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April-June 2013

From Garbage to Gold:

MANGO PEELS AS SOURCE OF PECTIN

(full story in p. 8)



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24th NRS R&D Winning Papers

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On the COVER

Gragasin et al. was awarded first place (Gold award) in the Applied Research (Technology/Information) category. The study aims to utilize mango peels that are otherwise considered waste as a source of pectin, allowing the country to potentially produce its own pectin to meet national demand.



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Full story on page 8

In this issue...
24th NRS R&D Winning Papers

Recognizing Researchers in Agri and Fisheries through NRS

by DR. NICOMEDES P. ELEAZAR, CESO IV

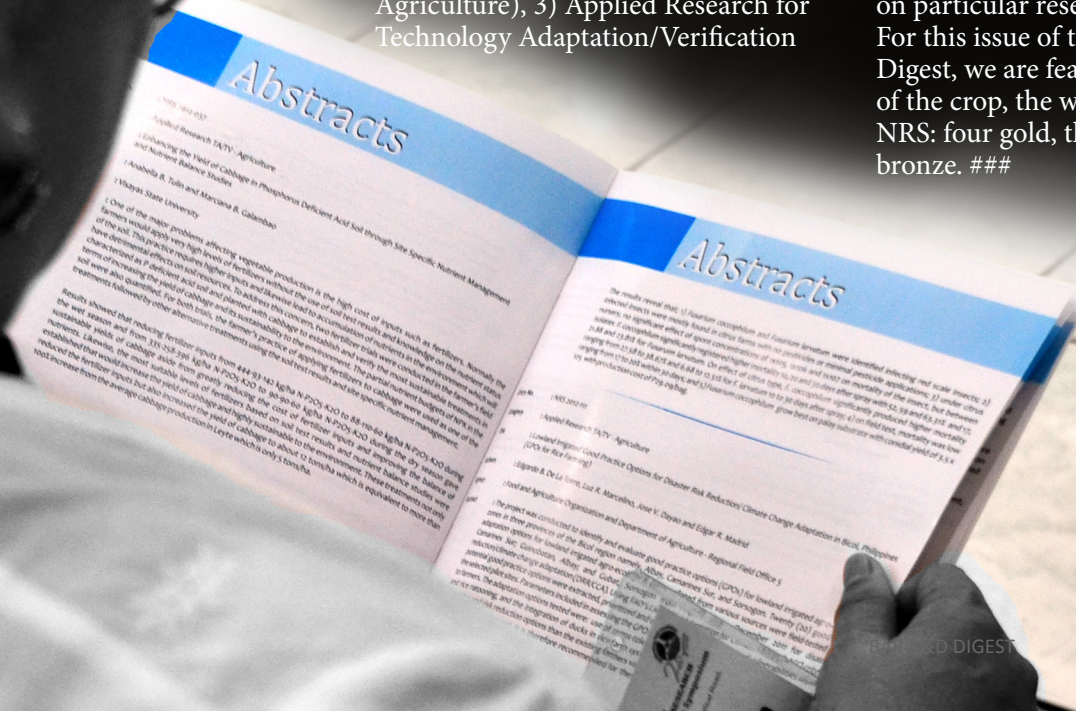
Held annually for more than two decades now, the National Research Symposium or NRS has become a signature event for BAR that attracts a great number of people and the attention of mass media. First staged in 1998, the NRS has been faithfully held each year by BAR to highlight significant research results and technologies generated by researchers and scientists in the fields of agriculture and fisheries.

Through the years, the NRS has served as a good venue to disseminate new technologies and knowledge in support to agriculture and fisheries modernization. In recognition of BAR's contribution to the DA's goal of attaining food security, the NRS was commended by Agriculture Secretary Proceso J. Alcala during the 24th NRS held last year for serving as "an effective platform wherein new research and technologies are properly recognized and tapped for their potentials to become key factors for a more productive agriculture sector".

The year 2012 was a good year for the DA-BAR National Research Symposium judging by the harvest of entries, 140 which is 11 percent higher than the previous year. In the 24th NRS, there were five categories: 1) Basic Research, 2) Applied Research for Technology Information/Generation (or TG/IG Agriculture), 3) Applied Research for Technology Adaptation/Verification

(or TA/TV Agriculture), 4) Applied Research for Technology Information/Generation (or TG/IG Fisheries), and 5) Development Research - Agriculture. Awards were not given in the previous categories of TA/TV Fisheries and Development Research - Fisheries. The AFMA Best R&D Paper Award and other awards were given in each of the current categories.

The award is notable in that it is given to works of researchers that have resulted to new technologies, information, processes, and systems beneficial to agriculture and fisheries. Not surprisingly, several of the entries are based on researches conducted, not by one, but by two or several agencies under collaborative undertakings which make for an effective and efficient way of doing research as the best available facilities and minds are set to focus on particular research concerns. For this issue of the BAR R&D Digest, we are featuring the cream of the crop, the winners of the 24th NRS: four gold, three silver, and one bronze. ###



CALL FOR PAPER

21st National Symposium

6-9 October 2009

RDMIC Building, Elliptical Road corner Visayas Avenue, Diliman, Quezon City

Theme: "Sakahan, Kaulanan, Kawalanan: Imbensang Pagpapahalaga ng mga Farmer and Fisherfolk through Research"

RESEARCH PAPER CATEGORIES

1. Basic Research
2. Applied Research – Technology/Information Generation (Agriculture)
3. Applied Research – Technology/Information Generation (Fisheries)
4. Applied Research – Technology Adaptation/Verification (Agriculture)
5. Applied Research – Technology Adaptation/Verification (Fisheries)
6. Socio-Economics Research
7. Development Research (Agriculture)
8. Development Research (Fisheries)

AWARDS

Best R&D Paper Award P1P 50,000.00
 1st Runner up P1P 30,000.00
 2nd Runner up P1P 20,000.00

22nd National Research Symposium



23rd National Research Symposium

"Harnessing Research for Safe and Quality Agri-Fishery Products"

OPENING PROGRAM
 10 October 2011
 4/F RDMIC Bldg, Visayas Ave., Quezon City

AWARDING CEREMONY
 11 October 2011
 Manila Hotel, Roxas Boulevard, Manila

25 years (1987-2012)
 Celebrating R&D Excellence

20th National Research Symposium

*Mula sakahan patungong hapag-pagamay
 Bringing the benefits of agricultural R&D closer to the people*

2 October 2008
 RDMIC Building, Visayas Ave., Diliman, QC

3 October 2008
 BSWM, Visayas Ave., Diliman, QC

In the last 25 years since the Bureau of Agricultural Research (BAR) started the conduct of the National Research Symposium (NRS), this event has come a long way. NRS has become a signature event of the bureau that researchers from all over the country look forward to it every year.

The NRS is a nationwide competition wherein various research papers in the fields of agriculture and fisheries vie for recognition alongside cash incentives.

But NRS is not just a competition for recognition. As the bureau chief, Dr. Nicomedes P. Eleazar puts it, "NRS is a show of the country's prowess, a demonstration of the ability of our R&D manpower to meet the expectations of high quality research. Through the NRS, we are finding fresh confidence in



The NRS in the Last 5 Years:

Furthering Knowledge in R&D

by RITA T. DELA CRUZ

ourselves as we recognize each one's ability to contribute to the overall productivity of the sector."

Trends for the Last 5 Years

Except in 2010, the trend in the number of paper entries is increasing over the last five years. To address the 26 percent decline in entries in 2010, the bureau decided to increase by more than 100 percent the cash prizes for major category winners to entice more researchers to join the NRS.

Another approach employed was to go for enhanced publicity, specifically, a more massive and intensive promotion of the NRS. And truly, both of these strategies proved effective as the number of paper entries for the next two years skyrocketed.

NRS Theme and Focus

To give focus and direction,

BAR adopts a particular NRS theme every year which is mainly dictated by the needs and relevancy in the sector and the directions and priorities of the Department of Agriculture.

For the last five years, the focus has been on securing food for the Filipino people through R&D, keeping to two R&D thematic thrusts of BAR: 1) food security and 2) increased productivity and profitability.

In 2011, for instance, the NRS adopted the theme, "Harnessing Research for Safe and Healthy Food and Agri-Fishery Products", which underscores the pivotal role of R&D in addressing the safety and health issues of the agriculture and fisheries products being consumed. This was borne out of the realization that, over the years, many advances in food production have been developed through R&D but, throughout this course, many quality and safety issues from production to transport and storage remain unresolved.

In 2012, the focus was on "Responsive R&D Excellence towards Food Security and Growth in Agriculture and Fisheries" to highlight researches and innovations that would help the country to fully attain food security. BAR, as the national coordinating body for research and development, taps the expertise of hardworking scientists and innovative researchers all over the country, who will act as catalysts in further intensifying the government's initiatives to ensure food security for the Filipino people.

This year's competition, now on its silver year, will focus on the theme: "NRS@25: Pananaliksik Tungo sa Mataas na Ani at Kita sa Pagsasakahan at Pangangisdaan". ###

Addressing the Menace of *Phytophthora* Disease in Jackfruit

by LEILA DENISSE E. PADILLA

Eastern Visayas is popular for its high-quality flagship commodity - jackfruit or *langka*. However, production in the region was found to be declining through the years because of a disease that is affecting plantations in Biliran Islands, Samar, and Leyte.

Cognizant of the importance of jackfruit as the largest edible fruit with 18 identified uses, the Visayas State University (VSU) conducted a research funded by the Australian Center for International Agricultural Research (ACIAR) that found *Phytophthora palmivora* as the primary cause of the decline in jackfruit production in the region.

Given such significant research findings, the paper, "Etiology and Incidence of Jackfruit Decline in the Philippines Caused by *Phytophthora palmivora* (Butler)," was given the Gold Award for Basic Research in the 24th National Research Symposium (NRS) of the Bureau of Agricultural Research (BAR).

The research on which the paper was based, "Integrated Management of Phytophthora Diseases of Durian and Jackfruit in the Southern Philippines," was conducted by VSU in collaboration with ACIAR, Eastern Visayas Integrated Agricultural Research Center (DA-EVIARC), and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD).

The project team was led by Prof. Dr. Lucia M. Borines of the Department of Pest Management-VSU with Prof. Dr. David

Guest of the University of Sydney as the Australian project leader and Dr. Rosalie Daniel of the same university who served as the durian and jackfruit component coordinator.

***Phytophthora Palmivora:* Cause of Jackfruit Decline**

Phytophthora palmivora, a fungal-like organism that causes yellowing, blighting and canker lesions on leaves, canker on stem, tree decline, dieback and wilting, and root and fruit rotting, affects not only *langka* but also other high-value commodities such as coconut, cacao, durian, papaya, and palms.

Through a visual survey of 42 plantations in Biliran Islands, Samar, and Leyte, it was found that 85 percent are already experiencing a decline in jackfruit production, 52 percent of which have a 50 percent or higher disease incidence.

Isolations, pathogenicity tests, and pathogen characterization were also conducted. "Initial isolations yielded species of phytophthora, pythium, fusarium, colletotrichum and basidiomycetous fungi but most isolates were phytophthora. Fourteen isolates were found pathogenic to jackfruit after the conduct of Koch's postulates," Dr. Borines stated.

Pathogen Identification through PAR

The winning paper is mainly the output of the participatory action research (PAR) originally titled, "Etiology of Jackfruit (*Artocarpus heterophyllus* Lam.), Pathogen Characterization and Identification," conducted by Dr. Borines' team.

It also has inputs from the PARs of Prof. Reny Gerona titled, "Effect of Selected Insect Species on the Wilt Disease of Jackfruit," and Dr. Ruben Gapasin titled, "Effect of Nematode-Fungi Interaction on the Wilt Syndrome in Jackfruit," both from the Department of Pest Management-VSU.

These three researches are among the other PARs conducted under the jackfruit component of a bigger research project titled, "Integrated Management of Phytophthora Diseases of Durian and Jackfruit in the Southern Philippines".

The jackfruit component was done under the direct supervision of Dr. Borines and indirect supervision of Drs. Guest and Daniel of the University of Sydney.

Prof. Gerona's PAR identified seven insects associated with jackfruit, four of which were found to carry *P. palmivora* to the trees. The associated insects are mealy bug, fruit borer, tree hoppers, myrmecinae ants (red), ponerinae ants (black), curculionid beetle, and chrysomelid beetle. The ants



Photo: LBRIONES

and chrysomelid beetle were found to be the most effective carriers among the four insects with the highest infection percentage on jackfruit seedlings.

Dr. Gapsin's PAR found that *P. palmivora* alone is the main cause of jackfruit decline, even if nematodes and fusarium are also present and cause jackfruit diseases.

The other jackfruit PAR trials aimed at improving nursery and orchard management practices and introducing them to smallholder farmers in order to manage the disease.

A team led by Dr. Carlos S. de la Cruz, chief of the EVIARC satellite station located in Abuyog, Leyte, conducted management trials in the nursery while four jackfruit farmers did actual management trials in their orchards.

The results of these trials were discussed in another earlier paper submitted by Dr. Borines to BAR in 2012 titled, "Participatory Action Research (PAR) on Phytophthora Management Delivers Positive Outcomes for Smallholder Jackfruit

Farmers".

The paper discussed the utilization of fermented organic additives (FOA) (i.e., green silage, chicken dung, and microbial inoculant) in the potting media mixes together with improved nursery practices to protect jackfruit seedlings against *P. palmivora*.

The four selected farmers also utilized and assessed management strategies on-farm. Improved cultural practices, including cultivation, sanitation, construction of drainage canals, mounding, mulching, and application of chemicals and plant defense activators, were implemented during the PAR trials.

During regular monitoring by the proponents, it was found that the management strategies improved the health condition of trees and increased the yield while reducing production costs and losses which resulted to farm income rise.

In conclusion, Dr. Borines stated, "the simple participatory action research trials conducted by selected jackfruit farmers enriched their knowledge and skills in managing [the] Phytophthora disease. They also learned other best practices in orchard management from local scientists and from each other through farm cross visits and interactions during farmer's field days (FFDs) and extension trainings. Their farm income significantly increased after the short period of actual experimentation in their farms."

For more details, please contact: Dr. Lucia M. Borines, project leader and professor, Department of Pest Management, Visayas State University (VSU) through telephone: (053) 536-7250 or e-mail: lucyborines@gmail.com.

From Garbage to Gold:

Mango Peels as Source of Pectin

by ZUELLEN B. REYNOSO

Apart from their world-renowned hospitality, Filipinos are best known for their thriftiness. A plastic container previously holding your favorite ice cream will find its way to the dumpsite only if it has been reused more than twice (i.e., as *ulam* container in your fridge then as a tool organizer on your home desk). Filipino pork dishes, such as pork sisig, are made from pig's ears and cheeks

- animal parts usually ignored by other cultures. These are testament to the Filipinos' tendency of not letting anything go to waste. Such is the case for the mangoes in the country.

The Philippines is blessed with several varieties of mangoes as the country is one of the Asian countries where mangoes are endemic and well regarded. Mango is even a national fruit to three

countries, namely,

Pakistan, India and the Philippines.

Manggang kalabaw (Carabao mango or Champagne mango) is the biggest

among the local varieties, and is often referred to as the "Manila super mango" which is recognized in the Guinness Book of World Records to be the sweetest mango in the world. The so-called "Indian mango" (*katchamita*) is another variety found here, smaller than *manggang kalabaw* and is also less sour when unripe, and less sweet when ripened. There are also the *piko* (*pico*) and *pahunan* varieties found all over the country. All varieties can be eaten unripe when its flesh is green to almost-white and very sour (*manggang hilaw*) along with *bagoong* (shrimp paste), or consumed when the fruit has ripened to a bright yellow-orangey color at its sweetest phase, needing only a spoon to scoop out the flesh.



An abundance in mango supply leads to greater revenues for the country. Since numerous provinces in the archipelago produce mangoes, the country is able to supply its own needs with export produce to spare, and stands as the seventh top mango producer in the world. Forty-eight countries receive Philippine mangoes with fresh mangoes accounting for 59 percent of the total mango export. Of the remainder, 18 percent counts as mango puree, 16 percent as dried mangoes, and seven percent as juice. Producers include Davao, Cotabato, Sultan Kudarat, General Santos, Ilocos region, Misamis Oriental, Sarangani, and Cebu; with top production coming from Zamboanga del Norte, Negros Occidental, Pangasinan, and Guimaras.

Through the Department of Agriculture (DA) High Value Crops Development Program (HVCDP), efforts are being directed towards sustaining the supply of mango for export. This year alone, P15 million has been allotted for seedling distribution, postharvest machine supply, and capacity building to be led by the Philippine Mango Industry

Foundation, Inc. and this is just for one institution. Grants and funds are given to other agencies and organizations for other initiatives designed to increase and sustain mango production in the country.

However, production is not the only concern of the mango industry. With only 10 percent of the total mango production being exported, this means that 90 percent of our total production remains in the country for local consumption. Forty-one percent of the mango supply left in the country is used to produce value-added mango products. This means that majority of mango waste from processing remains in the country. Presently, an average of five truckloads a day of mango waste materials from

Through the HVCDP, efforts are being directed towards sustaining the supply of mango for export. This year alone, P15 million has been allotted for seedling distribution, post-harvest machine supply, and capacity building.

mango processors alone is disposed in dumpsites around the Philippines. This includes the peelings and endocarp (tough inedible part in the middle of the fruit). Combined with other crop wastes, they become part of the mountains of garbage that plague the nation today.



www.mboard.pccard.dost.gov.ph

Mango Waste as Pectin Source

In the Philippines, pectin is supplied through importation as both the raw materials (from apple and citrus peels) and the technology is not available in the country. According to the Department of Trade and Industry (DTI), in 2011, imports of pectin amounted to a little over P2 billion to supply the total pectin needs of pharmaceutical, cosmetics, and food processing industries.

Pectin is derived from the Greek word meaning “congealed or curdled” and is found in plants. It is used mainly as a gelling or thickening agent in numerous food (jams and jellies) and pharmaceutical products (as a source of dietary fiber). It is derived from fruits, chiefly from apples followed by citrus fruits.

During the 24th National Research Symposium, a paper titled, “Utilization of Mango Peels as Source of Pectin” by Ma. Cristina B. Gragasin, Aileen R. Ligisan, Rosalinda C. Torres, and Romulo R. Estrella of the Department of Agriculture’s (DA) Philippine Center for Postharvest Development and Mechanization (PhilMech) and the Department of Science and Technology –Industrial Technology Development Institute (DOST-ITDI), was awarded first place (Gold award) in the applied research (technology/information) category. The study aims to utilize mango peels that are otherwise considered waste as a source of pectin, allowing the country to potentially produce its own pectin to meet national demand. Effective utilization of mango waste also means less material in dumpsites and less environmental issues.

In the study, Gragasin evaluated the pectin quality harvested from native



Pectin from Apple

Pectin from Mango

Photos: PHILMECH

Carabao mango (*Mangifera indica*) with reference to the United States Pharmacopeia (USP) specifications for pharmaceutical-grade pectin.

According to her, after determining that carabao mango peels could be a source of USP-standard pectin, we will not only be able to focus our resources on developing Philippine-produced pectin from mango peels, but that we will be able to generate income-generating jobs and minimize solid waste materials.

The paper further revealed that “the volume of mango peels needed to produce the total volume of the country’s pectin importation, which amounted to 94,849 kg in 2011, can already be supplied with just two percent of the total mango peels wasted at the processors level.” This means that with this new knowledge, we will not only fully meet the country’s pectin requirement but possibly produce for the foreign market as well.

Mango R&D for E&E (Economy and Environment)

This study presents a three-pronged solution to three different but equally relevant issues in our time today: costly importation; lack of income-earning opportunities; and the eternal battle against waste management inadequacies—are all very heavy but ultimately, solvable problems.

Mango peels now can be used to extract pectin; thus, the group of Gragasin is able to supply the country’s demand for the product and veer away from importing majority of our pectin demand. And because tons of mango peels rest in mountains of other waste products in dumpsites, this need not be the case as this once considered garbage can now be utilized for profit.

The study also promotes income opportunities for mango farmers as they are now able to earn based more than the sweet meat part of the world-famous Philippine mango.

Mango peels that once lined the surfaces of the mountains of waste products could now be part of an income-generating process. From an import cost of P2 billion, we turn to the mango peels discarded and deemed valueless to supply our pectin demand—from garbage to gold. ###

For more details, please contact: Ma. Cristina B. Gragasin, supervising science research specialist, PhilMech through email: cristygragasin@yahoo.com



An average of five truckloads a day of mango waste materials is disposed in dumpsites.

Good Practices Option: Best Defense against Natural Calamities *in Bicol*

Photos: BIARC

by DIANA ROSE A. DE LEON

With the right farming system even the damage that can be brought upon rice fields by a calamity can be prevented or lessened. This is what was emphasized in R&D paper titled, “Lowland Irrigated Good Practice Options (GPOs) for Disaster Risk Reduction/Climate Change Adaptation in Bicol (GPOs for Rice Farming)” during its presentation in the 24th National Research Symposium organized by the Bureau of Agricultural Research (BAR). The paper, presented by Ms. Luz R. Marcelino,

co-author and manager of the Department of Agriculture, Regional Field Unit V – Bicol Integrated Agricultural Research Center (DA RFU V-BIARC), bagged the grand prize for the Best R&D Paper under the technology adaptation/technology verification - agriculture category.

The study materialized when Bicol Region was hit the hardest during the onslaught of strong typhoon Reming. An estimated 18,800 hectares (ha) of rice fields

were destroyed, and more than 153 million pesos was the estimated loss in input costs such as seeds, fertilizers, and labor.

Building Rice Farmers’ Resiliency against Calamities

With technical and funding support from Food and Agriculture Organization (FAO), the DA-BIARC conducted an overall assessment and designed a rehabilitation plan for agriculture that features the enhancement of livelihood of rice



“

The provinces of Albay, Camarines Sur, and Sorsogon were observed to be vulnerable to typhoons, strong winds, flooding and soil salinity. There is really a strong need to alter the traditional farming practices in these areas.

”

farmers in the perennially typhoon-affected areas in the Bicol Region.

Based on the assessment, the provinces of Albay, Camarines Sur, and Sorsogon were observed to be very vulnerable to typhoons, strong winds, flooding and soil salinity. There is really a strong need to alter the traditional farming practices in these areas. The study team therefore recommended various farming systems that are suited to the farmers' needs and risks without compromising their income.

They started from identifying the GPOs to be tested in these provinces. Following a series of elimination and validation, out of the 20 GPOs initially identified, five potential GPOs were found to be highly suitable for lowland irrigated conditions such as the rice growing areas in these three provinces. The GPOs were chosen based on the data gathered from

three cropping seasons, taking into consideration their possible influence on crop yield, crop maturation period, and acceptability to farmers. With these five GPOs, the expectation was that disaster-risk reduction and climate change adaptation will be improved.

The Best Five GPOs

The first GPO that the study recommended is the use of early-maturing rice varieties like NSIC Rc 120 and IR-60. According to Ms. Marcelino, this GPO is highly recommended in areas wherein there are frequent typhoons. With an early-maturing variety, the risk of exposing the planted rice to impending calamities is lessened. It can be harvested 92 days after transplanting in comparison to

the locally used variety, *Binatang*, which takes 108 days before it can be harvested. Based on the field testing done using this GPO in those three provinces, despite being harvested early, the yield is comparable and, in some instances, exceeded that of the *Binatang*. Based on the study, an increment in yield of 670 kilograms (kgs) per ha, which when converted to cash is equivalent to 8,040 pesos, can be obtained.

The use of a salt-tolerant rice variety like the NSIC Rc 108 is the second GPO chosen. It was tested in Sorsogon wherein saline intrusion is a common scenario that has caused low rice production. Using the salt-tolerant variety, the farmers increased their yield from 1.95 tons per ha to 3.12 tons per ha. The additional 1.14 tons per ha when converted to cash



Comparison of early maturing variety (right) and farmer's variety (left), grown in Gubat, Sorsogon.

is equivalent to 13,700 pesos. However, it was observed by the farmers that seedbed preparation takes longer (25-30 days before transplanting) when using the salt-tolerant variety. This is why in the study, the researchers recommended the use of an early-maturing saline-tolerant variety such as the NSIC Rc 188 as an alternative.

For the rice crop to withstand above normal rainfall conditions is the purpose of the third GPO which is the use of submergence-tolerant rice variety. NSIC Rc 194 is recommended for its characteristics of high milling recovery at 65 percent, good eating quality, and better adaptation under rainy and flooded conditions. With the use of this variety, the farmer can get an additional 1,700 kgs per cropping season or an average income of 20,400 pesos per ha which is 38 percent higher than existing farmers practice using this GPO.

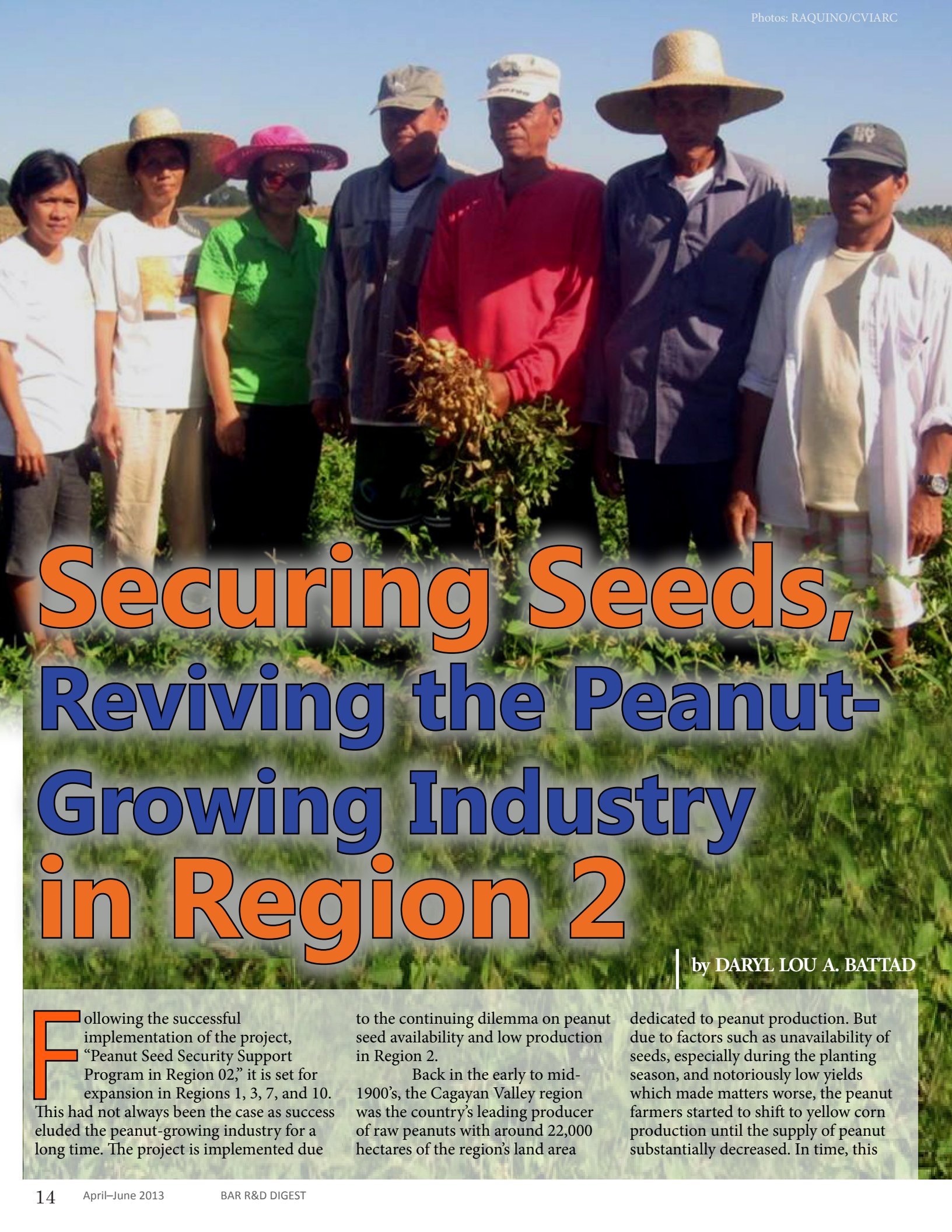
The fourth GPO tested and validated is the timing of planting and rice ratooning. Rice ratooning, which is known in the local dialect as *suli* and *saringsing*, is traditionally practiced in Bicol. It can be adopted by farmers who have less capital while also avoiding high production loss during the typhoon months of October to December (2nd cropping). It is recommended to use a short maturing variety like NSIC Rc 158 with good ratooning ability. There is an increment in rice yield of 580 kgs per ha after 45 days can be added to the income of the farmers. Lastly, the GPO of rice-duck farming is recommended for typhoon-prone, flood-prone, and salt-affected areas. Aside from the money earning potentials from the sale of duck eggs, ducks can also help in improving rice seedling growth by eating pests such as insects, and weeds. Ducks can freely roam around the rice field two weeks after transplanting up until rice maturity. It was found out in the study that the integration of ducks with the rice crop provides an additional source of income and

adaptation is easier for the farmers compared to rice mono-cropping alone.

As a continuing effort, the FAO and the DA RFU V-BIARC will be conducting another research applying these GPOs in 10 other sites grouped into three landforms – the upland, the submerged areas, and the saline areas in Bicol region with a total area of 6.45 hectares.

It is an imperative for a country such as the Philippines is always affected by calamities to develop and strengthen its strategies for disaster-risk reduction and climate change adaptation in order to protect its food supply and avoid shortage. This study answers this need especially on ensuring that rice productivity and its availability will not dwindle. The five GPOs recommended give assurance to the farmers that they need not worry anymore about their livelihood especially in times of natural disasters. ###

For further inquiries, please contact: Ms. Luz R. Marcelino, DA-BIARC manager, through her email: luzcelinomar@yahoo.com



Securing Seeds, Reviving the Peanut- Growing Industry in Region 2

by DARYL LOU A. BATTAD

Following the successful implementation of the project, “Peanut Seed Security Support Program in Region 02,” it is set for expansion in Regions 1, 3, 7, and 10. This had not always been the case as success eluded the peanut-growing industry for a long time. The project is implemented due

to the continuing dilemma on peanut seed availability and low production in Region 2.

Back in the early to mid-1900’s, the Cagayan Valley region was the country’s leading producer of raw peanuts with around 22,000 hectares of the region’s land area

dedicated to peanut production. But due to factors such as unavailability of seeds, especially during the planting season, and notoriously low yields which made matters worse, the peanut farmers started to shift to yellow corn production until the supply of peanut substantially decreased. In time, this

Researchers and crop experts led by Ms. Rose Mary G. Aquino of DA-CVIARC came up with a research program that aims to increase and sustain peanut production in Region 2.



reduced the country's peanut production, prompting efforts to revitalize the peanut-growing industry.

The Cagayan Valley Integrated Agricultural Research Center (CVIARC) of the Department of Agriculture- Regional Field Unit 2 in Ilagan, Isabela coordinated with different organizations in putting up a proper production management system geared to elevate the status of the peanut industry in the region.

Researchers and crop experts led by Ms. Rose Mary G. Aquino of DA-CVIARC came up with a research program that aims to increase and sustain peanut production in Region 2 through improved seed system (formal and informal) combined with the development and promotion of new varieties and a package of technology for confectionery variety production. That success was reached by the program is a story reported during the 24th National Research System through a paper titled, "Peanut Seed Security Support Program in Region 02" presented by Ms. Aquino. It won the gold award under the development-agriculture category.

The expansion of this award-winning program to other regions will be laid in July 2013 through the partnership of the Bureau of Agricultural Research (BAR) and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD).

For Healthier and Brainier Filipinos

Peanut will make you smarter. This is no rural myth as peanut (*Arachis hypogaea*

L.), called in the vernacular, *mani*, is indeed a brain food for its high niacin content that is essential for brain health.

According to PCAARRD, peanut has good nutritional value with the following proximate nutrient content: 25.67 percent crude protein, 20.05 percent carbohydrates, 47.41 percent crude fat, 4.39 percent moisture, and 2.48 percent ash.

Peanut is also an affordable protein, as it is readily available at a price within reach of most Filipinos, and is an energy food source for humans and animals alike having 25 percent protein and 45 percent oil composition.

Also called groundnuts, they are a good source of many essential nutrients such as carbohydrates; fiber; vitamins A, E, B2, and B6; and choline. Various researches now available point out the valuable role of peanuts in man's battles with serious health conditions such as obesity and diabetes.

Some studies show that peanut has antioxidants and resveratrol, which is known for its anti-aging properties, and are said to help reduce one's likelihood of getting cardiovascular diseases and lowers cancer risks.

With the forthcoming expansion of the program to more regions, the DA, its partner agencies, the various stakeholders,

and growers will not only boost peanut production but will potentially contribute to the improvement of Filipino health as more will benefit from its nutritional value.

Richer Peanut Folks

Economically, there are truly many advantages in growing peanuts: the generation of substantial profit; a big market, both locally and internationally; and a fairly competitive pricing for the commodity. On the production side, Philippine soils are deemed immaculate for peanut planting, especially in region 2. All it needs for the industry to take off are improvement in the variety, guaranteed seed resource, and dedicated researchers and support systems.

The formulation of the peanut security support program in region 2 resulted to obvious increases in yield and productivity that was obtained with the use of high quality seeds, superior varieties and good technology.

From 1,210 kilograms per hectare in 2008, the produce perked up to 400,000-600,000 kilograms per hectare, translating to about PhP 15 to 20 million in revenue for peanut growers.

Despite the sedimented and sandy soils in some parts of Cagayan Valley and high production risks due to floods and droughts, farmers are remarkably doing well and earning a net income of about P31, 770 per hectare.

Further, the high production created more employment opportunities for household members like housewives and children, which means additional income for the family. The project includes two major components: peanut crop improvement; and peanut technology transfer acceleration through efficient seed support systems to be conducted, consecutively.

A major issue addressed by the first component was the problem of low yield brought about by the repeated use of mixed and old peanut varieties. Under the Peanut Crop Improvement component, the project implementers were able to identify and select varieties with improved yield and resistance

CVIARC of DA-RFU2 in Ilagan, Isabela coordinated with different organizations in putting up a proper production management system geared to elevate the status of the peanut industry in the region.



to drought and to foliar and soil-borne diseases. They also identified appropriate production technologies for confectionery peanuts, and developed high yielding varieties and yield-enhancing production technologies especially appropriate for the wet season production. This component on crop improvement delivered exemplary results, having met the farmers' desire for improved varieties. The variety locally known as "G.D. Lasam-Pride" passed evaluation and was recommended as the first drought-tolerant peanut variety in the Philippines.

Also, there are new promising peanut selections: ICGV 01273, ICGV 96176, and ICGV 97120, that were recently accepted and recognized by the Field Legumes Technical Working Group (FLTWG) as national cooperative testing (NCT) official entries. After varietal evaluation, selection, and recommendation, the first Package of Technology (POT) for confectionery peanut production was finally developed, which served as the farmers'

guide in improving yield in region 2 and in other peanut-growing regions across the Philippines.

The best thing about this endeavor is neither seen nor measured in numbers. To the researchers and farmers alike, this project is making possible social upliftment in ensuring food security, and empowering resource-poor farmers, household members, and women through their involvement in the entire production process. It also accelerated the promotion and adoption of improved varieties and technologies for enhanced peanut productivity, resulting to the development and sustainability of local seed and food business enterprises.

Even more, this project promotes a sound environment through decreasing dependence on synthetic fertilizer and pesticides. Peanut was also noted to be

unaffected by climate change and is identified as a "fallback crop" for the farmers during times of calamity. Through the efforts of the program, devastated crops and idled lands need not be issues anymore to the farmers and to the entire region.

With these developments and progress in Cagayan Valley's peanut production, the plan to replicate the program in the neighboring regions and elsewhere is most welcome as it will potentially lift, not just the regional economy but also the health and well being of the local constituents, and, hopefully, that of the entire nation in due time. ###

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A top-down view of a bowl filled with fluffy white cooked rice. The bowl has a dark rim. The background is a light, neutral color.

Prolonging of the Shelf-Life Cooked Rice

by ANNE CAMILLE B. BRION

One of the leading and most important food crops in the world is rice. Among most Filipinos, it is considered as the staple food and is an integral part of every household during meal times.

In celebrating 2013 as the National Year of Rice, we have to push ourselves to become more responsible rice consumers and try our best to reduce rice wastage to achieve our country's goal of becoming self-sufficient in rice.

Extending the Life of Cooked Rice for Later Consumption

As early as breakfast time, rice is already cooked and prepared for our tables. Sadly, there are times when cooked rice is not all consumed resulting to leftovers. This leads to retrogradation in rice which occurs when cooked rice becomes firm upon cooling and storage. Retrogradation then is what prompts people to reheat the rice in trying to

restore its eating quality.

In finding a way to control retrogradation and extend the shelf-life of cooked rice, Dr. Maria Patricia V. Azanza and Ms. Jennibeth Paglinawan of the University of the Philippines Diliman embarked on a study to assess retrogradation control in grains of Japonica rice cultivars. The study, "Retrogradation control in acid-pasteurized Japonica rice cultivars," bagged the silver award

during the 24th National Research Symposium (NRS) of the Bureau of Agricultural Research (BAR).

The study showed the potential of acid-pasteurized technology which allows cooked rice to be consumed much later even without reheating. It used Japonica rice cultivars, namely, Kanto and Jasponica which have low apparent amylose content, low gelatinization temperature, and soft to medium gel consistency. According to the International Rice Research Institute (IRRI), it is these three chemical characteristics that determine the quality of cooked rice. Amylose content determines moistness and stickiness of the rice grain. Gelatinization temperature tells how long the rice needs to cook. Gel consistency tells how hard the rice will become when it cools down. Based on literatures,

Kanto and Jasponica possess grain characteristics which indicate lesser tendency to retrograde.

The two rice cultivars were each subjected to steeping and cooking solutions which contained acidic carbohydrates, κ -carrageenan and carboxymethyl cellulose (CMC), tartaric acid, and palm olein oil. After boiling the acidified rice, these were placed in pouches, sealed, pasteurized in boiling water, and then stored at ambient conditions (temperature of $28^{\circ}\text{C} + 2^{\circ}\text{C}$), without reheating, for three months. After 12-weeks of storage, the acid pasteurized rice samples were tested for pH level and water activity (A_w), and analyzed through descriptive sensory evaluation.

Benefits for the Human Population

Results of the study reveal that with a maintained pH value ≤ 4.00 and water activity of $A_w \leq 0.85$, the acid pasteurized rice samples were perceived to have no sour taste and therefore safe for human consumption.

As for the sensory analyses, five regular rice eaters evaluated the changes in the textural and non-textural characteristics of the rice samples. The textural descriptors used to analyze each sample were: firmness, springiness (degree to which grains return to original shape after partial compression), cohesiveness (degree to which sample deforms rather than break), chewiness, and starchiness. On the other hand, non-textural descriptors include color, natural aroma, natural flavor, and sourness.

The textural profiles of the *Kanto* rice sample were found to be almost the same as the freshly cooked rice even when stored for two weeks. It was firm, springy, did not form a

“Kanto and Jasponica possess grain characteristics which indicate lesser tendency to retrograde.”



cohesive mass, chewy, moist, and starchy. It retained its white color during the whole duration of the storage. Its natural rice aroma remained near distinct at two weeks' time, but slightly decreased after 12 weeks. Its natural rice flavor also turned out to be slightly distinct.

Meanwhile, firmness, springiness and cohesiveness were observed to increase in the Japonica rice sample. These changes in the textural parameters, according to previous studies, have been reported as events in the retrogradation of cooked rice during storage.

Based on these results, the acid-pasteurized *Kanto* sample did not show retrogradation during the test storage. The quality right after it was cooked and after 12 weeks of storage were almost the same. Therefore, this rice cultivar can be a suitable raw material in the preparation of acid pasteurized rice products.

What does this tell us? This research on rice provides us with something new on the consumption of rice. In times of calamities such as floods, ready-to-eat, acid-pasteurized cooked *Kanto* rice can be used as relief goods because it can last safely for a few months without need for re-heating. It can also be given as food ration to military people whose lives are always on the constant move and where cooking is considered to be an impractical task. It can also serve as a stable ready-to-eat convenience food for people who do not have the means to cook all the time.

“Success in research is attained when its social responsibility is realized.” This is the lesson that the authors of the study would wish to

impart. Every research done should be looked at from a broader perspective and how its result can impact and benefit the entire human population. ###

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Developing High-Yielding POLE SITAO CULTIVARS for Organic Production

by WILSON G. VILORIA III

Pole sitao is also known as long-podded cowpea, asparagus bean, snake bean, or Chinese long bean. In other dialects it is known as *dau gok* in Cantonese, *thua fak yao* in Thai and *kacang panjang* in Indonesian and Malay, *sitaw* in Tagalog, *utong* in Ilokano, *latoy* in Ilonggo, *bora* in the West Indies, and *vali* or *eeril* in Goa, India. The pods of this crop are about half a yard long, despite what the name suggests; the subspecies, *sesquipedalis* (one-and-a-half-foot-long), is rather an exact approximation of the pods' length.

Thinking just how famous pole sitao or simply sitao is? It is the fifth mentioned vegetable in one of the most popular children's songs in the Philippines, the "Bahay Kubo". This climbing herbaceous plant is also an ingredient of the original yummy Ilokano dish, *pinakbet* or mixed veggies with bagoong and some meat chunks and cooked to perfection.

Pole sitao is a great source of fiber and a variety of nutrients such as protein, vitamin A, thiamin, riboflavin, iron, phosphorus, and potassium, and is a very good source for vitamin C, folate, magnesium, and manganese. In a 100g

serving size of pole sitao there are 47 calories, 0 grams of total fat, 0 mg cholesterol, 4 mg sodium (0 percent daily value), 8 grams of total carbohydrates (2 percent daily value), and 3 grams of protein (5 percent daily value). There are also 17 percent DV vitamin A, 2 percent DV iron, 31 percent DV vitamin C, and 5 percent DV calcium. (Percent daily values are based on a 2000 calorie diet. Individual daily values may be higher or lower depending on individual calorie needs.)

During the recently concluded 24th National Research Symposium organized by BAR, the paper titled, "Development of Organic Varieties of Pole Sitao (*Vigna unguiculata* (L) Walp.subsp. *sesquipedalis* (L.) Verdc.)," won the silver awarded. The study employs breeding, segregation, and pedigree

selection of pole sitao. An added factor which makes it more unique and remarkable is that the breeding work is geared for organic agriculture.

The study is led by Rodel G. Maghirang, Gloria S. Rodulfo, Fatima Amor M. Tenorio, and Maria Emblem O. Grulla from the Institute of Plant Breeding- University of the Philippines Los Baños (IPB-UPLB), and Milagros Cacal of the Palawan Agricultural Center of the Palawan Agricultural Experiment Station (PAES). It sought to address the problems of low vigor, vulnerability to pests and diseases which all lead to yield losses. Eventually, the group succeeded in producing pole sitao cultivars that

outperformed the existing varieties.

Plant breeding is basically the art and science of changing the genetics of plants in order to produce desired characteristics; it is the deliberate manipulation of plant species in order to achieve desired genotypes and phenotypes for specific purposes (Sleper, 1995).

Meanwhile, FAO/WHO Codex Alimentarius Commission defined organic agriculture as “a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any

specific function within the system.”

Those two terms guided the development of the new cultivars of pole sitao by the team of Dr. Maghirang. The main objective of the study is to select, breed, and recommend pole sitao varieties that perform well under organic agriculture conditions. The specific objectives include the production of varieties that are suitable to this specific environment in comparison to the existing commercial variety and to evaluate and recommend the varieties for organic agriculture. The study was conducted in experimental stations and on-farm.

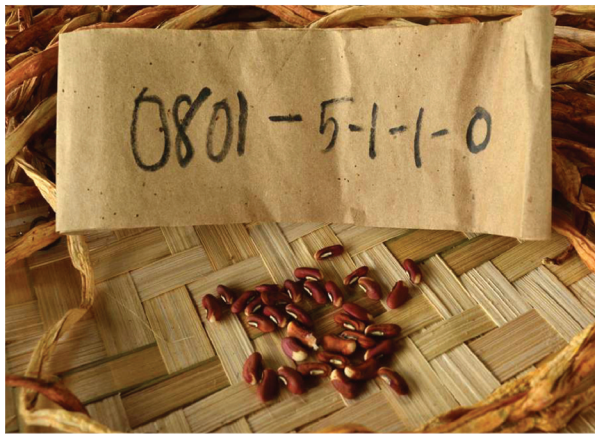
Under a DA-BAR funded project in 1999, the performance evaluation of pole sitao under organic conditions was initially done. In 2005 this was followed by hybridization and pedigree selection under organic conditions. Cultural management aspects

including as minimal weeding and minimal pest control measures, and the use of composted manures and compost materials for soil health and fertilization, were carried out for the organic agriculture environment. Further breeding, segregation and pedigree selection until F6 (sixth filial generation) of pole sitao that will perform better under organic conditions than the recommended commercial variety were done.

Ten F6 lines were assessed and compared to a commercial check variety (Sandigan) using established parameters for selection such as vigor, earliness, pod quality and acceptability, pest and disease resistance, storability, and yield under a two-season trial.

In summary, the results of the study showed that breeding under organic conditions resulted to the selection of potential organic varieties of pole sitao. Among the entries,





The study addressed the problems of low vigor, vulnerability to pests and diseases which all lead to yield losses. The group succeeded in producing pole sitao cultivars that outperformed the existing varieties.



Photos: RMAGHIRANG

10116-1-1-0-0, 0801-5-1-1-0, 10421-0-0, and 1096-1-1-0-0 outperformed the check variety, *Sandigan*, with yields of 25.26t/ha, 25.19t/ha, 24.9t/ha, and 26.19t/ha for the first trial, respectively; and total yields of 15.31t/ha, 19.39t/ha, 17.6t/ha, and 18.07t/ha, respectively for the second trial. Additionally, these lines are moderately to highly resistant to pest and diseases, have good storability, and acceptable pod qualities. Under an initial on-farm trial in Palawan, the two preferred entries, 10421-0-0 and 1096-1-1-0-0, had high yields and good pod qualities.

Yes, it is a malignant truth and it's not new to our ears that some vegetable producers apply synthetic pesticides and fertilizers excessively with the worst case scenario being that the fruits and pods are dipped in a container containing a mixture of those chemicals to improve their crops' yield and growth performance but sacrificing the health of unaware consumers

in the process. However, with this development in organic pole sitao, we are one step closer to a healthier and safer choice. ###

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Tikod Amo:

AN INSTANT HIT AMONG Seafood Enthusiasts

by RITA T. DELA CRUZ

A seafood delicacy is now becoming an instant hit, not only among the locals who live in the coastal communities of Surigao del Sur, but also to those who have heard and tasted the delicious and tasty Tikod Amo.

Tikod Amo is the name given to an endemic oyster species by the people living in the Barobo Coastal waters in Lianga Bay, Surigao del Sur. This unique oyster got its name because its adductor muscle resembles that of a monkey's heel.

According to Gemma A. Asufre, researcher from the Surigao del Sur State University (SDSSU) this oyster species seems to be unknown in the international species nomenclature database as no information that describes its biological features is to be found. Hence, it was assumed that "Tikod Amo" is a new species under genus *Spondylus*.

The researcher from SDSSU is trying to determine its species identification as this is crucial in the culture of this endemic species. Tikod Amo is even aesthetically attractive with the five colors of its internal parts. Its closest relative is *Spondylus squamosos* with a mere five percent difference in DNA to Tikod Amo.

Unknown to many, this endemic oyster species is said to be delicious and tasty making it a favorite seafood delicacy among the locals. Catching Tikod Amo has also become a good source of income among the marginalized fishers in the coastal areas of Surigao del Sur.

Given its high local demand, the price of Tikod Amo is higher than the price of any ordinary oyster meat available in the market. Its current price in the local market



Photos: GASUFRE

is about P400 per kilo for the unshelled meat. With such demand, production cannot adequately supply the local hotels and restaurants.

Internationally, it is also gaining popularity. Among the foreigners who came to know about this rare oyster species, Tikod Amo has become a hit following curiosity about its distinct taste. In fact, Asufre revealed that “Koreans and Chinese who come to the Philippines to buy sea cucumber for export are also willing to import Tikod Amo if there’s a supply. One interested supplier wanted to buy at least 300 kilos per week.”

With the increasing demand for Tikod Amo and the constant harvest, the natural stock of this oyster in the wild is now being threatened. Also, the practice among gatherers of collecting spat (baby oysters) from the wilds is not sustainable and it poses a threat, not only to the diversity of oyster species in the area, but also to the hard coral substrates where these species naturally dwell. As a result, the oyster catch has declined by 40 to 60 percent between 2006 and 2008.

To further mitigate the possible direct impact of this practice on the environment, the potential of Tikod Amo as an oyster species was studied particularly on the sustainability of its production. Hence, the project titled, “Preliminary Study of Tikod Amo on its Potential as an Oyster Culture Species” was implemented by SDSSU with funding support from the Bureau of Agricultural Research (BAR). The study, initiated in 2008 and completed in 2010, was led by Asufre and Miguel O. Baay, assistant regional director of the Bureau of Fisheries and Aquatic Resources (BFAR), CARAGA.

One of the important results that the study generated is the culture technology of Tikod Amo. Asufre said that, “Aquaculture of Tikod Amo offers a great opportunity for learning about its biology and may produce the key to restoring depleted areas.”

One of the key recommendations of the group of Asufre is the use of “bottom polyculture” in the culture of Tikod Amo.

Polyculture is the practice of raising more than one species of aquatic organism in the same pond. The motivating principle is that fish production in ponds may be maximized by raising a combination of species having different food habits. The polyculture of fish is based on the concept of total utilization of different trophic and spatial niches of a pond in order to obtain maximum fish production per unit area. The mixture of different fishes gives better utilization of available natural food produced in a pond. The compatible fish species having complimentary feeding habits are so stocked that all the ecological niches of pond ecosystem are effectively utilized (Singh, 2013).

Compared with monoculture system of fish production, the possibilities of increasing fish yield per unit area through polyculture is considerably higher and more profitable. Also, combining different species in a polyculture system effectively improves the pond environment.

“For growing Tikod Amo, we recommend the bottom polyculture. It’s culturing the oyster at the bottom of the pond. We grow these oysters together with seaweeds and fishes like milkfish, grouper,

and siganid in the mariculture areas of Barobo Bay,” explained Asufre.

The integration of oysters in a polyculture system may be applied in 146 hectares of fishpens in the mariculture zone.

According to Asufre, this kind of culture system will not only increase the production of Tikod Amo, together with other species, but it will also expand employment among both mariculture fishermen and oyster gatherers. ###

For more information on Tikod Amo and its culture technology, contact: Ms. Gemma A. Asufre, Surigao del Sur State University (SDSSU) through mobile no. 0946-333-0229 or email: gaasufre13@gmail.com

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Photos: GASUFRE

Increasing Cabbage Yield

through SSNM

by PATRICK RAYMUND A. LESACA

Vegetable production in the Philippines is one of the prime aspects of the country's agriculture. Aside from being a major source of nutrition for Filipinos, it is also a major source of livelihood for our farmers. Providing higher economic returns, developing new export markets for high value crop and livestock commodities, and improving farmers' income are among the Department of Agriculture's main priorities. However, for vegetables, the high cost of production inputs, such as fertilizers, is a major impediment to improved productivity.

It has been observed further that vegetable farmers apply high levels of fertilizers as a normal practice without the benefit of soil test and knowledge as to the nutrient status of the soil. Not only is this a waste of resource, but this practice also tends to accumulate nutrients in the soil which has detrimental effects on the general environment. It is not sustainable over any length of time.

To correct and improve such farming practice, Dr. Anabella B. Tulin and Ms. Marciana B. Galambao of the Visayas State University (VSU) set up two fertilizer trials in a cabbage farm located in Cabintan, Ormoc City, Leyte wherein soil is characterized as a phosphorus-deficient acid soil. The study, "Enhancing the Yield of Cabbage in P Deficient Acid Soil through Site Specific Nutrient Management and Nutrient Balance Studies" won the silver award during the 24th National Research Symposium (NRS).

The Study

Barangay Cabintan is located 18 km northeast of Ormoc City with an elevation of around 900 m above sea level. Common land uses in the area include vegetable cropping (sweet peppers, cabbage, eggplant, tomatoes), and corn production. The rest of the area is allowed to

fallow or left to wild shrubs and forest tree species. The soil of Cabintan is derived from volcanic deposits and the abundance of strongly-binding amorphous material means that phosphorus-fixation capacity is high in this type of soil. While phosphorus may be present in the soil, it is rendered unavailable to plants by this characteristic.

The objectives of the study was to determine the most sustainable soil treatments in terms of increasing the yield of cabbage while minimally impacting the environment, and to establish through nutrient balance assessments the best levels of nitrogen (N), phosphorus (P), and potassium (K) fertilizer application for profitable cabbage production in P-deficient soil. To address this concern, two fertilizer trials were conducted in P-deficient acid soils in farmer's fields planted to cabbage in order to establish and verify the most sustainable treatments in terms of increasing the yield of cabbage

with least harm to the environment. The partial nutrient budgets of NPK in the soil were also quantified. In both trials, the farmer's practice of applying fertilizers to cabbage were used as one of the treatments (control) followed by alternative treatments that were based on the soil test results and on the application of site-specific nutrient management (SSNM) tools.

Treatments include for the wet season are: T1, 444-93-142 kg/ha N-P₂O₅-K₂O (as the farmer's practice), and the following alternative treatments: T2, 44-55-142 kg/ha N-P₂O₅-K₂O; T3, 88 -110- 60 kg/ha N-P₂O₅-K₂O; and T4, 66 -82.5 -45 kg/ha N-P₂O₅-K₂O. For the dry season, the treatments include: T1, 355 -258 -396 kg/ha N-P₂O₅-K₂O (as the farmer's practice); T2, 120-120-90 kg/ha N-P₂O₅-K₂O; T3, 60-60 -30 kg/ha N-P₂O₅-K₂O; and T4, 90-90-60 kg/ha N-P₂O₅-K₂O.

The findings reveal that reducing fertilizer inputs from 444-93-142 kg/ha N-P₂O₅-K₂O to 88-110-60 kg/ha N-P₂O₅-K₂O during the wet season and from 355-258-396 kg/ha N-P₂O₅-K₂O to 90-90-60 kg/ha N-P₂O₅-K₂O during the dry season gives sustainable yields of cabbage, reduces the cost of fertilizer inputs, and improves the balance of nutrients. These treatments not only reduced the fertilizer inputs, but also increased the yield of cabbage from an average of only 5 tons per hectare to about 12 tons per hectare.

Observations and Findings

The researchers believe that there is need to assess the current soil fertility status in soils used for vegetable production, quantifying the rates of nutrient removal from these systems (mass balances), and developing strategies for matching nutrient inputs to crop and soil requirement through judicious and integrated application of inorganic and organic fertilizers.

The use of organic fertilizers is recommended but there is a need to quantify the availability and types of materials, evaluate the treatment and stabilization technologies, and determine how organic fertilizers can be applied in conjunction with inorganic fertilizers to optimize productivity and profitability. Dissemination and training activities are also required to promote the outcomes and maximize the benefits of proper soil fertilization to growers.

Dr. Tulin reiterated that crop production can be increased without any increase in the negative environmental

impact associated with agriculture. Greatly enhanced efficiency in the use of nitrogen, phosphorus and water, as well as the adoption of integrated pest management minimizes and can even do without the need for toxic pesticides. The study of Tulin and Galambao further noted that nothing is wrong with fertilizers biophysically or environmentally when properly used.

The usual recommended rates for fertilizers assume that soil fertility is low. However, it is not appropriate to apply these to continuously cultivated soils as such soils increase in residual fertility over time (Yoo and Jung, 1991). When the accumulation of some nutrient elements in the soil is already evident, it is time to re-evaluate soil fertility.

Macronutrients are the most important elements considered by most vegetable growers. Plants absorb these elements at different rates and according to growth stages. If there is an excess of soil nutrients, the surplus will not be taken by plants anymore but could be lost by denitrification and/or by leaching for N, and fixation for K and P (Saito, 1991). Thus, an assessment of the amount of available NPK, as well as the level of micronutrients, through soil testing is recommended.

Vegetables planted without fertilization will not attain profitable yield and this forces farmers to apply high levels of fertilizers which tend to accumulate in the soil over long periods of time. Usually the farmers apply fertilizers without the benefit of soil tests and they, therefore, are not aware of the nutrient loading and imbalances in the environment and their adverse effects on our fragile soil resources. "Thus, one way to minimize these problems is to develop an effective and holistic site-specific nutrient management to enhance vegetable production in the province of Leyte," concluded Tulin.

The results from the soil survey described by Tulin et al. (2010) were used to develop the summary of nutrient status of

vegetable soils in order to determine which soil chemical properties were limiting factors to the production system described by the farmer. In determining the nutrient status of the soils in Cabintan, five composite soil samples were obtained from different farmers' fields that have been continuously grown to vegetables as representative of the site.

The soil survey results indicate that the vegetable soils in Cabintan are typically low in soil pH, high in percent organic carbon and total N, low in P and CEC, and are from low to high in K. The low P confirmed the volcanic nature of Cabintan soils which have very high P-fixing capacity. The very high amounts of percent organic carbon and total N could be attributed to the application of high levels of chicken manure in most vegetable soils in Cabintan.

Conclusions and Recommendations

Sustainable soil fertility and nutrient management entails an understanding of the soil fertility status, matching inputs to crop requirements, and monitoring to ensure nutrients do not accumulate or diminish over time. Farmers' better understanding of the application of fertilizer based on crop need and soil analysis can lead to effective and efficient allocation of capital for farm inputs.

The researchers provided scientific evidence on the importance of using the appropriate tools and methods in assessing the fertility status of the soil and in designing alternative fertilizer treatments that will provide the sufficient amounts of nutrients needed by the crop. With the conduct of proper soil tests and nutrient balance determinations, the amount of fertilizers applied by the farmers can be greatly reduced to more economical and sustainable levels.

The findings further indicate the importance of soil test in establishing holistic site-specific nutrient management for cabbage production, especially in coming up with the best treatment and input combinations for profitable cabbage production. The observed increase



in the yield of cabbage indicates that the recommended levels of NPK fertilizers used in the project/ experiment do work.

The significant findings and conclusions that can be drawn from the study were as follows:

- The nutrient status of phosphorus-deficient acid soil in Cabintan was determined from the soil test results and participatory assessment surveys. The findings gave proof about the importance of applying appropriate and more environmentally-suitable levels of NPK fertilizers to improve the growth and yield of cabbage in the P-deficient acid soils of Cabintan, Ormoc City.
- Among the different treatments used, a fertilizer level of 88-110-60 kg/ha N – P₂O₅ – K₂O was found to be more productive and sustainable for cabbage production in either the wet or rainy seasons. This gave a yield of about 12 tons/ha and entailed a fertilizer cost of no more than P16,000/ha which is equivalent to 40 percent of what the farmer normally spends.
- During the dry season, a fertilizer level of 90-90-60 kg/ha N – P₂O₅ – K₂O was found to be most sustainable for cabbage production. This gave a yield of about 12 tons/ha at a fertilizer cost of P6,123.00 which is only 20 percent of what the farmer normally

shells out. Relatively higher levels of fertilizers are needed during the wet season as compared to the dry season.

- Site-specific nutrient management practices are guided by the philosophy of matching fertilizer application to the nutrient requirements of the crop and the fertility status of the soil based on soil test results and nutrient mass balance.
- Farmers can be taught to understand the fertility status of the soil, as the basis for proper fertilizer management in their area, along with nutrient application, uptake, removal and mass balances in vegetable production.

The most suitable levels of fertilizers based on soil test results and nutrient balance studies for increasing the yield of cabbage were established. The information generated in the project was shared with other farmers through a techno forum conducted at Cabintan, Ormoc City. Dr. Tulin recommended that the said technology be verified in other sites in Leyte that grow vegetables and those that grow root crops, which is another important source of food in the province. ###

For more information, please contact: Dr. Anabella B. Tulin of the Visayas State University at telephone no. (053) 563-7229 or email: belle24@yahoo.com

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Addressing the Diminishing Blue Crabs

by JACOB ANDERSON C. SANCHEZ

Have you ever imagined the ocean without one of its familiar armored sea creatures? Undeniably, the blue swimming crabs are diminishing and, as a consequence, they are hardly seen even on our plates anymore.

Prized for its sweet, tender meat, these ten-legged crustaceans are among the most heavily harvested crab species. The blue swimming crab (*Portunus pelagicus*) is a high value seafood, not only among Filipinos, but among other countries as well.

Its main export market is the United States. Previous data shows that 90 percent of the exported blue swimming crab went to the US as crab meat. The volume of export in 2010 was approximately 1,580 tons. This went down to 1,103 tons in 2012, indicating that we are harvesting less and less blue swimming crabs.

The decreasing supply of raw material for blue crab meat processing can have startling consequences. It can lead to unemployment for those working in processing plants as well as loss of income

for fisherfolk.

Several factors at play are to be blamed for the blue swimming crab's disappearance. Beyond climate change, these include the deterioration of the environment where the crabs swim, the policies/ordinances of the government which may be detrimental to the blue crab or ignore it entirely, and worse, illegal and excessive crab capture.

Know your Blue Crabs

The blue swimming crabs' shell colors are attributed to their habitat. It is the male crabs that are bluish while females are grayish green. Only male has blue-colored claws while the claws of mature females have bright orange-red tips. Their large, powerful claws are not only used for defense, digging, and to gather food; but also for gender display.

An easier way to distinguish

between male or female is their apron. Males have a letter t-shaped abdomen while the females' are triangular and rounded as they grow and age.

It matters whether the individuals harvested are male or female since the former is slightly cheaper in the market while the latter commands a higher price at Php 350-450 per kilo. This market trend compels the fishers to capture more live females, sometimes, even when the females are still spawning - in layman's term, carrying soon-to-be crablets. Still, for some fishers who are strongly market driven, the sex is disregarded as long as they have a catch. To them, any catch is good as cash.

Restoring the Numbers of Blue Crabs

To help restore the crab fishing industry, the Bureau of Fisheries and Aquatic Resources (BFAR) Regional Field Office VI conducted the study

titled, “Reproductive Biology of *Portunus pelagicus* caught in the Western Visayan Sea”.

The researchers estimated the sex ratio of male to female crabs; determined the frequency distribution of each gonadal stage of female crab to show annual spawning pattern; estimated the length at first maturity of female crabs; and measured the size range of crabs caught using various crabbing gears.

A total of 3,488 samples from five major crab stations in Western Visayas were collected. Macroscopic identification of female gonads coupled with length-weight data collection per individual samples was done to and used to come up with biological indicators.

The findings reveal that spawning occurs year-round but with defined peaks occurring in the months of November to February and July to September during the non-ovigerous stages. The ovigerous or egg-bearing stages were observed to have its peak in the months of March to May. The sex ratio was found to be 1:1 male versus female.

Length at first maturity, with value of 11.46 cm carapace width (diameter of shell covering), shows that catches from various fishing gears such as bottomset gillnet, crab pot, and otter trawl had high percentages of immature sizes indicating recruitment overfishing. Based on the findings, 57 percent of bottomset gillnet

catch, 95 percent of otter trawl catch, and 62 percent of crab pot catch are juveniles.

Bottomset gillnets are fine-filamented nets which touch the seabed held in place by numerous floats and anchors. When crabs pass through the net but its body can't escape, it is said to be 'gilled' or entangled. On the other hand, the otter trawl has two horizontal platforms to keep the mouth of the funnel-shaped net open wide while the net is being towed by a fishing boat.

Crab pots or traps consist of a variety of designs that take the form of cages or baskets with one or more entrances, with or without bait. They are usually set on the seabed, either singly or in rows, and are connected by ropes to float on the surface to show their location. Crabs enter through a one-way opening and then can't escape. With the crab pot technology, fishing can be selective. Specific types of blue swimming crab can be attracted by placing the traps in targeted areas and using particular types of bait. Any juveniles or unwanted species

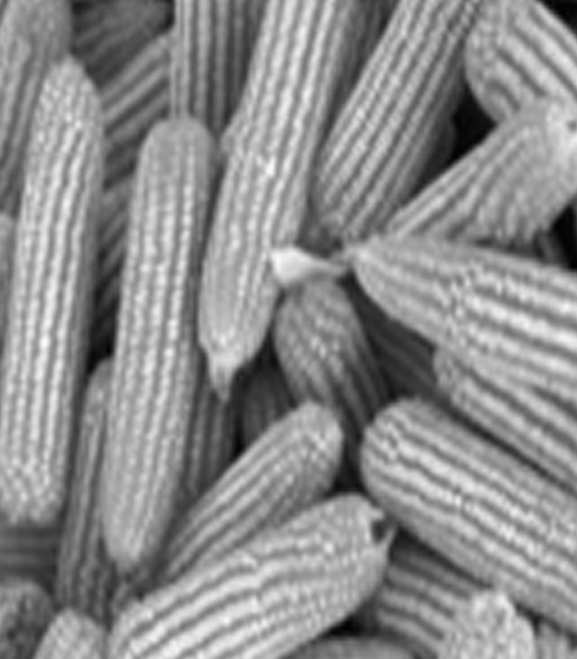
that are caught can be removed from the traps without injury and returned to the sea alive.

The researchers recommend that regulatory measures should include banning of the catching of berried or ovigerous crabs, strict implementation of size limit at 11.5 cm, closed season during the peak spawning period, and banning of the use of the bottomset gillnet and otter trawl operation while regulating the use of crab pots.

For their effort, researchers from the Bureau of Fisheries and Aquatic Resources Regional Field Office 6 bagged the bronze award during the 24th National Research Symposium under the category of applied research technology generation/information generation (TG/IG)- fisheries category. ###

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Improving Hybrid Yellow Corn Production through SSNM

by LIZA ANGELICA D. BARRAL

Corn is considered as the second most important crop after rice in the Philippines. A versatile crop, it finds use as human food, animal feed, and raw material for production and processing.

About 14 million Filipinos prefer white corn as their main staple while yellow corn accounts for about 50 percent of livestock mixed feed. Some 600,000 farm households depend on corn as a major source of livelihood.

For the past five years, Cagayan Valley has been the top contributor of yellow corn in terms of national production. As of 2012, the region produced 1,808,784 metric tons of yellow corn for a 34.51 percent share of total production. The region was followed by SOCCSKSARGEN and Northern Mindanao with total production of 960,272 metric tons and 864,835 metric tons, respectively (BAS data).

For the other regions, the effort is on increasing their own production of yellow corn and it is here that they need to collaborate with R&D partners.

Improving Hybrid Yellow Corn Production in Quezon

In the municipality of Tayabas in Quezon, corn production averages just 3.2 tons per hectare. The figure is quite alarming because it falls well below the national average of 4 tons per

hectare. One of the reasons identified is lack of information on corn nutrient management in the region. As may be expected, the fertilizer recommendation for Region IV-A is very general and is not specific for a particular area. Thus, fertilizer management should be developed for specific locations and field conditions in order to attain higher corn yield and profit.

The Lipa Agricultural Experiment Station (LAES) under the Department of Agriculture-Regional Field Unit IV-A, Southern Tagalog Integrated Agricultural Research Center (DA RFU IV-A- STIARC), conducted a study in October 2008-March 2011 which aimed to develop economically viable and environmentally sound corn nutrient management strategies for Tayabas, Quezon. The research, "Site Specific Nutrient Management (SSNM) Strategies for Hybrid Yellow Corn Production in Tayabas, Quezon," was part of the national program of the Corn RDE Network funded by the Bureau of Agricultural Research (BAR). The study was submitted to BAR as an entry in the 24th National Research Symposium under the Applied Research-Agriculture Category. It won the bronze award.

The SSNM is a tool developed by the International Plant Nutrition Institute (IPNI) that enables technicians and farmers to tailor nutrient management to the specific conditions of farms, and it provides a framework for nutrient best management practices.



During the conduct of the research for enhanced hybrid yellow corn production, refined SSNM rates were developed by STIARC-LAES for both wet and dry seasons in sites located in Brgy. Isabang and Brgy. Mayuwi in Tayabas, Quezon in October 2008 -October 2010. Results showed that replacement of 23 kilogram urea with 6 packs of BIO N increased the yield by 1.4 tons/hectare during the dry season and wet season, respectively. On the other hand, replacement of 23 kilogram urea with organic manure increased the yield by 1.1 and 1.4 tons/hectare in the dry and wet seasons, respectively.

After using the fertilizer specific for the area, one of the significant results was increased yield of adopters in Tayabas, Quezon and in Brgy. Bunggo, Calamba City. Results also reveal that there is an additional net benefit of using SSNM, SSNM + BIO N and SSNM + OM during the four cropping seasons.

SSNM models and recommendations for various locations were developed by using softwares like Nutrient Expert and Nutrient Manager developed by IPNI. Another tool, the leaf color chart (LCC), was used as a guide in determining the rate of nitrogen application during the corn plant's critical growth stages. Hence, using the tools contributed to the development of SSNM strategies for hybrid yellow corn production in the area.

Impact of the Technology Innovation

Through the conduct of the research, it was clearly confirmed that SSNM serves as an effective guide for farmers to determine, adjust, and apply the proper

amount of nutrient and fertilizer that the crop needs for specific growth stages. Ms. Avelita M. Rosales, project proponent and Corn RDE coordinator at LAES said that, farmers should be equipped with adequate information. "Corn farmers need to know the effect of specific practices such as proper nutrient management and fertilization on the yield of corn and the increase in income which will be derived from using the SSNM technology. Furthermore, it is also necessary for the growers to know the effect of proper plant nutrition on the occurrence of pests or diseases on corn plants," Ms. Rosales added.

The SSNM also encourages farmers to utilize available indigenous nutrient sources as it is not limited to the use of synthetic fertilizers, microbial inoculants such as BIO N and gives them options in using additional fertilizers. The LCC, a user-friendly and inexpensive diagnostic tool was effective in indicating the corn plant's nitrogen status and thus helped in determining the exact amount of nutrient to be given to the crop.

One of SSNM's relevant contribution to the environment is it helps in the mitigation of climate change due to the minimal use of inorganic fertilizers. SSNM technology helps in the mitigation of climate change because of the lesser use of inorganic fertilizer. The use of synthetic fertilizers contributes to the global warming as it can cause

the loss of soil carbon dioxide. Also, the quick guide in fertilization that was developed with the use of SSNM will be very useful to technicians, extension workers and, most especially, to the farmers.

Another significant indication of the research project's success was the full acceptance by five farmer cooperators and 20 adopters of the SSNM technology. Mr. Rico Bautista and Mr. Gary Bautista, two of the adopters of the research project, garnered the Regional Corn Gawad Saka Award for the years 2011 and 2012. Mr. Bautista is now a corn entrepreneur with 100 hectares of corn areas in Quezon and is utilizing the SSNM plus OM (organic matter) technology. ###

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Canned Chevon and Mutton

Goat's meat (chevon) and sheep's meat (mutton) may not be Filipino's conventional choices for meat products, but it is now slowly gaining popularity. Aside from being packed with the essential nutrients, they contain less fat and cholesterol compared with other meat. This endeavor is made possible through the R&D initiatives of Cagayan Valley Small Ruminants Research Center, Isabela State University (CVSRRC-ISU).



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