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Minimizing losses through effective Postharvest handling

Contents

AFACI

Forging partnership for food and agriculture

BY DR. NICOMEDES P. ELEAZAR, CESO IV

Food and agriculture are two key concepts that sustain human life. As the world's population continues to grow, the demand to produce more food intensifies putting more pressure on the agriculture sector. Every player within the value chain becomes crucial in addressing food security and achieving sustainable agriculture.

According to the Asian Development Bank, "two-thirds of the world's hungry reside in Asia and the Pacific, and food insecurity persists bringing the specter of hunger and undernutrition to millions more of the region's poor." There is a need therefore to focus on a comprehensive and multi-sector engagement including forging partnership and collaboration that deals on the various issues that beset food and agriculture.

This has been the underlying principle behind the establishment of the Asian Food and Agriculture Cooperation Initiative (AFACI) which aims to promote sustainable agricultural growth in the Asian region and contribute to economic development through technological cooperation in food and agriculture sectors.

AFACI was established through a Memorandum of Understanding (MOU) signed among member-countries on 3 November 2009. The agreement covers various pan-Asian projects including capacity-building initiatives of member-countries in the form of workshops and training programs. Specifically, its activities are geared to the development of sustainable agriculture and food technology to help economies deal with the changes in the agricultural environment, such as climate change and technology transfer, through international collaborations.

Through the establishment of AFACI, a network of member-countries is established enabling them to cooperate, link, and share technologies and best practices in jointly addressing issues on food production and sustainable agriculture.

To date, AFACI has 13 member countries: Bangladesh, Cambodia, Indonesia, Kyrgyzstan, Laos, Mongolia, Myanmar, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand, and Vietnam.

Six years after it established its partnership in the Philippines, through the Department of Agriculture, the initiative is now reaping the benefits of the projects that are being implemented in the country.

This issue of the ***BAR R&D Digest*** is featuring 12 AFACI-supported projects, two of which are being led by the Bureau of Agricultural Research (BAR). These two projects are on Integrated Management System for Plant Genetic Resources (IMPGR) and Agricultural Technology Information Network in Asia (ATIN). Other projects featured are on agricultural land management, postharvest technology of horticultural crops, establishment of lignocellulosic feedstock, biofertilizer technology, establishment of agro-meteorological information system, sustainable organic farming technology, development of locally GAP programs, rice production techniques, integrated pest management, and agricultural mechanization for cassava.

During the recent AFACI Annual Evaluation Meeting held on 4-5 June 2015 in Clark, Pampanga, it was announced that of all the AFACI projects being implemented, four projects from the Philippines were conferred the "Most Outstanding" and "Outstanding" awards.

Two projects, "Establishment of Network and Model Manual on Postharvest Technology of Horticultural Crops in Asia" by Dr. Perly Nuevo of UPLB; and "Development of Rice Production Technologies for Increased Self-Sufficiency of Staple Food in Asia" by Dr. Vicky Lapitan of PhilRice won the "Most Outstanding" projects award while the other two, "Asian Network for Sustainable Organic Farming Technology (ANSOFT) by Mr. Rodel Carating of BSWM; and "Enhancing Agricultural Mechanization Technologies for Crop Production and Postharvest Processing of Cassava" by Dr. Romualdo Martinez of PHilMech took home the "Outstanding" award. ###

"One Asia"

Building network through AFACI

BY LIZA ANGELICA D. BARRAL

Countries across the Asian Region have been experiencing common and even diverse agricultural issues and challenges which can delay the growth and economic development of the sector. Despite the long-term scenario, many countries realize and acknowledge the importance of establishing cooperation among countries as an effective means of intensifying agricultural development through knowledge sharing and selecting best agricultural practices for effective and efficient technology transfer.

Since its establishment in 2009, the Asian Food and Agriculture Cooperation Initiative (AFACI) aimed of promoting sustainable agricultural growth and contributing to the economic development in the region through technological cooperation in agriculture and food sectors. With the vision of creating "One Asia", AFACI continues to establish and maintain a network among Asian countries by sharing of agricultural knowledge and experience; and agricultural technology innovation in response to the long-term and emerging issues in agriculture particularly on food production, climate change, global warming environmental conservation, genetic resources, capacity building, and technology transfer, among others.

Aside from building closer ties within the region, AFACI has been actively involved in the international society's efforts to address poverty and hunger in Asia by identifying appropriate and practical strategies in attaining sustainable agriculture. As of now, the AFACI has 13 member countries including Bangladesh, Cambodia, Indonesia, Kyrgyzstan, Laos, Mongolia, Myanmar, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand, and Vietnam.

Establishing stronger partnership

To affirm the commitment of the Philippines as one of the member countries of AFACI, the Department of Agriculture (DA), represented by Undersecretary Bernadette Romulo-Puyat, signed a Memorandum of Understanding (MOU) on the establishment of AFACI together with the representatives of other Asian countries namely, Cambodia, Korea, Laos, Sri Lanka, and Vietnam on 3 November 2009. The MOU formalized the cooperation of the member countries in promoting sustainable agricultural growth in the region.

The DA and AFACI partnership led to the funding support of R&D projects specifically on sustainable farming technology, plant genetic resources, postharvest technologies, agricultural land management, climate change adaptation, pest management, rice production, production and processing, good agricultural practices (GAP), and biofertilizer technologies among others.

As the lead and coordinating agency in agriculture and fisheries research and development (R&D), the Bureau of Agricultural Research (BAR) has been involved in two of AFACI's Pan-Asia Projects. These are: 1) "Strengthening Plant Genetic Resources (PGR) Management System: Conserving the Diversity of Priority Vegetables (Solanaceous Crops) Germplasm in the Philippines"; and 2) "Establishment Agricultural Technology Information Network (ATIN) in Asia".

PGR and ATIN projects

The project titled "Strengthening Plant Genetic Resources (PGR) Management System: Conserving the Diversity of Priority Vegetables (Solanaceous Crops) Germplasm in the Philippines" aimed to strengthen the management system for plant genetic resources conservation, exploration, collection, characterization, evaluation, distribution, monitoring and documentation for its sustainable use. It has two major components that deal with first, strengthening the national PGR network, and second, conserving Solanaceous vegetable species including tomato, eggplant, and pepper.

Meanwhile, the project titled "Establishment Agricultural Technology Information Network (ATIN) in Asia" aimed to establish collaboration with the existing agri-based networks and systems to construct and expand a web-based standardized platform on agricultural science and technology information. Further, the database will help the policymakers and government workers in the field of agriculture to make future decisions in conducting R&D breakthroughs and policy outcomes that gear towards sustainable agricultural development. By reinforcing the existing websites of agricultural government sector worldwide, producing information education and communication (IEC) materials, and conducting capacity building for researchers and agricultural workers, AFACI member countries can contribute in disseminating knowledge and up-to-date information that farmers and other stakeholders need for sustainable agricultural production.

The Pan-Asia projects of AFACI also paved the way for funding and support of other projects implemented by state universities and colleges, DA attached agencies and staff bureaus, and other R&D institutions. ###

ATIN: Bringing technologies beyond boarders

BY LIZA ANGELICA D. BARRAL

Information Communication Technology (ICT) is one of the most vital tools for technological development and effective information dissemination. It serves as a universal portal which connects people from different parts of the globe to share and to gain access of timely and relevant information. Further, ICT facilitates intermediate steps in improving the quality of public services in various sectors. No wonder many of the sectors nowadays are using ICT in telecommunications, education, business, health, agriculture, and other sectors.

In agriculture, ICT helps in disseminating knowledge and up-to-date information that farmers and agricultural producers need such as production, pest management, postharvest technologies, acquisition of quality seeds, credit and insurance, water supply for irrigation, livestock care, latest R&D breakthroughs and market prices.

Despite the promising outcomes of ICT in agriculture sector, many countries still remain poor in terms of accessibility to web-based information due to poor networking and absence of effective management.

In the latest Web Index conducted by British computer scientist, Tim Berners-Lee, the Philippines ranked 26th place on the social impact category among 61 nations. The study included impact of the Internet access to basic services, social networking sites, teacher training via the Web, the use of virtual social networks, and Web use for public health. In terms of communications infrastructure, which refers to the standards pertaining to accessibility of digital content, affordability of web access, reliability of electricity supply, percentage of households with computer, the Philippines only ranked 39th place.

In response to the emerging need of enhancing the utilization of ICT in agriculture sector through improved web-based information network in Asia, the Asian Food and Agriculture Cooperation Initiative (AFACI), established the Agricultural Technology Information Network (ATIN) in 2010.

ATIN aimed to establish collaboration with the existing agri-based networks and systems as well as to construct and expand a web-based standardized platform on agricultural science and technology information directed towards supporting agricultural development and policymaking among member

countries in Asia. Specifically, ATIN aimed to: 1) reinforce the existing websites of agricultural government sectors worldwide and spread sharing information among the member countries into the platform, 2) publish literatures including crop calendars, training materials and other agricultural data for in-depth understanding on cultivation and expand training programs to farmers, and 3) conduct capacity building for facilitating communication and management of AFACI website by providing On-the-Job Training (OJT) at AFACI Secretariat.

To collaborate with other AFACI member countries as well as to disseminate relevant information in agriculture and fisheries R&D, BAR regularly gathers and updates information related to agriculture for uploading in the website. Also, the bureau gathers a list of institutions and their website links (URL) conducting agricultural activities in order for the AFACI website to be incorporated in the BAR website. Aside from networking and data gathering, the ATIN also focuses on migrating or transferring of soft copies of BAR publications to its new platform, *Joomla*, in order to decentralize the uploading activities to the BAR online website.

One of the accomplishments of the AFACI's ATIN project was data developing and uploading for the AFACI web-based system. One of the vital information that were being uploaded in the database are agriculture and fisheries technologies specific to production of selected high value crops and commodities.

One of the project's milestones was the packaging and reproduction of various handbooks and packaging of technologies in compact disk (CD) form which benefited farmers, academicians, agricultural extension workers, and ATIN members. Among the publications were "Mga Pamamaraan sa Organikong Gulayan, Package of Technology (POT) of Different Vegetable Crops, Handbook on the Identification and Control of Pigeonpea Insect Pest and Diseases, and crop calendar for bitter gourd, cabbage, eggplant, garlic, okra, onion, pigeonpea, squash, sweet pepper and tomato. Among the various published technologies reproduced in a compact disk were Sapinit, sweet sorghum, banana chips processing, garlic technology commercialization, mushroom, seaweed and cacao production, organic chicken raising, organic vegetable production, and Edible Landscaping.

Aside from online and published sources, ATIN's information dissemination strategy was extended across the regions through the conduct of regional seminars which cater to the member institutions of the National R&D System for Agriculture and Fisheries (NARDSAF). This was conducted in close collaboration with the BAR Applied Communication Division (ACD) and the Edible Lanscaping (EL) Group of the University of the Philippines Los Baños (UPLB).

Since 2013, BAR, through ACD, has conducted seminars on Edible Landscaping, SNAP Hydroponics, and Mushroom Production and Processing in Regions 1, 4A, 4B, 5, 8, and 10.

As one of the components of the ATIN project, capacity building activities for DA employees were also conducted by sending On-the-Job Trainees (OJT) to AFACI office in Korea as communication development specialists for one year.

AFACI's ATIN is a promising project in such a way that the Philippines is contributing large amount of information not only for the benefit of their local beneficiaries but also to other member countries across Asia. Hopefully, ATIN will remain consistent and reliable by reaching people beyond borders and empowering every country using their acquired knowledge. ###

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Securing the future through PGR conservation

BY DIANA ROSE A. DE LEON

The Philippines is endowed with rich, distinct, and diverse biodiversity. In fact, the country is included in the 17 countries declared to have a megadiverse biodiversity in the world. This means that the Philippines is one of the 17 countries that contributes to 70 percent of Earth's animal and plant species.

However, the country is also included in the watch list of 25 global biodiversity hotspots wherein species are threatened with extinction due to loss and destruction of natural habitat, pollution, natural disasters, and development activities among others. Given that the state of biodiversity impacts the capacity of a country to achieve national food security, there is an imperative call for action to develop a holistic, systematize, and comprehensive plan and program to address the concerns of protecting, conserving, and managing the biodiversity.

Biodiversity supplies the quality and quantity of plant and animal needed by human for food production. Thus in agriculture, one of the approaches being tapped to conserve biodiversity is through strengthening the plant genetic resources (PGR) management and conservation in the country.

Plant genetic resource

According to World Intellectual Property Organization, genetic resource refers to "genetic material of actual or potential value"; and genetic material pertains to "any material of plant, animal, microbial or other origin containing functional units of heredity." The International Undertaking on Plant Genetic Resources defines PGR as "the reproductive or vegetative propagating material of: 1) cultivated varieties (cultivars) in current use and newly developed varieties; 2) obsolete cultivars; 3) primitive cultivars (landraces); 4) wild and weed species, near relatives of cultivars; and 5) special genetic stocks (including elite and current breeder's lines and mutants)."

The vulnerability of crops towards pests, diseases, and climate change makes conservation of PGR relevant in this age as genetic resources provide basic material for the selection and improvement of crop and its productivity through continuous breeding.

The country's genetic diversity, including those varieties that are still undocumented, is being threatened and fast diminishing. Genetic erosion, or the loss of individual alleles/genes and of combinations of alleles/genes, is happening. Modern cultivars such as the commercial hybrids are replacing the traditional cultivars which are quite problematic as most modern cultivars have narrow genetic base as compared to the traditional varieties and wild relatives. Having narrow genetic base means that the crop is susceptible to pest and disease outbreaks and changing climatic conditions.

The Philippines is the center of diversity of rice with a total of over 5500 collected and documented traditional varieties of rice. It is also considered as the center of origin and diversity of bananas in Southeast Asia with more than 90 varieties of cultivated bananas. These examples only prove the importance of traditional varieties as a source of genetic material to develop and improve the crop varieties to ward off pest and diseases, and to help adapt on the changing environment.

By collecting, characterizing, and conserving the PGR, there is a way to access the valuable traits of one crop as a reference and input for breeding initiatives. The set of traits identified for a specific crop may seem to be useless now, but may be valuable genetic asset in the future.

Strengthening PGR Management System in the Philippines

One initiative on PGR conservation is the Asian Food and Agriculture Cooperation Initiative (AFACI) funded project, "Strengthening Plant Genetic Resources (PGR) Management System: Conserving the Diversity of Priority Vegetables (Solanaceous Crops) Germplasm of the Philippines" which is being handled by the Bureau of Agricultural Research (BAR).

The main objective of the project is to strengthen the management system for plant genetic resources conservation, exploration, collection, characterization, evaluation, distribution, monitoring and documentation for its sustainable use. It targets to increase the diversity of the traditional varieties' germplasm collections.

The focus on Solanaceous crops, specifically tomato, eggplant, and pepper, was based on the inventory of National Plant Genetic Resources Laboratory (NPGRL) of the Institute of Plant Breeding-University of the Philippines Los Baños (IPB-UPLB) which found that there is a decrease on the number of germplasm collection of these commodities.

The project has two components. The first component is on strengthening the National Plant Genetic Resources Network and Management System. Under this component, it is identified that there is an urgent need to revitalize the National PGR Network, and to capacitate the network stakeholders on database information management system. As a result, there is a creation of PGR Network small group composed of focal persons coming from the Department of Agriculture-Regional Field Offices (DA-RFOs), NPGRL, and BAR. Training on collection, characterization, and documentation of PGR of Solanaceous crops was also conducted.

The second component of the project is on conserving diversity of traditional tomato, eggplant, and pepper germplasm and its related species. On this component the activities included the exploration and collection of tomato, eggplant, and pepper germplasm; regeneration and conservation of the three crops; and morphological and agronomic (qualitative and quantitative) characterization and assessment of genetic diversity.

The germplasm of tomato, eggplant, and pepper were collected from farmers' field and farm storages of 10 regions consisting of 14 provinces, namely:

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Ilocos Norte, Ilocos Sur, Nueva Ecija, Aurora, Kalinga, Isabela, Iloilo, South Cotabato, Bohol, Bukidnon, Camarines Sur, Mindoro Occidental, Misamis Occidental, and Bataan. There were 258 accessions collected.

Inventory of the existing foreign and local germplasm collections of tomato, eggplant, and pepper was done as part of conservation management of the Solanaceous crops. Prior the start of the project, NPGRL houses 4952 foreign and 380 local accessions of tomato, 310 foreign and 297 local accessions of eggplant, and 1819 foreign and 575 local accessions of pepper. As the project progresses, the germplasm collection increases by 10 percent, 25 percent, and 15 percent, respectively.

These accessions were subjected to germination test to assess the seed quality and viability, and to predict the performance of the seeds and seedlings once in the field. The test was done to see if the seeds require regeneration. Regeneration was done to increase the quantity of seeds available of any accession, or to restore the seed's maximum viability.

The project used the NPGRL Descriptors' List to do the morphological and agronomic (qualitative and quantitative) characterization. The genetic diversity, on the other hand, was assessed using the Standardized Shannon Diversity Index.

Other R&D support to PGR

Apart from the collaboration with AFACI, BAR also has partnership with UPLB for an on-going project titled "Integrating the conservation of plant genetic resources for food and agriculture into decentralized landscape management for food security and biodiversity conservation in critical eco-regions of the Philippines, otherwise known as ITPGRFA Project." The project aims to strengthen the conservation and sustainable use of PGR of rice, yam, taro, and sweet potato.

Moreover, BAR is supporting projects related to indigenous plants' utilization, conservation, and commercialization. There are also supports given to institutions to establish facilities and to acquire tools for the use on PGR. ###

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Profiling pests and diseases of rice and veggies

BY VICTORIANO B. GUIAM

Pests and diseases can hinder optimized production of rice and vegetables - food crops that matter much to the nutritional well-being of Asians. Of particular concern are migratory pests that not only cause direct damage but can carry dangerous disease microorganisms as well.

Incidences of rice virus diseases are related with the rice plant hopper (RPH) population at particular plant stages. In Asian countries, RPH outbreaks and associated viruses are closely associated with rice cropping patterns. Continuous use of high yielding varieties (HYVs) with their narrow genetic diversity and excessive use of pesticides that upset the balance of natural ecosystems are considered the likely causes for RPH outbreaks and losses in production may rise with intensification of production to meet increased demands for rice in the region.

Vegetables are a mainstay in the region's culinary arts as they usually accompany rice in Asian dining tables. There is therefore an interest in the biological and ecological characteristics of vegetable pests as these can serve as virus vectors and pose threats to the availability of vegetable produce.

AFACI inter-country efforts

On 26-28 April 2011, the Asian Food and Agriculture Cooperation Initiative (AFACI), with the National Academy of Agricultural Sciences (NAAS) of Korea, held an international workshop to establish collaboration on the control of migratory RPH and associated rice virus diseases in Asia. The participants expressed the need for a multinational collaborative network on these pests and disease organisms, focusing on limiting the movement of migratory RPH among countries. As a result, an integrated pest management (IPM) project, "Collaborative Network for the Management of Migratory Rice Planthoppers and Associated Virus Disease of Rice in Asia", in which the target pest and disease organisms is closely being monitored by participating Asian countries, was launched.

In a succeeding meeting on October 28-November 1, 2013, aside from reports on progress in dealing with RPH and associated viruses and related information by participating countries, agreement was reached on a Technical Cooperation Project (TCP), "Collaboration in the Construction of Epidemiology Information Interchange System for Migratory Disease and Insect Pests in Asia Region (IPM)" that aimed to establish an international cooperative network on best management of migratory insect pests and associated viruses; develop and distribute essential molecular kits for field identification of rice planthoppers and associated viruses; analyze the genetic diversity of planthoppers and virus populations in the region; and examine the biological and ecological characteristics of the vegetable pests that carry viruses in the region. The project started in 2013 to end in 2016. Expected outcomes were: 1) annual monitoring information on RPH and rice viruses from AFACI member-countries generated and shared via the AFACI - Asian Migratory Insects and Viruses Surveillance System

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Addressing P-deficient in upland rice

BY DARYL LOU A. BATTAD

A rice dependent country such as the Philippines consistently strives to intensify its rice production now more than ever. The increase in the population puts more pressure to farmers to produce more even though the areas of production continue to decline.

In the case of the Philippines, upland rice farming, which mainly involves smallhold farmers, is the lowest yielding rice production system. It occupies about 0.10 M hectare which accounts for 4.3 percent of the country's rice growing area. Upland farming culture is deemed important, but it is still considered a minor rice-growing system in most of Asia. One of the major limitations to this scenario, especially in the Philippine setting, is Phosphorus (P) deficiency.

A major abiotic stress that limits plant growth and yield in upland rice production in many other parts of the world, P deficiency results in poor root development, early flowering and ripening, thus leads to equally poor nutrient uptake for proper plant growth. It further implies impaired functions of other nutrient elements. Phosphorus has a critical role in plant physiology, being a necessary constituent of ATP nucleic acid, phospholipids, phosphosugars, and many other important biochemical compounds. It is also an integral to the conversion from solar to chemical energy that plants need to synthesize sugars, starches, and proteins. In rice, proper P nutrition increases the leaf number and leaf blade length, the number of panicles per plant and the number of seeds per panicle.

This battling issue on upland rice farming opened an opportunity for the Philippine Rice Research Institute (PhilRice) Los Baños to develop elite/outstanding breeding lines adapted and acceptable to upland condition with yield higher than the current level (at least 4 t/ha grain yield) and tolerant to P-deficient soils. Project leader, Dr. Victoria C. Lapitan, supervising science research specialist at PhilRice, perceived that P-deficiency is one of the most important constraints affecting yield in the uplands, however the application of P fertilizer and irrigation enhancements, though it lessens the effect of low P availability and mitigate drought stress, are not cost effective and its excessive application is potentially and environmentally undesirable.

Supported by the Asian Food and Agriculture Cooperation Initiative (AFACI), the project, "Genetic Improvement for Upland Rice through MAS for Tolerance to Phosphorous Deficiency" focused on the development of Phosphorus uptake (Pup1) rice cultivars, which is an attractive and cost-effective approach to increasing rice yields where P deficiency is the major constraint. Pup1, a major quantitative trait locus (QTL) located on rice chromosome 12 confers tolerance of P deficiency in soil. This involved modern molecular breeding techniques such as marker-assisted selection or MAS and double haploid.

MAS is considered advantageous in selecting for complex traits, pyramiding of multiple genes, and in backcrossing; while double haploid systems allow rapid generation of homozygous lines, which improves breeding efficiency by reducing the amount time required to develop fixed lines. The combination of MAS and double haploid techniques can be a powerful tool in the breeding program for upland rice.

The project evaluated rice germplasm and surveyed with Pup1 markers which involved 93 rice germplasm including 65 elite rainfed lines, 19 rainfed and 1 upland varieties, 7 double haploid lines, and 1 traditional variety. Evaluation was carried out at seedling stage under +P and –P conditions under a screenhouse. From these 93 germplasm surveyed with Pup1 markers, 30 genotypes were found out to have the Pup1 gene. These then were evaluated under P-deficient conditions based on adaptability and yield performance, resulting to the selection of parent materials based on molecular survey and performance evaluation of varieties NSIC Rc238, NSIC Rc240, PSB Rc82, and NSIC Rc222 to be recipients of the Pup1 gene.

These materials now carrying the Pup1 gene were used accordingly in the generation of different elite lines such as isogenic lines (NILs), recombinant inbred lines (RILs), and doubled haploid lines (DHLs). Field evaluation of these elite lines under P-deficient and drought conditions was conducted which resulted to more than three-fold increase in yield.

To date, identified farmers in Cavinti, Laguna are now using the selected P-deficiency tolerant varieties.

With such a remarkable research development in upland rice farming, this project was selected as the "Most Outstanding" project by the AFACI-member countries in 2014.

These project results can be a tipoff for upland rice farming in stepping towards the call of the Philippine government through the Department of Agriculture in rice self-sufficiency, encouraging upland-based farming across the country. On a much wider perspective, with many generations yet to come, upland-based farming can be a remedy to the 'urbanization' of lands once dedicated to agriculture. ###

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Organically-based nutrient management technology for upland rice production

BY PATRICK RAYMUND A. LESACA

Healthy soil is important to the agriculture sector and cannot be overly emphasized since soil fertility and plant nutrition are crucial and essential elements for survival.

Soil fertility management is an important element to increase crop productivity. It is therefore necessary to increase the efficiency of fertilizers through effective management not only in the lowland, but also in upland areas. There is also a need to identify and develop cheaper sources of fertilizer materials and soil conditioners for soil fertility improvement.

As a result of green house effects due to climatic changes, new land management technologies are needed to optimize nutrient availability and irrigation technology in respective rainfed cropping systems in upland agricultural areas.

Given this, the Agricultural Systems Cluster-University of the Philippines Los Baños (ASC-UPLB), under the leadership of Dr. Florentino Monsalud, has conceptualized a research study that will enhance agricultural productivity through the application of organically-based nutrient management technology for upland rice production. This consequently led to the development of a three year project, "Agricultural Land Management for Improving Soil Fertility in the Philippines" funded under the Asian Food and Agriculture Cooperation Initiative (AFACI). The project aimed to: 1) establish a system utilizing organic resources and managing soil nutrients; and 2) explore, utilize, and promote the efficient use of fertilizer raw material resources.

According to Dr. Monsalud, the project seeks to boost agricultural production through animal waste-based organic fertilizers and Vesicular Arbuscular Mycorrhiza Root Inoculant (VAMRI). At the household level, Monsalud said that the farmers' goal is to produce crops and animals for food and cash to satisfy other basic needs of the household. Attainment of that goal largely depends on land productivity and quantity and quality of available crop production inputs. However, the constantly increasing cost of production inputs, the deteriorating land quality, and vulnerability of the farms to a number of climate-related risks, particularly in the rainfed agricultural areas, all contribute to low productivity.

Activities undertaken

The major activities conducted were site selection, resource assessment, documentation of nutrient management practices and sources of fertilizer materials, and designing of the area-specific Integrated Nutrient Management (INM) options for upland rice production. The biophysical characterization was done in the different farming systems considered. The climate, soil physical, chemical, and microbiological properties in the project area were also determined. Farming practices and farm resources in different typical upland farms were documented.

The availability of secondary information were also used by the project team in determing the nutrition management practices, sources of fertilizer minerals, and organic ferilizers being applied to selected upland areas in the three major islands of the country. Other than obtaining baseline data or information, the team designed the Integrated Nutrient Management (INM) options based on the biophysical resources of the area, socio-economic circumstances of the farmers and the nutrient requirements of the upland rice production system. Included in the resources were technologies and presence of institutions that can provide innovative technologies and technical assistance.

Based on the study, the nutrient requirements of the rice-based production system were matched with the resources, including technology and capability of the farmer. and Options were recommended which can be tested in the farmers' field and in the screenhouse.

For greenhouse vegetable production (GVP) organic fertilizers, these were made from the combinations of different natural ingredients including alumina-silicate material, biochar, plant residues, animal waste, molasses, and soybean oil cake. Biofertilizers included VAMRI plus Bio-N Inoculant and half Recommended Rate (RR) of Inorganic Fertilizer. VAMRI is a concentrated mycorrhizal inoculants consisting of pure spores inside root fragments. Another option is to combine GVP organic fertilizers with biofertilizers. Other combinations can be designed depending on the fertility status of the target area.

The project proponent is recommending the active participation of the local government units (LGUs) in the technology demonstration and dissemination of the project results and proposed that local mobilization are crucial inputs in the establishment of a village level organic fertilizers production center. ###

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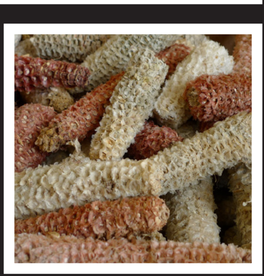

The production of liquid biofuels, such as bioethanol, is being advocated as a sustainable alternative to petroleum fuels which have increasing uncertainty in supply due to rising demand, decline in known reserves, and concerns over global warming and green house gas emissions. Among the feedstock sources identified for bioethanol include sugarcane, sorghum, cassava, and lignocellulosic materials. At present, sugarcane is the main feedstock for the production of bioethanol for the so-called "first-generation" biofuel production. The Bureau of Agricultural Research (BAR), as the focal agency for biofuels R&D of the Department of Agriculture (DA), is advocating the use of sweet sorghum as an additional feedstock.

For "second-generation" biofuel production, the utilization of renewable biomass resources has attracted global interest. 'Plant biomass' refers particularly to cheap, abundant non-food lignocellulose-rich materials from plants. Lignocellulosic materials (dry matter from plants, also called 'lignocellulosic biomass') hold promise as feedstock for bioethanol production with their abundance and availability, low cost, potential benefit to farmers, and positive environmental impact.

Agricultural residues as feedstock for bioethanol production

Among the lignocellulosic materials suitable as feedstock for bioethanol production, agricultural residues generated as waste after harvest or during/after processing of agricultural crops are of special interest because they are renewable, do not compete with the food uses of the crops and are widely available in most regions of the country. These wastes are usually either left in the fields, discarded elsewhere, or are burned.

Agricultural residues also serve as alternatives to forest woody biomass and thus can help reduce the pressure on forests. With short times to harvest, agriculture can provide continuous supply of raw material for sustained bioethanol production. The successful exploitation of agricultural residues as biofuel feedstock can be a major contributor to local development.

The PADCC-UPLB project

With the ultimate goal of developing a multilayer technical plan for commercializing bioethanol and biomass production, DA, through the Philippine Agricultural Development and Commercial Corporation (PADCC), jointly with UPLB and in partnership with Korea's Rural Development Administration, implemented the Asian Food and Agriculture Cooperation Initiative (AFACI) - assisted project for the development of a portal that provides basic information on the various locally available feedstocks and the establishment of a unified agriculture and forestry bioenergy network. An online database, the portal provides knowledge, methods and techniques concerning lignocellulosic resources that can be made available to the scientific, agricultural, forestry and industrial communities and updated as the project progresses. Information included distribution, quantity, availability, competing uses and current market value of biofuel feedstocks in the Philippines and evaluation of potential agricultural and forestry lignocellulosic resources for bioenergy in the country. The project was implemented in 2010-2013 and was led by Prof. Rex B. Demafelis of the College of Engineering and Agro-Industrial Technology of UPLB.

A project activity in developing the portal was determining the bioenergy potential of local major lignocellulosic resources. The feedstocks studied were agricultural residues (rice, corn,

Exploring agricultural residues as lignocellulosic biofuel feedstock

BY VICTORIANO B. GUIAM

Lignocellulose **refers to plant dry matter (biomass), the most abundantly available raw material on the Earth for the production of bio-fuels, mainly bio-ethanol.**

and coconut wastes) in Year 1, forest resources (fast growing trees and their residues) in Year 2, and grasses in Year 3.

Lignocellulosic biomass from agricultural wastes

Of the top rice-producing provinces in 2010, the amount of rice straw of Nueva Ecija, Pangasinan, and Isabela totaled to 3,180,712 MT and was found to have a combined ethanol potential of 502.55 million liters (MLi). While other provinces in Central Luzon, Western Visayas, Cagayan Valley, Ilocos Region and SOCKSARGEN are also high rice producers, it is only these three provinces that were each found to have the potential to generate at least 2 megawatts of power from rice straw and can meet the requirement of a minimum contiguous rice-producing area of 150,000 ha within a 40 km radius.

For corn residues, the top ten corn stover-producing provinces are Isabela, Maguindanao, Bukidnon, South Cotabato, Cebu, North Cotabato, Lanao del Sur, Lanao del Norte, Zamboanga del Sur, and Cagayan. Only Isabela (956,208 MT) and Bukidnon (755,976 MT) meet the minimum required contiguous area of 48,000 ha within a 40 km radius. The maximum ethanol potential from corn stover of these two provinces adds up to 301.34 MLi based on a combined total yield of 1,712,184 MT.

In terms of corn cobs, the top ten producing provinces are Isabela, Bukidnon, Maguindanao, South Cotabato, North Cotabato, Ilocos Norte, Lanao del Sur, Cagayan, Lanao del Norte, and Pangasinan. Of these provinces, only Isabela (241,630 MT), Bukidnon (194,236 MT), South Cotabato (176,525 MT), North Cotabato (81,367 MT), Ilocos Norte (73,814 MT), Lanao del Sur (69,210 MT), and Cagayan (67,208 MT) have at least 2 MW power potential, with Isabela having 5 MW, while Bukidnon and South Cotabato had 4 MW each. For coconut shell and coconut husk, the top ten producers are Quezon, Davao, Oriental, Davao del Sur, Zamboanga del Norte, Leyte, Lanao del Norte, Zamboanga del Sur, Misamis Occidental, Misamis Oriental, and Maguindanao. However, in terms of having at least 2 MW power potential with coconut shell, 51 provinces qualify. With coconut husks, 52 provinces have at least 2 MW power potential.

If the potentials for rice and corn residues can be fully realized, these can provide substantial amounts of bioethanol or used for power purposes in the top producing provinces. The study also found that coconut has the highest potentials for power as it is available in significant amounts in many provinces.

Lignocellulosic biomass from forest and grassland

Based on current information, the total forest cover of the country consists of open forest systems (4,030,588 ha or 56.23 percent of total), closed forest systems (2,560,872

ha or 35.72 percent), plantation forests (329,578 ha or 4.60 percent), and mangrove (247,362 ha or 3.45 percent). Of interest to the project are the open forest and plantation forests.

The provinces with open forest systems are Isabela (339,717 ha), Palawan (254,155 ha), Agusan del Sur (226,024 ha), Occidental Mindoro (167,424 ha), Oriental Mindoro (166,238 ha), Samar (161,639 ha), Cagayan (151,685 ha), Eastern Samar (142,403 ha), Surigao del Sur (120,501 ha), and Aurora (120,311ha). The areas that qualify as plantations are in the provinces of Nueva Ecija (38,538 ha), Mindoro Oriental (35,828 ha), Antique (23,913 ha), Biliran (23,317 ha), Iloilo (21,195 ha), Ilocos Norte (20,514 ha), Benguet (17,579 ha), Nueva Vizcaya (15,701 ha), Cagayan (15,068 ha), and Ifugao (14,911 ha).

With the sole indigenous tree species included in the study, bagras, 208.07 ha area will be needed for 1 MW power potential. For higher power potential, the area needed is multiplied accordingly such as a 5 MW power potential will need 1,040.33 ha (x 5), and 10 MW will require 2,080.66 ha (x 10). With Mangium, 111.32 ha will be needed for a 1 MW power potential; Moluccan sau, 491.35 ha; acacia, 413.20 ha; ipil-ipil, 502.11 ha; yemane, 142.53 ha; teak, 273.53 ha; and mahogany, 289.83 ha.

The Philippines' grassland areas are estimated to be nearly 1.9 million hectares, more than 70 percent of which are in Luzon, in its mountains and hills, idle lands, and marginal lands. For bioethanol and biopower production, using the criteria that 70 percent of the land should be covered with grasses and are within a 25 km radius, a number of contiguous provinces were found to have suitable grassland hectarage. These are: Ilocos Norte (45,000); Abra (53,100); Kalinga,Mountain Province, Ifugao, Isabela (81,000); Abra, Ilocos Sur, Mountain Province, Benguet (36,800); Ifugao, Isabela, Nueva Vizcaya (107,600); Benguet, Nueva Vizcaya, Pangasinan (72,000); Pangasinan, Zambales (53,300) ; Zambales, Tarlac (41,600); Tarlac, Pampanga, Nueva Ecija (35,200); Zambales, Pampanga, Bataan (43,300); Nueva Ecija (56,700); Nueva Ecija, Bulacan (39,400); Occidental Mindoro (27,900); Occidental Mindoro (60,400); Masbate (52,800); Masbate (29,300); Iloilo (22,700); Antique (16,900); Misamis Oriental (15,500); Misamis Oriental, Bukidnon (28,400); Bukidnon (33,900); Maguindanao (32,800); Sarangani (44,700); and South Cotabato, Sarangani (48,200).

In determining the area required for establishing boiler-turbine biomass power plants, three grass species were studied: cogon, Napier grass, and Miscanthus. With cogon, about 10 t/ha can be harvested. Required hectarage for a 1 MW power plant is 472.77 ha; a 3 MW plant, 1, 418.30 ha; a 5 MW plant, 2,363.84 ha; and a 10 MW plant, 4,727.68 ha. The project also noted that the competing uses of these grasses with biomass purposes were as roofing material, and as forage and fodder for ruminants.

Napier can yield 20 tons from one hectare, and a 1 MW plant will need 265.37 ha; a 3 MW plant, 796.10 ha; a 5 MW plant, 1,326.83 ha; and a 10 MW plant, 2,653.66 ha. With Miscanthus, yielding 10 tons from a hectare, a 1 MW plant, will

require 492.99 ha; a 3 MW plant, 1,748.98 ha; a 5 MW plant, 2,464.96 ha; and a 10 MW plant, 4,929.92 ha.

Prospects

The Philippines is one of the few countries with a mandated biofuels law and the government is aggressively developing alternative feedstocks to replace or complement sugarcane for bioethanol. In terms of supply, lignocellulosics are better than raw sugar from sugarcane since raw materials are sourced from wastes which hardly have any commercial value, do not compete with food purposes of the crop, and, as by-products, need little space.

However, unlike feedstock like sugarcane juice which is easily converted to bioethanol though conventional means, lignocellulosics require a special process to break the "ligno" (or lignin) component, a chemical structure that makes plants tough and rigid which has to be broken in order to access its sugar content for conversion to bioethanol. More intensive energy is needed to increase the ethanol yield of lignocellulosics to a viable state. In addition, as the ethanol yield is low, a further energy input is needed to increase its concentration. Collection and transport are also significant challenges.

As current technology does not yet render bioethanol production from lignocellulosics economically feasible, making lignocellulosic biomass bioethanol remains a costly proposition compared to conventional sugarcane bioethanol. Nonetheless, with continuous improvements in technology, coupled with supportive government interventions, the potentials of lignocellulosic bioethanol from agricultural residues as an alternative to petroleum fuels may be realized in the foreseeable future. ###

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Equipping cassava farmers through mechanization technologies

BY MA. ELOISA H. AQUINO

Cassava is considered as one of the major rootcrops in the Philippines. Its total production in 2012 reached to about 2.223 million tons, which was about one third of the total production.

"Direct food use constitutes only 10 percent of total production. A big portion is used in processing, 64 percent of which is used for food related products. However, the commercial feed milling is aggressively increasing its utilization marked at 32 percent," reported Dr. Romualdo Martinez of the Philippine Center for Postharvest Development and Mechanization (PhilMech).

In view of the increasing economic importance of cassava, the Department of Agriculture (DA) is vigorously addressing the issues and concerns that hinder the growth of the industry. "These include: a) low productivity - national average yield is about 10.23 tons per hectare; b) limited planting materials of high-yielding varieties; c) low adoption of recommended cassava production technologies; d) inadequate production credit financing; and e) limited mechanization and postharvest equipment," Dr. Martinez added.

Under the Philippine Cassava Industry Development Roadmap for the Year 2012-2017, cassava production is aimed to increase at 6.82 million tons and increasing average yield to 21 ton per hectare by year 2017.

In view of this goal, Dr. Martinez implemented the project, "Enhancing Agricultural Mechanization Technologies for Crop Production and Postharvest Processing of Cassava" a project funded under the Asian Food and Agriculture Cooperation Initiative (AFACI). The project aimed to develop and establish appropriate cassava mechanization technologies for crop production and postharvest processing that are suited to the requirements of cassava farmers (and other end-users).

Activities include: 1) baseline assessment of technical and socio-economic issues related to cassava mechanization, 2) technical cooperation on adoption of Thailand cassava digger, to include local fabrication, evaluation, monitoring of field performance, and information dissemination, and 3) calibration for cassava of a locally developed grains moisture meter. The project covered the monitoring of field performance and information dissemination of locally developed cassava dryer and improved cassava granulator/chipper.

Based on the project documents submitted to BAR, the Rapid Rural Appraisal of technical and socio-economic issues related to cassava mechanization was conducted in five major cassava producing provinces, namely, Isabela, Pampanga, Leyte, Bukidnon, and

South Cotabato.

About 6.0 m long and 2.4 m wide, a prototype cassava belt dryer was developed under locally funded PhilMech research project. "The dryer has a rated input capacity of one ton per hour of granulated cassava. A biomass furnace provides heat to the dryer. The dryer is being developed in cooperation with a local agricultural machinery manufacturer in Isabela," Dr. Martinez explained.

The AFACI project monitored the performance of the dryer. During the period, around 60 tons of granulated cassava were dried which test results showed that the dryer had great potential.

The Department of Agriculture also allotted funds to install and operate 15 cassava drying centers nationwide. Lectures on cassava drying were facilitated in DA-Regional Field Offices in Bohol, Davao City, CARAGA, Butuan, Surigao del Norte, and Nueva Ecija.

Also, under the project, a prototype cassava digger which is in used in harvesting cassava was fabricated and tested in the provinces of Isabela and Quirino in cooperation with a local agricultural machinery manufacturer in Isabela. Pre-tests were made in the towns of Cauayan, Diffun, San Mariano and Iligan, reflecting very satisfactory performance with great potential under local farm conditions. This was collaboration with the AFACI project counterpart, Dr. Anuchit Chansing of the Agricultural Engineering Research Institute, Thailand, for the local fabrication and evaluation of a Thailand cassava digger that he developed.

"Feedbacks were gathered from farmers and other observers of field tests. Results showed that observers pointed out several advantages of using cassava digger, namely, reduction of drudgery, reduction of labor requirement, faster harvesting, and reduction of harvesting losses. Most of the observers expressed interest to use the digger," Dr. Martinez said.

To date, identified cooperators namely the Abraza Multi-Purpose Cooperative (Quirino); Dr. Richard Torno (Pampanga); Fatima Multi-Purpose Cooperative (Leyte); Southern Mindanao Integrated Agricultural Research Center (Davao City); and Antongalon-Agusan Multi-Purpose Cooperative (Butuan City) are utilizing and managing the enhanced the agricultural mechanization technologies resulting to improved cassava production and postharvest processing benefitting local cassava farmers in the country.

The project bagged the "Outstanding" project announced during the AFACI Annual Evaluation Meeting held on 4-5 June 2015 in Clark, Pampanga. ###

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Fruits and vegetables are important sources of human nutrition. Even before they reach our tables, they go through a series of activities from harvesting, handling, storage, processing, marketing, to the final delivery to the consumer. In the course of these activities, substantial losses in quantity and quality are incurred due to physical damage, physiological decay, water loss, and pest and diseases, among others.

According to the Food and Fertilizer Technology Center for the Asian and Pacific Region, postharvest losses of fruits and vegetables are high in Asian countries estimated at 20-50 percent. While causes of loss differ depending on the crop, area, climate, infrastructures and facilities, strategies and interventions to prevent postharvest losses are often specific to local conditions. Rather than increasing cultivation areas, minimizing postharvest losses is being looked at as a more advantageous opportunity to increase food availability and enhance global food security in a more sustainable manner.

Minimizing postharvest losses through model manual

In 2012, the Postharvest Horticulture Training and Research Center at the University of the Philippines Los Baños embarked on a project, "Establishment of Network and Model Manual on Postharvest Technology of Horticultural Crops in Asia". Supported by the Asian Food and Agriculture Cooperation Initiative (AFACI), the project is aimed at reducing postharvest losses, improving the quality, and enhancing food safety of fresh horticultural crops through the development of a network and practical model manual on postharvest technologies.

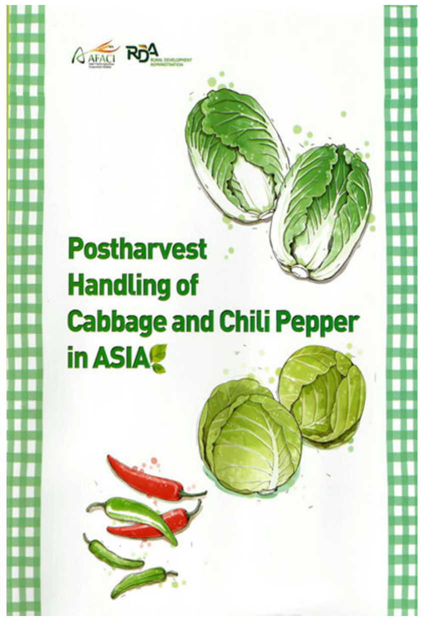
Dr. Perlita A. Nuevo, principal investigator of the AFACI project in the Philippines, said that quality and food safety are two of the most important factors being considered by consumers in buying fresh produce. "Over the last

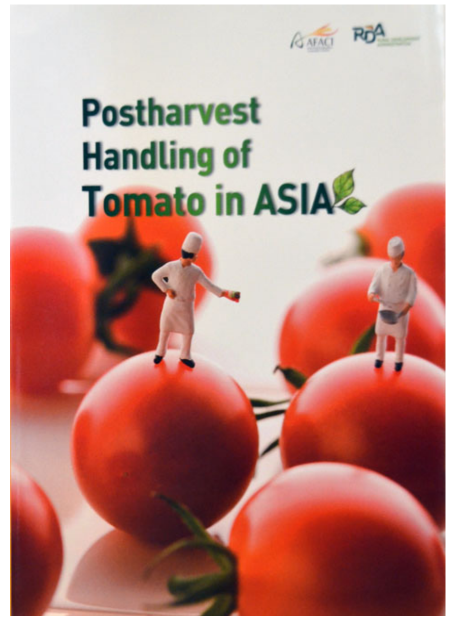
Minimizing losses through effective postharvest handling

BY ANNE CAMILE B. BRION

decade, detection of food-borne illness associated with fresh fruits and vegetables has increased. Issues on microbiological and chemical hazards became utmost concerns. Therefore, postharvest technologies have been developed to address the broader subject of prolonging shelf-life, food quality, food safety, and food security," she stated. To deal with postharvest handling issues, the project recognizes the significance of developing a model manual that provides adequate information on proper and appropriate postharvest technologies and handling practices for horticultural crops.

In its three years of implementation, the project was able to produce and publish two manuals on postharvest handling of three important horticultural crops in the country – tomato, cabbage, and chili pepper. The publications provide practical guides and procedures that aim to prevent losses in such crops especially during the postharvest stages. For instance, the use of harvesting gloves and a pair of pruning shear is recommended to protect tomatoes during harvest. A harvesting aid also proves to be a better option than plastic sacks. In the case of cabbage, individual wrapping in a paper or newspaper before packing in polyethylene bags after harvest resulted in loss reduction and prolonged storage life. With the introduction of more effective ways to handle crops, an average loss of 16. 2 percent was computed for tomatoes as compared to the 21.25 percent loss using conventional strategies. On the other hand, an average loss of 30 percent was





registered for cabbage as opposed to the 38 percent loss from commonly used technologies.

As of now, a manual is being developed that deals with postharvest handling of high value crops such as banana, mango, and strawberry. Since the AFACI project is being implemented in other member-countries including Bangladesh, Cambodia, Indonesia, Lao PDR, Mongolia, Nepal, Sri Lanka, Thailand, Vietnam, and Korea, the establishment of a network is an important component to address issues on postharvest management through information exchange on the best practices and technologies of horticultural crops grown in Asia.

This project was recognized as "Most Outstanding" among member-countries in 2014. Dr. Nuevo was joined by Dr. Matilde V. Maunahan in the conduct of this AFACI project. ###

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Developing locally appropriate GAP

BY PATRICK RAYMUND A. LESACA

Good Agricultural Practices (GAPs) are sets of methods necessary for the production of safe, wholesome fruits and vegetables. It serves as guide in implementing best management practices to address food safety. Farmers and manufacturers are urged to take a proactive role in minimizing food safety hazards that are potentially associated with safety of fresh produce.

In the Philippine setting, the Department of Agriculture-Bureau of Agriculture and Fisheries Standards (DA-BAFS) is mandated under Republic Act 8435 or the Agriculture and Fisheries Modernization Act (AFMA) to formulate and enforce standards of quality in the processing, preserving, packaging, labeling, importing, exporting, distributing, and advertising of agriculture and fishery products. BAFS is also mandated to conduct research on product standardization, and align local standards with international standards.

In adherence to the law, the DA issued Administrative Order No.10 s. 2013, which provided the legal basis for the implementation of the Philippine Good Agricultural Practices (PhilGAP). The program is a concerted effort among agencies within the department with specific activities focused on the development of food safety standards and implementation mechanisms.

GAP is a pro-active measure that has been identified to address food safety issues at the farm level. It involves the application of all available knowledge to produce safe and healthy food and non-food agricultural products in a sustainable and humane manner while achieving economic viability and social stability. The practices are directed towards preventing chemical, biological, and/or physical contaminants from entering the food chain from production, harvesting to postharvest and handling. The concept also serves as a reference tool for deciding, each step in the production process, on practices and/or outcomes that are environmentally-sustainable and socially-acceptable.

To strengthen standardization process and to be at par with ASEAN agricultural practices, the Bureau of Agricultural Research (BAR), as the country's lead agency on Organic Agriculture R&D program, collaborated with the BAFS in supporting the project "Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System". Funded under the Asian Food and Agriculture

Cooperation Initiative (AFACI), the project aimed to: 1) assess a study that provides the general status and progress of implementation of the national GAP program including its elements such as standards, inspection, certification and information dissemination; 2) come up with a report of the field validation showing the effects of the current farmers practices to the microbial and chemical quality of agricultural commodities; and 3) develop farmer-group specific GAP manuals, training modules and other related documentations for specific major crops of the chosen pilot demonstration area based on the studies/surveys conducted.

After three years of implementation, the project proponents were able to assess the implementation of the PhilGAP Program; conduct baseline and impact monitoring survey; and draft the farmer-group specific GAP manuals.

According to Ms. Mary Grace R. Mandigma of BAFS, results of the study contributed greatly to the concepts and strategies that are now regarded as offshoots of the AFACI GAP project, which resulted to the 1) establishment of Regional GAP Teams; 2) production of GAP Manuals and Field Experience on Target Crops, and 3) production of GAP Standard (in original document/English translation).

As a follow through on what had been accomplished, the proponents are recommending to work on the 1) establishing Regional GAP Teams (RGTs) in select regional field offices; 2) finalizing the Philippine National Standard (PNS) Code of Hygienic Practice (COHP) for Taro Leaves; 3) capacity building activities for farmers and agricultural extension workers in support of the adopted PNS; 4) funding of activities related to traceability; and 5) publishing PNS COHP for Taro Leaves. ###

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Building model organic farming village

BY DARYL LOU A. BATTAD

The agriculture sector has long been advocating various community-based strategies in carrying out farming technologies for a wider, large-scale adoption. Research has it that this kind of approach has been found effective especially in reaching out to smallhold farmers. This is exactly the case with the Asian Network for Sustainable Organic Farming Technology (ANSOFT), one of the Asian Food and Agriculture Cooperation Initiative (AFACI) projects implemented in the Philippines.

The project's underlying principle implies that practicing organic farming in a village unit is more effective than individual farmer-based task in building up farming technologies, exchange of information, recycling organic materials, linking animal husbandry and farming, and marketing. Additionally, consequently developing a model organic agricultural village in each AFACI member country such as the Philippines is appropriate to improve its organic agricultural system.

Implemented by the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture through its principal investigator Senior Science Research Specialist Rodelio Carating, this project is the second phase of the "Construction of the Asian Network for Sustainable Organic Farming Technology" that focused on model organic farming village specifically in Catarman, Camiguin Island. Aiming to establish a model organic agricultural village in the Philippines, the project embarked on the compilation of effective organic farming technologies in the country, exchange of information among AFACI member countries on successful cases of model organic cultivation, and development of a model organic agricultural village.

Joining the organic trend

Year after year, people grow more inclined in healthier lifestyle, which ignites a greater interest in organic farming. People start to look for better, healthy options, and this has led to many government and interest groups in the promotion of organic farming. In the Philippines, organic agriculture is quickly gaining ground as more programs are being implemented towards a healthier, sounder people and ecosystems.

In this light, ANSOFT considers that the development and promotion of organic agriculture in Asia is a mission of both government agencies and private institutions. At country level, a networking for sustainable organic farming technology is established among government, non-government organizations, and civil societies pursuing organic agriculture in rural development work to share and exchange farming technology and information.

Building a network of organic practitioners

The Mindanao Network on Sustainable Organic Farming (MINSOFS) was organized as part of ANSOFT. The organization of the network is timely and came at a time when the Philippine Legislature enacted the Republic Act 100681 (otherwise known as the Organic Agriculture Act of 2010), which was directed to ensure prioritization and appropriation of funds to support

programs, projects, and activities for its operation and sustainability.

MINSOFS is a network of networked members, in which some of the members are actually organizations engaged in organic agriculture. MINSOFS represents the link to ANSOFT which targets to pursue and accomplish ANSOFT goals of technology generation and information sharing. A governing council was established since 2011, with current roster members coming from the government, academe, non-government organizations, civil societies, organic agriculture enterprises, and religious organizations.

The ANSOFT networking in the Philippines focuses mainly in the Mindanao region because it has the largest organic agriculture sector in the country.

Shaping the organic 'farmville'

In the middle of the project's three-year implementation for phase 2, results were proficient in the attainment of the ultimate goal: the establishment of an organic farming village in the country. It was able to publish a book which is the proceedings of the Phase 1 workshop with Mindanao organic farming network members that constitute Mindanao Sustainable Organic Farming Technologies.

As of June 2015, a wide range of information on organic practices were made available in the ANSOFT website. These included varietal adaptability trial, use of sea water for corn seed treatment, pelletized local feeds for pigs: my multi-functional machine, vermicomposting, foliar fertilizer from urine and banana sap, application of guso (Sargassum sp) as foliar spray, carbonized rice hull (CRH), fermented fruit juice (FFJ) as foliar spray, indigenous microorganisms, Korean natural farming – the nutritive cycle theory, system of rice intensification, asset base sustainable agriculture program, participatory vegetable breeding and selection, and Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura (MASIPAG) rice production technology.

A model village was established through a member network comprising of subsistence upland and hillyland farmers, the Kalitungan Upland Sustainable Farming and Stewardship Association with about 20 members, which devoted themselves to practice organic agriculture and conscious of maintaining if not improving the ecological functions of the mountain foot slopes they live on. Theirs is located in Catarman, island of Camiguin, which involve crops such as coconut, cassava, banana, kamote, palay, corm, fruits, coffee, and vegetables.

Another accomplishment of the project was its active participation in ANSOFT workshops, one of which was the attendance of BSWM Director Silvino Tejada on the 2014 ANSOFT Expert Workshop held on July 1-5, 2014 in Kathmandu, Nepal. Farmer trainings were also held and completed by the farmer participants that featured topics such as "Small Family Farm Investment for Sustainable Organic Agriculture", and "Livestock and Poultry Production Ecointensification and Ecointensification Integration Investment".

The results so far delivered by the project expressed its objective to enhance and strengthen the institutional capacity of the Philippines to ensure the success of linkaging and establishing not only an organic village in Mindanao, but to the entire country, realizing farmers resorting to organic farming.

As for ANSOFT, a conceptualization of the possibility of other MINSOFS members to host future activities in promoting organic agriculture is continuously being looked into. It is also organizing the Mindanao Young Sustainable Organic Agriculture Action Network (MYSOAAN) as an outcome of MINSOFS under phase 1, involving 14 on-the-job training students. Through the expansion of the network joining the organic agriculture bandwagon, it is not a distant reality that we get to see the Philippines a certified organic agriculture country.

The project bagged the "Outstanding" project announced during the AFACI Annual Evaluation Meeting held on 4-5 June 2015 in Clark, Pampanga. ###

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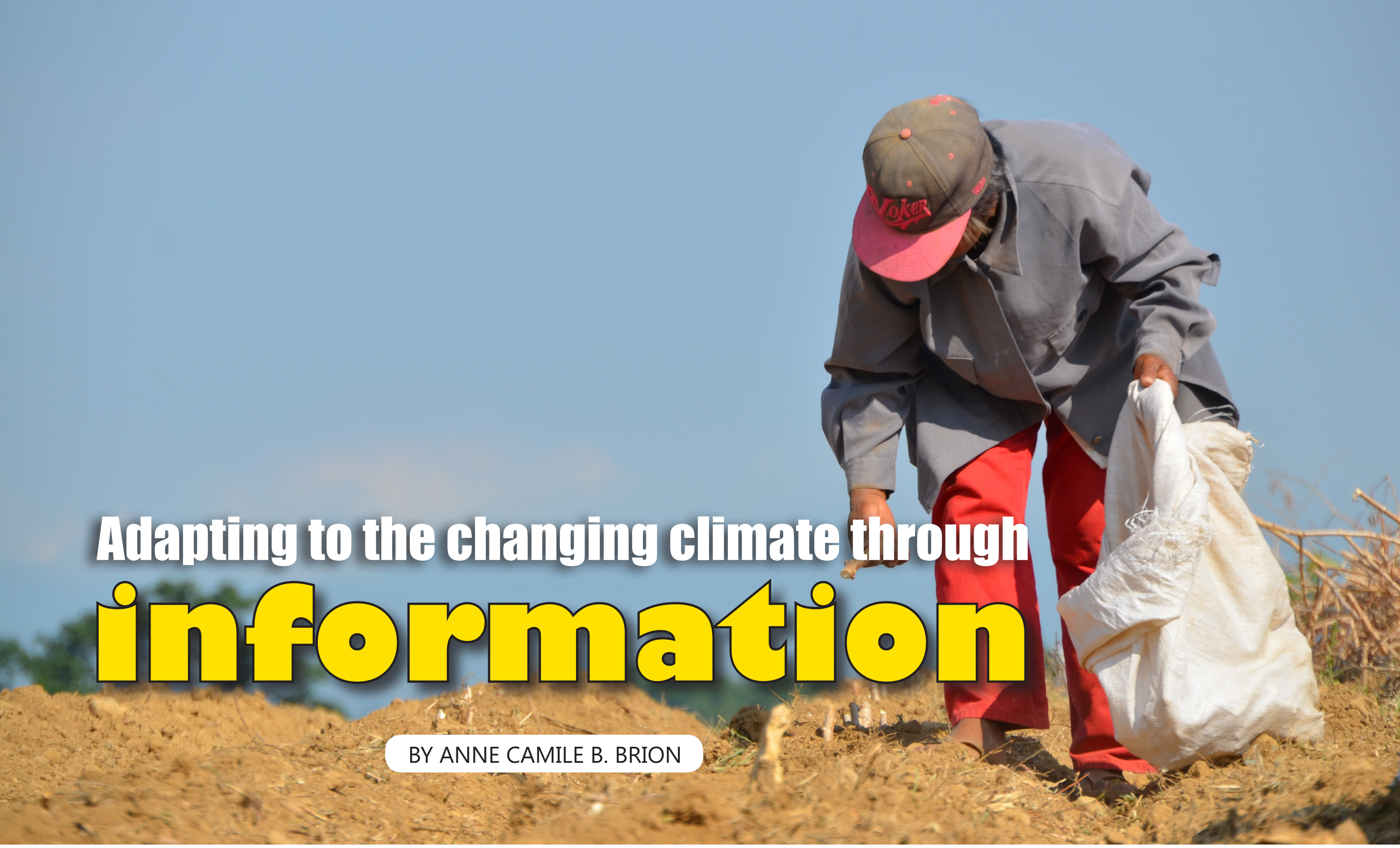

Adapting to the changing climate through information

BY ANNE CAMILE B. BRION

Agriculture is one of the most vulnerable sectors to climate change as it relies heavily on climate-sensitive activities. Crop productivity, livestock and poultry health, and fisheries capture are all affected by extreme and erratic weather patterns caused by the changing climate. The occurrence of this phenomenon is believed to be affecting not only food production, but all the four dimensions of food security – availability, access, stability, and utilization (Hiepe, 2009).

While the incidence of climate change cannot be prevented as it already exists, adaptation and mitigation strategies are becoming of utmost importance in overcoming its detrimental effects. Utilizing agro-meteorological information is seen as an adaptive strategy that can surmount the challenges brought about by climate change.

Establishment of agromet stations and AWS

In 2012, the Asian Food and Agriculture Cooperation Initiative (AFACI) supported a project titled, "Production and Services of Agro-meteorological Information for the Adaptation to Climate Change in the Philippines". It was implemented by the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture (DA) in conjunction to the Philippine Council for Agriculture and Fisheries (PCAF)-PL480 assisted project which the BSWM is also implementing titled, "Establishment of Agro-Meteorological Stations in Highly Vulnerable Agriculture Areas: A Tool for Climate Change Adaptation and for the Development of Local Early Warning Systems".

The projects paved the way for the installation of 100 agromet stations comprising Automated Weather Stations (AWS) and standard rain gauges. AWS, basic component of an agromet station, are accurate and dependable equipment that generate and analyze real-time data on weather parameters including rainfall amount and intensity, temperature, wind speed and direction, relative humidity, air pressure, solar radiation, sunshine duration, soil temperature, and soil moisture. Such AWS were strategically positioned across all regions and were validated by BSWM in cooperation with the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA). Obtained data are being collected and recorded every 15 minutes and sent through mobile phones to the central server. After which, the data can be viewed and monitored by accessing www.agromet.da.gov.ph. For each AWS, relevant data analysis varies for each parameter.

Utilizing data from AWS

Generated data and analyzed information from the AWS cater to the specific needs of the agriculture sector's clienteles and stakeholders. In the case of farmers, the data provide them with forecasting tools that help them in making informed decisions regarding their farming activities and even solve related field operation problems. For instance, potential changes in rainfall patterns can prompt the farmers to make a shift in their cropping calendar. Extreme or unusual weather conditions may also cause probable incidence of pests and diseases. With weather data on hand, farmers may think ahead of ways and means to prevent or control the occurrence of such weather-related pests and diseases. In one of the trainings conducted in view of the project, it was reported that data on wind direction is essential in predicting the spread of cocolisap. Likewise, recorded data can also be of use as immediate reference during construction activities of irrigation facilities and other farm-related infrastructures; as well as provide valuable information in cloud seeding operations.

The usefulness of these data also found its way in disaster risk reduction management. Short duration yet very intense rainfall observed from AWS which are located upstream of flood-prone areas can indicate potential flooding downstream. Hence, AWS data can aid in the development of threshold values in relation to rainfall and water level of creeks or rivers that can cause flooding in a community. Apart from these, data on temperature was also observed to have a correlation to mosquito reproduction that can help in the conduct of researches on dengue.

In 2014, a specialized training on "Crop Simulation Modeling and Application in Land Resources Management: A Training Program on a Decision-Support System for Agro-Technology Transfer (DSSAT)" was conducted for technical partners in DA-Regional Field Offices (RFOs). In view of the training, an on-farm experiment for rice production was conducted using different varieties for two cropping seasons. The genetic coefficients of selected rice cultivars, yield gap analysis, and relationship between yield and the timing of planting were identified. Using the DSSAT software, the experiment aimed to predict the impact of climate change to rice yield given the varying climate scenarios.

Catering to the stakeholders

With these potentials, information on the services of the agromet data are being intensively disseminated to target clienteles, users, and partner institutions using all forms of media. These include project briefing and orientation, and provision of training to partners in the regions and local government units (LGUs) on the use and benefits of the weather data and information. In addition, capacity-building activities were conducted such as hands-on training on the operation, care, and maintenance of AWS for the assigned observers, and training for farmers through the conduct of an Enhanced Farmers' Field School (EnFFS) wherein they are trained to analyze the relationship of weather condition to their crops, soils, and the environment.

The development and reproduction of information, education, and communication (IEC) materials also form part of the project's activities. Farmers and other interested individuals can access the daily weather data in their respective municipalities through the printed materials posted on their bulletin boards. A Facilitators Manual was also developed and was provided to LGU agricultural technicians, facilitators, and partner institutions such as the Agricultural Training Institute (ATI) for their use as well. Ultimately, the project seeks to reduce the agriculture sector's vulnerability to climate change. In achieving this, farmers and the communities must be equipped with knowledge on appropriate technologies that they can use to adapt to and mitigate the impacts of climate change. ###

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(AMIVS) platform – a system developed for the management of migrating RPH and associated rice viruses where outbreaks of RPH and associated viruses, detected in-country or inter-country, will serve as the strategic basis for reducing RPH populations below threshold levels; 2) practical tools for field identification of RPH and rice viruses; 3) determination of regional RPH population characteristics and recommendations on forecasting and identifying appropriate management strategies; and 4) identification of the prevalent insect pests and viruses of vegetable crops of each collaborating country.

Pest and disease monitoring of local crops

The country's project under this international undertaking, titled, "Assessment of Rice Planthoppers Populations and Viruses in the Philippines", is being conducted by the Philippine Rice Research Institute (PhilRice) in partnership with the Rural Development Authority (RDA) of the NAAS of Korea and is led by Mr. Genaro S. Rillon of PhilRice's Crop Protection Division.

With the goal of reducing losses of rice crops from RPH outbreaks, it is oriented towards the development of efficient management strategies for impending RPH surges and their associated damages. The project's objectives were to: 1) monitor RPH populations and associated viruses in the Philippines; 2) assess the damage to rice crops caused by RPH; and 3) determine the factors that enhance RPH outbreaks and rice virus epidemics.

Weekly monitoring of RPH was done at PhilRice Central Experiment Station (CES) in Muñoz, Nueva Ecija from January 2014 to April 2015 using light traps. In 2015, the data showed that highest numbers of brown plant hopper (BPH) and white plant hopper (WBPH) were from March to April. These patterns indicate that RPH population peaks towards the rice crop's end or as the crop nears maturity in the dry and wet seasons. With sticky traps, monitoring of RPH was conducted in two field sites: PhilRice CES and Sto. Domingo, Nueva Ecija during the dry and wet seasons of 2014 until the dry season of 2015. High populations of RPH were noted to coincide with the reproductive to ripening stages of rice plants as the insects are able to get more nutrition at these times. In the wet season, the insects were noted to attack earlier, with WBPH appearing ahead of BPH.

As to the damage assessment, while no evidence of virus diseases were seen in the selected sites, patches of hopperburn due to BPH and WBPH feeding in 2014-2015 with 10-50 percent damage were noted in nearby areas planted to inbred and hybrid rice in April to March.

After rice, pest monitoring in Solanaceous crops, particularly tomato and hot pepper, were assessed from January to March 2015. For tomato, the insect pests observed were leafminers, leaf-feeding ladybird beetles, tomato fruitworms, cutworms and other lepidopteran defoliators. Disease damage on tomato leaves was in the form of sunken irregular brown spots and mosaic patterns coupled with the curling of young leaves and shoots. Blossom end rot was also observed that rendered the fruits non-marketable. For hot pepper, mites, whiteflies and fruitworms were noted. Powdery mildew disease was seen on the leaves of hot pepper. Sunscald was also observed as damage due to exposure of the fruits

In 2015, the data showed that highest numbers of brown plant hopper (BPH) and white plant hopper (WBPH) were from March to April. These patterns indicate that RPH population peaks towards the rice crop's end or as the crop nears maturity in the dry and wet seasons.

to direct sunlight.

While observed hopperburn incidences in the country were not of outbreak proportions, their regular appearance in rice fields warrants continued monitoring for BPH and associated damage to prevent possible outbreaks and yield losses. The Philippines continues to cooperate in this AFACI effort.

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With right farming technologies, significant positive changes can happen not only to the income of farmers but to the community as a whole. This was the case of a Community-based Participatory Action Research (CPAR) project being implemented in Batanes. The project is funded by the Bureau of Agricultural Research (BAR) and is being implemented by the Provincial Local Government Unit (PLGU) of Batanes. The island province is located on the northernmost part of the country and characterized by its geographical isolation, unique topography and the unpredictability of weather conditions. *(Photo by Diana Rose de Leon)*

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