Young vegetable farmers in La Trinidad, Benguet are up before sunrise to harvest the season's mature produce. These farm products are brought to the markets in Baguio City, nearby towns and provinces, and even as far as Metro Manila.

PHOTO: DON LEJANO

BAR Research and Development DIGEST

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Diliman, Quezon City 1104

Entered as Second Class Mail at Quezon City Central Post Office Permit No. 752-01 NCR subject to Postal Inspection

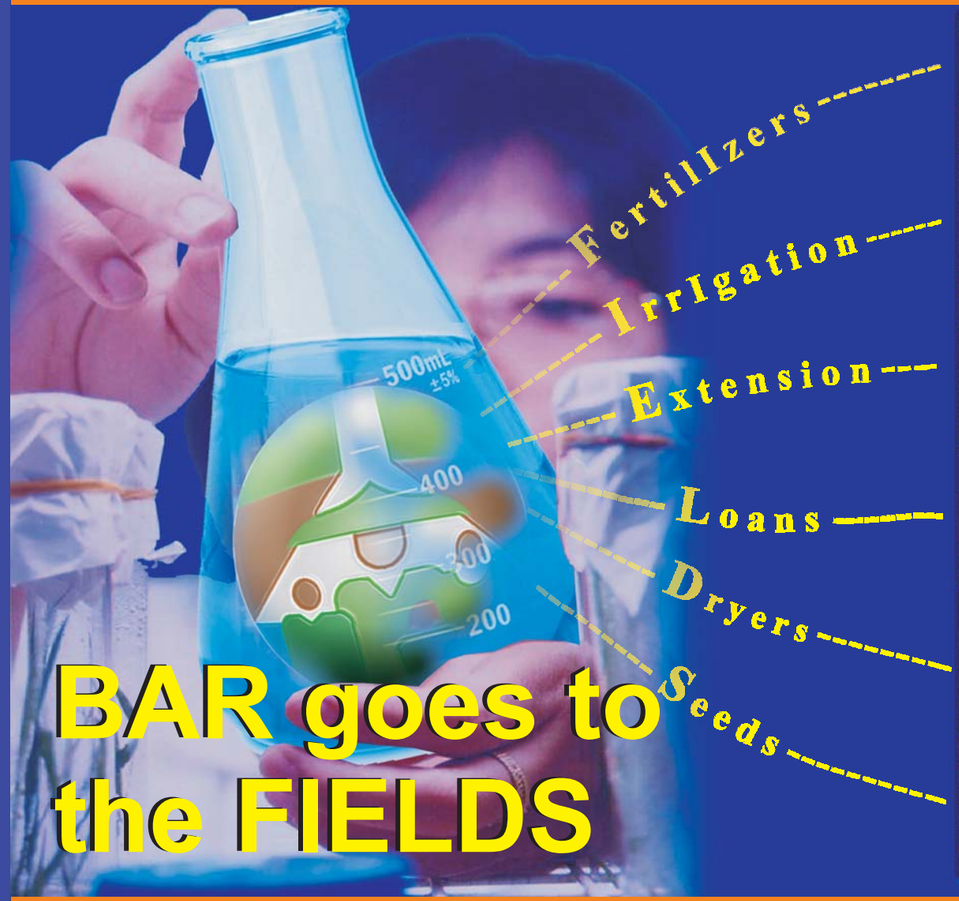
ISSN 1655-3934

BAR Research and Development DIGEST

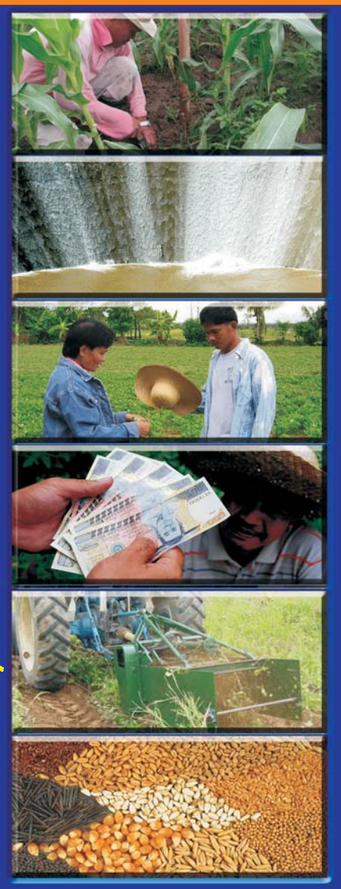
Official quarterly publication of the Bureau of Agricultural Research

BINHI AWARDEE (2007)
Agricultural Magazine of the Year
FLORENDO AWARDEE (2004)
Outstanding Information Tool for Print

Volume 11 Issue No. 1 | visit us at: *http://www.bar.gov.ph* | January - March 2009



BAR goes to the FIELDS



INSIDE...

BAR responds to DA's F.I.E.L.D.S. Program

BY **NICOMEDES P. ELEAZAR,** *CESO IV*

Barely a year ago, President Gloria Macapagal-Arroyo announced her administration's new food production drive for the agriculture sector. Clustered into six assistance packages, FIELDS program was introduced to the public with each letter standing for **F**ertilizer, **I**rrigation, **E**xtension, **L**oans, **D**ryers, and **S**eeds. The six components, according to President Arroyo, are the essential ingredients in making food abundant, accessible, and affordable in the country.

From the President's P43.7 B budget for the FIELDS program, P5 billion has been allocated for the continuous training of farmers on new technologies and research and development (R&D) to increase yields and lower production costs. This includes a budget earmarked for R&D, and a portion each for capacity building programs, trainers' training, and the agriculture and fisheries education system.

Given such policy direction, BAR has refocused and aligned its RDE initiatives giving significant emphasis on this strategic support system to realize the goals of agribusiness development. In doing so, BAR strengthened its involvement at the grassroots' level by bringing significant research results out of the shelves and into the farmers' field.

BAR responds with the implementation of its two strategic banner programs, namely: Community-based Participatory Action Research Program (CPAR) and National Technology Commercialization Program (NTCP). Vital to these efforts is the emphasis placed on processes over and above goal achievement.

To address the major changes in global realities, RDE areas such as alternative sources of energy, biotechnology, organic agriculture, promoting nutrition through indigenous vegetable production were given high priority to address rural poverty and food inadequacy.

With the aim of achieving productivity growth, BAR implemented various programs and projects aimed at increasing agricultural production. These include, aside from varietal and cultural practices improvements, projects that support productivity enhancement from production to postproduction stage.

BAR's response to the FIELDS program is best reflected in the first quarter issue of the BAR R&D Digest giving emphasis on the important role of research in each component of FIELDS (with the exception of the L-component which covers agricultural credit and loan programs and services).

For the F-component, we are featuring three BAR-supported R&D programs on Site Specific Nutrition Management (SSNM), vermicomposting, and a bio-organic fertilizer from sweet sorghum residue developed by our regional partners.

The I-component highlights two community-driven initiatives on the successful *Dampalit* Watershed project of the Makiling Center for Mountain Ecosystems (MCME) of UPLB and BSWM's project on community-based watershed management to improve livelihood opportunities in selected areas in the Philippines.

For the E-component which includes extension, education and training, BAR features four major ICT initiatives: e-Learning and the CPAR *e-Pinoy* FARMS M&E system which is now operational in the regions. Other BAR-supported initiatives are on the cyber village to enhance rice productivity with IRRI and extension strategies on the dissemination of milkfish technology with World Fish Center.

We are also featuring two postharvest facilities: non-refrigeration technology and sweet potato harvester as contribution to the D-component of FIELDS.

Lastly, for the S-component, we are showcasing new and improved varieties on *ubi*, banana, and hybrid squash.

We, the key players of the R&D community, would like to do so much to bring great impact to our people. By strengthening our partnerships with other R&D institutions and stakeholders in the agriculture and fisheries sector, we are in a way increasing and opening greater opportunities that they provide and channel resources. The exposure and experience at this level of collaboration have intangible but valuable advantages for all of us.

On our end at BAR, such initiatives should be premised on meeting the objectives of sustained employment and income generation for the small producers and transforming them into a modern-technology and science-based and information-sensitive entrepreneur.

BAR Research and Development DIGEST
The official quarterly publication of DA-BAR
Volume 11 Issue No. 1 January - March 2009
Website: http://www.bar.gov.ph

BAR R&D Digest is published by the Bureau of Agricultural Research (BAR), a staff bureau of the Department of Agriculture (DA) mandated to ensure that all agricultural research is coordinated and undertaken for maximum utility to agriculture. This quarterly publication contains articles that are based on studies conducted by NaRDSAF-member institutions.

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VIOLET SWEETNESS:
Ubi's full potentials uncovered

BY **DONDON CARLO P. LEJANO**

PHOTOS: RDELACRUZ

In the provinces, ubi or purple yam is consumed as boiled root crop and as an ingredient to local dishes and sweets. Today, this root crop is also gaining popularity as flavoring and ingredient to a wide array of food products from ice cream to cakes to candies to wines, etc.

Ubi is considered as minor commodity in the Philippines though, its commercial potential recognized. Ubi has many uses and can be utilized as both fresh tubers and processed products. It is an essential carbohydrate food with starch as its main component. It also contains sucrose and glucose which provide its sweet flavor.

Aside from the starch and sugar contents of ubi, which makes it perfect for baking and confectionary preparations, it also has the essential proteins, phosphorus, crude fiber, ash and vitamins B1, B2, E and also moisture and energy. Health-wise, these components make ubi comparable to other viable root crops such as cassava and sweet potato. It also makes a good alternative for rice, corn and legumes.

In the Philippines, Bohol is the leader among provinces in terms of ubi production. The older Boholanos consider ubi as their sacred food since according to them, it sustained them during times of long drought and saved them from hunger. Ubi is now widely marketed in powdered form and as puree and has an increasing demand in countries like Australia, Canada, Taiwan, Japan and the US.

Tagged as one of the country's five major root crops for export, it is but right for ubi to receive its due attention in terms of its production and marketing. Although Bohol is the largest ubi producer in terms of hectarage, there are reports of the decline in production and export. Problems and constraints that beset production hinder ubi from reaching its full potential as a major high-value crop.

Enhancement of *ubi* R&D through BAR support

The Bureau of Agricultural Research (BAR) provided financial support for the Ubi Agribusiness Development Project of the Department of Agriculture RFU 7 - Central Visayas Integrated Agricultural Research Center (CENVIARC). This project is aimed at increasing the volume of ubi production and enhancing the development of the ubi production industry in Bohol with new production standards.

Three varieties of ubi grown in Bohol were covered in this study kinampay, baligonhon, and VU-2.

In the course of project implementation, various agribusiness components of management such as planning, production, post-harvest and marketing were undertaken. With considerations for ubi as an economically feasible commodity for agribusiness venture, fifty farmer-partners from the municipalities of Guindulman and Dauis were identified as recipients of technical and financial assistance for ubi production. Farmers training, procurement of farm inputs, farm establishment, monitoring and evaluation and field days were then conducted.

Market systems were designed to increase the absorption of ubi products in the market. These market systems minimized the involvement of middlemen and facilitated direct marketing of ubi from the farmers to the direct buyers. This was done through linkaging with target markets and participation in agro-fairs and the ubi festival celebration.

The 50 farmer-partners who were chosen to participate in the project used a new and improved package of technology on ubi. Two methods were used in land preparation the ridge method and the hill method. The project also dealt with the preparation of planting materials or ubi-setts, planting, fertilizer application, mulching, weeding, pest and disease control, harvesting, and storage. The yield, income and cost of production were used as parameters in the study.

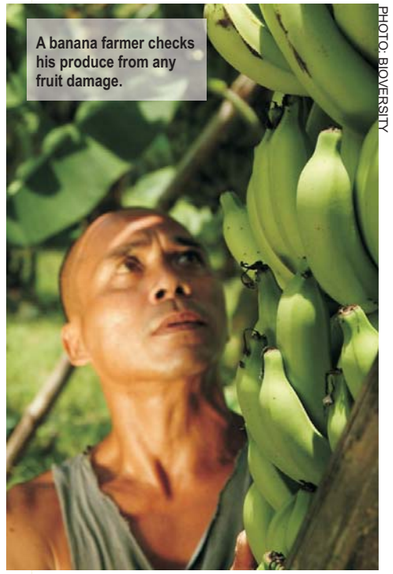
Improved *ubi* prospects

With favorable results attained, the implementation of this Agribusiness Development Project was turned over to the farmer's association in the towns of Guindulman and Dauis in Bohol. Repayment received for planting materials, fertilizers and other inputs was turned over to the farmer's organization which is now managing the roll over scheme.

As of today, the farmers are enjoying increased farm income because of the improved production efficiency. They were able to reduce the farm post-harvest losses. The share of the farmers in the final market price was increased because of the direct marketing system. While the farmers enjoy bigger earnings, the consumers take pleasure in what have become everybody's favorite ubi products. It can be said that ubi powder, fried ubi chips, yam spread, ubi jam, ubi *pastillas*, and other ubi products have brought contentment to the producers, processors and consumers of ubi.

The future brightens for RP bananas

BY **DONDON CARLO P. LEJANO**



A banana farmer checks his produce from any fruit damage.

PHOTO: BIOVERSITY

As the country's leading export fruit crop generating an average of $400 million in annual export revenues, bananas have made the Philippines the second largest banana exporter in the world. The Philippines belongs to the region considered the "origin" of the banana plant, hence, bananas thrive very well in the country's warm and humid climate. *Lakatan* is the variety most widely grown by small-hold banana growers in Northern Luzon, along with *Saba*, *Latundan*, and *Bungulan*. Cavendish is the export variety grown by commercial banana plantations in Southern Philippines, particularly in Davao.

Banana's different uses

Banana is not far from coconut as the tree of life owing to its many uses. Aside from being eaten fresh, the ripe fruit can also be processed into jam, candies, and purees. On the other hand, the unripe bananas may be processed into starch and chips. Banana extracts can also be processed into wine, catsup and vinegar.

In some areas, especially in the provinces, the banana leaves are believed to be medicinal and can heal open-skin wounds faster. Aside from being used as packing materials in markets and other areas of trade, the banana leaves are also used for cooking purposes. The same thing goes with the banana blossom, which is an important ingredient in some special Filipino dishes. When dried banana blossoms have an export market.

Like abaca, the banana fiber can be made into ropes, sacks and mats. The banana peel is also being utilized as a material for making paper and paper boards.

Problems encountered in growing bananas

But things are not always smooth-sailing for the banana industry. Threats of disease and pest infestation are major concerns in production, especially to small-hold banana growers who do not have the financial and technical capabilities to deal with these diseases.

The common banana diseases encountered in the country include:

Banana bunchy top disease. This is caused by a virus and is spread through a vector – aphids. It is characterized by the narrowing of the leaf and reduction in surface area. It causes the banana to have a stunted growth and distorted bunch stalks. The fruits tend to be small.

Bugtok. Reddish brown vascular discoloration that extends upwards from the male flower is one symptom of *bugtok*. *Bugtok* is caused by bacteria and is transmitted by sucking insects and by the use of materials contaminated with the bacterium. Dry or gelatinous grayish black or yellowish red tissues may be present in the fruit which can extend to the entire pulp. The plant does not die and may appear normal.

Fusarium wilt.This is caused by a fungus. It causes chlorosis that starts from the leaves. Dark brown discoloration is visible on the vascular tissues which can be seen in cross sections of pseudostem. In its later stage, the plant will have thin pseudostems, small bunches and poorly filled fingers with atypical yellowing and wilting of the leaves. Dead leaves can be seen surrounding the base like a skirt. The plant dies a few months after infection.

Aside from these diseases, bananas are also susceptible to insect pests like the banana brown aphid, mealybugs, thrips, and corm weevil. Containing these problems is crucial to protect livelihoods of small-holders and in the process, protect the supply of bananas to lucrative local and international markets.

R&D support to banana industry

Noting the possible risks that the banana industry is facing, the Bureau of Agricultural Research (BAR), being the lead agency for research and development (R&D) in agriculture, is giving full support in the development of measures to protect what is considered as the country's top foreign exchange-earning fruit. This is in line with BAR's endeavors to build a strong, relevant, and responsive R&D foundation in the country.

Through a BAR funded project, Bioversity International and the Institute of Plant Breeding-University of the Philippines Los Baños (IPB-UPLB) established the National Repository, Multiplication and Distribution Centre (NRMDC) in the country. The NRMDC's serve as the national bank for conservation of introduced local varieties under *in-vitro*, screenhouse, or field conditions; multiplication and distribution of germplasm to interested parties; and evaluation and promotion of *Musa* germplasm, especially newly-introduced accessions and *in vitro* propagated planting materials.

There are two NRMDCs in the country: one is located in IPB-UPLB, the other at the Bureau of Plant Industry in Davao.

continue to p. 4

A banana enthusiast reads the Bioversity-BAR "Farmers' Handbook"

PHOTO: RDELACRUZ

BAR goes to the F.I.E.L.D.S.

BY **MANUEL F. BONIFACIO, PhD**

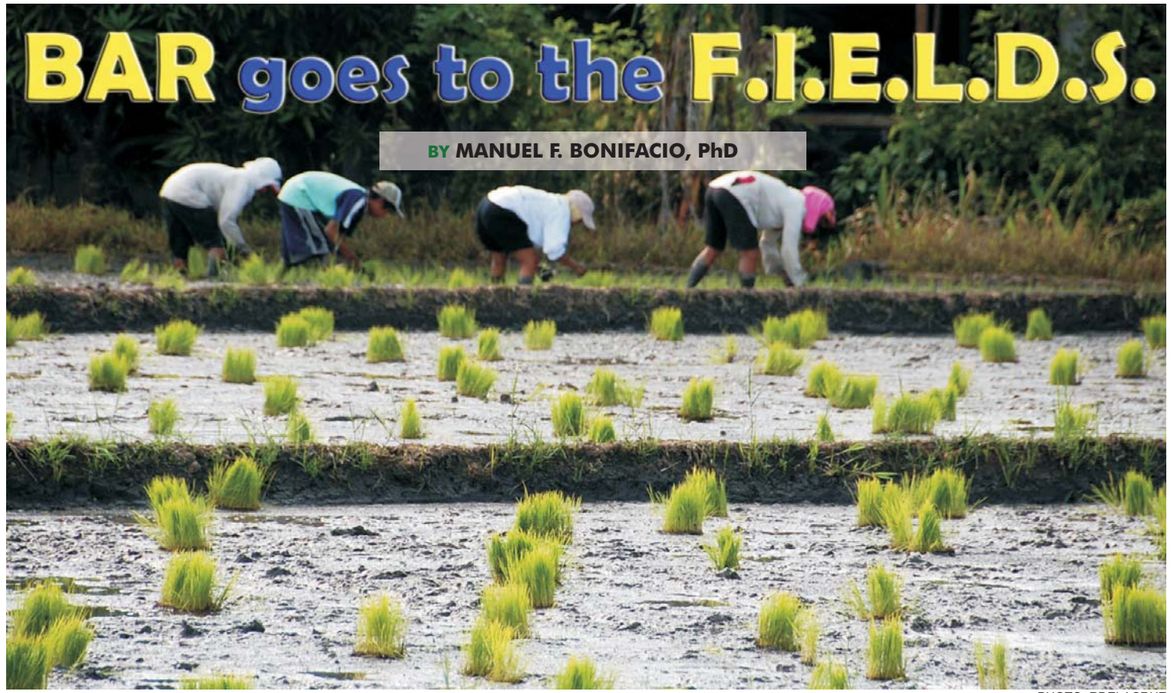


PHOTO: RDELACRUZ

In response to DA's commitment to improve the country's food production and the living conditions of farmers and their families, the DA through the pronouncement of Secretary Yap is instituting innovative support systems in agriculture that calls for the implementation of FIELDS. These involve **F**ertilizer, **I**rrigation, **E**xtension and Education, **L**oans, **D**ryers and **S**eeds. Without any doubt, the identified components of support system are vital and will remain critical in fast tracking the movement of agriculture into the much broader horizon of the agricultural landscape - global competitiveness.

The challenge facing us today is not to take these elements and treat them individually. This was the essence of agricultural methodology of action before which in the long run resulted to limited impact. A number of evaluations of agricultural services have revealed that its operations are fragmented and not cost-effective. In response to this situation, memos of agreement have been signed through the years purportedly intended to facilitate, support and put into operation -- inter-agency networking, linkages and complementation. The essence of the agreement, however, was never put into practice after such ceremonies.

In an attempt to overcome this counterproductive situation of agricultural development, BAR, as the main agency of DA responsible to research and development took a bold move to institute an inter-related banner programs on Community-based Participatory Action Program (CPAR) and Technology Commercialization (TECHCOM). These two programs were designed to realize the goal of MTPDP focused on agribusiness development. BAR is cognizant of the pronouncement of Secretary Yap that agriculture is business and farmers must be information-sensitive.

Conscious of its responsibilities to generate the right information at the right time, BAR took a forward looking move by heeding the AFMA recommendation on the adoption of a framework focused on resource management. It has recognized the role to be played by management in the new management of production. The role of information in the decision making of farmers was given major attention by BAR.

It is in this connection that BAR likewise took a critical perspective by adopting an analytic stance in relation to the conceptual approaches to agriculture. This is best illustrated in its critique of the goal of MTPDP. It fully agreed with the plan that the goal of agriculture is agribusiness development and this is reflected in the idea that agriculture is business.

Given BAR's critical perspective, however, it showed that there are three major processes that must be instituted before the requirements of agribusiness are met. Using the resource management framework, it put into operation the total trajectory of agribusiness development in terms of stages, namely: stage I – Income generating activities; stage II – enterprise development; stage III – integration of enterprises; and stage iv – agribusiness development.

It therefore, *reframed* its research and development on the basis of critical processes vital to the goals of making agriculture business. Indeed, BAR is proud to be playing its part in instituting an information-driven agriculture.

A careful exegesis on the outputs of the researches reported in this Digest will readily reveal the range of issues that must be given attention in realizing the goals of agribusiness development. The research and development agenda of BAR is centrality focused the vital role of technology in agribusiness development. It developed an approach that made technology transfer and commercialization complementary and in fact, inter-connected.

While BAR is fully aware of the importance of technology as a key driver in development, it avoided the mistake committed before; it did not take technology to stand alone – meaning, technology-driven

agriculture. The research reports in this Digest demonstrated the importance of connecting the means (technology) and relations (management) of production into a singular process. The two are interactive and complementary. There is a good sample of technology transfer and commercialization in the research reports.

In order to insure the operational connection of the two, the community-based resource management framework is reflected in the all the reports. A major focus is given to participation, organization and decision making of farmers. The real essence of empowerment was shown in various modes of organizing for the new management of production. As reflected in the various reports, farmers have become cognizant of the value of organizing for action and its power is enhanced with the adoption of the right technology at the right time. The interaction of technology transfer and farmers' organization is very evident in all the research reports.

The research reports must also be credited in giving attention to the participation of the private sector and most especially that of the local government. Indeed, we now have strong evidence of the encouraging support extended to agriculture by the local government. By using its political authority for the larger good, instituting equity and social justice especially for the marginalized farmers is now being realized. We are pleased to be a part of institutionalizing social justice to raise the welfare, especially, of these farmers. As

PHOTO: JLAPITAN

PHOTO: RBERNARDO

shown in all the reports in this Digest, the two banner programs of BAR, by their nature, reflect the design of interventions that will uplift the status of these farmers and open them to opportunities to be part of the mainstream for agribusiness development.

BAR can confidently claim that all the researches reported in this Digest have given the much needed focus on the various elements of F I E L D S. Yet, all are fully cognizant of the need to locate these elements within the framework of resource management. The research reports have initiated the institutionalization of technology-driven innovative support system for agribusiness development in the context of resource management. It is with an optimistic note that more studies responsive to the changing landscape of agriculture – especially in mainstreaming the marginalized sector of the rural community will be undertaken.

The furture... *from page 30*

The farmers' handbook

Through DA-BAR's Scientific Publication Grants, Bioversity International published a Farmer's Handbook on Introduced and Local Banana Cultivars in the Philippines. The handbook aims to provide researchers, technicians and farmers information on the morphological and agronomic traits, fruit characteristics and reactions to common diseases of banana. Presented in the handbook are the 21 introduced and 8 local cultivars based on field trials performed through the efforts of the DA-BAR, Bioversity, and the NRMDC.

Most of the introduced banana cultivars are considered table and dessert-type bananas like the FHIA-01 variety which has an apple-like flavor and the FHIA-18 which has a sweet and acidic taste. Aside from being consumed as a fresh-fruit dessert, other introduced cultivars are also suitable for cooking and processing. FHIA-02, FHIA-17 and Cachaco varieties may be cooked and boiled while FHIA-21 and FHIA-23 may be processed to become banana chips for export. Meanwhile, *Tall Williams Cavendish* is a table-type variety with excellent flavor making it highly preferred in the international market. *TMBx 1378* is one cultivar which is best suited for brewing.

On the other hand, local cultivars like the *Buñgulan* and *Lakatan* are said to have very high Vitamin A content. *Latundan*, which is common in the market, is favored to be fed to children because of its easy digestibility. The *Cuarenta Dias* is a table-type variety popular for its sweetness though it sells cheaper compared with other common table-type cultivars. Other common local cultivars like *Saba* and *Cardaba* are popularly cooked as *turon,* which, aside from being a favorite snack for Filipinos, is also a source of income for small entrepreneurs.

With the circulation of this handbook, researchers have now a useful guide in the selection and identification of cultivars for further studies. Likewise, banana growers can be properly guided in their planting activities. With this information, interventions for the growth and sustainability of the banana industry can be pursued with more vigor in the coming years.

For more information on the introduced and local banana cultivars as well as their other potential uses, you may contact Bioversity International at 845-0563 and 812-7686.

resource/capital to support input costs; 4) absence of a community-based organization to channel individual acts into collective action and assistance to help community members; and 5) lack of mechanism to harness the development support of local and provincial government units.

High potential for hybrid seed production

Responding to those concerns, FCDF collaborated with the East-West Seed Company (EWSC), a Philippine-based producer of vegetable seeds for domestic and foreign markets, and assessed the suitability of Sto. Niño for hybrid seed production of squash.

The project started with 10 farmer-cooperators who were provided with breeder seeds of selected parents for planting simultaneously with the technology for subsequent crossing to produce the hybrid squash seeds. Providing loans in kind plus additional labor support for pollination work is one of the components of the project to ensure that the necessary production inputs such as fertilizers, and pesticides are actually applied.

Due to the favorable weather condition and suitable type of soil, the results confirmed the economic advantage of squash hybrid seed production, compared with the predominant corn crop raised in the area, generating a net income of PhP 50,000.00 to PhP 70,000.00 per hectare in a period of four months. Farmer-cooperators successfully harvested 150-200 kg per hectare of hybrid squash seeds.

The secret lies in the seed itself

What is good about the hybrid varieties of squash is that even small-scale farmers can produce big income from their small farms. More farmers are getting interested in planting hybrid seeds not only because crop yields are high and fetch a good price, but also because they can market the produced hybrid seeds.

As further guarantee, EWSC established a buy-back agreement with farmers through the FCDF. At a guaranteed price of PhP 425.00 per kg, EWSC will buy all the produced squash hybrid seeds that pass their quality seed standard. Moreover, it is encouraging FCDF to increase its target beneficiaries to 200 and design a scheme for the massive commercialization of hybrid squash seed production, extending this to other suitable farming communities to expand the number of farmers who get benefits from the technology.

At present, the project involves 135 small farmers cultivating a total of 46.6 hectares. These farmers are engage in hybrid squash seed production as an integral part of their farming systems during the dry cool months of December to March. They have been enabled to generate more income and improve their living standards.

"Based on the good stand of the present squash crop, the project will not only generate more income for participating farmers; it will also provide job opportunities to many unemployed and underemployed women, thus supporting the Comprehensive Livelihood and Emergency Employment Program (CLEEP)," said Ms. Angelina Batugal, director of research of FCDF.

Squash as a nutritious, indigenous vegetable

Squash, botanically known as *Cucurbita maxima* Duchesne ex Lamk., is commonly cultivated in the country throughout the year. This vegetable is recognized as an important source of vitamins and minerals which can address problems on malnutrition. It is an indigenous vegetable which we should not neglect but wisely utilize. By improving crop species indigenous to us, we will have comparative advantage in producing them, and perhaps, even expand into exports.

Significantly, the initiative on hybrid squash seed production is also in line with DA's program on sustainable nutrition advocacy which promotes the production, marketing and consumption of highly nutritious vegetables.

Further project developments

To give the farmers sufficient understanding on the technology of profitable squash seed production, a series of training activities on squash pollination techniques were conducted between December 2008 and January 2009. Seed production training specialists from EWSC and FCDF served as the resource persons during the trainings.

The project field staff, particularly the technicians, conducted regular visits to farmers' fields. With the end of empowering the farmer-cooperators, they guided the farmers on the proper steps and techniques in squash seed production starting from land preparation, fertilizer application, plant spacing, hilling up, pest control, irrigation, the fruit harvest, seed extraction and drying.

According to Batugal, the project is progressing very well, stressing that establishment of a community-based organization for squash farmers is already in the agenda of FCDF. She also said that a 1.75 hectare demonstration farm was already put up at Brgy. Centro Norte (one of the eight project sites) wherein male and female parent seeds provided by EWSC were planted in November 2008. Hand pollination was done to ensure optimum hybrid seed production. Presently, the pollinated plants have started to bear fruits.

In addition to provision of technical assistance, the development of a squash hybrid seed production techno-guide is being worked out which will include information or step-by-step procedures on squash production from planting to harvesting to secure the quality of produced hybrid seeds.

This article was based on a BAR-funded project titled "Commercializing and Integrating Hybrid Squash Seed Production Technology Into the Cropping Systems of Sto. Niño, Cagayan" being implemented by the Farmers Community Development Foundation International (FCDF).

For more information, please contact Ms. Angelina M. Batugal, director of research of FCDF, Sacay Grand Villa, UPLB, Los Baños, Laguna. You may contact her through tel. no. (049) 536 6210 or send an email to: fcdfinternational@yahoo.com.

PHOTO: FCDC

Increasing farmers' income through hybrid squash seed production

BY CHRISTMAS B. DE GUZMAN

PHOTO: FCDC

"Quality seed is crucial for farm productivity and food security." Dr. Sam Page, senior scientific officer at CABI, once said that "good quality seed is key to achieving food security and, in order to do this, we must focus on the farmers who do not have enough resources to feed their families throughout the year."

The goal of the Department of Agriculture (DA) on the Seeds component of President Gloria Macapagal-Arroyo's FIELDS Program (Fertilizer, Irrigation, Extension and Education, Loans, Dryers, and Seeds and postharvest facilities) is food sufficiency through the use of high-yielding seeds to increase rice and food production. FIELDS was launched on April 2008 and is committed to improve the country's food production and the living conditions of farmers and their families.

Taking into consideration the importance of good quality seeds in the implementation of FIELDS, a technology commercialization project titled "Commercializing and Integrating Hybrid Squash Seed Production Technology into the Cropping Systems of Sto. Niño, Cagayan" is being undertaken and supported by DA through the National Agricultural and Fisheries Council (NAFC) and the Bureau of Agricultural Research (BAR).

The project is one of the 13 high-potential projects getting financial assistance from the 2KR-Grant Assistance for Underprivileged Farmers (GAUF) through a grant fund received by the DA from the Government of Japan (GOJ). The Farmers' Community Development Foundation International (FCDF), a non-stock, non-profit, tax-exempt foundation in Los Baños, Laguna, is the project proponent. FCDF is dedicated to promoting the development of farming communities in socioeconomically depressed areas.

The project aims to increase the income and improve the quality of life of small farmers in Sto. Niño, Cagayan. Specifically, it intends to establish a community-based organization of farmers in the locality to institutionalize technology transfer and commercialization of hybrid squash seed production. Integrating hybrid squash seed production into the regular cropping systems of farmers will be targeted to optimize farm productivity and income.

Existing farming systems and constraints identified

The municipality of Sto. Niño is one of the poorest and nutritionally-deficient towns of Region 2. The traditional cropping systems in the area are generally rainfed rice-based for the lowlands and corn-based for the uplands and flood plain areas along the Chico River. Monocrop of corn is planted in the flood plain areas in May-August and December-March while the rainfed lowland areas are planted to rice in July-October rendering the areas vacant the rest of the year. In both cropping systems, net farm income which is around PhP 5,000.00 per hectare is very low to provide a modest way of living for a farming family.

Seed production is a delicate undertaking and requires adequate technical know-how aside from the need for adequate capital to venture in this undertaking. Among the problems identified in the municipality are: 1) lack of farmers' knowledge on the appropriate technology to produce optimum squash seed yields (150-200 kg seeds per hectare); 2) lack of farmers' knowledge on seed postharvest and processing technology to produce/maintain quality seeds; 3) limited

PHOTO: DA-CVIARC

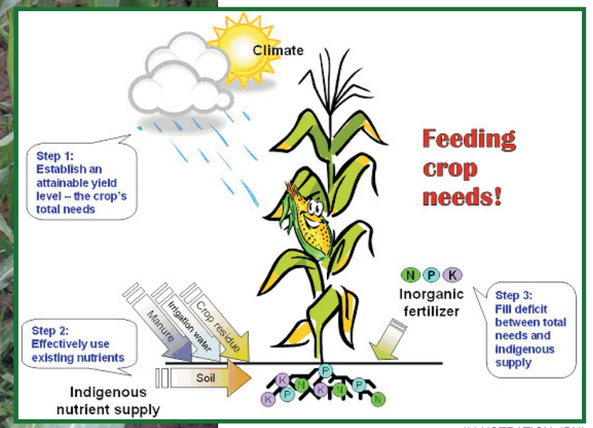


ILLUSTRATION: IPNI

Optimizing nutrient use of crops through SSNM

BY EDMON B. AGRON AND JULIE MAE C. PASUQUIN

A healthy crop requires a perfect match of nutrient supply with plant demand: enough to support high yield, the right mix to avoid deficiencies, and availability at the right time to achieve optimal growth. Plants acquire most nutrients, dissolved in water, through their root system from soil and other indigenous sources such as decomposing crop residues. However, the indigenous nutrient supply, particularly nitrogen (N), phosphorus (P) and potassium (K), is typically insufficient to achieve high and profitable yield in cereal crops such as rice and maize. Additional nutrients, supplied by fertilizers, will need to be added to safeguard yields and food supply. However, with surging prices of farm inputs, especially fertilizer, farmers and policy makers may be tempted to cut costs by reducing the use of one or more fertilizer nutrients –a risky strategy. At some point, less fertilizer use can mean lower crop yield, less profit for farmers, and –eventually higher risk of food shortage in the country.

According to Dr. Christian Witt, Director for Southeast Asia Program of the International Plant Nutrition Institute (IPNI), high fertilizer prices are the result of a tightening global market that follows the basic principles of supply and demand. The demand for food –and thus, fertilizers –has been increasing through the years, driven by population growth and increasingly diversified diets as income in developing countries grow.

Fertilizer production of some nutrients, on the other hand, has not always kept pace with demand and it will take some time and investment in production facilities to correct this. While the situation has eased a little in 2009, fertilizer prices may continue to remain relatively high in the near future. Farmers –especially those with low cash flows – will need to change their fertilizer strategies and make better use of fertilizers to optimize their production systems. Fortunately, new technologies are now available to assist farmers in their decision making.

As part of the comprehensive program of the Philippine government to raise food sufficiency level and ensure adequate, accessible, affordable and nutritious food for Filipinos dubbed as FIELDS *(Fertilizer, Irrigation, Extension and Education, Loans, Dryers and other post harvest facilities, Seeds and other genetic materials)*, the Bureau of Agricultural Research (DA-BAR) in partnership with the Bureau of Soil and Water Management (BSWM), the University of the Philippines Los Baños (UPLB) and the International Plant Nutrition Institute (IPNI), launched a national initiative to increase the productivity and profitability of maize (corn) farming through site-specific, integrated crop and nutrient management. The project on Site-Specific Nutrient Management

PHOTOS: DA-CVIARC

Scientists have found a way for farmers to increase their profit and produce more food by optimally applying essential nutrients to their crops.

(SSNM) for Maize in the Philippines is part of a multi-national research initiative that aims to i) quantify and understand the yield potential of maize in favorable environments of Southeast Asia and ii) develop and evaluate a new SSNM approach and best crop management practices for maize through on-farm research in major agro-ecological zones of the Philippines, Vietnam, and Indonesia.

Concepts of SSNM were first developed for irrigated rice in Asia, but its principles are generic and applicable to other cereal crops like maize. The SSNM approach strives to enable farmers to adjust fertilizer use to fill the deficit between the nutrient needs of a high-yielding crop and the nutrient supply from naturally-occurring indigenous sources, including soil, crop residues, manures, and irrigation water. SSNM does not specifically aim to either reduce or increase fertilizer use. Instead, it aims to apply supplemental nutrients from fertilizer at optimal amounts and times to match the needs of the crop.

SSNM provides guidelines and tools for site-specific management of N, P, K –the major nutrients needed by the crop, as well as other essential elements. One of the tools available for managing N is the leaf color chart (LCC). The LCC is a plastic ruler-shaped strip containing four or more panels ranging in color from yellowish green to dark green. It is used to assess the crop's need for N based on the color of the leaves. Plants with dark green leaves indicate little or no immediate need for N. Yellowish green leaves indicate a relatively higher and urgent need of the crop for N fertilizer. Originally developed for rice, the LCC is also suitable for maize providing farmers with a good diagnostic tool for detecting N deficiency during the season.

Following the strategy used in rice, the principles of SSNM for maize were developed through a series of researcher managed on-farm and on-station experiments covering a wide range of bio-physical and socio-economic conditions in Southeast Asia. In the Philippines, on-farm trials were conducted in the three key maize-producing provinces of Isabela, Bukidnon, and Nueva Ecija/Tarlac in 2005-2007. Data from these trials showed that the SSNM concept has significant potential to enhance the productivity and profitability of maize farming in favorable irrigated and rainfed environments. With SSNM, yield increased on average by 1.0 t/ha and net benefit by PhP5,170/ha as compared with the farmer's practice across all sites and seasons.

In August 2008, a new two-year project in partnership with the Regional Integrated Agricultural Research Centers (RIARCs) commenced with exploratory trials in all 16 regions in the country to develop, evaluate, and disseminate improved nutrient and crop management strategies for maize from 2008 to 2010. First results will be presented at a review and planning workshop in April 2009 confirmed earlier studies. Based on data from seven regions obtained in 2008/09, used led to a yield advantage of about 1 t/ha compared to the farmers' practice with even greater yield improvements in reached with refined SSNM strategies to be tested in 2009. Field trials further revealed a lower contribution of Bio-N and organic matter application to nitrogen supply than previously assumed. Based on first season results, Bio-N and applied organic matter (ranging from 500 kg/ha to 5000 kg/ha depending on the source) contributed only about 23 kg N/ha or one bag of urea/ha and not 46 kg N/ha or two bags of urea/ha as previously assumed.

Work is underway to provide farmers with options particularly where the risk of crop failure is high (i.e. from flooding or drought). Low-risk strategies (with lower input costs) are under development at sites where farmers face a high risk of crop failure while the standard SSNM strategy would be deployed in the more favorable environments where farmers consistently achieve high yield and profit.

Inspite of higher fertilizer prices, there is still hope for profitable yields to Filipino farmers. Site-specific strategies coupled with best management practices promise higher returns through higher yields and effective fertilizer use.

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PHOTOS: LMIRANDA

The designs

The two prototype designs developed were display-type and cabinet-type evaporative coolers. The cooler uses the principle of evaporative cooling with a 20 cm thick layer of charcoal as cooling pad. Based on the research, it can reduce the ambient temperature by 2.1 to 6.3°C and raise the relative humidity by 12.4 to 36.5%. The humidification efficiency of the display-type cooler ranged from 74.3% to 81.5% and 93.5 to 99.3% for the cabinet-type. The display-type has an average water consumption of 1.1L/hr whereas the cabinet type has an average consumption of 1.8L/hr.

The display-type evaporative cooler was designed for vegetable retailers. The cooler has an overall dimension of 1.83 m in length, 0.92 m in width and 1.0 m in height. The cooler is composed of a holding bin, 20 cm thick cooling pad (0.21m^2 pad area) made of charcoal, submersible pump, sump tank, and fan. The holding bin is made of plywood, with the inside portion lined with metal sheet. The bin is insulated with ¾ thick Styrofoam placed between the plywood and metal sheet. The perforated metal flooring supports the weight of the commodities and serves as the entry port of cooling air. The exhaust fan (75W, 30 cm diameter) mounted after the cooling pad provides the cooling air required. The 20 m thick charcoal pad is retained in a metal holder fastened with 1" X 1" wire grids on the front and rear sides. The pad holder contained about 14 kg of charcoal with average size of 3.83 cm length, 2.11 cm width and 1.65 cm. thick.

On the other hand, the cabinet-type could be used by vegetable retailers and traders and also farmers who intend to store their produce for some time. It is 2.30 m in length, 0.94 m in width and 1.80 m in height. It has the same components as the display-type unit. Two units of 75 W high pressure exhaust fan were placed opposite the cooling pads. The 20 cm thick charcoal pad having an area of 0.52 m^2 is continuously watered by a 12 W submersible pump. The storage chamber is made of plywood and metal sheet with styrofoam in between them.

Based on these features, it was noted that the performance testing and evaluation of commodities placed in the evaporative cooler have better visual and textual quality than those left under ambient conditions. This could be attributed to the low temperature and high humidity conditions maintained outside the chamber.

Product application and utility

The introduction of refrigeration is a smart move. With the use of locally available materials such as charcoal, coco mat and wood shavings, these materials serve the purpose as cooling pads. Based on this, the two prototypes of localized non-refrigerated storage system could be constructed for use by farmers, retailers and traders of fruits and vegetables such as eggplant, tomato, bitter gourd, *pechay*, cabbage, Chinese cabbage, sweet pea, green pepper, cucumber, Baguio beans, string beans, *kalamansi* and mangoes. Successes with these commodities prove that the two systems can support the performance requirements on storability and quality.

The cabinet-type evaporative cooler can accommodate 240 kg to 400 kg of assorted fruits and vegetables which can store produce during the peak of the harvest season. On the other hand, the display-type evaporative cooler can accommodate a load of 50 to 75 kgs of assorted vegetables while awaiting sale.

The two systems can prolonged the shelf life of fruits and vegetables ranging from 2 to 4 days giving the producers significant time to wait for market prices to improve.

With this additional storage technology within the means of more farmers, consumers are assured of the availability of quality vegetables and fruits for a longer period of time.

Reference:
Miranda, LM et. al (2008) Design and development of non-refrigerated storage system for selected fruits and vegetables. Bureau of Postharvest Research and Extension, Science City of Muñoz, Nueva Ecija.

PHOTO: RDELACRUZ

Localized non-refrigeration prolongs quality of harvested fruits and vegetables

BY **MARLOWE U. AQUINO, PhD**

PHOTO: farm4.staticflickr.com

When fruits and vegetables are harvested, they are cut off from their source of water and nutrition and soon start to deteriorate. They lose weight, their texture becomes puckered, flavor changes from crispy fresh to blunt, color from bright to dull and, generally their nutritive value and appearance depreciate. Nothing can be done much to save them especially when sold in fresh form. Two vital factors are known to affect the quality of fresh fruits and vegetables –time and temperature and researchers have zeroed in on these.

Both are important factors in postharvest product deterioration and they affect not only the quality of the produce but their marketability as well. Because of these, research activities have been done to address and prolong the storability and or shelf life of products and at least maintain some of the physical characteristics for freshness and quality.

Is refrigeration the answer?

Improving food production, processing and handling including its availability is the concern of both producer and consumer. Meat and fish easily spoil in a few hours if these are not handled properly. On the other hand, fruits and vegetables may take a little longer to deteriorate but become perishable if these are not properly handled immediately upon harvesting. In the past, researchers worked to maintain the physical characteristics of the produce in terms of color, texture, and taste and how these are transported, processed and packed. One of the solutions then was refrigeration especially for farm produce that is perishable and undergoes continuous physical change. But how about if there is no ready refrigeration facilities available for the produce?

Some say refrigeration must be there or farm produce must be immediately sold before its quality goes. This view prevailed until the idea and conduct of trials and prototyping for a localized non-refrigeration system that saves the quality of fruits and vegetables came along. With such a system in place, the producer will have the option to store and preserve his produce until prices are met with out the need for an expensive and elaborate refrigeration set up.

Developing the system

In view of the need to properly handle agricultural products especially fruits and vegetables immediately after harvesting, a group of researchers from the Bureau of Postharvest Research and Extension (BPRE) and Postharvest Horticulture Training and Research Center of the University of the Philippines Los Baños (PHTRC-UPLB) designed and developed a low-cost and simple non-refrigerated storage system (NRSS) for prolonging product shelf-life and marketability.

The NRSS is an attractive alternative system that can maintain the quality of produce and reduce quality deterioration of a number of commodities at less expense compared to refrigeration and therefore increase the income of farmers, retailers and traders. The research undertaking was funded by the DA-Bureau of Agricultural Research from April 2006 to December 2007.

PHOTO: LMIRANDA

PHOTO: RDELACRUZ

BY **CHRISTMAS B. DE GUZMAN**

"Feed the soil, not the plant, and the soil will feed the plant as the key to successful farming is soil health." According to Jon Biloon, a noted sustainable farmer in Hawaii, conventional farmers must understand that feeding the soil and allowing the soil to feed the crops is very important. From the organic farmers' point of view, the soil is alive with a wide range of soil organisms which live in a complex relationship with one another. Thus, the exchange of minerals and nutrients between plants and the soil organisms represent a critical link in plant health and productivity.

Here in the Philippines, conventional agriculture chose to make use of inorganic fertilizers and thus permeated our fragile soils with high inputs of soluble fertilizers and toxic chemicals aggravating an already difficult situation. Truth is, less than half of all commercial fertilizers applied to our farmland are ever utilized by the plants. The rest only contaminates the groundwater as well as other water resources (e.g. river and its tributaries).

The soil, after decades of damage from high input farming, get to lose their fertility and the ability to support crops. Soils that are exposed in times of drought can be further degraded, becoming remarkably hard, porous and sterile for growing crops. Clearly, interventions are needed to rehabilitate the soil in these two instances.

What is vermicomposting?

Sustainable soil improving practices include the use of cover crops, crop rotation, composting, mulching, living mulches and the use of natural-source fertilizers, according to Biloon.

Composting is the purposeful biodegradation of organic matter, such as domestic and agricultural wastes. Decomposition is carried out by microorganisms, mostly bacteria, but also by yeasts and fungi. In low temperature phases, a number of macroorganisms such as springtails, ants, nematodes, isopods and earthworms also contribute to the decomposition process, as well as soldier flies, fruit flies and fungus gnats. Needless to say, a wide range of organisms capable of decomposing organic wastes are active in the environment.

Vermicomposting, which is composting using earthworms, can be a faster alternative for the treatment and decomposition of organic wastes, producing good quality fertilizer with nutrients in slow-release form (natural fertilizer that will release its nutrients over a period of time). The earthworms and microorganisms in the soil convert the organic wastes to rich compost called "worm castings", " vermicast" or "vermicompost," a nutrient and microbially-rich material.

Vermicomposting as a community-based technology

The thrust of the Fertilizer component of the DA's FIELDS program (Fertilizer, Irrigation, Extension and Education, Loans, Dryers, and Seeds) is to capacitate farmers to produce their own organic fertilizer. Agriculture Secretary Arthur C. Yap pointed this out during an agricultural techno forum held some time in late 2008 at the Bureau of Soils and Water Management (BSWM).

One of the two banner programs of BAR is the Community-based Participatory Action Research (CPAR). It aims to strengthen the role of R&D in technology transfer and in production management system while at the same time institutionalizing active community participation in the overall management of farm and coastal resources for enterprise and agribusiness development.

PHOTO: AMENDOZA

Answering the need to promote the adoption of improved vegetable production techniques of farmers in the municipality of Kiangan, Ifugao in line with the F-component of FIELDS, a CPAR project titled "Community-based Participatory Action Research on Vegetable Organic Farming in Kiangan, Ifugao" is being implemented by the Ifugao Provincial Agriculture, Environment and Natural Resources Office (PAENRO) and the Municipal Local Government Unit of Kiangan in coordination with BAR.

With funding support from BAR, it specifically aims to: 1) increase the income of 16 households in Brgy. Baguinge and 10 households in Brgy. Tuplac through their adoption of improved vegetable production techniques on 57,500 m^2 of land increasing profit margins by 20%; 2) improve resource management capabilities of rural communities; and 3) promote the growing of organically produced vegetables by displaying products/harvest in the local market booth to encourage other farmers to grow organic vegetables in their respective farms.

One of the technologies to be used in improving vegetable production is vermicomposting. Utilizing vermicompost as source of organic fertilizer will be adopted by the CPAR farmer-cooperators in the two barangays. Vermicomposting is a low cost technology. The establishment of a community-based vermicomposting facility is seen an environment-friendly, sustainable way to raise crops and cut production costs. In addition, vermicomposting technology can be easily acquired by the farmers and is a potential income-generating activity.

Training farmers on vermicomposting

Recently, a training on vermicomposting (12 March 2009) was conducted for 62 organic farmers in Kiangan, complementing the CPAR project effort to increase the income of farmers in the adoption of improved vegetable production technologies. The training was supported by BAR as a project component.

Majority of the farmer-participants belong to the Baguinge Organic Farmers' Association of Brgy. Baguinge and Good Shepherd Organic Farmers' Association of Brgy. Tuplac with two farmers from Brgy. Ambabag also participating.

To effectively enable the farmers in making their own organic fertilizer through vermicomposting, BAR tapped the expertise of Mr. Antonio de Castro and his wife, Mrs. Rebecca de Castro, both vermiculturists from EarthWorm Sanctuary and members of the Organic Producers Traders Association (OPTA). The EarthWorm Sanctuary, located in Quezon City, promotes earthworm use as the best solution to the garbage and food crisis and is known in the country for its successful organic vermicompost farm. An expanding national market is sustaining production of their vermicompost and organically grown vegetables.

Vermicomposting is a simple technology that does not require a big capital and intensive labor. One can start with a kilo of earthworms which costs from Php500.00 to Php1,000.00. The basic materials for earthworm beds are hollow blocks, plastic sheets and used fishing nets. A shredder is optional since earthworms can breakdown the substrates or waste materials which usually consist of discarded vegetables, animal manure, rice hull (*ipa*), sawdust (*kusot*), hay (*dayami*) and leaves.

According to Mr. de Castro, the earthworm, "African night crawler" or *Eudrilus eugeniae,* is what he uses in their farm as this particular species of earthworms is voracious, eating one to two times their body weight every day. It has a high reproductive rate (an adult breeding earthworm produces 3.6 cocoons per week) and can thrive in a wide range of environments. "They are more prolific and survives well in our area," Mr. De Castro pointed out.

Immediately after the lecture, hands-on-training and demonstration on vermicomposting followed at the farm of one of the farmer-cooperators in Brgy. Tuplac.

Benefits of vermicomposting

Vermicomposting is safe and is not hazardous to the health of the farmers. In fact, the farmers' health is promoted because by using vermicompost, they avoid exposure to toxins and other harmful chemicals.

Agronomical studies show that

PHOTO: MVILLAREAL

A mechanized sweet potato harvester for efficient postproduction

BY **EDMON B. AGRON**

PHOTOS: PHILROOTCROPS

Sweet Potato is one of the most important food sources in the Philippines. Aside from its starchy tuberous roots, young leaves and shoots are also edible and a good source of dietary fiber, vitamin A, vitamin C, and vitamin B6. It is likewise appreciated as a source of antioxidants for neutralizing body toxins as by-products of metabolism.

Nowadays, the demand for sweet potato has dramatically increased with the realization of its potential for commercial applications. It is used as a raw material for manufacturing of flours, starch and pectins that are highly commercializable and exported to other Asian countries like of Japan, China and Korea. Its flour can be processed into products of fermentation such as soy sauce and alcohol. On the other hand, starch is also a material used in the manufacture of textiles or paper while dried sweet potato chips find in animal feed formulation.

With demand for sweet potato increasing, the government is now looking forward to improve the production of the sweet potato industry through research and development. One thing that needs to be improved is the traditional harvesting techniques and procedures that cause losses and poor crop quality.

Harvesting is one of the important parts of any farming ventures. It is when the labor and long time patience of farmers get to be paid off. In sweet potato production, harvesting can become the most critical part of the entire production and marketing operation as crop yield and quality can no longer be increased but they can be decreased, sometimes drastically by improper or inefficient harvesting practices.

Based on studies, certain cultural conditions, such as excess nitrogen, excess water, and poor soil aeration, can predispose tubers to damage. Traditionally however, most of the actual damage occurs when farmers plow or manually dig tubers during harvesting. Aside from being a laborious and very slow harvesting method, it bruises tubers and even breaks it into pieces. This decreases the crop value, if not spoil its marketability. In such instances, harvesting losses can reach 40-50 percent of the total harvest.

Preventing such damage has led the Philippine Root Crop Research and Training Center – Visayas State University (PhilRootcrops – VSU) to develop a tractor-drawn sweet potato harvester to increase the sweet potato harvest.

According to Alan B Loreto, agricultural engineer and professor at the VSU and proponent of the project, mechanization can improve the harvest operation thus enhancing productivity, efficiency and quality of sweet potato farming.

The PhilRootcrops has developed hand tools and animal-drawn implements for root crop farming. However, due to increased in area and volume of sweet potato production, these animal-drawn implements are no longer appropriate. Machine developed elsewhere for Irish potato will not work with sweet potato because of botanical differences between the two crops. The vegetative portion of the potato plant will senesce at maturity and does not interfere during harvest. On the other hand, sweet potato vines remain intact and actively growing even during maturity and poses a problem on harvesting (PRCRTC annual report). Indeed, creating a harvester specifically designed for sweet potato is needed.

The PhilRootcrops - designed sweet potato harvester has a customized vine cutter that effectively removes vines, leaving only the stalk close to the sweet potato roots to facilitate easier digging. It also has single-row digger - another feature of the machine that would allow farmers to harvest as fast as 1.08 hectare a day at the speed of 2 km per hour.

Researchers have estimated that this harvester could significantly reduce harvesting cost, which is about 13-25 percent of the total production cost.

The project is major effort of the government to improve the sweet potato industry in support to its banner program dubbed as FIELDS, which means (Fertilizer, Irrigation, Extension and Education, Loans, Dryers and Seeds) – the overall framework development for agriculture and fisheries that has been adopted to ensure adequate, accessible, affordable and nutritious food for Filipinos.

The project was funded by the Department of Agriculture through the Bureau of Agricultural Research (DA-BAR).

The article is based on the project "Development of a Tractor-Drawn Sweet Potato Harvester" by Alan B. Loreto and Manolo B. Loreto of Philippine Root Crop Research and Training center, Visayas State University (PhilRootcrops-VSU), funded by the Bureau of Agricultural Research (BAR)

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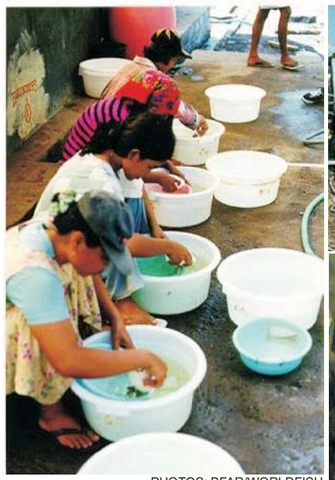

PHOTOS: BFAR/WORLDFISH

Hence, four sites that operate smallscale production of milkfish were selected for the projects pilot site: a) Brgy. Dulao, Aringay, La Union; b) Brgy. Raois, Sto.Tomas, La Union; c) Brgy. Malacapas, Dasol, Pangasinan, and; d) Brgy. Nayom, Infanta, Pangasinan.

Fingerling production

The usual stocking density of the milkfish farmers in Aringay, La Union ranged from 30-60 per m^2. The NIFTDC team recommended a stocking density of 30 pieces per m^2 in the pilot sites based on the shallow depth of the existing ponds to efficiently utilize their pond area. To hasten the technology transfer, the milkfish farmers were enticed to adopt the piloted nursery technology by giving them access to milkfish fry from BFAR-NIFTDC hatcheries at a discounted price. Based on the results, the farmers in the municipalities of Aringay and Dasol were able to earn additional incomes ranging from PhP 1,000 to 50,000 relative to the size of the nursery pond and stocking density. The harvested fingerlings were either sold by the farmers to nearby markets or used as stock for their growout operations. The benefit of disseminating this type of technology in other milkfish growing areas is that it assures a steady supply of milkfish fingerlings especially in localities that are far from private or public hatcheries. Similarly, the growing demand for larger milkfish fingerlings, used for seeding of mariculture cages, and for juveniles both present good opportunities to develop fingerling production.

Feeding management

Four demo sites were established to demonstrate the growth performance of milkfish under different culture methods and to help the milkfish farmers better understand the importance of proper feeding management to the farmers. Proper feeding management needs to be emphasized to the milkfish operators because of the fact that most of them have a tendency to feed their stock *ad libitum*, especially for those that have external financiers and do not have any problem with feed supply.

The following treatments were established in the four demo sites: a) Pond 1- Milkfish Polyculture with *P. vannamei* (white shrimp); b) Pond 2- Monoculture of *P. vannamei* (control); c) Pond 3- Milkfish with fish management; d) Milkfish with *ad libitum* feeding. From the results, the polyculture of milkfish with shrimp yielded the best result, followed by milkfish with controlled feeding, *P. vannamei* monoculture, and milkfish fed *ad libitum*. This result shows the efficiency of feed consumption under the milkfish-shrimp polyculture. Cost and return analysis also revealed that, for a one-season cropping of milkfish polyculture with white shrimp for a 1,500 m^2 pond, this resulted to a total net income of PhP15,635 vs PhP 9,435 for milkfish polyculutre. This is about 66% additional income due to the addition of the shrimp crop.

Meanwhile, the cost and return analysis of one season cropping for milkfish grow-out production with proper feed management, a 5% increase in net income was achieved through controlled feeding vs. ad libitum use of feeds. The increase in income could be attributed to the lower cost of feed as 33% less feed was used compared with the *ad libitum* use of feed. These results lend support to the economic soundness of the piloted technologies.

Value adding of milkfish products

Deboned milkfish is the most popular value-added milkfish product. The production of deboned milkfish has given rise to other value-added products. Trimmings and bits of the flesh that are invariably removed with the bones can be

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PHOTOS: BFAR/WORLDFISH

earthworm-produced fertilizer is richer in plant nutrient than the soil, containing five times more nitrogen, seven times more phosphorus, 11 times more potassium, three times more exchangeable magnesium, and one and a half times more calcium. It contains a high percentage of humus, which helps soil particles form into clusters creating channels for the passage of air and water. This kind of humus is found to be more effective compared to ordinary compost and chemical fertilizers and its use can lead to higher crop yield over a longer period of time.

Organic farmers are encouraged to adopt vermiculture (worm farming) and vermicomposting because these support organic vegetable production. Vermicompost can be used as soil conditioner bringing the soil back to life. As it increases soil life and fertility, regular use of vermicompost improves the soil texture and its water holding capacity. It is considered "nature's perfect organic fertilizer" which is very appropriate to those venturing into organic agriculture. As an investment, vermicomposting costs only about Php2.00 per kilo while commercial chemical fertilizer costs Php8.00 to Php15.00 per kilo.

Potential in the market

At present, demand for organically produced food crops is increasing. Organic fertilizer has likewise increased in use as result of steep increases in the price of commercial fertilizer.

These developments work in favor of vermicomposting. Aside from the fact that no imported inputs are required in vermicomposting, producing your own

PHOTO: CDEGUZMAN

fertilizer makes you less vulnerable to changes and fluctuations in the prices of other commodities particularly chemical farm inputs. There is practically no risk at all in producing vermicompost whether for one's use or surplus production.

During the training, Mr. de Castro offered his help to the farmers in finding markets for their organically grown produce once they succeed in production.

Are farmers engaging in vermicomposting?

Earthworms have been dubbed "nature's tiny farmers" because of their ability to help plow, aerate, hydrate and fertilize the soil and produce plant food. Consistent as the earthworms, the members of the Baguinge Organic Farmers' Association and Good Shepherd Organic Farmers' Association are now busy raising organic vegetables in their CPAR project sites. The training on vermicomposting served as a means of broadening not only their farming knowledge but also their entrepreneurial skills. Vermicomposting is now seen as a technology that can be fully established and operationalized in Kiangan starting with simple vermicomposting structures in two farmer sites. Vermicompost produced will supply the organic fertilizer requirement in Kiangan and, eventually, nearby towns.

Snap beans, *pechay*, Chinese cabbage, tomato and eggplant are among the vegetables now grown by the producers' group. Maximizing the acquisition of knowledge on improved organic vegetable production and linking the farmers to market shall be facilitated and strengthened by PAENRO of Ifugao and the Municipal Agriculture Office of Kiangan.

A great way to make rich compost, vermicomposting helps rebuild the health and fertility of the soil resulting to better crop yield. Thanks to the earthworms which are making this possible. These humble creatures might well be the answer to our problems on solid waste management, environmental protection, and food security.

This article was based on a BAR-funded project titled "Community-based Participatory Action Research on Vegetable Organic Farming in Kiangan, Ifugao" being implemented by the Provinvial Agriculture, Environment and Natural Resources Office (PAENRO) of Ifugao.

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PHOTO: CDEGUZMAN

Cost effective soil enhancer from sweet sorghum residues

BY **RITA T. DELA CRUZ**

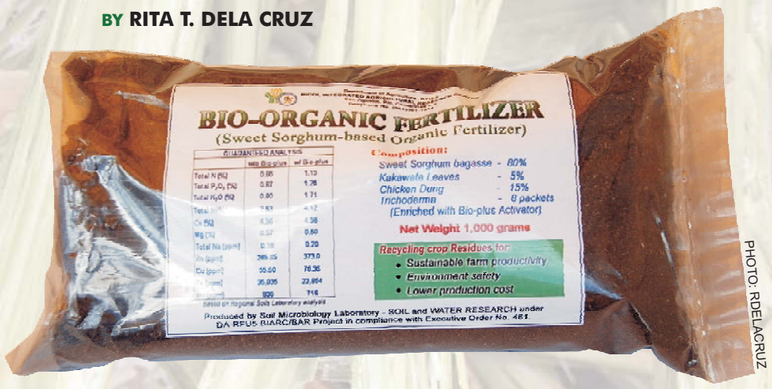

PHOTO: RDELACRUZ

Who would have thought that farmers can still extract profit from residues? An innovative, environment-friendly technology to convert sweet sorghum bagasse into bio-organic fertilizer has been developed by researchers from the Bicol Integrated Agricultural Research (BIARC).

Bio-organic fertilizer is compost from any organic material that has undergone rapid decomposition through the action of introduced homogeneous microbial inoculants. It is different from fresh organic fertilizer where natural decay process is brought about by the action of heterogeneous microbes present in the organic matter. Compared with the traditional composting method, the introduction of microbial inoculants shortens composting time from three months to just 3-4 weeks.

Inoculants are commercially available in selected areas in the country but could be easily accessed. One of these are the Compost Fungus Activator (CFA) often used is Trichoderma harzianum, a single celled fungus that hastens the decomposition of organic materials high in lignin and cellulose like bagasse.

Bagasse is the pulp or dry refuse left after the juice is extracted from sweet sorghum or sugarcane stalks in the process of production for sugar, ethanol production and other sweet sorghum products.

For this particular technology, the researchers used sweet sorghum bagasse and make use of the bagasse produced from sweet sorghum plantations that ordinarily would be treated as farm waste that need to be disposed.

Why go bio-organic?

The use of bio-organic fertilizers is promoted as inexpensive alternatives to restore the fertility of poor degraded soils. Poor soils are the result of intensive agriculture, slash and burn methods, extensive use of pesticides and chemicals, mining, and urbanization. These practices degrade the quality of our soils and result to low yields and low productivity.

When applied to crops, bioorganic fertilizers can supply specific nutrients to plants, thus these are also known as microbial fertilizers. Their effects include enhancing the supply and total volume of plants' nutritional elements, stimulating of plant growth, or stimulating of the plants' absorption of nutritional elements.

They facilitate the continuous and long-term soil improvement, recycling and availability of nutrients and minerals essential for the survival, growth and fruit bearing of a wide variety of plants and trees.

Recycling sweet sorghum bagasse

BIARC implemented a collaborative project on the commercialization of sweet sorghum through a collaborative undertaking with the Bureau of Agricultural Research (BAR) and the Mariano Marcos State University (MMSU). This resulted to the successful field tests of sweet sorghum varieties that were found suitable in Bicol's agro-climatic condition. From this, BIARC proceeded to the region-wide commercialization of sweet sorghum including the development of village-level technologies.

Following the Four F's Crop strategy for sweet sorghum, representing Food, Fuel, Feed, and Fertilizer, BAR urged its regional partners to continuously develop technologies to promote not only high agricultural productivity but making use of available resources for other farm uses.

According to Romulo C. Cambaya, head of the Soil and Water Research Unit of BIARC who also leads this initiative, conversion of bagasse from sweet sorghum after juice extraction into bio-organic fertilizer is one of the region's initiatives.

Cambaya said that a one-hectare plantation of sweet sorghum will yield about 50-75 tons of stalks and produce from 22,000 kgs to 35,000 kgs of bagasse. Given the technology developed by BIARC, the bagasse can be converted to approximately 88-151 bags of bio-organic fertilizer with value from P22,000 to P37, 750.

There are six basic steps in producing bio-organic fertilizer from sweet sorghum residues according to Cambaya. These are: 1) collecting leaves after stalk stripping; 2) gathering sweet sorghum bagasse; 3) shred sweet sorghum bagasse using machine shredder; 4) composting the shredded bagasse (combining the CFA with bagasse, chicken dung, kakawate) ; 5) turning over the compost after two weeks; and 6) harvesting well-decomposed sweet sorghum bagasse.

PHOTO: RDELACRUZ

Efficient dissemination of smallscale milkfish aquaculture technologies

BY **ELLAINE GRACE L. NAGPALA**

Milkfish is considered the most important aquaculture species grown in the country. It is widely grown in 7 out of the 16 regions of the country, majority of which are in Central Luzon, Northwestern Luzon, and Western Visayas. In 2005 alone, the production of milkfish rose to nearly 52% or 289.2 thousand metric tons of the Philippines' total aquaculture output of fish and shellfish valued at PhP 17,577 (BAS, 2007).

To strengthen the milkfish industry, research and development (R&D) agencies have contributed significantly by providing technologies that increase the options to the milkfish farmers in terms of modification and improvements in grow-out practices, i.e., adoption of multiple and high-input production systems, feed formulation, broodstock management and hatchery technology.

Despite the advancement in technology for the milkfish industry, there seems to be a wide gap between the systems practiced by the milkfish farmers and the state-of-the-art in milkfish technologies. Some call it the "yield gap" referring to the difference in realizable harvest between research stations and actual production farms. Hence, there is an urgent need to disseminate innovations to the farmers in order to attain the full benefits of technological developments.

In view of the importance of the milkfish industry in the country, the dissemination of appropriate technologies to milkfish farmers, especially the small scale operators, becomes crucial. Through wide-scale dissemination of new milkfish technologies, the country can secure the long term viability of the sector with producers able to optimize their operations.

Milkfish project

To address the need to disseminate the latest technologies for the milkfish industry, the National Integrated Fisheries and Technology Development center of the Bureau of Fisheries and Aquatic Resources (BFAR-NIFTDC), the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC-AQD), the University of the Philippines in the Visayas, and The World Fish Center, collaborated on the conceptualization of a project titled, "Dissemination and Adoption of Smallscale Milkfish Aquaculture Technologies in the Philippines".

The general objective of the project is to study the production, marketing and policy structures of the of the milkfish industry in the Philippines in order to identify the constraints and opportunities for the future growth with emphasis on the adoption and impact of technological development using case studies in small-scale hatchery/nursery, grow-out production and processing systems. It is expected that the output of the research can be transferred or replicated in other parts of the country.

The milkfish project was divided into four parts, namely: Policy and Socioeconomic Review; Technology Review and Screening Component; Overall Framework and Baseline Information; and Pilot testing and dissemination of the technology component. The activities in these components are interrelated and their respective outputs will be jointly used to come up with strategies and recommendations to develop the smallscale milkfish industry.

Given the pro-poor focus of the project, the pilot case studies are aimed to showcase production and postharvest technologies prioritized by the project for smallholder operators. It was felt that by targeting the smallscale and mediumscale producers/ operators, the participation of small milkfish producers and operators in the supply chain will be encouraged.

that include BAR, Pampanga Agricultural College, Central Luzon State University, Visayas State University, University of Southern Mindanao, Agricultural Productivity Center in Bohol, Regional Field Units of the Department of Agriculture, and participating local government units (LGUs).

Also dubbed as the "Cybervillage Project", the collaboration aims to test and develop approaches in dealing with the range of problems faced by farmers and how best to make these options more widely known at the village and municipal levels through the use of ICT. More specifically, the project will study the effectiveness of computer-based information and knowledge dissemination to the rural areas.

In the long term, the project aims to enhance the farmer's productivity by continuosly improving on the models of technology transfer combined with relevant ICT.

Operating the cyber villages

The effectiveness of the RKB and other ICT systems were tested at pilot sites in the country at two levels: the pilot villages (barangays) and pilot municipalities. At the pilot village level, eight sites were selected. There were in Infanta (4), Quezon and Bay (2) and Victoria (2) in Laguna. Meanwhile, the pilot municipalities were identified on the basis of their being OPAPA sites: Magalang, Pampanga; Muñoz, Nueva Ecija; Bacolod/Bago City, Negros Occidental; Davao Sur/Oriental; and Kabacan, North Cotabato.

Cyber units (computer and related equipment) were installed in the selected barangays and municipalities with the assistance of the OPAPA and PhilRice team. Through the installed cyber units, the available information in the knowledge bank are delivered to the pilot sites using different delivery approaches. Orientations on the project mechanics and overview of the knowledge bank and its functionality, and trainings on the use and maintenance of cyber units and RKB were given to the identified partners to ensure that the project will proceed as expected.

With the installation of the system, farmers can now have easy access to information they need on rice production.

USM cybervillage

In the cybervillage project managed by the University of Southern Mindanao, cyberunits were installed in the LGU of Kabacan in Cotabato and in the different FITS centers in Kidapawan, Arakan, Tapawan, et. al. Basic training for the farmers for the operation of the cyber units were conducted as well as focus group discussions. Discussions on the pests of rice, rice marketing and postharvest management were conducted through web conferencing between rice farmers and the experts from PhilRice in Midsayap in Cotabato and Muñoz in Nueva Ecija.

Also for kids

In one of the pilot sites of the project in Infanta, Qeuzon, a Youth for School Project (YFS) was launched by a non-government organization as part of the cyber village project. The YFS was incorporated as a regular subject in the school curriculum. Staff members and farmer-volunteers of the Integrated Community Development Assistance, Inc. (ICDAI), the NGO based in Infanta, taught the young students about growing rice, managing pests and diseases, and many other aspects of growing rice using the RKB. In this program, the students whose parents are also farmers use the RKB to search for solutions to the problems that their parents encounter in their rice farms.

Through the YFS, it is expected that the younger generation would be better informed about agriculture and therefore would aspire to be farmers in the future.

Info at our fingertips

Rapid advancement in information technology has been beneficial to the different sectors of society today. Likewise, ICT has reduced the cost and increased the spread of information; reduced previous barriers of time and location; and accelerated the integration of national production and finance systems. A good instance is the bridging of the gap between research outputs and the rice farmers through the cybervillage project, where information is made available at the farmer's fingertips at his convenience. The long-term implications of the project include increases in rice production and with parallel increases in efficiency lower cereal prices. In other words, this means improved productivity for the rice farmers and a stable and affordable rice supply for the consumers.

The article is based on the project "Improving Knowledge Exchange and Decision Making Among Rice Stakeholders through ICT-based Technology Promotion and Delivery Systems" of the International Rice Research Institute (IRRI), coordinated by the Bureau of Agricultural Research.

Farmer activities in relation to the cybervillage project.

PHOTOS: IRRI

In composting the shredded bagasse, the Rapid Composting Technology (RCT) involves inoculating the substrate along with small amounts of animal manure with *Trichoderma*, a cellulose decomposer fungus. Using this inoculant, referred to as compost fungus activator (CFA), the composting time is reduced. Specifically, the RCT combination used is 80% sweet sorghum bagasse, 15% chicken dung, 5% *kakawate* leaves, and 8 packets of CFA (per one ton mixture). The bagasse is soaked in water before adding the chicken dung after which the *kakawate* leaves are mixed in.

After harvesting the well-decomposed sweet sorghum bagasse, it is dried, sieved, weighed and packed ready for market.

Profit from near zero capital

There is more advantage to bio-organic fertilizers over the commercial chemical counterparts. It involves recycling of nutrients from waste material, it is a cheap alternative or supplement to inorganic fertilizers thus leading to increase in yield and profit, and is environment-friendly. Soil tilth and fertility are also mentioned and even enhanced.

According to reports, with decreasing input price, bio-organic fertilizers can increase farmers yield and profit by as much as 30 to 200 %. Agricultural and industrial wastes if processed into biodegradable fertilizers and enhanced with microorganisms can continuously improve the growth, protection, and productivity of the plants/crops.

A 25,000 kg of sweet sorghum bagasse can produce 125 bags of the bio-organic fertilizer which can be sold at P230 per bag, with a gross value of P28,750.

Reference:
"Sweet Sorghum Residue Recycling Bio-organic Fertilizer Production" by Adante, AR, AC Baylon, AG Rafer, RC Cambaya, and EB delos Santos of the Bicol Integrated Agricultural Research Center (BIARC), Department of Agriculture-Regional Field Unit 5 (DA-RFU 5), San Agustin, Pili, Camarines Sur.

For more information on this technology, please contact Romulo C. Cambaya of the Soil and Water Research Unit, BIAR), DA-RFU 5, San Agustin, Pili, Camarines Sur or contact him at telephone no. (054) 361-1944.

PHOTOS: AVELASCO

Romulo C. Cambaya of BIARC shows how to make bio-organic fertilizer from sweet sorghum residues.

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processed into fishballs, *lumpiang shanghai, quekiam* and embutido. These products enjoy a good market domestically and in other countries with large overseas Filipino communities.

To introduce the mentioned value adding techniques, training on processing milkfish into different product forms to widen its market base was undertaken by the cooperators of the project. Training manuals were also used as supplement materials. Aside from the training of the cooperators, a training of trainors was also conducted to sustain the technology dissemination in the countryside beyond the end of the milkfish project. Based on the results from the 333 cooperators on milkfish processing in the three pilot barangays, the average additional income that could be earned from value-added milkfish products can range from PhP 277 to 655 per operation per day.

The success of the milkfish processing projects in the pilot sites was made possible by the full support of the local government, where the municipal government recognized and tapped the potential of the project and made it a model livelihood program of the barangay.

Conclusion

It could be said that the proper dissemination and adoption of small-scale milkfish technologies can be an important strategy in addressing poverty alleviation. However, as observed in the study, there are still some issues that need to be addressed in order to strengthen the extension delivery system of milkfish technologies. For instance, the existing national extension program needs to be strengthened both in terms of structure and management to address the logistics concern in extension delivery system. An effective linkage and coordination between BFAR-Regional Offices and fisheries training centers, State Universities and Colleges, LGUs and other non-government fisheries agencies which are directly working with local communities along the line of technology transfer must be established and sustained.
Information campaigns and trainings of fisheries technicians and extension workers in milkfish producing areas should also be conducted prior to dissemination at the grassroots level to build the capacity of local government unit officials on nursery and grow-out production, as well as milkfish processing and value addition.

Dissemination efforts in the area of technology adoption, especially in the form that can be easily taken up by farmers due to its adaptability and low capitalization requirement, have a strong potentials for enhancing the productivity performance and income of small-scale stakeholders. The importance of extending simple and easily adaptable technologies to small-scale farmers and operators is that the outcomes of technology transfer can be realized readily in the very short term. Success can be a motivating factor that can bring confidence to extension workers and clientele themselves and, hence, technology transfer can be self-reinforcing and sustainable.

The article is based on the project "Dissemination and Adoption of Smallscale Milkfish Aquaculture Technologies in the Philippines" by Westly R. Rosario NFRDI and Yolanda T. Garcia of UPLB.

PHOTO: MCME

Dampalit Watershed Project:

Reconciling agricultural productivity and environmental concerns

BY **RITA T. DELA CRUZ**

With the continued growth of human population, agriculture faces the challenge of producing sufficient food for all without further sacrificing the environment. The rising concern for climate change is another issue that must be taken into account given its direct effect on agriculture and food supply.

The greater challenge therefore for any community-driven intervention is to achieve agricultural productivity and profitability without compromising further the environmental integrity of our local landscape and the global environment.

But how does one prevent environmental degradation and still provide livelihood for the upland farmers and the communities that depend heavily on forest-based resources?

This is a challenge that the Makiling Center for Mountain Ecosystems (MCME) of the University of the Philippines Los Baños College of Forestry and Natural Resources (UPLB-CFNR) is addressing.

In the case of the Makiling Forest Reserve (MFR), which is a major source of livelihood for many landless farmers in the adjacent and nearby communities of Los Baños, this was never an easy task especially if the farmers and forest occupants look at any government intervention as a major restraint on their livelihood. Most of them, particularly the elders, are hesitant to embrace new ideas that are introduced to them.

Past records show that punitive actions such as arresting and imprisoning illegal MFR occupants proved ineffective along with resettlement endeavors. Forest occupants return gradually and continue to grow by the numbers.

So like the saying, "if you can't beat them, join them" the government, instead of imposing punitive actions on illegal occupants, upland farmers and communities are now engaged as partners in addressing the problems of environmental degradation and poverty in the area.

The key is the implementation of a participatory upland development program that is both pro- environment and pro-upland farmers that at the same time features an ecological approach to agriculture.

Crop and livestock production systems must be managed recognition of environmental costs and benefits. To create agricultural landscapes that are managed for multiple benefits aside from food, there is a need for an integrative research and a multi-stakeholder participation with all gaining benefits.

Why a *Dampalit* Watershed project?

The *Dampalit* watershed of the MFR plays a crucial role in the well being of the surrounding communities that draw benefit from it. The watershed is part the MFR's major watershed zones with an area of 690 hectares with its water flowing largely to the Laguna Lake where many fish ponds are located.

The Laguna Water District gets its water supply from the watersheds which it distributes among its four major municipalities including Los Baños, Bay,

Enhancing rice productivity through the Cyber Village

BY **ELLAINE GRACE L. NAGPALA**

During the last harvest season, a rice farmer incurred most of his losses from the storage of his produce due to the diseases that damaged his stored grains. Not wanting to repeat the same losses and to maximize his profits from his current harvest, the rice farmer proceeds to the barangay hall, logs on to the computer to check the RKB on how he could store his harvest without being infested by pests.

The Rice Knowledge Bank (RKB) is an online repository of extension and training materials related to rice production launched by the International Rice Research Institute (IRRI). It contains information about rice farming from rice seeds, to land preparation and crop establishment, to postharvest handling, up to its economics and marketing. It is the first, comprehensive, digital rice production library containing an ever-increasing wealth of information on training and rice production.

Farmers meeting in one of the sites of the cybervillage project in Laguna.

PHOTO: IRRI

Underutilized knowledge

Over the decades, new technologies were successfully developed and enormous amounts of information generated only to fail in reaching those who need them the most the farmers. This is attributed to the inadequate or underdeveloped extension services. It's already bad when the new technologies are neglected but worse when these are forgotten because they have not been utilized.

Recently, information and communication technology (ICT) has advanced to the point that it has become popular and accessible to many. Since the ICT platform is the emerging trend for the activities of different sectors, it is now popularly used the modality to support information sharing and technology transfer. In the agriculture sector, the RKB of IRRI is an example.

In the recent years, both the Department of Agriculture (DA) and Department of Science Technology (DOST) have independently built their respective information infrastructures. The Bureau of Agriculture Research (BAR) developed the Agriculture and Fisheries Research and Development Information System (AFRDIS), a comprehensive information system for R&D in agriculture and fisheries established to strengthen the knowledge management capacities of the National Research and Development System for Agriculture and Fisheries (NaRDSAF). On the other hand, the Philippine Research, Education, Government Information Network (PREGINET) project of the Advance Science and Technology Institute (ASTI) has laid down a nationwide data backbone for all government agencies and non-commercial private organizations to interconnect.

The National Information Network (NIN), implemented by the DA-Information Technology Center for Agriculture and Fisheries, interconnects the institutions, agencies, bureaus and individual farmers and fisherfolk enabling them to access, exchange, and share research results, market information, and development activities related to agriculture and fisheries R&D, among others.

Under a forged agreement between DA and DOST, with a number of research institutions and SUCs, an ICT based technology delivery system was created in 2003. The Open Academy for Philippine Agriculture (OPAPA) is a strategic alliance of knowledge generators, content developers, network providers, learning centers, resource generators, and management experts who will use ICTs to provide extension services and learning opportunities to farmers. This was conceived as a program to promote and improve research-extension-farmer linkages through the use of ICT and distance learning.

The cyber village

To test the effectiveness of the RKB and other systems that utilize ICT, the project "Improving Knowledge Exchange and Decision Making among Rice Stakeholders through ICT-based Technology Promotion and Delivery Systems" was launched by IRRI, in partnership with the Philippine Rice Institute and other collaborating agencies

The e-Learning strategy for agri & fishery development

BY **MARLOWE U. AQUINO, PhD**

PHOTO: MAQUINO

Information sharing is better organized and systematic because it provides a step-by-step procedure of proven and applied technology on the production of particular commodities or on support and other imports for producing quality products.

Farmers learn to use the computer to search relevant information.

Never before has access to information been as easy in this ever changing and developing world. Information may come in various forms and delivered in different means to a wide variety of end-users. Today, information is immediately available through the World Wide Web or internet limited only by the skills of the person making the search.

In agriculture and fisheries, developments have changed information in the various ways and landscape that it caters to specific clientele. It has also dramatically changed how people respond and form their perceptions. Because of this, established institutions have developed their unique strategies for sharing vital information for agriculture and fisheries development.

One of the newest is the e-Learning modality for agriculture and fisheries development. In some forms, information sharing through this modality is, in comparison, better organized and systematic because it provides a step-by-step procedure of proven and applied technology on the production of particular commodities or on support and other imports for producing quality products. Through electronic means teaching and learning for development is facilitated.

What is e-Learning strategy?

e-Learning is a sub-component of the e-Extension modality of modern agricultural and fisheries development. It is an on-line system that provides a learning-teaching portal on agriculture and fisheries technology use and marketing. Also, it is a strategy that supports specific commodities on production and processing management systems. Furthermore, it is complemented by two other strategies that enhance the competitive advantage of agriculture and fishery commodities within a given agro-ecological zone. These are the e-trading, which is an online agriculture and fisheries trading place for quality produce; and the e-farming, which is also an online system that seems as a farm and business advisory mechanism for making effective and efficient production management system decisions.

All three use the information and communications technology management platform. But it is the e-Learning strategy that is wider in wide scope because it caters to several stakeholders that are in need of agriculture and fisheries information and technologies. The e-Learning users learn new techniques based on proven technology packages developed by researchers, extensionists, development workers and farmers. These experts have combined scientific and indigenous practices that have been tested through time in order to improve farm income and sustain development. Based on this, e-Learning addresses the existing knowledge, skills and even the attitude of farmers or fisherfolk towards farming and fishing activities.

Development and application of e-Learning modules and packages

In the development and packaging of an e-Learning Module, a comprehensive understanding and literature review is done on appropriate and applicable technologies for people and communities. e-Learning modules are normally based on the results of extensive research and development efforts from laboratories to on-station to farmer's field. Everything must be considered in preparing a total package of technology. As soon as this is done, the e-Learning Module plan is prepared, evaluated and reviewed by a group of technical experts. The technical experts are people who are knowledgeable in their field and have done research that enhance and support a particular technology of a given technology. They have also worked with farmers or communities who have utilized and applied their technologies for increased

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Calauan, and Calamba and other nearby provinces. The headwater of the Dampalit Falls is also a popular local tourist spot.

To ensure the productive and sustainable management of the watershed, a participatory upland development project was implemented by the Makiling Center for Mountain Ecosystems (MCME) of the University of the Philippines Los Baños College of Forestry and Natural Resources (UPLB-CFNR). This is in collaboration with a farmers' organization-Samahang Magsasaka sa Mataas na Lupa ng Lalakay sa Bundok Makiling, Inc. (SAMALUP) and the local government of Brgy. Lalakay.

The project was implemented in April 2006 to 2008 with funding support from the Bureau of Agricultural Research (BAR) in line with its drive to empower upland farmers through community-based participatory development programs.

In general, the two-year project aimed to address the problems of poverty and environmental degradation through participatory involvement of upland farmers in the development process, making them partners of the government. Consequently, by tapping their active participation, the MFR's resources are how being managed and protected in a sustainable basis and in harmony with the existing national forestry and environmental laws.

Specifically, the project has four objectives: 1) determine the current state of, and gather benchmark information on the resources, farming systems and socio-economic condition of the farmers; 2) provide knowledge and skills in designing, planning and developing upland farming systems; 3) establish demonstration farms showcasing appropriate upland farming techniques in partnership with farmer groups; and 4) strengthen the capabilities of the farmers' organization in upland development.

Among the interventions and activities introduced which are community-driven in nature include training, seminars, and study tours which helped the community developed the leadership and administrative skills needed to manage their people's organization (PO) independent of outside experts. Other interventions included joint training for farmers, residents, LGU and project staff members which proved to be valuable, especially in creating greater trust and understanding among program partners.

Public-private partnership coming to reality

Former SAMALUP President Martin P. Onico is happy that what he envisioned more than a decade ago is slowly being realized through this project. He said this during the SAMALUP Farmers' Day, a first of its kind wherein they showcased farming technologies and their farm produce. It was attended by 220 farmers, and officials from MCME and UPLB, and the local government unit of Lalakay in Los Baños.

Onico added that, "this project provided us adequate information, skills, and means of livelihood which enable us to go on with our farming activities without compromising the forest."

Lalakay Barangay Chairman Gaudencio P. Macatangay highlighted the importance of the project, not only for its benefits to the communities dependent on the watershed, but also its impact on the environment as a whole. He said that, through this project there is a great chance that the next generation would be able to enjoy clean and safe water. He added that, this participatory development project serves as a model for other nearby communities to adopt and follow.

In his message for the occasion, BAR Director Nicomedes P. Eleazar stressed that poverty in the uplands need not immediately lead to environmental degradation. He mentioned that, upland farmers resort to natural resources misuse to survive. "They depend heavily on these forest resources for their basic needs and unless we teach them on the importance of sustainable development, there will come a time when the forest resource will no longer be there for the next generation to enjoy."

He added that this watershed project is great proof that upland farmers can coexist in harmony with their marginal environments.

Los Baños Mayor Caesar P. Perez commended the project and hoped that the project will be emulated by other communities. He emphasized the importance of upland farmers' participation in this endeavor and hoped that their income-generating capability will improve.

PHOTOS: MCME

PHOTOS: MCME

Dampalit Watershed project as a model extension program

Given the success of the project and its impact on upland farmers and its surrounding communities, the Dampalit Watershed Project won the 2009 UPLB Outstanding Extension Program Award. The award is aimed to encourage leadership, resourcefulness, effectiveness, and dynamism in carrying out the extension functions of the university. The project was adjudged based on the impact on profession/clients, creative output, and effectiveness.

On the impact on profession/clients, the project was able to introduce various innovations and community-driven interventions whose impacts are felt directly at the grassroot level. For one, the revival of SAMALUP from being inactive for 10 years to a SEC-registered people's organization (PO) with a legal personality, thus enabling it to enter into agreements with other agencies in implementing rural and natural resources development projects/activities, is already a feat in itself.

Another accomplishment of the project is how MCME was able to overcome the distrust of the upland farmers and involving them in the realization of the project which is evident in the decrease number of violations in the area. As a result, the SAMALUP is now closely working with MCME in environmental protection and management policy, and rules and regulation implementation in MFR. Also, SAMALUP has created its own tribunal committee which strictly implements these rules and regulations.

With the success of the project, it was able to link up with other agencies, both international and local, adding to the recognition not only of the Damapalit watershed but the SAMALUP as well. With the upland farmers being able to share their experiences in farming, many people have benefitted from the Dampalit watershed as training and learning laboratory site.

The project was selected as one of the learning sites by the International Adaptive Learning and Linkages in Community-based Natural Resource Management (ALL in CBNRM) program. This provides the platform and venue for learning groups in Cambodia, Vietnam, Philippines, Indonesia, Thailand, and Laos to share their experiences in project implementation through e-forums and conferences.

Indeed, with the success and lessons learned in implementation, the project has been presented in national and foreign gatherings through paper, poster, and video presentations. The IEC materials that have been produced have become references for participatory sustainable forest management.

The Dampalit Watershed Project is the recipient of the 2009 Outstanding Extension Program/Project.

SAMALUP celebrates Farmers' Day

PHOTO: RDELACRUZ

The application of such data and information to management has resulted to key players' active involvement in project planning, policy advocacy, research agenda setting, and transfer of technologies through the different methodologies and strategies of knowledge management. This entire system shall make possible the development or fine-tuning of technologies and the enhancement of farmers, fisherfolk, and community capabilities.

Towards community resource management and development

In view of constant development in information management and maturity of the communities it serves, the e-Pinoy FARMS® has been responding appropriately to the needs and concerns of farming and fishing populations. Geared towards agribusiness development, it has emphasized the value of information in farming and fishing operations by placing it as the centerpiece of innovations.

With the sharing of information between and among key players and stakeholders, the use of technologies that are location-specific, priority commodities, development-oriented and even client-oriented has become accepted. Because of this, communities are now on the verge of making their activities more responsive to the changing times and are becoming more innovative, integrative and dynamic. After all, information is the key factor in the system that leads all players to manage their community resources in more effective and efficient means and develops its potential as a stable and reliable social organization.

The CPAR e-Pinoy FARMS® is the latest iteration in BAR's interventions for improving the lot of the agricultural smallholder. Programs come and programs may go but the e-Pinoy FARMS® has established the yardstick for resource management and community development which is that this is best accomplished through proper and effective information sharing. The success of succeeding strategies may well be measured against this standard.

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production and profit.

If proven to have the technical merits, the preparation of the technology package can start including validation of technical inputs and requirements of key users of technology. Later on, the draft package is evaluated further by the technical experts. A presentation is required to describe the technical feasibility and social acceptability of the technology is before a panel of reviewers. If accepted, information technology (IT) personnel are called in for the module's preparation as IT packages. A series of technical evaluations are done next which may take several weeks or months until it is approved to be part of the learning-teaching packages.

To date, there are several learning modules in crops, livestock, and fisheries. Different agencies have identified course developers who were trained to use the ICT platform of agriculture and fisheries technology development and management.

The e-Learning module preparation is coordinated and managed by the DA-Agricultural Training Institute in collaboration with the Bureau of Agricultural Research (BAR), the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and other research and development institutions. These agencies also support the National Information Technology Service (NITS) that provides up-to-date information and news on technology breakthroughs in Philippine agriculture and fisheries development.

Changing lives

Given its success as a source of appropriate and timely information and technologies for people and communities, the e-Learning strategy has become much in demand or the 'in thing' these days. The ready available of technical materials and information on certain commodities have helped shape the direction the farming and fishing sectors with shifts in mind-set and orientation of information users, farmers and fisherfolk attitudes towards farming and fishing activities are seeing a change. However, this very modern state-of-the-art and relevant approach is not without problems remain some doubt as to its effectiveness.

With the developments in information and communications technology, people are becoming aware that it is not only the knowledge to be gained that matters but the need to change in their mind-set, especially on computer literacy, and in their attitude towards computers, mobile phones, audio and video recorders and even digital cameras for interactions and relationships. Once these concerns are understood and addressed, then surely we can make our farmers, fisherfolk and their communities be attuned to information and communication technology sensitive mechanism for sustainable agriculture and fisheries development and the utilization and application of e-Learning or the other e-systems in agriculture and fisheries development will follow.

In the operation of the e-Learning strategy, it has to be a constant reminder that whenever there is a new module or package is to be developed, the peoples' condition must be taken into account - from their level of understanding and knowledge of the technology, to their skills in acquisition, and to their attitude towards change – towards the development of a behavior that encourages development of the commodities that they produce or process and the development of communities they are building for the coming generations. There is everything to be gained in starting from where the people are.

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management, action planning including visioning and program development, policy decision making and knowledge management which supports all other initiatives vis-à-vis program management. Also, this system has completely changed the perspective of information technology management into knowledge management that highlights information-sensitivity and development-oriented capability of community-based projects including the enhancement of farmers and their organizations to effectively organize and manage vital resources for sustainability and achieve agribusiness development.

It was originally piloted in two regions, DA-RFU V through the Bicol Integrated Agricultural Research Center (BIARC) and the DA-RFU IX through the Western Mindanao Integrated Agricultural Research Center (WESMIARC) for test runs for effectiveness and efficiency. Today, the system has expanded in scope to include all the other regional research centers throughout the country, highlighting the different priority commodities of the regions including the different agro-climatic conditions of each identified project site. Each region has its own regional system located at the RIARC and is directed to a central hub at DA-BAR for proper system operation and data management.

System operations of *e-Pinoy* FARMS® for community development

Given that each community implementing CPAR is unique, different data sets were prepared along side the development of data management for proper information to be generated to support the whole operation of community-based projects. This will unify all data across locations with varying agro-climatic condition but with the same data management framework.

Through this unified system, redundant procedures in data management are rationalized and streamlined. It will enhance and serve as repository of mission-critical information to support planning, decision-making, and policy formulation for agriculture and fisheries development. With advanced information and communication technology strategies, the system is able to do the following:

- Enable stakeholders to effectively monitor activities related to value-chain management, value adding and enhance agri-enterprise development and more diverse income opportunities for the households;
- Provide the mechanism for process documentation of community-based initiatives;
- Strengthen linkages and networking with local government units, research institutions, and the private sector through participation and complementation; and
- Provide access to information technologies for informed decision-making including possible market linkages to farmer/fisherfolk associations and cooperatives.

In each CPAR site, the system captures basic information about the farmers, the barangay characterization of the CPAR project site, project team and implementation details, and the financial management. These different sub-systems are arranged in such a way that they contribute to the whole process of information management at the same time provide critical information for community development. With the data translated to usable information, the system aids in the process of making farmers and fisherfolk aware of what the ideal sites for production are and how resources are best managed in relation to the whole community-based project operation and management.

e-Pinoy FARMS® utilization and application

The timely processing of data into usable information within the realm of data management system is the key success factor of e-Pinoy FARMS®. Based on data which comes from the project partners and implementers at the local levels, these are processed at the regional level which is then encoded to a database management system and data are transmitted via internet. This mechanism is the best alternative solution because not all regional research centers have their internet connectivity. DA-BAR is now working with other DA units, particularly the Information Technology Center for Agriculture and Fisheries (ITCAF) for appropriate translation of data into relevant information and its smooth transfer to key players and users of community-based information.

Since the system works on data and proper information management, it was customized to include computer-generated reports which combine human and computer interventions that consolidate multi-location data, access mission-critical reports, and share information in real time to support decision-making across organizations for effective management of resources.

Corollary to the implementation of the e-Pinoy FARMS® for CPAR M&E is the ability of stakeholders to translate information into action and effectively link this to current knowledge streams of production. This enables key players to monitor participation in action-oriented projects such as package of technology applications, allocation of resources, production and market linkage of base commodity, and the documentation farmers' practice towards integrated farming systems.


PHOTO: MAQUINO

Operationalizing the CPAR e-Pinoy Farms M&E System in Region 7.

Enhancing community's role in water resource management

BY RITA T. DELA CRUZ


PHOTO: BAR ALBUM

Human life depends on water. Whether as a resource or a commodity, water remains to be the basis of agricultural, industrial, environmental, and sanitation needs. Despite its high importance to society, water continues to be taken for granted and exploited as natural resources.

Over the past few years, the country has witnessed the rise of a new approach in natural resource management (NRM), which consequently convinced policymakers and key players of the agriculture and fishery sectors, to involve the local communities and stakeholders in the management and conservation of the country's natural resources.

The community-based natural resource management (CBNRM) approach addresses not only collaboration among the key players that influence access to natural resource but also empowers the local people, particularly the marginalized farmers, to actively participate in resource management.

Since most of the inhabitants in upland areas practice subsistence farming, they greatly depend on rainfed agriculture, which subsequently becomes a risk-prone agriculture practice due to soil erosion. The degradation of watershed areas and mountain ecology is one of the critical environmental concerns the country is facing today.

It was through this scenario that the project titled "Community-based Watershed Management Approach in Improving Livelihood Opportunities in Selected Areas in the Philippines" was launched in 2005. With the Bureau of Soils and Water Management (BSWM) and the Federation of Free Farmers (FFF) implementing the project, the Bureau of Agricultural Research (BAR) funded this two-year project.

In collaboration with Regional Field Units (RFUs) I, III, VII, the International Crops Research Institute for the Semi-arid Tropics (ICRISAT), and the local government units (LGUs) the project was finally implemented in four pilot provinces of the country: Sta. Maria in Ilocos Sur, San Clemente in Tarlac, Doña Remedios Trinidad in Bulacan, and Talibon in Bohol.

According to a summary report, the four project sites selected for the study represent the upstream portion of the watershed. Bulacan for instance generally represents the mountainous to hilly part, Bohol and Tarlac represent both the upland hilly and lowland landscapes, while Ilocos Sur represents the downstream part and is mostly flat areas. Soil quality in these areas is hardly profitable to grow crops since the soil is shallow, low fertility, and acidic. Most farmers living in the watershed areas are engaged in subsistence farming which may be attributed to their tenurial status, capital costs, market access and financial support.

The projects hopes to provide employment opportunities for the local communities through various natural resource-based livelihood activities while at the same time, taking care of the environment by minimizing land degradation through sound soil and water conservation and management technologies to promote sustainability.

But more than that, the watershed project is trying to demonstrate effective cases of local initiatives and active community involvement and participation in managing the country's natural resources at the community level, which are principally based on local

wisdom and knowledge with technical support from the government.

One of the important objectives of the project is to provide livelihood opportunities and improve the income-generating activities of the farmers who are generally engaged into subsistence farming. This is done by empowering the community with technical know-how through the conduct of hands-on training, lectures, consultation meetings and workshop on sustainable watershed management. Likewise, through community-driven interventions, technologies were introduced to improve crop production and farm income.

In the case of Doña Remedios Trinidad in Bulacan, water availability for domestic agricultural use became their leading problem. Since water supply in the area is scarce, agricultural production is low. Through the project, the Parungao water storage and distribution system was constructed which improved the production system and income of farmers. By providing water, the community is now focused on sustainable agricultural activity like growing of vegetables even during the dry season. Likewise, water for household use was also made available.

Since the local community in Talibon, Bohol is also engaged in subsistence farming, priority needs were focused on providing potential livelihood opportunities by making use of available agricultural resources. Members of the community surrounding the Sto. Nino Small Water Impounding Project were empowered and technically equipped through the conduct of trainings on soil and water conservation technologies, soil fertility enhancement and agri-based livelihood opportunities.

Meanwhile, the condition surrounding the Casipo micro watershed community in San Clemente in Tarlac is marginal in terms of its physical attributes and absence of support facilities. Mindful of the importance of sustained supply of water for crop cultivation, the community rehabilitated the construction of new small farm reservoirs through a resource sharing scheme by the community. This strategy ensured shared responsibilities and accountabilities and a sense of ownership.

For the community of Sta. Maria, Ilocos Sur, temporal variability and scarcity of rainfall becomes a natural constraint to livelihood improvement. Thus, a small farm reservoir was reconstructed inside the Ilocos Sur Polytechnic State College which serves as an outdoor laboratory for farmers, students and the community in the dissemination of information and demonstration of technologies on soil and water conservation.

Reference:
"Community-based Watershed Management Approach in Improving Livelihood Opportunities in Selected Areas in the Philippines" A Summary Report Submitted by BSWM to BAR.

> ***"The projects hopes to provide employment opportunities for the local communities through various natural resource-based livelihood activities while at the same time, taking care of the environment by minimizing land degradation through sound soil and water conservation and management technologies to promote sustainability."***

Community-driven watershed management activities and interventions in four project sites

PHOTOS: BSWM

PHOTOS: RDELACRUZ

Operationalizing CPAR e-Pinoy FARMS® for a more interactive community

BY **MARLOWE U. AQUINO, PhD**

After decades of programs and projects supposedly geared to help farmers and fisherfolk, it has dawned on government planners that the end result should be producers able to make wise decisions in their operations. It was also realized that providing the farming communities the means to do this would be the best way to elicit rural progress. And at the center of such assistance is information that is meaningful to the agricultural stakeholders.

Two years ago, BAR realized that there was a need to integrate and combine strategies of participatory approaches in development programs and information and communications technology (ICT) for faster acquisition and transfer of technologies in its endeavors for the countryside. Towards this end, the Bureau of Agricultural Research (BAR) collaborated with the Optiserve Technologies, Incorporated (Optiserve) to develop a system that would support and enhance one of DA-BAR's major programs. The Community-based Participatory Action Research (CPAR) was the recipient of a computerized operating system that laid out the terms for enhanced monitoring and evaluation of participatory projects on community resource management.

Originally intended for managing community resources, the CPAR e-Pinoy FARMS® Monitoring and Evaluation System opened avenues for CPAR implementers to understand the intricacies of development communications and management. Its application was developed for community-based participatory action researches in agriculture and fishery commodities using the farming systems research and development methodology. The working model has met success and it is now being utilized in all the regional integrated agricultural research centers or RIARCs under the Department of Agriculture – Regional Field Units in partnership with local government units and the private sector.

The CPAR e-Pinoy FARMS®

The CPAR e-Pinoy FARMS® Monitoring and Evaluation System was developed out of the need to optimize the use of data generated from the field through the BAR-funded CPAR projects implemented by the different RIARCs and the local government units (LGUs) by translating these into appropriate forms and delivering these information to farmers and fisherfolk and their communities through electronic means such as the internet. With better informed communities, they would be enabled to improve their living condition and make decisions on how best to make use of technologies under different commodities across specific locations and community resources.

The Optiserve Technologies, Inc. has been assisting DA-BAR in the development of the CPAR e-Pinoy FARMS® M&E system as a unified monitoring and evaluation system for community-based projects. The e-Pinoy FARMS® is an electronic system which is unique in that it addresses the operation of a Farm Resource Management System which integrates an Enterprise Resource Planning (ERP) solution with built-in capability to integrate all data and processes of an organization into a unified system.

It starts from community resource