and Genetic Resources Research and Development(ICABIOGR)	Bogor, West Java
Indonesian Research Centre for Veterinary Sciences	Bogor, West Java
Indonesian Centre for Agricultural Post-Harvest Research and Development (ICAPOSTR)	Bogor, West Java
Indonesian Centre for Agricultural Technology Assessment and Development	Bogor, West Java
Indonesian Centre for Agricultural Library and Technology Dissemination(ICALTD)	Bogor, West Java

Central Research Institute for Fisheries and Central Research Institute for Animal Sciences).

1981 - 1986

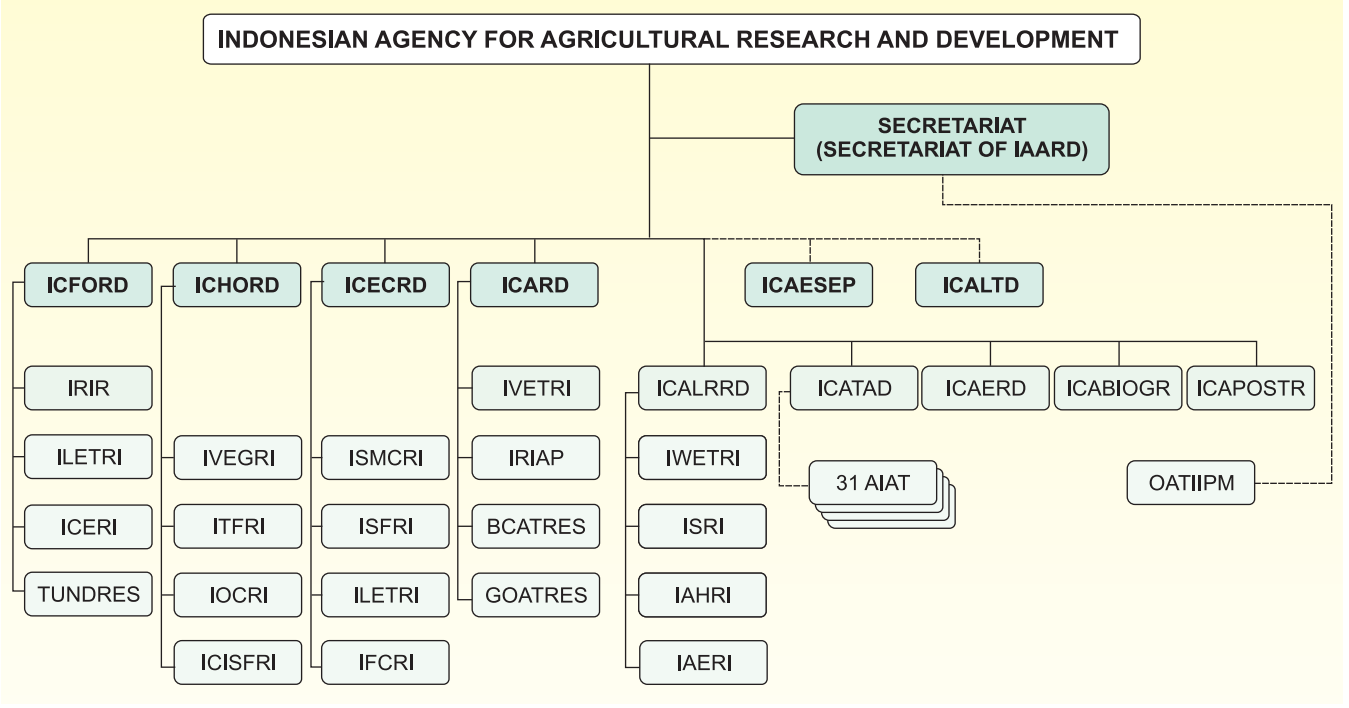
In 1983, the institution changed structurally based on Presidential Decree No. 24 in year 1983. Then IAARD consisted of: Secretariat, Centre for Agricultural Statistic and Data Processing, National Library for Agricultural Sciences, Centre for Soil Research, Centre for Agro-Economic Research, Research Coordinating Centre for Food Crops, Research Coordinating Centre for Industrial Crops, Research Coordinating Centre for Horticulture, Research Coordinating Centre for Animal Sciences, Research Coordinating Centre for Fisheries.

RESEARCH INSTITUTES AND STATIONS

Research Institutes	Location
Food Crops	
Indonesian Legumes and Tuber Crops Research Institute	Malang, East Java
Indonesian Cereals Research Institute	Ujung Pandang, South Sulawesi
Tungro Disease Research Station	Sidrap
Estate Crops	
Indonesian Medicinal and Aromatic Crops Research Institute	Bogor, West Java
Indonesian Tobacco and Fibre Crops Research Institute	Malang, East Java
Indonesian Coconut and Palmae Research Institute	Manado, North Sulawesi
Indonesian Spices and Industrial Plants Research Institute	Sukabumi, West Java
Horticulture	
Indonesian Ornamental Plants Research Institute	Cianjur, West Java
Indonesian Tropical Fruits Research Institute	Solok, West Sumatera
Indonesian Vegetables Research Institute	Bandung, West Java
Indonesian Research Institute for Citrus and Subtropical Fruits	Batu, East Java
Livestock	
Indonesian Animal Production Research Institute	Bogor, West Java
Beef Cattle Research Station	Pasuruan, East Java
Goats Research Station	Sei Putih, North Sumatera
Non Commodity	
Indonesian Agroclimate and Hydrology Research Institute	Bogor, West Java
Indonesian Wetland Research Institute	Banjarbaru, South Kalimantan
Indonesian Soil Research Institute	Bogor, West Java
Indonesian Agricultural Environment Research Institute	Pati, Central Java

ASSESSMENT INSTITUTES

Assessment Institutes (AIATs)	Location
Banda Aceh AIAT	Lampineung, Banda Aceh
North Sumatera AIAT	Medan, North Sumatera
West Sumatera AIAT	Sukarami, West Sumatera
Bengkulu AIAT	Bengkulu
Riau AIAT	Pekanbaru, Riau
Jambi AIAT	Kotabaru, Jambi
South Sumatera AIAT	Palembang, South Sumatera
Lampung AIAT	Bandar Lampung
West Java AIAT	Lembang, West Java
DKI Jakarta AIAT	Jakarta
Central Java AIAT	Ungaran, Central Java
Yogyakarta AIAT	Yogyakarta
East Java AIAT	Malang, East Java
Bali AIAT	Denpasar, Bali
West Nusa Tenggara AIAT	Mataram, West Nusa Tenggara
East Nusa Tenggara AIAT	Kupang, east Nusa Tenggara
North Sulawesi AIAT	Menado, North Sulawesi
Central Sulawesi AIAT	Biromaru, Central Sulawesi
South Sulawesi AIAT	Makassar, South Sulawesi
South East Sulawesi AIAT	Kendari, South East Sulawesi
South Center Sulawesi AIAT	Gorontalo, South Center Sulawesi
Central Kalimantan AIAT	Palangkaraya, Central Kalimantan
West Kalimantan AIAT	Pontianak, West Kalimantan
East Kalimantan AIAT	Samarinda, East Kalimantan
South Kalimantan AIAT	Banjarbaru, South Kalimantan
Maluku AIAT	Ambon, Maluku
North Maluku AIAT	Ternate, North Maluku
Papua AIAT	Jayapura, Irian Jaya
Banten AIAT	Banten
Bangka Belitung AIAT	Bangka Belitung



1987 - 1991

According to the Presidential Decree No. 4 in year 1990, it consisted of: Secretariat, Centre for Agricultural Research Programming, Centre for Agricultural Library and Research Communication, Centre for Soil and Agroclimate Research, Centre for Agricultural Socio-Economic Research, Central Research Institute for Food Crops, Central Research Institute for Horticulture, Central Research Institute for Industrial Crops, Central Research Institute for Animal Sciences, and Central Research Institute for Fisheries. Based on Ministerial Decree No.75/Kpts/OT.210/2/1991,the IAARD had another one unit of echelon II, that was Centre for Agricultural Machinery Development.

1992 - 1997

The Presidential Decree No.83 was spelled out by the Ministerial Decree No. 96/Kpts/OT.210/2/1994, for organizing its working under the Ministry of Agriculture. Then IAARD consisted of 11 second echelon units: Secretariat, Centre for Agricultural Research Programming, Centre for Agricultural Library and Research Communication, Centre for Soil and Agroclimate Research, Centre for Agro- Socio-Economic Research, Central Research Institute for Industrial Crops, Central Research Institute for Horticulture, Central Research Institute for Animal Science, Central Research Institute for Fisheries, and Centre for Agricultural Machinery Development.

1998 - 1999

Based on the Presidential Decree No.61/1998, organization structure of the IAARD changed; as the Central Research Institute for Industrial Crops moved under the coordination of the Ministry of Forestry and Estate Crops. And the institute had: Secretariat, Centre for Agricultural Research Programming, Centre for Agricultural Library and Research Communication, Centre for Soil and Agroclimate Research, Centre for Agro-Socio-Economic Research, Central Research Institute for Food Crops, Central Research Institute for Horticulture, Central Research Institute for Animal Science, Central Research Institute for Fisheries, and Centre for Agricultural Machinery Development.

2000 - 2001

In the middle year 2000, the IAARD re-oriented based on Ministerial Decree No.160/Kpts/OT.210/3/2000. During this period, Central Research Institutes became Research Centres. Its structure consisted of 7 second echelon units—Secretariat, Centre for Soil and Agroclimate Research, Centre for Socio-Economic Research, Research Centre for Food Crops, Research Centre for Horticulture, Research Centre for Animal Sciences and Centre for Agricultural Machinery Development. And Central Research Institute for Fisheries was placed under Ministry of Fisheries and Marine and Centre for Agricultural Library and Research Communication was shifted to the Secretariat General, Ministry of Agriculture.

Based on the Ministerial Decree No. 01/Kpts/OT.210/1/2001, the IAARD was restructured, Research Centres became Research and Development Centres and Centre for Estate Crops came under the Ministry of Agriculture. The IAARD consisted of 8 second echelon units—Secretariat, Indonesian Centre for Food Crops Research and Development, Indonesian Centre for Horticulture Research and Development, Indonesian Centre for Estate Crops Research and Development, Indonesian Centre for Animal Science Research and Development, Indonesian Centre for Soil and Agroclimate Research and Development, Indonesian Centre for Agro-Socio-

Economic Research and Development, Indonesian Centre for Agricultural Engineering Research and Development.

2002 - 2004

In 2002, Centre for Agricultural Machinery Development was renamed as Indonesian Centre for Agricultural Machinery Development based on the 2002 Agriculture Ministerial Decree No. 403. In addition, the Technical Implementation Units (TIUs) were restructured by issuing of 2002 Agriculture Minister Decree No. 59; thus TIUs under the IAARD were 23—17 research institutes/ assessments and 6 research stations. In 2003, the IAARD upgraded 2 research institutes at echelon III into Research and Development Institutes in echelon II b namely Indonesian Centre for Agricultural Biotechnology and Genetic Resources Research and Development (ICABIOGRD) (Agriculture Ministerial Decree No.631/ Kpts/OT.140/12/2003), and Indonesian Centre for Agricultural Post- harvest Research and Development (ICAPOSTR) (Agriculture Ministerial Decree No.632/ Kpts/OT.140/12/2003). Also two AIATs were established in two provinces— Banten Assessment Institute for Agriculture Technology, and Bangka Belitung Assessment Institute for Agriculture Technology (Agriculture Ministerial Decree No.633/Kpts/OT.140/12/2003).

2005

In 2005, IAARD reorganized based on the Agriculture Ministerial Regulation No. 299/Kpts/OT.140/7/2005, consisted of Secretariat of the IAARD and 4 Centres for Research and Development— 1) Indonesian Centre for Food Crops Research and Development, 2) Indonesian Centre for Horticultural Research and Development, 3) Indonesian Centre for Estate Crops Research and Development, and 4) Indonesian Centre for Animal Sciences Research and Development. In addition, Indonesian Centre for Agriculture Socio-Economic and Policy Studies (ICASEPS) was established replacing Centre for Socio-Economic Research and Development and was positioned under the Secretariat General of the Agriculture Ministry; though technically, the ICASEPS was managed and supervised through the IAARD.The IAARD also managed and supervised the Indonesian Centre for Agricultural Library and Technology Dissemination (ICALTD). This centre managed agricultural library services and dissemination of agricultural science and technology.

Furthermore, based on the Agriculture Minister Regulation No. 300/Kpts/OT.140/7/2005, Indonesian Centre for Agricultural Land Resources Research and Development (ICALRRD) was established from Indonesian Centre for Soil and Agroclimate Research and Development. The ICALRRD coordinated R&D activities on land resources, agroclimate and hydrology and swampy lands. Besides, Assessment and Development Institute for Agriculture Technology was reorganized into Indonesian Centre for Agricultural Technology Assessment and Development (ICATAD), based on the Agriculture Ministerial Regulation No. 301/Kpts/OT.140/ 7/2005. The ICATAD coordinated 28 Assessment Institutes for Agricultural Technology (AIAT) to work on location-specific technology.

2006 - 2010

In 2006, two research institutes changed from echelon IIIa to IIb. The Indonesian Rice Research Institute became the Indonesian Centre for Rice Research. Indonesian Research Institute for Veterinary became Indonesian Research Centre for Veterinary Sciences. In addition, two new AIATs were built in Gorontalo and North Maluku. Another AIAT came into existence in 2007 in West Papua.

Till 2010, IAARD consisted of Secretariat, 13 Research Centres, 15 Research Institutes, 31 AIAT, three Research Stations, and Office of the Agricultural Technology Transfer and Intellectual Property Management.

2011

Tailoring to the change of the Ministry's organization and strategic environment conditions, in 2011 also IAARD continued to arrange its technical units e.g. the Indonesian Plantation Research Institute to the IAARD in the Indonesian Centre for Food Crops Research and Development. Need of developing agriculture technology for two new provinces —Kepulauan Riau and West Sulawesi—was to support acceleration of beef self-sufficiency programme, and also to manage plant diseases because of climate change. To manage it, the IAARD had done following changes in five technical units— organization improvement, to upgrade the echelon, adding mandate and developing new technical units.

2012 - present

The IAARD's organizational development undertaken on an ongoing basis and adjusted to the demands of the dynamic changes in the strategic environment of Agricultural Research plays an important role in supporting Vision and Mission of the IAARD. The policy is aimed to strengthen Government organization to work efficiently through the issuance of two regulations— Presidential Decree 47 of 2009 on the Establishment and Organization of the Ministry of State and Presidential Regulation No. 24 of 2010 concerning status, tasks, and functions of Echelon Ministry and the Organizational Structure, Duties, and Functions of the State Ministries.

The implementation of the Agriculture Minister Rule Number 61, 2010, Ministry of Agriculture, in general, and the IAARD, in particular, continued to perform organizational structuring, by proposing 50 UK and UPT of the IAARD to rename "Department of Agriculture" as "Ministry of Agriculture". Several strategies were for improvement of tasks and function of the IAARD's research institutes and research centres, and also for maximizing functions of experimental garden.

Organization restructuring done by the IAARD in its research institutes and centres is in the process of approval by the Ministry of Administrative Reform and is framed by Ministry Agriculture's Decree to define scope of the IAARD's organizational management.

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INDIA

FATI technology to assess impact of high temperature on rice-crop

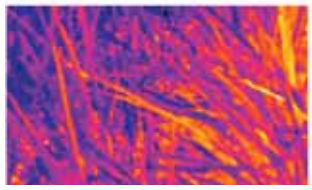
Increase in the surface-air temperature at the end of the 21st century is predicted to be around 1.4-5.8 °C, relative to the temperatures of 1980-1999. Probably, there will be an increase in the variability around this mean too. Thus, it becomes necessary to evaluate responses of crop-plants to high temperatures and to estimate extent of high-temperature effects on the growth and yield of plants.

Free Air Temperature Increment (FATI) technology has been developed to facilitate increased canopy temperature in the fields. This technology does not involve any enclosures; it warms up the environment with infrared heaters under open field conditions. All radiations below 800 nm are screened by selective cut-off filters to avoid undesirable photo-morphogenetic effects. By tracking ambient canopy temperature in a reference plot (unheated- control) with thermocouples using an electronic control circuit, the radiant energy from the heater is modulated to produce a desired increment in the canopy temperature of an associated high-temperature stressed plot (with options of continuous day and night or only in day or in night). This technology was used for rice for the first time to study high-temperature stress effects.

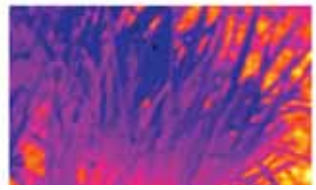
Temperature Gradient Tunnel (TGT)

Free Air Temperature Increment (FATI)

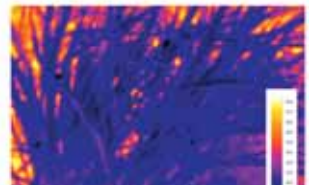
Control, Open field



Thermal image of leaves in TGT



Thermal image of leaves in the FATI



Thermal image of leaves in the open field

High temperature stress effects were studied on the growth and yield of twenty rice cultivars, grown under two different technologies —Free Air Temperature Increment (FATI) and Temperature Gradient Tunnel (TGT). The cultivars were exposed to 2 °C above the ambient temperature. Rice- plants exposed to high temperature showed significant reduction in growth duration, Leaf Area Index (LAI), biomass, yield and Harvest Index (HI), and substantial increase in spikelet sterility and membrane stability indices. Plants exposed to high temperature under the FATI showed more decrease in LAI (15-20 %) and plant height (15-22%), and less increase in spikelet sterility (14-18%) than those grown under the TGT technology.

The differences between the two technologies can be attributed to reduced light penetration, restricted air circulation and other associated changes in the microclimatic environment inside the TGT. Such changes are minimal or null in the FATI technology, as substantiated by the leaf temperature characterized by thermal images of the plant canopy.

This study clearly showed that without altering microclimate drastically, the FATI can be used to study high temperature effects on growth and yield of crop-plants.

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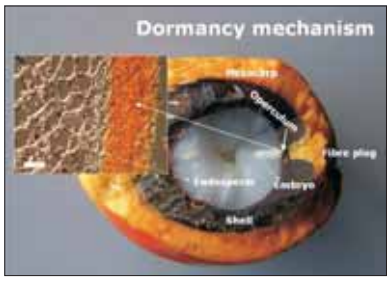
Breaking seed dormancy in oilpalm

Oilpalm cultivation is being promoted by the Government of India to bridge supply and demand of edible oils. It is estimated that around 5 million germinated seeds are required per year to meet the demand of planting material. The main source of its planting material for commercial cultivation is germinated seeds. Strong seed dormancy in oilpalm indirectly causes delay in its nursery operations and also wastage of precious crossed seeds due to delayed or no germination.

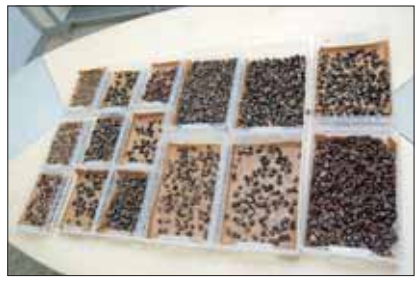
Seed dormancy was usually overcome by "dry heat method"; subjecting seeds to 39º - 40ºC for 40 - 60 days. In this, large quantities of seeds were wasted. Moreover, it was a cumbersome process.

Aseptic de-operculum seed germination technique

Seeds are extracted from artificially pollinated fresh fruit bunches (FFB) and are surface-air dried after soaking in water for 4 days by daily changing water until 22% seed moisture content by dry weight basis is attained. Thereafter, seeds are thoroughly cleaned and treated with 0.1% Bavistin solution for 5 minutes, and surface dried for two hours. The dried seeds are packed in



Seed dormancy due to mechanical barrier to embryo



Aseptic de-operculum germination technique

polythene bags and heat-treated only for two days to extract kernels by removing entire endocarp without any damage to kernels (Kernels are extracted by cracking endocarp using hammer). The plate-like structure of operculum is removed of the individual seeds using "aseptic sterile blade"; without damaging embryo. The naked and de-operculated seeds are cleaned in filtered water and dipped again in fungicide. Two layers of water- soaked germination papers are kept at the bottom of the High Density Plastic container and de-operculated seeds are kept on the germination paper and covered with one more layer of germination paper. Such arrangement is for incubation at 25-28° C, and thus the germination starts within a day, and completes within 5-7 days. The weak, abnormal, damaged seeds can be easily identified from the lot; and seeds with well differentiated plumule and radicle alone should be planted in the primary nursery. This method can be adopted in the commercial seed production centre as a routine technique to augment seed production.

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MALAYSIA

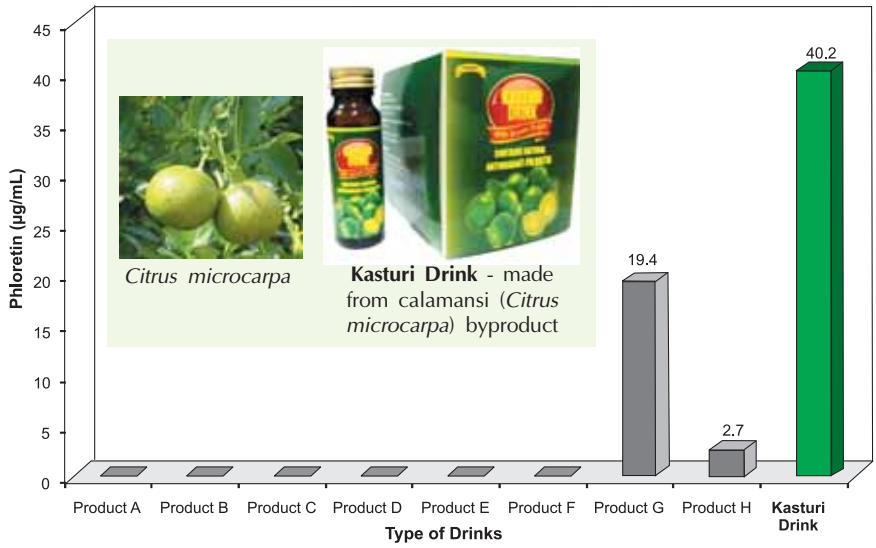
High antioxidant drink from calamansi (*Citrus microcarpa*)

Several studies have shown citrus-fruits to be associated with lower risk of colorectal, esophageal and stomach cancers and stroke. Health benefits of these fruits are attributed to their richness in polyphenols that may counteract oxidative stress and hence may help reduce risk of certain chronic diseases.

Calamansi or 'limau kasturi' or *Citrus microcarpa* is a small citrus-fruit with a loose skin and a sweet musky smell. It has a beneficial compound, phloretin-G, which has high Trolox Equivalent Antioxidant Ratio (TEAR) value of 3.4; higher than epigallocatechin-gallate, potent antioxidant compound in green-tea. Phloretin-G is found stable at high temperature and high pressure. High phloretin-G drink, **Kasturi Drink**, has been developed successfully from calamansi.

The drink was prepared by the fermentation of the selected high phloretin-G parts of calamansi with beneficial microorganisms. It showed high quantity of beneficial phloretin-G even after 18 months of storage and also an overall acceptability of 9.0 in sensory evaluation. Vitexin-2-O-rhamnoside was also found in the Kasturi Drink. This compound is being used as an antihypertensive agent in the USA. In the drink, fibres from selected sources were also added to optimize its benefit. With the newly developed enzyme technology, phloretin-G content in the product can be enhanced further.

The functional food industry, consisting of food, beverage and supplement sectors, is one of areas of the food industry in Malaysia that is experiencing faster growth in the recent years. The newly developed product may substitute similar imported functional foods in Malaysia.



Phloretin-G in **Kasturi Drink** and other commercial products

This product has won several awards in the local and International competitions: **Gold Medal** of the International Trade Fair 'Ideas-Inventions-New Products' (IENA-Germany) 2013; **Gold Medal** of the Malaysia's BioInnovation -BioINNO-Awards 2013, **Malaysian Innovative Product Award and Best Invention for Research Institutes and Organization** at the Malaysia's International Invention, Innovation and Technology Exhibition (ITEX-2013) as well as **Gold Medal** of the Malaysian International Technology Expo - 2013.

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MYANMAR

Improved varieties of food- legumes for the Central Dry Zone

The Department of Agricultural Research has been recognized as the major centre for releasing improved varieties of food-legumes—greengram, blackgram, chickpea, pigeonpea, soybean and cowpea, which are grown widely across the country. Food Legumes Section, DAR, has some on-going projects in collaboration with the ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) to have impact studies of improved chickpea varieties, introduced from the ICRISAT in the Central Dry Zone areas of Mandalay, Magway and Sagaing Divisions. Since 1985, the DAR [formerly Agriculture Research Institute (ARI), the Central Agricultural Research Institute (CARI)] has carried out international varietal trials in collaboration with the ICRISAT. About over 90% of the pulses growers are at present using improved varieties, released by the Food Legumes Section, DAR.

Furthermore, the Food Legumes Section of the DAR is collaborating with the Australian Center for International Agricultural Research (ACIAR) to promote legume- based farming systems in the Central Dry Zone areas.

High-yielding yellow mosaic virus resistant greengram variety

A high-yielding improved variety of greengram (mung-bean) Yezin 14 with resistance to Mungbean Yellow Mosaic Virus (MYMV) has been released by the Food Legumes Section of the Department of Agricultural Research (DAR).

Yezin 14 greengram

Lately, MYMV has been assessed as a severe disease of mungbean- growing areas across the country. The Food Legumes Section had released some of the MYMV resistant varieties, which were introduced from the Asian Vegetable Research and Development Centre (AVRDC). But this new variety, Yezin 14, has been preferred by farmers and stakeholders over the earlier released varieties in terms of seed colour, yield and maturity.

In demonstration trials, the variety has shown good yield and satisfactory level of resistance. Seed multiplication programme for this has already been carried out in collaboration with the Department of Agriculture (DOA).

Extra short-duration pigeonpea ICPL 88039

Pigeonpea is mainly grown in the Central Dry Zone (CDZ) areas of the country as it enhances soil fertility, is drought resistant, requires fewer inputs, and is utilized as a fuel-wood.

Pigeonpea ICPL 88039

Most of the traditional pigeon-pea varieties are medium- to- long duration ones and are usually inter-cropped with greengram, ground-nut, cowpea, cotton, sesame, etc. Adoption of short-duration variety with yield stability and adaptability is one of the essential effective methods to reduce vulnerability due to climate change.

An ICRISAT improved pigeonpea variety ICPL 88039 is of extra short duration, and matures in 120-140 days; traditional cultivars were photoperiod sensitive and took 180 to 250 days for maturity.

In Myanmar, seed coat colour and seed size are important for pigeonpea farmers to fetch higher market price. Traders prefer yellowish-red/reddish-brown seed colour with smaller seed weighing 8-11 g/100 seeds. ICPL 88039 has reddish-brown seed colour and weighs 10-11 g/100 seeds.

In 2011, most of the farmers in Magway Division (one of the Central Dry Zone divisions) failed their first crop due to serious drought in June-July. ICPL 88039 was sown as a second crop in part of the areas under receded water, and it produced about 16 baskets per acre (1,293 kg/ha). This variety also performed well in the other dry zones — Nyaungoo, Pakokku, and Myingyan Districts.

Food Legumes Section of the Department of Agricultural Research multiplied its seeds in the research satellite farms of the respective regions, and distributed them to farmers.

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INDIA

Oyster-mushroom processing can be a boon to small-scale mushroom growers

Oyster- mushroom (*Pleurotus* sp.) grows on a wide range of agricultural wastes in all temperatures (15-35°C) with 100% biological efficiency; hence it is called as the *'Future Mushroom of India'*. This mushroom has many advantages to its credit—simple cultivation practices, superior neutraceutical properties (57-65% carbohydrates, 20-30% proteins and 2-2.7% fat), and comparatively 1.5-2 times lesser cost of cultivation than commercially produced button mushroom. It has only marketing problem, owing to its high perishability, shorter shelf-life (1-2 days) and seasonal production that results in glut and thus distress sale.

Various processing techniques have been standardized for fresh and dried oyster-mushrooms to develop value-added products. Crunchy quality oyster-mushroom biscuits, comparable with the commercially available biscuits in terms of appearance, flavour and taste, have been prepared successfully. From fresh mushrooms, pickles and mushroom-jam have been prepared. These value-added products have been found stable up to six-eight months at the ambient temperature. Oyster-mushroom powder was recommended at 5-10% of the total volume for the preparation of biscuits and jam, based on the desired nutritional value, taste and flavour.

Biscuits Pickle Jam

Trey sun-drying MAP of fresh mushroom Fluidized bed drying

Oyster-mushroom can also be consumed fresh as mushroom curry, mushroom *pakoda*, mushroom patties and mushroom soup; all are low fat, protein-rich foods for consumers.

The uncontrolled longer sun-drying (with 48-52% relative humidity at ambient temperature for 18-22 h) was responsible for deteriorated dried oyster texture and colour for powder preparation. This has been resolved with fluidized bed drying (4-6 h at 45-50°C hot air temperature). For fresh oyster mushroom, modified atmospheric packaging (MAP) (2.5-5% CO_2 and 5-10% O_2), using plastic punnets of 200 g and 400 g over-wrapped with PVC film, to extend shelf- life of the mushroom by 6-8 days at 4-6°C storage temperature has also been achieved.

By adopting processing technologies and sound-marketing strategies, small-scale oyster-mushroom growers can have 18-35% higher income.

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'Pusa Breakfast Cereal' from quality maize protein

A ready-to-eat "**Pusa breakfast cereal**" with quality protein maize (QPM) has been prepared. QPM with better yield and protein quality than the normal maize as well as lower glycemic response is being advocated for introduction in the regular diet.

The product was prepared through extrusion processing, which gave advantages of the least nutrient losses during processing, high throughput capacity and no environmental pollution, etc. over the traditional processes. The product was also incorporated with functional ingredients containing phytonutrients, which imparted also natural, attractive colour. The

Pusa Breakfast Cereal Pusa Breakfast Cereal with functional ingredients

Nutritional quality of the Pusa Breakfast Cereal

Energy	382 kcal energy per 100 g
Moisture	3% (wb)
Protein	9.6%
Fat	1.5%
Ash	2.4%
Fibre	3.4%
Carbohydrate	82.5%
Calcium	122 mg/100g
Iron	3 mg/100g
Total carotene	2.9 mg/100g
β-carotene	2 mg/100 g

phytonutrients may help in combating illnesses.

This product is round in shape and has a soft texture, and it can be consumed with/without milk. It has been rated highly acceptable on organoleptic evaluation by people of different age-groups. The product is free from synthetic colour and flavour. As it is with low glycemic value, it can be suitable even to diabetic people. The product can be a malnutrition fighter. It can augment income of growers/ farmers as they themselves can process the grains into the product.

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INDONESIA

International Conference on Agricultural Post-harvest Handling and Processing

The Indonesian Agency for Agricultural Research and Development (IAARD) organized jointly with the FAO and the International Commission of Agricultural and Biosystems' Engineering (CIGR), an International Conference at Sultan Hotel, Jakarta, Indonesia, during 19-21 November 2013.

In the Conference, 11 invited papers were presented on the environment-friendly bio-based technologies, emerging food- chain system, non-destructive quality analysis, plant factory, precision agriculture, active and smart packaging and halal food. Further, there were 40 oral presentations and 39 posters on novel technologies in plant factory, post- harvest handling technology, food-processing technology, grain handling and quality, post-harvest quality and management, and nanotechnology applications in food and agricultural products.

At the site, the premiere mangoes export was launched using Controlled Atmosphere to Dubai. Trial test of mango export with refrigerated container under CA (Controlled Atmosphere) by shipment to Dubai was carried out in cooperation with the IAARD (Indonesian Agency for Agricultural Research and Development). Mango cv Gedong was taken from farmers' orchards around Majalengka and Cirebon, West Java, with 80-85 % maturity. Post-harvest handling used combination of HWT (Heat Water Treatment) and waxing with fungicide content.

Export started with transporting mango container from Packing House of PT Alamanda Sejati Utama on 18 November 2013 to the storage at the Tanjung Priuk seaport. Mango was shipped on 20 November 2013, and was estimated to arrive at Dubai after 14 days.

As the side event to the Conference, bilateral talk convened between the IAARD and the FAO. This was organized by the organizing committee of the ICAPHP and Secretary General of the IAARD as the Chairperson with the FAO vocal point, Dr Eugenia Serova, Director, Rural Infrastructure and Agro-Industries Division,

Agriculture and Consumer Protection Department, Food and Agriculture Organization of the United Nations.

Five points emerged in the Conference are following.

- Development of Sustainable Food Reserve Garden (Programme KRPL)
- Technology transfer of Crop-Livestock Integration: Model Development (training material for farmers)
- Inter-island distribution and transportation of fresh/ perishable fruits/vegetables to reduce losses
- Development of biodegradable packaging and utilization of biomass waste
- Local food fortification for combating malnutrition

The breakthrough strategies derived from this Conference have been wrapped in the strategic approaches called "**green economy**" to meet global challenges of foods, feeds, fibre, fuels and environment. For instance, in Indonesia, at present intensive efforts are being made for producing biofuels from agricultural waste.

This Conference has also formulated an important plan called as **"The Jakarta Initiative"**— a harmonization of the following strategic plan in research and development to accelerate realization of green economy.

- Achieving food security through food diversification by promoting use of under-utilized crops, development of greener food production in sub-optimal land, and considering local wisdom.
- Providing safe food through greener agro-ecosystem and food processing.

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MALAYSIA

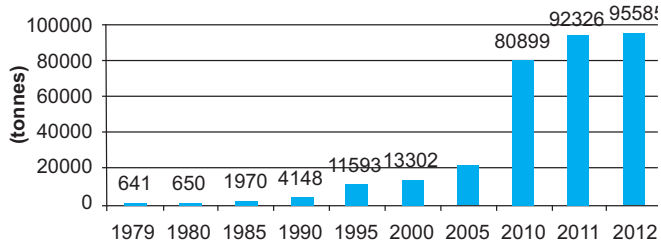
Certified seed production

Seeds of superior variety and high quality are prerequisite to achieve high farm productivity. In Malaysia, rice is the staple food, thus activities related to increasing rice productivity such as rice-seed production are given high priority by the Government. To ensure supply of quality rice seed to rice- growers, the Department of Agriculture has implemented voluntary *Rice Seed Certification Scheme*. Thus, certified rice seeds production in Malaysia has increased consistently from its first inception in 1979; and from 2008 (94,925 tonnes) is able to meet country's annual rice seed requirement (74,000 tonnes).

However, the country is dependent on the imports of seeds of vegetable and food crops; almost 90% of the total seed requirement. These seeds are mainly imported from China, Taiwan, India, Indonesia and Thailand. Temperate vegetable seeds are imported from European countries.

All the hybrid seeds of oilpalm and clonal seedlings of rubber are produced locally by the private sector and by the government- linked companies.

The Department of Agriculture has also launched *Fruit Clonal Seedling Certification Scheme* in the year 2010. Mother-plants in the blocks are inspected and verified for their genetic identity, and clonal seedlings of perennial fruit-trees are propagated mainly through bud-grafting; and tissue cultures of banana and plantain are examined for their genetically true-to-type seedling conditions, complying to specified seedling standards. To date, there are 11 species of tropical fruit- trees, comprising 52 varieties in the certification scheme, and a total of 4,924 (2010), 476,168 (2011), 2,061,056 (2012) and 3,027,174 (2013) clonal seedling materials have been, respectively, certified.



Certified rice seed production in Malaysia

Field inspection of MD2 pineapple

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SINGAPORE

Converted food -waste to food products

In Singapore, a report by the National Environment Agency (NEA) in 2011 has revealed that more than 600,000 tonnes of food-waste is generated annually, and only 10 % of it is being recycled.

As a net importer of food, it is important for Singapore to optimize its limited resources, and enhance its food supply resilience. In ensuring a resilient supply of safe food for the Nation, the Agri-Food & Veterinary Authority of Singapore (AVA) has been leveraging on the technology and on the innovation to help local food industry to increase productivity and reduce wastage. One of the ways is by recycling food-wastes.

Okara, a whole-some by-product generated during manufacturing of soy milk and tofu, is one example of food-waste that can be recycled.

Okara Floss ready to be commercialized

Range of okara products developed by the AVA

Employing innovation, research, and technology, AVA, through its Post-Harvest Technology Centre, has successfully converted protein- and carbohydrate-rich product into mock sausages, a wide range of vegetarian foods, and an animal feed.

Singapore's 38 soy milk and tofu processing plants collectively discard at least 30 metric tonnes of okara daily. The AVA shared this conversion technology with industry stakeholders through various platforms.

Feedback from the industry indicated that the sensory experience derived from these okara products was compatible with the real meat products, and the products were even tastier. Through AVA's efforts, one company has successfully commercialized Okara Floss, which is a vegetarian mock- meat floss.

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THAILAND

Medicinally important plants of family Acanthaceae

The plants belonging to family Acanthaceae are considered important for their medicinal value by the people across North, Central and North-eastern Thailand.

A total of 39 species and 2 varieties were studied for their uses; which are given in the following table.

Acanthaceae members used for medicinal purposes by ethnic groups in the North, Central and North-eastern Thailand

Botanical name	Status	Ethnic group	Use
Acanthus ebracteatus Vahl	Indigenous species	20 21	Stem boiled to cure pain of the body (20);Whole plant used as a tonic; Leaf pounded with alcohol to apply for curing painful knee (21)
Acanthus montanus T. Anderson	Exotic	1	Mature leaf boiled in water and this taken orally for curing diabetes and to decrease pains and aches
Andrographis paniculata (Burm.f.) Wall. ex Nees	Indigenous species	15 18 20 21 22	Fresh leaf chewed to cure fever, diarrhea; Mature leaf boiled in water and this taken for curing pains and aches
Barleria cristata L.	Indigenous species	1 2 3	Root used as a tonic (1); Whole plant boiled in water, that is used for bathing to cure abnormal menses (2); Root pounded and applied to cure insect poison (3)
Barleria lupulina L.	Cultivated species	1 3 14	Root pounded and extract used to cure insect poison (1); Root ground in liquor to cure poison (3) Root ground in liquor to be applied for insect poison (13) Root ground and applied for curing skin disease (14)
Barleria strigosa Willd.	Indigenous species	1 2 16 18	Mature leaf boiled in water to be taken orally as a tonic(1 2); Whole plant used for curing gastrointestinal tract disease (16 18)
Clinacanthus siamensis Brem.	Indigenous species		Whole plant ground and applied for curing skin disease
Dicliptera roxburghiana Nees	Indigenous species	4	Whole plant boiled in water to be taken orally for curing stomachache and bloated symptom;and used by women as a tonic after childbirth
Graptophyllum pictum Griff.	Exotic species	13	Leaf ground and applied to stop bleeding
Hemigraphis glaucescens (Nees) C.B. Clarke	Indigenous species	5	Leaf pounded to cure serious wound or blisters
Justicia adhatoda L.	Indigenous species	2 3 8 10 11	Young leaf cooked in spicy soup (11); Root and leaf pounded to cure itchy symptom (11); Whole plant boiled in water to be used for curing fever and cough (2 8 10); Flowers used to cure fever and bronchitis (3)
Justicia diacantha Imlay	Cultivated species	11	Whole plant ground and applied for curing insect poison
Justicia gendarussa Burm.f.	Indigenous species	2 4 11	Whole plant ground and applied for curing insect poison
Justicia glomerulata Benoist	Indigenous species	2	Whole dried plant with a tonic property used as a tea substitute for women after childbirth

Botanical name	Status	Ethnic group	Use
Justicia procumbens L.	Indigenous species	2 10 11	Leaf used as scrub for applying on a serious wound
Justicia quadrifaria (Wall. ex Nees) T. Anderson	Indigenous species	4 6 7	Whole plant boiled in water to be taken orally for curing stomachache and bloated symptom
Justicia ventricosa Wall.	Indigenous species	11 12	Leaf ground with steamed water to massage for curing infantile convulsion
Nelsonia canescens (Lam.)	Indigenous species	5	Leaf ground and applied for curing itchy symptom
Peristrophe acuminata Nees	Indigenous species	11	Leaf ground and applied for curing itchy symptom
Peristrophe lanceolaria (Roxb.) Nees	Indigenous species	5	Leaf ground and applied for curing seriously infected wound
Phlogacanthus curviflorus Nees	Indigenous species	1 2 4 5 7	Whole plant ground and applied for curing swelling, pain, liver disease (1 2 5); Root pounded and mixed with alcohol and applied for bone-crack cure (4); Root boiled with chicken to cure stomachache (4); Leaf used for body massage to cure fever and infantile convulsion; Whole plant and leaf boiled in water and used for bathing for curing fever (7); Leaf warmed on the fire and used to cure fever and pain (11 12)
Rhinacanthus nasutus (L.) Kurz	Cultivated species	14 21 22	Leaf ground and taken to cure ring-worm symptom; and boiled in water and taken orally for curing gout
Ruellia tuberosea L.	Exotic species	13	Seed soaked in water and applied on wound and on sore
Sanchezia oblonga Ruiz & Pav.	Exotic species	4	Mature leaf pounded into small bits to apply on the body to cure backache, waist-ache, tendon-ache, muscle-ache and cyanosis
Staurogyne lanceolata (Hassk.) Kuntze	Indigenous species	5	Root and leaf boiled in water and taken as a tonic; Leaf chewed for curing cough
Strobilanthes anfractuosa C.B. Clarke	Indigenous species	5	Whole plant boiled in water and taken orally for curing sore-throat
Strobilanthes nivea Craib	Indigenous species	20	Whole plant and leaf used to cure gonorrhea
Strobilanthes lanceifolius T. Anderson	Indigenous species	2 6	Root boiled in water and taken orally for curing fever
Strobilanthes pentstemonoides (Nees) T. Anderson	Indigenous species	2	Root boiled in water and taken for curing fever
Thunbergia coccinea Wall.	Indigenous species	7 8	Young stem boiled in water for bath to cure fever (7 8); Root and leaf used for curing poison (3)
Thunbergia fragrans Roxb. var. *fragrans*	Indigenous species	13	Whole plant mixed with other plants, boiled in water, and taken for curing paralysis and symptom of an abnormal large blood vessel in the abdomen
Thunbergia grandiflora Roxb.	Indigenous species	2 5	Whole plant ground and applied on the skin, and boiled in water to bath for curing small skin protuberance, inflammation and itchy symptom; Root, whole plant and leaf used for urine disease, urinary stone; Leaf ground and applied for curing skin disease, serious wound, inflammation
Thunbergia hossei Clarke	Indigenous species	13	Root mixed with *Polygonum chinense* and boiled in water, and taken for curing pain of lower abdomen in case of venereal disease
Thunbergia laurifolia Lindl.	Indigenous species	13 19	Leaf ground and applied for curing insect poison (13); Leaf and stem ground and applied on wound from the hot- water burn and skin irritation (13); Leaf used for medicinal formulations (19)
Thunbergia similis Craib	Indigenous species	13	Root boiled in water and taken orally for cyanosis
Thunbergia fragrans Roxb. var. *vestita* Nees	Indigenous species	13	Root mixed with *Polygonum chinense* and boiled in water, and taken orally for curing pain of lower abdomen in case of venereal disease

Ethnic groups: (1) North (1-13): 1 = Karen, 2 = Yao, 3 = Tai Lu, 4 = Hmong, 5 = Akha, 6 = Lahu, 7 = Paluang, 8 = Shan 9 = Lisu, 10 = Haw, 11 = Lawa, 12 = Khmu, 13 = Native people (North)
(2) North-eastern (14-20): 14 = Phutai, 15 = Kha (So), 16 = Nyaw, 17 = Kaloeng, 18 = Yoy, 19 = Buru, 20 = Kula
(3) Central (21-22): 21 = Thai Song Dam, 22 = Native people (Central)

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INDIA

ASEAN member-countries personnel trained in e-extension in India

Fourteen agricultural personnel from Malaysia, Vietnam, Cambodia, Lao PDR, Thailand, the Philippines and India were trained in a programme entitled *IT Application for Agricultural Extension (e-extension) for ASEAN* , organized at the National Academy of Agricultural Research Management (NAARM), Hyderabad, India, from 6 to 17 January 2014. The objectives of the training were: *(i)* to provide a bird's eye view of India's agricultural extension system in terms of structure, agenda, business and performance for enabling cross-country learning and applications by the ASEAN participants; *(ii)* to equip ASEAN participants with theoretical and practical knowledge on IT applications in agricultural extension delivery (e-extension) for enhanced performance ; and *(iii)* to sensitize participants on the role of the supportive factors for IT application in agricultural extension system, especially at the practical level.

Dr K.D. Kokate, Deputy Director General (Agricultural Extension), Indian Council of Agricultural Research, New Delhi, India, in his inaugural address said that sharing of experiences in the different countries would improve research and would also give focus on the food value for the poor. Dr S.L. Goswami, Director, NAARM, said that the NAARM provides a platform for sharing information. This is through the cutting-edge technologies to communicate and share, including GIS and Remote Sensing Applications in Agricultural Research and Development, Use of Participatory GIS for Empowering Rural Communities, M- and E-extension and Integrating Farmers into Agricultural Value Chains. In the interactive session participants shared their experience on the IT applications in the agricultural extension.

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PHILIPPINES

1st ASEAN ICT Programme for sharing knowledge in agriculture and fisheries

Since the Agriculture and Fisheries Modernization Act (AFMA) 1997, the Philippines has placed all-out efforts in modernizing agriculture and fisheries sectors through Information and Communication Technology (ICT).

The Philippine Department of Agriculture through Agricultural Training Institute (ATI) hosted an ASEAN ICT Exchange Visit Programme as part of its commitment to the ASEAN Sectoral Working Group on the Agricultural Training and Extension (AWGATE). Fourteen delegates from Malaysia, Indonesia, Thailand and the Philippines participated in the programme.

The programme was held on 22 September to 1 October 2013 at Bayview Park Hotel in Manila, with the field learning visits at Quezon City, Laguna, Nueva Ecija and Benguet.

ATI Director, Asterio P. Saliot, said "the Philippines is very privileged to be the first host of the ASEAN ICT Exchange Visit, and hopes that each ASEAN member- state will host activities like this as we expand and explore more in electronic extension programme". He also added that he "intends to complete the e-trading programme of the ATI before the ASEAN economic integration of 2015".

The programme provided platform for knowledge sharing and exchange of agricultural information and technology among the ASEAN member-states and the Philippines. In addition, it also aimed to establish a Community of Practice (COP) for e-extension within the ASEAN region.

At the opening ceremony, Dr Evelyn Aro-Esquejo, ATI's Deputy Director for Policy and Administration, reiterated importance of ICT as a possible solution for problems in agriculture. "Through ICT we have reached far more farmers and fishers in the countryside and through ICT we have empowered our farmers," said Dr Esquejo.

Dr Alexander G. Flor, a KM expert and professor at the

University of the Philippines Open University (UPOU), delivered lecture on: *Knowledge Management (KM) Initiatives for Agriculture and Fisheries Extension*. Likewise, Jose Rey Y. Alo, ATI's e-Learning process adviser, presented some ICT-based solutions for agricultural extension.

The participants visited and observed some of the Philippine ICT-supported initiatives for agricultural development. The delegates visited the Rice World Museum of the International Rice Research Institute (IRRI), and the IRRI-initiated project called Cybervillage in Victoria, Laguna. The delegates were also taken to northern Luzon to observe ICT-supported initiatives for research and extension of the Philippine Rice Research Institute, Philippine Carabao Center, as well as of the ATI-Regional Training Center in the Cordillera Administrative Region.

Ishak Pandak, Deputy Director of the Planning and ICT Division, Department of Agriculture, Malaysia, said, "he has observed some of the unique extension modalities using ICT that the Philippines employ and can be emulated in Malaysia". The other delegates likewise agreed with Pandak's view, particularly Dr O.D. Soebhakti Hasan of Indonesia and Siriwan Wungdee of Thailand.

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THAILAND

Integrated pest management in vegetables

The Department of Agricultural Extension (DOAE) of Thailand organized a Training Programme on the Integrated Pest Management (IPM) in Vegetables during 7 – 20 July 2013 in Bangkok. Its aim was to share knowledge and field experiences in the IPM practices in vegetables.

There were 25 participants from 8 ASEAN member- states—Brunei Darussalam, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. The training programme was related to strategy in pest management in Thailand, identification of major pests in vegetables, pest surveillance, pest management, plant quarantine and pesticide control, as well as country-wise interaction.

This Training Programme was the activity under the Strategic Plan of Action on the ASEAN Cooperation in Agricultural Training and Extension (SPA AWGATE).

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MALAYSIA

Organic certification for fruits and vegetables

In Malaysia, a course was organized on "Organic Certification for Fruits and Vegetables" by the Department of Agriculture, Malaysia (DOA); this was one of the cooperative activities agreed under the ASEAN-India Working Group on Agriculture and Forestry meeting held on 6 and 7 May 2013 in New Delhi, India.

The Training Course was held on 20 October – 2 November 2013 at The Everly Hotel, Putrajaya, Malaysia. Participants from Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, Vietnam and also from India attended the training.

Y.H. Dato' Mustafa Kamal b Baharuddin, Director General, Department of Agriculture, Malaysia, welcomed all the participants. In his opening remarks, Y.H. Dato' highlighted the importance of organic farming.

The programme was aimed to increase knowledge and understanding among the participants on the organic farming practices by deliberating on the following topics. Organic Farming—Principles, Prospects and Problems; Crop Management: Agronomic Practices in Organic Farming; Soil and Water Management in Organic Farming; Pest and Disease Management in Organic Farming; Importance of Microorganisms in Organic Farming; Organic Liquid Fertilizer and their Application; Organic Farming Certification in Malaysia—Good Organic Agricultural Practices (SOM); Harvesting and Post-Harvest Handling of Organic Product etc.

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Published by Dr Rameshwar Singh, Project Director (DKMA), Indian Council of Agricultural Research, Krishi Anusandhan Bhavan I, Pusa, New Delhi 110 012, Lasertypeset by Print-O-World, 2579, Ist Floor, Mandir Lane, Shadipur, New Delhi 110 008, and printed at M/s Royal Offset Printers, A-89/1, Naraina Industrial Area, Phase I, New Delhi 110 028.

Conceptualization *and* ***Editing:*** **Dr Rameshwar Singh** and **Shashi A. Verma** • ***Design and Production:*** **Dr V.K. Bharti** and **Kul Bhushan Gupta**