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USER'S GUIDE

Consecutively numbered, the bibliographic entries are classified according to subject category.

SAMPLE ENTRIES

MONOGRAPH

1 **C10**

2 Enhancement of the forest genetics laboratory of the College of Forestry and Natural Resources (CFNR) University of the Philippines Los Baños (UPLB) [Laguna, Philippines]. **Tolentino, E.L., Jr.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. TR-1826.* 2016.

3 4 5 6

9 Laboratory mass rearing of the five lepidopteran pests of corn namely the…

10 FORESTS; LABORATORY EQUIPMENT; FORESTRY EQUIPMENT; UNIVERSITIES;

SERIAL ARTICLE

1 **E16 Production economics**

2 Enhancing soybean productivity and local availability in Region 2 [Cagayan Valley, Philippines]. **Calderon, V.J.F., Aquino, R.M.G., Olinares, R.B., dela Cruz, C.G., Batang, E.F. Jr., Atalin, V.U., de Guzman, S**. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) . v.43 (Supplement no. 1) p. 43-44 (Jul-2018).*

3 7 8

9 The program created awareness on the importance of soybean for human, livestock and soil health in Cagayan Valley [Philippines] through promotion of soybean production, food utilization …

10 GLYCINE MAX; SOYBEANS; PLANT PRODUCTION; PRODUCTIVITY; FOOD TECHNOLOGY; HEALTH FOODS; HOUSEHOLDS; DOMESTIC CONSUMPTION; PHILIPPINES

BOOK CHAPTER

E14

Bioethanol production from macroalgae and socio-ecological implications: Project 1: socio-ecological assessment and analysis for algal biomass production, development and promotion.

Fernandez, P.R.,Jr, Geganzo, L.G.L., Subade, R.F., Napilan-Espectato. L. Bioethanol production from macroalgae and socio-ecological implications. Fernandez, P.R.Demafelis, R.B.Geganzo, L.G.L.Subade, R.F.Napilan-Espectato, L.Santiago, D.E.O.Movillon, J.L.Hourani, K.Gatdula, K.M.Magadia, R.V.Jr.- College, Laguna (Philippines), *2016. TR-1732. p. 1-71 .*

IPB Var 6 is a white-flint open pollinated variety. It is a quality protein maize (QPM) that is high yielding and

ZEA MAYS; MAIZE; VARIETIES; SEED; PROTEINS; PROCESSED PRODUCTS; FOODS; TECHNOLOGY; TECHNOLOGY

1. Subject category
2. Title
3. Author (s)
4. Corporate author
5. Date
6. TR No.
7. Conference title, place, and date
8. Journal title, volume, number, page and date of publication
9. Abstract
10. AGROVOC DESCRIPTORS
11. Title and Author of the book/report
12. Collation/page

Table of Contents

C – EDUCATION, EXTENSION AND INFORMATION

C10 - Education

Intensive beekeeping training course report. **Barroga-Barbecho, J.B.** *College, Laguna (Philippines). TR-1889. 2018. 84 leaves.*

The UPLB [University of the Philippines Los Baños, College, Laguna] is committed to its vision as the National center for Bee Research and Development in the Philippines to support sustainable management of agriculture, forestry, and beekeeping industry. The Program offers quarterly beekeeping training to continuously develop appropriate apicultural and meliponiculture technologies for farmers, women, entrepreneurs, and hobbyist to generate income. A total of 29 participants from Luzon, Visayas, and Mindanao enrolled in the November 05-10, 2018 intensive beekeeping short course. Participants of the training were composed of beekeeper, government employees, farmers, businessmen, office secretary, teachers, managers, driver, LGUs, therapist, analyst, engineer, nurse, IT, filmaker, OFW. Almost 90% of the participants have no experience and knowledge on handling and keeping bees. The 5.5-day training activities includes lectures supplemented by practicum, field workk, apiary (Apis millifera and A. cerna) and meliponary (Tetragonula biroi) visits. Lectures and practicums given by UPLB Bee Program trainers and demonstrators were conducted informally to allow the participants to bring in their questions immediately.

APIDAE; APIS CERANA; APIS MELLIFERA; TRAINING COURSES; EXTENSION ACTIVITIES; DIFFUSION OF INFORMATION; APICULTURE

Summative evaluation of the 'Promote Good Nutrition' training program. *National Nutrition Council , Taguig, 1630 Metro Manila (Philippines). Philippines Univ. Los Baños, College Laguna (Philippines). Inst. of Human Nutrition and Food. College, Laguna (Philippines). TR-1900. Jan 2019. 97 leaves.*

Malnutrition continues to be prevalent among Filipinos, especially children. The Promote Good Nutrition (PGN) is a component of the Accelerated Hunger Mitigation Program (AHMP) which was started in 2007 under President Gloria Macapagal Arroyo and continued under Aquino administration and made a regular program of the National Nutrition Council (NCC). The general objective of the PGN was to improve the knowledge, attitudes, and practices of families to demand adequate nutrition and safe foods. The project aims to assess the extent to which outputs and outcomes were achieved, the quality of the documentation program, assess the process of implementation, efficiency of the program

inputs in relation to the accomplishment of desired outcomes, to evaluate the PGN program in terms of relevance and objectives in relation to AHMP context of LGUs, and identify important lessons for recommendation to future activities. A mix quantitative (survey) and qualitative techniques such as focus group discussion and key informant interviews (FGD, KII) was used in data collection. The PGN conducted a total of 4,776 batches of training, involving 138,257 city/numicipal and barangay implementers from 80 provinces and the National Capital Region. The PGN increased the number of 0-6 months old infants that are exclusively breastfed and increased the number of children 6-24 months given complementary foods. The PGN also helped decrease the number of pre-school children with below normal low weight for their age, and increased the consumption of vegetables and eggs. The PGN training generally resulted in the enhancement of health-seeking behavior among mothers, in more responsible parenting as well as greater consciousness about good health for themselves and their family. PGN trainings aim to enabling people to manage their own limited resources and break the cycle of nutrition problems. However, problems and solution need to be contextualized, because problems evolve and people move on. It is recommended that PGN training be sustained. For its sustainability, the following are recommended: 1.Institutionalize PGN trainings from the National to the local levels; 2.Build in continuing quality improvement of training content and processes; 3.Explore the use of multi-media and blended channels of training; 4.Develop an evaluation scheme across levels.

MALNUTRITION; TRAINING COURSES; TRAINING PROGRAMMES; DIET; DIFFUSION OF INFORMATION

C20 - Extension

Farmers' adoption of improved rice varieties in Cambodia. **Ghimire, R., Suvedi, M.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 41-57. (Jun 2018).*

Determinants of adoption of wet- and dry-season improved rice varieties in Cambodia were analyzed. Selection pattern and intensity of information sources, and barriers to adopt agricultural technologies by rice farmers were examined. Probit model was used to analyze household survey data, covering 24 provinces, 48 districts, 95 communes and 192 villages. The results show that farmers use a combination of information sources to meet their needs indicating that any single source does not satisfy all the farmers' information needs. The most used information sources were farm radio and television, followed by farm extension meetings/workshops. Frequent service providers for both male and female farmers were NGOs, local commune/village office and local extension service centers. The frequently-mentioned barriers to adopting new farm technologies are lack of technical

knowledge/skills and technological incompatibility--farmers stated that technologies were not suitable to their farms. This may mean either that the technology is not climatically fit or it is labor-intensive, costly or not suitable to smallholder farmers. Other frequently mentioned barriers were unavailability of credit to invest in new technology and access to market information. Adopters and non-adopters were significantly different in educational levels, access to improved seeds, and contact with extension agents. The study highlights how the farmer's age, educational level, family size, and extension-related variables influenced the farmer's behavior in selecting wet- and dry-season rice varieties. Use of seed from their own harvest showed a negative effect on adoption, suggesting that access to seed from reliable sources will benefit the farmers by increasing production and income. Incorporating researchers' and extension officials' message in television and radio programs, and implementing educational learning programs may be the policy alternatives to enhance adoption and rice productivity in Cambodia.

ORYZA SATIVA; VARIETIES; TECHNOLOGY; DIFFUSION OF INFORMATION; EXTENSION ACTIVITIES; WET SEASON; DRY SEASON; FARMERS; INFORMATION NEEDS; TECHNOLOGY TRANSFER; INNOVATION ADOPTION; CAMBODIA

C30 - Documentation and information

Plant genetic resources data management, analysis and information generation at the National Plant Germplasm Repository. **Huelgas, V. C., Borromeo, T.H., Altoveros, N.C., Gueco, L.S., Descalsota, J.C., Aguilar, C.H.M., Gentallan, R.P.Jr., Bon, S.G., Damasco, O.P., Endonela, L.E., De Chavez, H.DR.** *College, Laguna (Philippines). TR-1858. 2017. 50 leaves.*

PLANT GENETIC RESOURCES; DATA PROCESSING; DATA ANALYSIS; INFORMATION MANAGEMENT; INFORMATION PROCESSING; INFORMATION SYSTEMS; GERMPLASM; INFORMATION STORAGE

Restoring crop diversity at the National Germplasm Repository: Project 7: documentation and data management and web-based publication of the National Plant Genetic Resources Repository Non-confidential Data and On-line Access to the Genetic Resources. **Huelgas, V.C.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1852. 2017. 90 leaves.*

The report of the project focused on the results of the three main activities: Activity 1 – System documentation of PHLGRIS, the NPGRL genetic resources data and information management system, Activity 2 – Data collection an uploading and maintenance of the PHLGRIS, and Activity 3 – Publication of the NPGRL non-confidential data and public access

to the genetic resources held the national repository through internet. The NPGRL multi-crop data and information system (PHLGIS) description and user manual was written in English. It consisted of fourteen chapters which describes all of the procedural steps, supported by screen shots, in browsing or accessing the data up to printing of query results. Search function is provided in the form to permit specific selection of accessions and traits. The selection can be migrated to MS Excl or can be directly printed. Requests for certain accessions are allowed and are subject for approval of the NPGRL material transfer agreement (MTA) and/or standard material transfer agreement (SMTA) which can be downloaded from the system. The different characterization descriptors and states of various crops such as legumes, vegetables, cereals, feed and industrial crops, medicinal plants, fruits (tree fruit, small fruits), tree nuts, and in-vitro culture were accommodated in the system different characterization data tables and dorms were prepared for different crops as their data varied. The characterization data pages were that of 46 crops (cereals, vegetables leagues, fruits, root crops, tree nuts, medicinal plants including those conserved in vitro). There were 26-99 attributes for every crop. A total of 23, 46 entries visible in 225 forms and called from 56 tables are in the system. These are accessible through passport, characterization, regeneration, viability, moisture content, documentation and distribution functionalities of PHLGRIS. A total of 1442 photographs of various accessions of 15 different crops that belong to 4 crop groups were taken wherein 924 were refined for hyperlinking to specified accession I the database system that was constructed. Two trainings were conducted on the use of PHLGRIS for the NPGRL curators and staff and the users (breeders, pathologists, geneticists, entomologists, physiologists, tissue culturist). The overall result of the training based on the evaluation of the curators and participants was rated very satisfactory in terms of its user interface and functionalities, and the form pages of the system were rated from the satisfactory to very satisfactory by the majority. NPGRL has already passed the system unto the UPLB ITC for uploading of the system into the internet under the domain of the UPLB [University of the Philippines Los Baños] website. However, there were incompatibilities with the UPLB internet system that PHGRIS needs reconstruction to suit the it. The former staff of the project who is now a regular staff of the genebank is the one on charge of the changes. Thus, the system, at the moment is accessible through the local network.

CROPS; GERMPLASM; PLANT GENETIC RESOURCES; GENETIC RESOURCES; DATA PROCESSING; INFORMATION STORAGE; DATABASES; INFORMATION SYSTEMS

E - AGRICULTURAL ECONOMICS, DEVELOPMENT AND RURAL SOCIOLOGY

E10 - Agricultural economics and policies

Distribution pattern and economics analysis of meliponaries in the Philippines. **Locsin, A.M.E., Cuevas, A.C., Polintan, E.A., Cervancia, C.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 155. (Oct 2018).*

The stingless bee, Tetragonulabiroi (Friese), is currently used in the Philippines for pollination of high-value crops like mango, avocado and some vegetables. It is also used for ecosystem restoration in disaster-hit areas. Apart from the impact of stingless bees on pollination, their products are popular and command high market value. The distribution pattern of meliponaries (stingless bee yard) in the Philippines was mapped and its economics feasibility analyzed. There are 85 meliponaries spread in Luzon(58), Visayas (20), and Mindanao (7). Among the beekeepers, only eight are keeping more than 1,000 T. biroi colonies where our economic analysis was based. All the colonies are located in Luzon, which could be explained by the abundance of feral colonies and nesting sites. In the Visayas and Mindanao, the predominant species is T. laeviceps, a species which does not produce surplus honey. The propagation of stingless bees on the commercial scale is feasible in the Philippines as shown in the Benefit-Cost Ratio value analysis. If the present value of benefits exceeds that of the cost, the BCR is greater than one, indicating that the project is feasible. In this study, the BCR is 1.31. Being native to the country, the stingless bee has a wide genetic pool and is resistant to pest and diseases, thus, the cost of rearing is lower, compared with introduced bee species. Moreover, it can exploit diverse floral resources, making their production sustainable.

APIDAE; SPECIES; POLLINATION; MANGIFERA INDICA; PERSEA AMERICANA; ECONOMIC DISTRIBUTION; COST BENEFIT ANALYSIS; PHILIPPINES

Ex-ante analysis of industry strategic S and T [Science and Technology] plans for marine resources sector: Project title: Ex-ante of industry strategic S and T [Science and Technology] plans for abalone. **Garcia, Y.T., Alcalde, J.V., Foliente, J.A.P.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. Southeast Asian Fisheries Development Center, National Highway, Tigbauan, 5021 Iloilo (Philippines). Aquaculture Dept. College, Laguna (Philippines). TR-1756. Nov 2016. 136 leaves.*

ABALONES; MOLLUSCA; MARINE RESOURCES; EX-ANTE IMPACT ASSESSMENT; SUPPLY; DEMAND; PRODUCTION

Impact of climate change and economic factors on Malaysia food price. **Wong, K.K.S., Lee, C., Wong, W.L.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 32-42. (Jun 2019).*

This paper is motivated by the increasing food price over the recent years (2010 – 2017) in Malaysia. Food is a necessity for mankind and everyone has equal rights to enjoy adequate food protecting from hunger and malnutrition. In general, we understand that food and agriculture production are highly related. Crop production is affected biophysically by climatic variables, i.e. suitable rainfall and temperature for photosynthesis process to take place. If these climatic variables alter extremely in a long-term period, crop production will be affected and crop damage can occur due to the climate change effect such as extreme flood and drought. Hence, if climate change effect is defined as a linear relationship, it will result in a misleading explanation whereby as long as rainfall and temperature increase (or decrease) it will cause the crop production to decrease (or increase). Given the problem associated with food price, this paper investigated the food price determinants by looking at both economic factors and climate change. Non-linear time series analysis namely Engle-Granger (EG) cointegration test and Error Correction Mechanism (ECM) were performed by including the determinants such as Carbon Dioxide (CO2), crude oil price, exchange rate and real gross domestic product (RGDP). The results showed that both economic Real Gross Domestic Product and climate factors jointly affect food price significantly and climate factor (CO2) exhibits a strong non-linear Ushaped impact on food price in the long run. In addition, the Error Correction Term (ECT) showed that food market will have a slower self-recovery mechanism to adjust and return the temporary food market demand-supply shock to the equilibrium.

FOODS; PRICES; MARKETS; ECONOMIC ANALYSIS; ECONOMIC GROWTH; EXCHANGE RATE; CLIMATIC CHANGE; MALAYSIA

Status and assessment of the ornamental sector in selected towns of Laguna Province, Luzon Island, Philippines. **Sanchez, F.C., Jr., Bernardo, E.L., Marcelino, R.T., Balladares, M.C.E., Ventura, A.N., Mendoza, J.J.O., Cedillo, N.O., Medina, N.G., de Guzman, R.P., Tayobong, R.R.P.** *College, Laguna (Philippines). TR-1911. 2018. 127 leaves.*

Ornamental farming was once described to be a sunshine industry because of the potential income that it could generate from exports and from local consumption. However, information on ornamental farmers, their production and business practices, and their outlook towards the industry is practically unknown. The lack of government support in

many facets of ornamental farming has also made the industry a less attractive option for enterprising individuals. This project involved the development of a survey instrument and data monitoring system and the establishment of baseline data on socio-economic status, production technology, and other business management variables related to the ornamental industry in Laguna [Philippines] . The first study component assessed the ornamental horticulture industry in Los Baños through the use of a pre-designed questionnaire to document aspects of business management and production technology related to ornamental horticulture with the aim of fine-tuning the developed questionnaire. The research design was characterized by multiphase data collection and integration of data collected from the survey, focus group discussion, and key informant interviews. Findings showed that ornamental horticulture was the primary occupation of the respondents. Foliage and flowering plants were the most saleable plants to the other farm owners and tractors. Through growing ornamental crops were viewed to have the high technical requirements, respondents don not follow standard procedures for crop management and price setting. Crop production- and management-related issues were some of the challenges encountered by the respondents. In spite of these, they were able to sustain their businesses. Partly, this may have been due to the role of the horticulture groups they belonged to and UPLB's continued support. The current situation of the industry was not solely based on the socioeconomic structure of the ornamental growers but was also pre-determined by the changing landscape of the industry. Pioneers in the industry have observed that income from ornamental farming has waned over the years, but the number of farmers and sellers seems to be increasing. The authors interpret this as indication the ornamental farming remains a profitable and financially-rewarding? Our research set out to profile ornamental farmers in four municipalities of Laguna-Calamba, Los Baños, Bay and Calauan and to identify factors that effect their perception into saying that ornamental farming is lucrative. The second component utilized the finalized questionnaire using what the project team learned from the first study component of this project. Using stepwise logistic regression, the authors found that 1)diversity products offered, 2)recycling of potting mix, and 3)use of cooling of ventilation systems were significant variables that would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. An increase in the number of farms, however, would decrease the likelihood of ornamental farming to be perceived as profitable. Results from our survey indicate the need for targeted intervention and R and D built around the four variables the authors have identified.

ORNAMENTAL PLANTS; FLORICULTURE; FARMERS; PROFIT; PROFITABILITY; INDUSTRY; PHILIPPINES

Storage decisions of jasmine rice farmers in Thailand. **Srisompun, O., Simla, S., Boontang, S.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 80-91. (Jun 2019).*

The effects of economic and other factors on the jasmine rice storage decisions of farmers were analyzed using a binomial logistic regression model. The farm survey data from nine major productive provinces in the Northeastern region, and 330 rice farmers sampled during the 2017/18 crop year were examined. The data collection was done in January to April, 2018. The probability of storing jasmine rice was 43.6%, and the physical factors of the farms exhibited the highest effect on the storage decisions of the farmers. Factors such as having a barn, the jasmine rice yield, the region, the cultivation pattern, the female labor proportion, and participation in the rice-pledging scheme positively affected the storage decisions of the farmers. In contrast, household income negatively affected the storage decision. The study results suggest that the implementation of a policy for reducing the paddy supply during the harvest season requires economic and other incentives. Rice barn development is crucial for and correlated with the storage decision. Therefore, providing support for constructing or repairing barns increased the storage decision probability. Primarily, the large scale farmers benefited from the rice-pledging scheme. Public schemes should be thoroughly implemented. The need for sophisticated equipment, regulation procedures, and the high cost associated with rice storage reduced farmer participation, but the scheme did not affect the rice farm gate price.

RICE; STORAGE; SUPPLY; COSTS; MARKETS; PROFIT; PRICES; FARMERS; DECISION MAKING; THAILAND

Technical efficiency of women in indigenous rice production in Sagada, Mountain Province, Philippines. **Flores, E.C., Delos Reyes, J.A.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 43-54. (Jun 2019).*

This study assessed the technical efficiency (TE) of Kankanaey women in rice production in Sagada, Mountain Province, Philippines. Primary data were collected in February 2016 for cropping period December 2014 to May 2015. From 120 respondents interviewed, 139 male-headed and 139 female-headed rice parcels were studied. The factors of production and TE were determined using stochastic production frontier analysis while mean differences between genders were t-tested. Small rice parcels had lower production because they were more difficult to cultivate, used lesser seeds, high yielding variety (HYV) and rodenticide. These constraints, along with problems of saktoto worm infestation and lack of water were more often experienced in women-managed parcels. These parcels had lower TE and production due to: non-participation of women in dap-ay; inadequacy of man-labor; smaller size of parcels; inadequate logistical and infrastructure support for

dilapidated terraces and pathways; lack of irrigation water; and lack of organic inputs for rice production. Women inclusion in the dap-ay especially in determining the agricultural calendar and declaration of ubaya; reviving the lampisa system for irrigation management; expansion of rice parcel area; practicing ub-ubbo; provision of logistical and infrastructure support for indigenous rice farming; and provision of rice technical support for organic rice farming were recommended.

ORYZA SATIVA; RICE; INDIGENOUS ORGANISMS; PLANT PRODUCTION; ECONOMIC ANALYSIS; PRODUCTION FACTORS; WOMEN; PARTICIPATION; ROLE OF WOMEN; ETHNIC GROUPS; PHILIPPINES

E11 - Land economics and policies

Application of Analytical Hierarchy Process (AHP) in generating Land Suitability Index (LSI) for sugarcane in Central Mindanao, Philippines. **Alburo, J.L.P., Garcia, J.N.M., Sanchez, P.B., Sta Cruz, P.C.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciecnes. 0859-3132. v. 25(1) p. 148-158. (Jun 2019).*

Sugarcane is one of the most promising industry in the Philippines and planted in any land in the country, particularly in Central Mindanao without prior assessment of the land to the crop. Application of an enormous amount of inputs to ensure better production is among common practice even in unsuitable areas. Generation of Land Suitability Index (LSI) in Central Mindanao as a major sugar cane district of Bukidnon province was made to identify the major factor that affects to sugarcane production, using Analytical Hierarchy Process (AHP) and GIS. The study was conducted last September 2015 to February 2016 on the 3 district of Bukidnon. Weights of six performance factors in determining LSI to sugarcane production were established using AHP. Soil depth was the most important among the factors. Utilizing the LSI, land sugarcane suitability maps were generated for the Central Mindanao. The results matched the validation by comparing the results with the actual yields from sugarcane growers, correlation analysis and other relevant data from the Regional Sugar Regulatory Authority. Soil water holding capacity has a significant positive effect on the sugarcane yield while elevation and slope have significant negative effects. Don Carlos, Maramag and Quezon that are extensive sugarcane growing municipalities are highly suitable in the study and actual conditions.

SACCHARUM OFFICINARUM; SUGARCANE; LAND EVALUATION; LAND SUITABILITY; GEOGRAPHICAL INFORMATION SYSTEMS; SOIL ANALYSIS; SOIL CHEMICOPHYSICAL PROPERTIES; PHILIPPINES

E14 - Development economics and policies

Analysis of income and factors determining the adoption of integrated rice-fish farming system in Seyegen Districts Sleman Regency, Yogyakarta, Indonesia. **Syaukat, Y., Julistia, D.R.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 66-79. (Jun 2019).*

Integreted rice-fish farming is a potential alternative farming to increase farmers' income in overcoming increasingly competitive land use. Rice-fish farming has been applied in Margoluwih Village, Seyegan District, Sleman Regency, Yogyakarta [Indonesia] Province for a few years. This study aims to analyze the use of inputs and production costs in rice-fish (minapadi) farming compared to monoculture rice farming, to estimate the income of rice-fish farming and monoculture rice farming, and to identify factors that influence farmers' decision in adopting the integrated rice-fish farming. The study was conducted at Margoluwih Village, Sayegan District, Sleman Regency, Yogyakarta in March 2017. A total of 50 farmers were surveyed, comprising of 25 rice-fish farmers and 25 monoculture rice farmers. The methods used to achieve these objectives are descriptive analysis, income analysis, and logistic regression analysis. The results show that rice-fish farming requires inputs such as fish seeds, fish feed, prebiotics, and molasses of sugarcane while monoculture farming does not require such inputs, but monoculture farming uses pesticides and herbicides to overcome pest attacks and applies more chemical fertilizers than rice-fish farming. The labor time devoted to ricefish farming is also higher than in monoculture farming. The total cost of rice-fish farming per hectare in one production season is Rp 63.47 million, while the total cost of monoculture rice farming amounted to Rp 17.55 million. However, rice-fish farming significantly earn more income compared to monoculture farming with an average value of Rp 28.45 and Rp 3.19 million per hectare in one growing season, respectively. Income is believed to be the main factor in determining the adoption, while social factors that influence farmer's decision to adopt rice-fish farming are age of farmer and experience of rice cultivation.

ORYZA SATIVA; FISHES; FARMING SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; FARM INCOME; FARM INPUTS; COSTS; INDONESIA

Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines. **Ella, V.B., Glaser, S.D., Oroza, C., Fajardo, A.L., Duka, M.A., Gonzales, J.A., Chen Lester Wu, Galoso, R., dela Cruz, K.M., Sadsad, J., Reyes, M.J., Fernandez, C.G., Zanchez, Z., Martinez, C., Bonoan, R., Tejada, A., Jr., Bacani, A.J., de la Cruz, C., Eusebio, V., Labrador, M.A.T., Marinas, R.** *College, Laguna (Philippines). TR-1880. 2018. 172 leaves.*

IRRIGATION; WATER MANAGEMENT; SENSORS; INFORMATION SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 1: pilot testing of the WSN technology in drip-irrigated upland crop production systems. **Fajardo, A.L., Wu, C.R., Sanchez, Z.D.C., Martinez, C.G., Glaser, S.D., Oraza, C.A., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 67-107.*

TRICKLE IRRIGATION; HIGHLANDS; UPLAND CROPS; PLANT PRODUCTION; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 2: pilot-testing of the WSN technology in lowland rice production systems with alternative wetting and drying technology. **Gonzales, J.A., Galoso, J.R.M., Tejada, A.T., Fernandez, C.G.P., Dela Cruz, K.M.S., Lampayan, R.M., Glaser, S.D., Oraza, C.A., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 108-127.*

ORYZA SATIVA; LOWLAND; PLANT PRODUCTION; IRRIGATION; IRRIGATION SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; SENSORS

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 3a. developmemt of water balance models and optimum irrigation operations schemes in upland cropping systems. **Duka, M.A., Sadsad, J.S., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 128-147.*

UPLAND CROPS; PLANT PRODUCTION; TRICKLE IRRIGATION; TECHNOLOGY TRANSFER; IRRIGATION; IRRIGATION WATER; WATER MANAGEMENT; SENSORS; INFORMATION SYSTEMS

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 3b. development of water balance models and optimum irrigation operation schemes in lowland cropping systems. **Duka, M.A., dela Cruz, K.M.S., Lampayan, R.M., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 148-172.*

LOWLAND; CROPPING SYSTEMS; INFORMATION SYSTEMS; WATER BALANCE; IRRIGATION; TECHNOLOGY TRANSFER; TECHNOLOGY; SENSORS

Exploring the demand dimension of good agricultural practices (GAP) adoption in the Philippines. **Banzon, A.T. Roberto S.** *Benedicto Professional Chair Lecture, College, Laguna (Philippines), 26 Jun 2019. College, Laguna (Philippines). 2019.*

The lecture investigates the third dimension (demand dimension) of the GAP Program in the Philippines. It complements the previous study of Banzon, Mojica and Cielo (2012) which examined the first two dimensions (supply and intervention dimensions). The lecture highlights the intermediaries' role in enhancing GAP adoption among farmers and in influencing consumer perception towards GAP-certified products. It also discusses the links among GAP, food safety, and the agri-food chain. The evolving worlwide focus on food safety and quality has been brought about by the development of food markets, new technologies, increased product differentiation and consumer affluence. Consumers and communities are also getting concerned about about safe food that is produced in a way that is environmentally and socially acceptable. These have led to the development of variety of regulatory systems, codes of practice and certification programs in agriculture and the food sector. GAP is used explicitly in some of these standards under the premise that such standards codifies a certain scheme of good practice. Aside from ensuring food safety and quality of produce, GAP aims to capture new market advantages through modification of the supply chain governance; improve natural resources use, workers' health and working conditions and/or create new market opportunities for producers and exporters in developing countries. Therefore, the GAP approach takes into consideration the concerns of producers and workers (supply dimension), consumers and retailers

(demand dimension), consumers and retailers (demand, dimension), and institutions and services (intervention dimension), and institutions and services (intervention dimension), that link the supply and demand dimensions. The level of food safety awareness is associated with a country's ease of access to best practice, technology and information, capacity to adopt best practice and technology and information, capacity to adopt best practice and technology and resource constraints. Hence, there is a low level of food safety awareness in developing countries like the Philippines. Filipino consumers generally associate food safety to pesticide-free and links it to organic produce. The majority of consumers are more concerned about a product's physical appearance than food safety. In addition, there is a low level of awareness and appreciation of GAP not only among the producers, but also among the intermediaries and consumers in the country. The examination and discussion of the demand dimension of the GAP Program provide a broader exploration of the third critical component and its role in the success of the GAP Program. There are opportunities for the push strategy towards adherence to food safety standards in the form of corporate social responsibility (CSR) initiatives. GAP-certified producers may benefit from a partnership with supermarkets with regards to steering costumers towards healthy food choices. Differentiating the GAP-certified products from the other products is mutually beneficial to the supermarkets and its suppliers. Furthermore, GAP-certified produce may benefit from exposure in health food and retail stores, and community and lifestyle markets which are patronized by middle-and high-income consumers. Lastly, the administrator of the GAP Program may re-examine their control protocol with regards to the use of GAP stickers to make it easier and more affordable for GAP-certified entities to use them in their product packaging. For future inquiry, the concept of this lecture may be extended to a full-blown research to achieve richer information and to allow for more methodological rigor and analytical depth in involving more respondents from the intermediaries and consumers.

DEMAND; SUPPLY; FARMERS; CONSUMER BEHAVIOUR; FOOD PRODUCTION; FOOD SAFETY; CONSUMPTION; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

Farmers' adoption of improved rice varieties in Cambodia. **Ghimire, R., Suvedi, M.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 41-57. (Jun 2018).*

Determinants of adoption of wet- and dry-season improved rice varieties in Cambodia were analyzed. Selection pattern and intensity of information sources, and barriers to adopt agricultural technologies by rice farmers were examined. Probit model was used to analyze household survey data, covering 24 provinces, 48 districts, 95 communes and 192 villages. The results show that farmers use a combination of information sources to meet their needs indicating that any single source does not satisfy all the farmers' information needs.

The most used information sources were farm radio and television, followed by farm extension meetings/workshops. Frequent service providers for both male and female farmers were NGOs, local commune/village office and local extension service centers. The frequently-mentioned barriers to adopting new farm technologies are lack of technical knowledge/skills and technological incompatibility--farmers stated that technologies were not suitable to their farms. This may mean either that the technology is not climatically fit or it is labor-intensive, costly or not suitable to smallholder farmers. Other frequently mentioned barriers were unavailability of credit to invest in new technology and access to market information. Adopters and non-adopters were significantly different in educational levels, access to improved seeds, and contact with extension agents. The study highlights how the farmer's age, educational level, family size, and extension-related variables influenced the farmer's behavior in selecting wet- and dry-season rice varieties. Use of seed from their own harvest showed a negative effect on adoption, suggesting that access to seed from reliable sources will benefit the farmers by increasing production and income. Incorporating researchers' and extension officials' message in television and radio programs, and implementing educational learning programs may be the policy alternatives to enhance adoption and rice productivity in Cambodia.

ORYZA SATIVA; VARIETIES; TECHNOLOGY; DIFFUSION OF INFORMATION; EXTENSION ACTIVITIES; WET SEASON; DRY SEASON; FARMERS; INFORMATION NEEDS; TECHNOLOGY TRANSFER; INNOVATION ADOPTION; CAMBODIA

Multidimensional approach in assessing farmers' barriers to and factors influencing organic agriculture adoption. **Argañosa-Matienzo, EL., Atienza-Tenorio, M. Department of Agriculture 2nd Floor BSWM Bldg. Elliptical Rd., Diliman, Quezon City (Philippines).** *College, Laguna (Philippines). TR-1857. 2017. v.1: 288 leaves; v.2: 295 leaves.*

Organic agriculture (OA) is influenced by social, technological, economic, environmental and political/institutional (STEEP) factors. The multidimensional approach involves the interconnectedness of factors requiring a systems approach to understand the link to OA adoption. This report highlights the determinants to OA adoption from a holistic and systems perspective using a multidimensional approach. Project sites were Tublay, Benguet, Sabtang, Batanes in Luzon: Dao, Capiz, Victorias City, Negros Occidental in Visayas, and Sta. Josefa, Agusan del Sur, Braulio E. Dujali, Davao del Norte in Mindanao [Philippines]. Survey interview, case study and participatory workshops were used. There were 360 respondents, 180 OA practitioners (30 per site). Likewise, 26 key respondents from partner agencies were interviewed. Case video of six practitioners and three best initiatives, for OA promotion were produced and distributed. For three Islands, practitioners had higher percentage in socio-demographic characters. Practitioners had higher percentage in socio-demographic characteristics. Practitioners are owners of bigger land holding, while non-practitioners had

lower education limited farming experience, and lesser family labor. Major challenges include limited knowledge in production, marketing, and certification requirements, tenure, natural calamities and chemical contamination. Limited funding and change in leadership hindered adoption. Farmer avail and prefer information on OA from active sources. They established information network with LGU [local government unit]/technicians, farmers' organizations and local persons. Partner agencies produced/distributed IEC materials and network among themselves. They identified recommendations to improve IEC materials and network among themselves. They identified recommendations to improve IEC materials production, dissemination and information acquisition abilities. Training needs include organic agritourism, pest management, and ICS formulation. Farmer's socio-cultural characteristics, farming practices, awareness and perception level, information acquisition abilities are prerequisites for OA training design and IEC material production. Capacitating partner agencies on using innovative and participatory extension approaches will ensure OA adoption. Gender differential roles of farmers on access and control over agricultural resources and benefits, farm labor, and decision making, depends on thev purpose and type of major enterprise and household dynamics/arrangement. Gender responsiveness of introduced technologies and if interests of both gender are better served in organic agriculture programs were not given much attention. Solid inclusive policy and institutional support were influential factors in OA adoption in the six sites. Combination of best initiatives facilitated OA promotion and advocacy. Enabling STEEP factors included organizing farmer groups, building their capacities through learning sites and technology demonstration farms, provisions of production, processing and marketing facilities. strong LGU support and committed institutional partnership with local and international network, and policy support, integrating OA into overall agricultural policies and programs, and market development, are key to realizing the full benefits of OA. Assessing determinants to OA adoption are useful for unified planning, implementation and evaluation of sustainable OA in the country. Ensuring inclusive participation of multi-stakeholders through holistic systems approach ultimately benefit organic farming communities.

ORGANIC AGRICULTURE; FARMERS; GENDER; SOCIAL PARTICIPATION; SOCIOCULTURAL ENVIRONMENT; TECHNOLOGY; TECHNOLOGY TRANSFER; DIFFUSION OF INFORMATION; INNOVATION ADOPTION

Operational policy for the development of the Philippine agricultural and fisheries mechanization index. **Amongo, R.M.C., Larona, M.V.L., Onal, M.K.S., Ilao, C.I.L., Lalap, G.N.L., Ogius, L.E., Melendez, P.B.** *Department of Agriculture, 2nd Floor BSWM Bldg., Elliptical Rd., Diliman, Quezon City (Philippines). Philippine Council for Agriculture and Fisheries. College, Laguna (Philippines). TR-1785. 2017. 166 leaves.*

It has been widely accepted the agricultural mechanization had been the precursor of industrialization of many developing countries in Asia, such as Korea, Japan, Taiwan, among others. The path from mechanization towards industrialization had not been easy. Political will, social preparation, and enactment of relevant laws are some of the factors that contribute to the success in implementing agricultural mechanization. Agricultural mechanization through large-scale system implemented by developed and developing countries in Asia was elevated at a higher level in the past decades for improved land, labor and crop productivity. With the importance of agricultural technology as highlighted in the UN Sustainable Agricultural Development Plan of 2015, an off-shoot of the Millennium Development Plan (2000-2015), an operational policy towards standardizing the agricultural mechanization index (AMI) is imperative towards updating and assessing the level of mechanization for policy directions. Moreover, the enactment of Republic Act 10601 otherwise known as the Agricultural and Fisheries Mechanization (AFMech) Law of 2013 stipulates the important role of mechanization in the country's agricultural development. The law mandated the government to support the investment for the distribution of agricultural mechanization technologies throughout the country in support of the food security ad sufficiency programs. However, different methodologies and descriptions on the level of mechanization by institutions involve in agricultural mechanization development were formulated which could serve as bases for decision making. Hence, there is a need to harmonize such methodologies and come up with a standard operational procedure in indicating our level of mechanization. Such information shall provide basis for policy and decision makers to make ell- informed decisions for the acquisition, distribution and utilization/adoption of agricultural mechanization technologies. Moreover the information will provide the operational procedure for regular updating of mechanization index for research development and extension activities and policy decisions related to agriculture and fisheries mechanization. This project is composed of four studies. The first study involves the benchmarking off the agricultural mechanization index in the Philippines vis-a-vis selected ASEAN countries. Two ASEAN countries namely Vietnam and Thailand were visited to gather the recent developments and to document the technologies utilized in determining their level of agricultural mechanization. Other countries namely: Myanmar, Lao PDR, Cambodia and South Korea were also benchmarked through a survey questionnaire. The second study comprised of the development of a standardized procedure for the Philippine agricultural mechanization index (AMI) where significant components were identified. The third study is the formulation of the standard operating policy for the AMI where a modified agricultural mechanization. The fourth study is the validation activities to verify the MAMI procedure in a rice growing area in Oriental Mindoro. Policy statements and related policies were formulated and submitted for adoption of the government through the Department of Agriculture.

AGRICULTURAL DEVELOPMENT; FISHERY POLICIES; PROCESSING; MECHANIZATION; STANDARDIZING; TECHNOLOGY; PHILIPPINES

E20 - Organization, administration, and management of agricultural enterprises of farms

Assessing resiliencies, biodiversity of global significance and environmental goods and services of GIAHS [Globally Important Agricultural Heritage Systems]-designated Ifugao Rice Terraces [Philippines] in comparison to conventional rice paddies. **Borromeo, T.H., Altoveros, N.C., Dayo, M.H.F., Aguilar, C.H.M.** *College, Laguna (Philippines). TR-1907. 70 leaves.*

This study was carried out by the University of the Philippines-Los Baños through funding support from the World Agricultural Heritage Foundation (WAFH). In order to study the effects of modernization-associated pressures on traditional rice-based agro-ecosystems, three upland irrigated farms (viz. Nagcarlan, Julongan and Ambabag) in Kiangan, Ifugao Province, Philippines were chosen as study areas. Nagacdan and Julongan (GIAHS sites) were chosen for this purpose while Ambabag, (a non-GIAHS site) was also selected to provide contrast to the preceding two agro-ecosystems. Changes in cultural identity, resilience, provision of economic services, crop diversity and biodiversity losses were recorded and the driving factors that underpinned these changes were dissected and analyzed. Using standardized tools and methodologies, the study was able to document wild scale cultural and biodiversity losses, lowered resilience, a diminishing capacity to provide ecosystem services (ES) and a severely eroded traditional crop base. Identified driving factors were the easy access to modern varieties, chemical inputs, information and microfinancing, education, market economy and Christianization. The farmers also disclosed that all these changes were heralded by the Green Revolution during the late 1960s to 1970s when high yielding varieties (HYVs) were promoted along with the intensive use of chemical inputs. Since then, Tinawon rice varieties had been discarded on a continuous basis and replaced with HYVs because of their perceived economic benefits. Consequently, age-old Ifugao farming rituals were also forgotten, rice conservation and varietal selection were no longer practiced, gender roles were reversed and there was an unfortunate shift from the traditional ugbbu system to paid labor. Moreover, the use of chemical inputs also resulted in the displacement of endemic fauna and the uncontrolled proliferation of introduced pests such as golden apple snail, giant earthworms and Asian swamp eels which wrought various forms of damage to rice crop and the terraces. The drive to earn more cash had also caused an increasing number of farmers to convert their swidden fields (habal) and some terraces to commercial gardens for high value vegetables. As for the woodlots (muyong), greatest diversity was observed for endemic trees and understory vegetation in barangay [village] Julongan. Unfortunately, field inspection in this village revealed that a significant number of endemic trees in the area had been girdled and left to die in

preparation for the establishment of an arabica coffea plantation. Furthermore, since the muyong harbors large proportions of endemic species, it ensures constant water supply for the terraces, protects against soil erosion, mitigates the adverse effects of climate change, contributes to pollination and natural pest control and allows for a host of other essential processes in the agro-ecosystem. It can be concluded therefore, that these 3 farming communities are on the verge of a complete shift to a modern agricultural system-one that is yield-driven, highly influenced by market economy and marked by low bio-cultural diversity. Before this transformation becomes complete and all resources and the Ifugao culture becomes irreversibly lost, it is imperative that interventions of a multi-faceted nature be instituted the soonest. Finally, the following are recommended for further studies, scientific interventions and possible promulgation of policy aimed at conserving the Ifugao agro-ecosystem and the culture that is closely interlinked with it: 1. Provide a viable market and incentives for the cultivation of Tinawon rice using traditional farming rituals; 2. Carry out casual chain analysis to study direct and indirect drivers of ecosystem change and their impacts; 3. Conduct an economic valuation of ecosystem services; 4. Undertake ex situ and in situ conservation of indigenous crops in the area; 5. Develop policies and programs for the preservation of Ifugao culture based on inclusive discourse involving older farmers and their younger counterparts; 6. Carry out studies for the possible valorization of intangible Ifugao cultural heritage which is closely intertwined with the lives of people in the community; 7. Conduct studies to quantify financial losses due to pest infestation and into integrated pest control methods of these plants.

ORYZA SATIVA; RICE; VARIETIES; INDIGENOUS ORGANISMS; HIGHLANDS; AGROECOSYSTEMS; IRRIGATED LAND; FARMS; ECOSYSTEMS; BIODIVERSITY; LOSSES; FARMING SYSTEMS; PHILIPPINES

Impact assessment of CY 2009 CBFM-CARP [Community-based Forest Management-Comprehensive Agrarian Reform Program] Project in Region IV-A [Cavite, Laguna, Batangas, Rizal, Quezon, Philippines. **Capinpin, H.L.L., Dolom, P.C., Casin, Ma.C.S., Nicmic, J.C., Punzalan, B.A.** *Department of Environment and Natural Resources, Visayas Avenue, Diliman, Quezon City (Philippines). College, Laguna (Philippines). TR-1906. 2017. 30 leaves.*

The respondents of the project ranges from 30 to 50 percent of the target 50% of the SES respondents last 2009. The beneficiaries of the project were at the middle to old age (40 years old and above). The oldest respondents was 86 years old as beneficiary of the projects. Eighty-six percent of the respondents attained elementary and high school level of education. Thus, this implies that the beneficiaries were familiar to the area since living there for a period of time. Roman Catholic was the major religious affiliation of the respondents. The average number of household size was 4. The ownership of the respondents in terms of vehicle, furniture, appliances and electronic gadgets increased over

the period of time. The income derived from CBFM-CARP [Community-based Forest Management-Comprehensive Agrarian Reform Program] project contributed in attained this items. No much improvement or changed on the availability of facilities on health, infrastructure, transportation, and credit facilities in each respective area. However, there was a significant increased on communication facility particularly on the use of mobile phone of the respondents. Waste disposal of the respondents improved over the period of the time from burning and throwing waste everywhere to practicing segregation, composting and collection from LGUs in their respective area. The average number of involvement of the respondents in an organization was to except from their membership in people's organization. Majority of the respondents mentioned that farming was the source of income from 2009 to 2015. The average primary annual income of the respondents increased from PhP41,976.86 to PhP 56,228.81 while the secondary annual income also increased from PhP33,752.90 to PhP46,035.23 over the period of time. The grand annual income of the respondents was PhP74,880.63 to 105,168.81. The annual income from the CBFM-CARP project was PhP2,030,903.00 which was only 12% of the grand total income of the respondents. The average percentage of the farm produced domestically ranges from 10-20% while the percentage sold was 80-90%. Expenditures and saving of the respondents increased from 2009 to 2015. The CBFM-CARP project is selected areas in Region 4-A [[Cavite, Laguna, Batangas, Rizal, Quezon, Philippines] contributed to the increased income and ownership of vehicle, furniture, appliances and electronic gadgets of the respondents.

FOREST MANAGEMENT; AGRARIAN REFORM; WASTE DISPOSAL; INCOME; PHILIPPINES

Potential development of glutinous rice community towards new agricultural culture tourisms in upper Northeastern Thailand. **Sattaka, P.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 92-103. (Jun 2019).*

Glutinous rice growing is concentrated in Northeastern Thailand. It not only impacts people's livelihoods, culture and traditions, but is also unique in its taste, consumption and extensive utilization. Thus, those in the glutinous rice community should make use of their unique glutinous rice culture to promote agricultural/cultural tourism. The study locations were Ban Phu in Mukdahan province, the Khao Mao Wan Community Enterprise, Ban Prong in Nakhon Phanom, and the Noi Chomsi Community Enterprises in Sakon Nakhon in January-March 2017. The study showed that the communities in Upper Northeastern Thailand have the potential to develop as an agricultural/cultural attraction. Moreover, the study indicated that glutinous rice attraction has high potential based on 10 indicators: production, processing, culture and tradition, location, facility, natural resource management, community participation, community administration, services, and promotion of glutinous rice attractions. However, the glutinous rice community can

improve attractions by focusing on food security issues. It is anticipated that by integrating rice cultivation and cultural activities into the overall community development program, glutinous rice attractions will increase awareness of the role of glutinous rice regarding food, jobs, and cultural security to ensure a sustainable quality of life for glutinous rice farmers and their associated communities.

ORYZA SATIVA; VARIETIES; CROP MANAGEMENT; RURAL AREAS; TOURISM; COMMUNITY DEVELOPMENT; THAILAND

What makes ornamental farming profitable? what the survey says. **Bernardo, E.L., Mendoza, J.J.O., Marcelino, M.C.E., Balladares, M.C.E., De Guzman, R.P., Medina, N.G., Cedillo, N.O., Ventura, A.N., Tayobong, R.P., Sanchez, F.C., Jr.** *30th National Research Symposium, , Pasay City (Philippines), 7 Nov 2018. College, Laguna (Philippines). TR-1911. 2018. p. 107-127.*

Ornamental farming was once described to be a sunshine industry because of the potential income that it could generate from exports and from local consumption. However, the lack of government support in many facets of ornamental farming has made the industry a less attractive option for enterprising individuals. Further, pioneers in the industry have observed that income from ornamental farming has waned over the years, but the number of farmers and sellers seems to be increasing. The authors interpret this as indication that ornamental farming remains a profitable venture. But what factors make it profitable and financially-rewarding? Research set out to profile ornamental farmers in four municipalities of Laguna—Calamba, Los Baños, Bay, and Calauan [Philippines] and to identify factors that affect their perception in saying that ornamental farming is lucrative. Using stepwise logistics regression, researchers found that 1)diversity of products offered, 2)recycling of potting mix, and 3)use of cooling or ventilation systems were significant variables that would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. An increase in the number of farms, however, would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. Results from the survey indicate the need for targeted intervention and R and D built around the four variables identified.

ORNAMENTAL PLANTS; HORTICULTURE; SPERMATOPHYTA; INNOVATION; PLANT PRODUCTION; CROP MANAGEMENT; PROFITABILITY; FARMING SYSTEMS; FARMERS; PHILIPPINES

E21 - Agro-industry

Ex-ante analysis of industry strategic S and T [Science and Technology] plans for marine resources sector: Ex-ante analysis of industry strategic S and T [Science and Technology] plans for sea cucumber. **Garcia, Y.T., Valientes, R.M., Abante, J.C.I.** *College, Laguna (Philippines). TR-1755. 2016. 103 leaves.*

SEA CUCUMBERS; INDUSTRY; MARINE RESOURCES; EX-ANTE IMPACT ASSESSMENT; HATCHING; NURSERY GROUNDS; PONDS; AQUACULTURE

Segmentation of the ornamental farmers in Laguna [Philippines] for targeted capacity-building programs. **Marcelino, M.C.E., Bernardo, E.L., Mendoza, J.J.O., De Guzman, R.P., Balladares, M.C.E., Cedillo, N.O., Ventura, A.N., Sanchez, F.C., Jr., Medina, N.G., Tayobong, R.P.** *30th National Research Symposium, , Pasay City (Philippines), 7 Nov 2018. College, Laguna (Philippines). TR-1911. 2018. p. 82-105.*

Policies and programs of government agencies are towards the benefit of stakeholders. However, the implementation usually is hindered by the understanding and willingness of the receiving end. The reception is usually affected by the socio-demographic characteristics and the personal characteristics of the individual that can be affected by the program. Hence, targeted policies or population, specific implementation and must be considered. As an industry with a valuable potential, the programs and policies to the ornamental farmers can also be considered for population-specific implementation. This study aims to segment the population or ornamental farmers in selected towns in Laguna, Philippines. Using a survey data on ornamental farmers conducted in Laguna, hierarchical clustering was performed as data mining procedure to exhaust segments with inherent inter-class heterogeneity among farmer characteristics. The optimum number of segments per municipality was two segments. After determining the segments, it was found that trainings for business practices, financial management, and technology transfer are very much needed to be implemented on specific farmer clusters within municipalities and not on the entire province. The results imply that existing capacity-building programs can realize their full potential if the participants are targeted based on their specific characteristics and not just simply implemented to the entire population of participants.

ORNAMENTAL PLANTS; HORTICULTURE; SPERMATOPHYTA; FARMS; DEVELOPMENT PLANS; INNOVATION; CROP MANAGEMENT; FARMERS; PHILIPPINES

Sugar crop-based biorefinery for an integrated production of sugar, ethanol and other high-value products. **Borines, M.G., Capunitan, J.A.** *UPLB Centennial Professorial Chair Lecture, College, Laguna (Philippines), 27 Jun 2019. College, Laguna (Philippines). 2019.*

Although the Philippines' sugar industry contributes greatly to the country's economy. It still faces major challenges in terms of competitiveness and inadequacy as brought by the full implementation of the ASEAN Free Trade (AFTA) and inability to meet the current demand for bioethanol as fuel blend (Ang, 2018). Thus, there is a need to create an alternative revenue stream for the industry and to eliminate ethanol imports, which can be achieved by developing high-value products from sugarcane, sugar and its by-products, as well as sweet sorghum, another potential sugar crop. This can be realized through the establishment of a sugar crop-based biorefinary, which is an integrated facility for sustainable processing of biomass into a spectrum of bio-based products (food, feed, chemicals and materials) and bioenergy (biofuels, power and/or heat. Thus, the lecture was done to develop a framework for the sugar crop-based biorefinery to produce high-value products suitable for Philippine sugar factories and distilleries. In this lecture, the biorefinery concept was first discussed, including its definition and elements such as feedstock, conversion processes, platforms and products. From the available literature, as well as studies that have been made at the Department of Chemical Engineering, the various products that cabe be derived from sugar crops by fermentation and conversion or recovery were described. For sugar cane, the following products can be developed from cane trash, cane juice or syrup, sucrose and mascovado: biofuels (ethanol, methane, hydrogen), bioplastics, platform chemicals, food products, compost or soil ameliorant and other important chemicals, food products, compost or soil ameliorant and other important chemicals and products (Anh, et al., 2000; Lukatijis, et al., 2018; Bonadio et al., 2018; Palisoc, 2017; Xiao et al., 2018; Vohra, et al., 2014; Vijayendra et al., 2001; Garcia et al., 2017; Khan, 1995). For sweet sorghum juice and syrup, fermentation products include biofuels (ethanol, butanol, hydrogen) as well as important chemicals such as butadiene and lactic acid, among others. For sugar manufacture by-products such as bagasse, molasses and filter cake, products like fuel, policosanol, bioplastics, bipolymer, baker's yeast, monosodium glutamate, itaconic acid, acetone, among others, can also be obtained. After describing the high value-products that can be developed from sugar crops and their byproducts, a sugarcane-based biorefinery was proposed, supplemented with a sorghum-based biorefinery. For sweet sorhum, a possible biorefinery scenario would be integrate it with an existing sugarcane-based biorefinery, and utilize the sorghum juice or syrup for bioethanol production. Biofuels Act 2006 has created a market for bioethanol characterized by demands-supply gap and big volume imports. A consisted and reliable year round supply of feedstock is a significant cost component for biorefinery. With the seasonality of sugarcane, the use of sweet sorghum as an alternate feedstock for distillery could fill the demand for feedstock since sweet sorghum is a persistent crop. Moreover, they could be handled by a traditional sugar cane harvest and processing system. Market study and life cycle analysis of the biorefinery models presented most be done to look at all the logistic problems and issues such as cultivation, harvesting, transport, pretreatment, etc. These studies might identify the more promising

biorefinery platform that will maximize the production of sugar, electricity and ethanol. Results of these studies might also help the policymakers to come up with a specific policy development in the country for the integration of sugar, ethanol and electricity in a sugar based biorefinery.

SUGARCANE; SORGHUM; SUGAR; ETHANOL; SUGAR INDUSTRY; LIFE CYCLE; CULTIVATION; HARVESTING; TRANSPORT; PURIFICATION

E40 - Cooperatives

Assessment of DOST [Department of Science and Technology] setup assistance on cooperatives in the CALABARZON [Cvite, Laguna, Batangas, Rizal, Quezon,] Region [Philippines]. **Asma, J.D.S., Sumalde, Z.M.** *College, Laguna (Philippines). TR-1908. 2016. 23 leaves.*

Cooperatives are unique type of an enterprise that should balance the economic efficiency of their operation and social relevance to its members. In order to achieve economic efficiency, the cooperative should improve their production and the quality of their products through technological adoption. Through the assistance of the Department of Science and Technology, the cooperatives were able improve their productivity through purchase production equipment, improvement their packaging materials and subject their products in nutritional and shelf life studies. Five DOST [Department of Science and Technology] assisted cooperatives were assessed in the nutritional and shelf life studies. Five DOST assisted cooperatives were assessed in the study. The Pinagdanlayan RIC MPC was able subject their product with shelf-life and nutrient content analysis which is requirement to penetrate the market. Palcon Multipurpose Cooperative was able to shorten their milking time from 2 hours to 30 minutes because of the acquisition of a milking machine. Buklod-Unlad Multipurpose Cooperative was able to mechanize their meat processing which led to an increase of 44.44 in terms of volume of production. San Jose Workers Multipurpose Cooperative was able to acquire bakery equipment. Lastly, the Sampaloc Talisay Producers Cooperative was able to comply with food safety standards and increase their production due to the provision of stainless steel table and smokehouse. Generally, the cooperatives are highly satisfied with the assistance of features are acceptable. It is important to note however that the bidding for the purchase of equipment and penalty of 2% per month in case of late payments got the lowest acceptability rating. The bidding process takes a long time and there is an additional cost for the suppliers in bidding that will cause to increase their price. The cooperatives are highly satisfied with the assistance of DOST staff in different aspects and activities of the program.

COOPERATIVES; PRODUCTION; QUALITY; TECHNOLOGICAL CHANGES; COOPERATIVE ACTIVITIES; COOPERATIVE PROCESSING; COOPERATIVE PURCHASING

E50 - Rural sociology and social security

Perception and scenario building for South Bay communities of Laguna de Bay, Laguna, Philippines. **Rebancos, C.M., Espaldon, M.V.O., Alaira, S.A., Macale, L.S.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 35.*

The study was conducted through a scenario building exercise using Focused Group Discussions and Key Informant Interviews as tools to capture perception of communities from South Bay. Municipalities of Calamba, Los Baños and Bay, Laguna. The output were perceived future lake conditions that details direction towards which the lake would develop 20-50 years with current year as point of reference while at the same time, establishing past condition and present use of the lake to establish motivation and drivers of change as the community sees them. The outputs of the activity are scenarios categorized into four. The first scenario is Business as usual. The community envisions lake characterized by declining fish populations, more garbage, more chemical and toxic wastes coming from industrial parks and factories, shallower depth of the lake, more reclaimed areas resulting from increased residential areas as subdivision and industries. The second scenario is the establishment of Mega Dike perceived to boost the industrial development particularly of municipalities along its path. The lake would be reclaimed for residential and commercial purposes, fishing industries would decline, problem on waste is prevalent, and the lake water would have been polluted. The third scenario, and the most desired future condition is the Restored Lake where the lake's water is clear, deep and teeming with native fish. Open fishing has access to grater areas of the lake. The fourth and last scenario is ecotourism where the lake's potentials as a tourist destination would be developed and showcased. Given these scenarios, authors conceptualized optimal lake use which balances fisheries, ecotourism, water resources, power generation, and lake rehabilitation.

LAKES; USES; ENVIRONMENTAL MANAGEMENT; WATER RESOURCES; WATER MANAGEMENT; AQUATIC ENVIRONMENT; ENERGY GENERATION; RURAL COMMUNITIES; PUBLIC OPINION; PHILIPPINES

Policy review of PCSD [Palawan Council of Sustainable Development] resolution 04-233 thru comparative social impact analysis: the case if indigenous Batak and Pelawan Almaciga tappers from Tagnipa, Roxas and Amas Brookes point. *College, Laguna (Philippines). TR-1851. Dec 2014. 45 leaves.*

Historically, almaciga (bagtik) concessions though tapped by indigenous peoples locally known as magbabagtik and found with ancestral domain were owned by private concessionaires who also control the market. These resulted to inequitable access and benefits from the gains of almaciga trade where IPs are the losing end. For decades IPs unrequited toil in Almaciga tapping have supplied a primary local economic industry that have fed economic clout and political power to traders turned ruling elites while pumping local forest revenues. It was only within the dacade that exclusive Almaciga concession rights were recognized and granted for indigenous peoples, PCSD [Palawan Council of Sustainable Development] resoluton 2004-233. This research study entitled 'POLICY REVIEW OF PCSD RESOLUTION 04-233 THRU COMPARATIVE SOCIAL IMAPACT ANALYSIS BETWEEN PELAWAN AND BATAK INDIGENOUS TAPPERS' COMMUNITIES WITHIN AMAS, BROOKES POINT AND TAGNIPA, ROXAS' attempts to answer if indeed PCSD Resolution No. 04-233 contributed to advance the social wellbeing of the indigenous peoples sector as crucial stakeholders of the local Almaciga industry and key agents of forest conservation. This is qualitative comparative case analysis study that explores policy dynamics between two contrasting socio-cultural context of Pelawan and Batak indigenous almaciga tappers in the course of PCSD Resolution No. 04-233 ratification and implementation. The CORE indicators namely C- Cultural Context; O- Organizational Response; and RE-Resource Rights and Equity were used to identify and analyze the factors that in Auence the in the the realization of the resolutions policy rationale base on the local perspectives and experiences. Findings reveal that almaciga forest and derived resins of the indigenous peoples is more than just an economic resource but a medium of forest-cultural interaction. The Almaciga resources served as an important adaptive mechanism to cope with the encroachment of cash economy in the Palawan Ips of Amas while bagtik is a means of livelihood survival in the case of the dwindling and improverished Bataks of Tagnipa. Despire the enactment of PCSD 2004-233, grave social inequities persists reflected in the exploitative middlemen or kapatas among the Btaks and the debt-ridden and credit-dependent market relations of Pelawan of Amas. Evidently, indigenous almaciga tappers' are crucial forest conservation actors whose customary status of recognition of land rights and tenure security, status of livelihood diversification and pressures of rural poverty; demographic and socio-cultural context along with local IP's organizational capabilities in Auence the sustainability of Almaciga

livelihoods and their access to Almaciga concession rights. POlicy gaps in establishing institutional clear strategies; weak policy education and communication to pertinent sectors, primarily IP communities undermined the implementation of PCSD 2004-233. Much is yet to be realized to achieve the policy rationale due to various interlinked socio-environmental and economic issues revolving the local Almaciga sectors. These are (a)acquisition of exclusive almaciga concession rights remains to be costly, tedious and problematic-compounded vy bureaucratic failures of corruption and ambuguity; (b)the tedious, snail-paced delineation and processing of their Certificate of Ancestral Domain Titles (CADTs), makes their aspiration and local assertion of rights to land and resources elusive; (c)lack of enabling mechanisms including institutional support and initial financial capital for IP-POs self reliant management of community-based almaciga trade and (d)lack of advocacy and policy lobbying to pursue reforms in Almaciga trade market relations towards equity. Based on the research insights, the following recommendations are proposed to contribute to the PCSD 2004-233 policy rationale of advancing institutional collaboration, genuine IP rights to land resources, forest conservation and social equity. These are (1)Pursue policy lobbying and program assistance to advance the genuine achievement of indigenous peoples rights to culture, land, resources and self-determination; (2)Formulation of accountability and transparency mechanism thru a Standard-Operating-Procedure (SOP) process Aow-chart and guidelines in O.M.L. Almaciga.License processing and renewal in all levels to counter corruption, promote public information, services of efficiency and good governance; (3)Conduct of Almaciga Policy and Multisectoral Conference to pursue multisectoral policy dialogue and institutional participation towards policy and market reforms not just on PCSD 2004-233 but on the local almaciga sector perse; (4)Advance financial support IP-PO concession holder, market and policy reforms for equitable benefit sharing (5)Institutional partnerships to support community based development programs, participatory organizational capacity development and governance involvement among indigenous almaciga tappers' communities; (6)initiative development of community-based forest biodiversity assessment and resource system monitoring and information system (CBMIS) centered on Almaciga IP-PO concession holders.

AGATHIS; SPECIES; ETHNIC GROUPS; FORESTRY POLICIES; LAND RESOURCES; ENVIRONMENTAL IMPACT ASSESSMENT; SUSTAINABLE DEVELOPMENT; FOREST PRODUCTS

Potential development of glutinous rice community towards new agricultural culture tourisms in upper Northeastern Thailand. **Sattaka, P.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 92-103. (Jun 2019).*

Glutinous rice growing is concentrated in Northeastern Thailand. It not only impacts people's livelihoods, culture and traditions, but is also unique in its taste, consumption and extensive utilization. Thus, those in the glutinous rice community should make use of their unique glutinous rice culture to promote agricultural/cultural tourism. The study locations were Ban Phu in Mukdahan province, the Khao Mao Wan Community Enterprise, Ban Prong in Nakhon Phanom, and the Noi Chomsi Community Enterprises in Sakon Nakhon in January-March 2017. The study showed that the communities in Upper Northeastern Thailand have the potential to develop as an agricultural/cultural attraction. Moreover, the study indicated that glutinous rice attraction has high potential based on 10 indicators: production, processing, culture and tradition, location, facility, natural resource management, community participation, community administration, services, and promotion of glutinous rice attractions. However, the glutinous rice community can improve attractions by focusing on food security issues. It is anticipated that by integrating rice cultivation and cultural activities into the overall community development program, glutinous rice attractions will increase awareness of the role of glutinous rice regarding food, jobs, and cultural security to ensure a sustainable quality of life for glutinous rice farmers and their associated communities.

ORYZA SATIVA; VARIETIES; CROP MANAGEMENT; RURAL AREAS; TOURISM; COMMUNITY DEVELOPMENT; THAILAND

Project 4: Assessing Socio-Ecological System (SES): visioning a sustainable future of Laguna de Bay [Laguna, Philippines]: under the program Ten Years after the Millennium Ecosystem Assessment of Laguna de Bay: towards a sustainable future. **Espaldon, M.V.O., Rebancos, C.M., Alaira, S.A., Tatlonghari, C.M., Dimasuay, G.L.B., Lacson, J.A.M., Macale, L.S., Gapaz, R.B., Tapia, J.M.L., Tapay, S.D., Fermalan, G.B.** *College, Laguna (Philippines). TR-1862. May 2018. 164 leaves.*

As an integral part in achieving the goal of studying the Laguna Lake [Philippines] system, this project looked into the social dimension. In doing so, the project utilized a Socio-Ecological System (SES) approach. The approach centers on the relationship between human society and nature on multiple sectional samplings. Major work of the project was centered on gathering information through various surveys of 17 barangays [villages] across the different municipalities surrounding the south bay of the Laguna Lake. These surveys were used to determine the perception of the communities towards the lake system. In learning so, the objective of the project is to craft policies for the optimal use of the resources as well as the land and water spaces of the area. Scenario building then followed the perception analysis using the information gathered from the study. Additionally, work was also done to determine different possible approaches to clean the lake in order to prepare it for a transition into the optimal state identified. Perception analysis revealed that

the uses of the Laguna Lake has not been for livelihood purposes. This has led the researchers to believe that neglect in the users could have stemmed from the lack of connection with the lake. This is emphasized by another result of the survey that shows a significant portion of the coastal community (around 11%) who dispose waste water in the lake. These destructive practices are identified to have been possibly caused by the communities' lack of access to sewage treatment facilities with around 88% of the community without access. Lack of segregating practices with the solid wastes where in almost half of the population (45%) do not practice segregation also affects the pollution situation significantly. This study was proved significant for the community as 63% see the lake worsening in condition 10 years from now. With this, desired changes with the lake were asked from the community and the following scenarios were identified and constructed: no fishing pen activities, an engineered lake scenario, and an ecotourism scenario. These scenarios were then combined for their best characteristics as well as to include proper sewage treatment plants as well as room for the projected highway to be constructed near the lake to create an optimal use scenario for the lake. Four technologies were identified which could be used for decreasing the pollution levels in the Laguna Lake: Aquatic Macrophyte Biosorption System (AMBS), Effective Microorganism, Sewage Treatment Plants, and Constructed Wetlands. These technologies have also been founded to be effective not only in some part of the Philippines but also in several countries. A Focus Group Discussion was then employed to ask the community members which of the technologies were more desired and acceptable to them for deployment. Participants wanted a pollution abatement technology that is sustainable as much as it was effective in cleaning the lake water. With this, they identified, despite the large cost, Sewage Treatment Plants to be most effective and sustainable as well as innovative as more modern designs could be implemented. Other outputs of the project include a segmentation analysis which could aid in the policy making determining which parts of the population were least aware of the different pollution problems. A policy forum called LEAP was also conducted to show not only the projects' policy recommendations but also the entire program outputs. A draft of the Laguna Lake book entitled Restoring Laguna de Bay: A Vital Natural Resource in Crisis was also completed and is red for printing as soon as editing is completed.

LAKES; WATER POLLUTION; WATER CONSERVATION; NATURAL RESOURCES; WATER QUALITY; LOCAL GOVERNMENT; RURAL COMMUNITIES; COMMUNITY INVOLVEMENT; RESOURCE CONSERVATION; ENVIRONMENTAL POLICIES; PHILIPPINES

Social acceptability of pollution abatement technologies to improve the quality of Laguna de Bay [Philippines] . *Project 4: Assessing Socio-Ecological System (SES): visioning a sustainable future of Laguna de Bay [Laguna, Philippines]: under the program Ten Years after the Millennium Ecosystem Assessment of Laguna de Bay: towards a sustainable future, Espaldon, M.V.O.Rebancos, C.M.Tatlonghari, C.M.Dimasuay, G.L.B.Lacson, J.A.M.Macale,*

L.S.Gapaz, R.B.Tapia, J.M.L.Tapay, S.D.Fermalan, G.B..- College, Laguna (Philippines). TR-1862. May 2018. p. 121-134.

LAKES; WATER POLLUTION; WATER QUALITY; POLLUTION; RESOURCE MANAGEMENT; PHILIPPINES; RURAL COMMUNITIES; SOCIAL PARTICIPATION

Technical efficiency of women in indigenous rice production in Sagada, Mountain Province, Philippines. **Flores, E.C., Delos Reyes, J.A.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 43-54. (Jun 2019).*

This study assessed the technical efficiency (TE) of Kankanaey women in rice production in Sagada, Mountain Province, Philippines. Primary data were collected in February 2016 for cropping period December 2014 to May 2015. From 120 respondents interviewed, 139 male-headed and 139 female-headed rice parcels were studied. The factors of production and TE were determined using stochastic production frontier analysis while mean differences between genders were t-tested. Small rice parcels had lower production because they were more difficult to cultivate, used lesser seeds, high yielding variety (HYV) and rodenticide. These constraints, along with problems of saktoto worm infestation and lack of water were more often experienced in women-managed parcels. These parcels had lower TE and production due to: non-participation of women in dap-ay; inadequacy of man-labor; smaller size of parcels; inadequate logistical and infrastructure support for dilapidated terraces and pathways; lack of irrigation water; and lack of organic inputs for rice production. Women inclusion in the dap-ay especially in determining the agricultural calendar and declaration of ubaya; reviving the lampisa system for irrigation management; expansion of rice parcel area; practicing ub-ubbo; provision of logistical and infrastructure support for indigenous rice farming; and provision of rice technical support for organic rice farming were recommended.

ORYZA SATIVA; RICE; INDIGENOUS ORGANISMS; PLANT PRODUCTION; ECONOMIC ANALYSIS; PRODUCTION FACTORS; WOMEN; PARTICIPATION; ROLE OF WOMEN; ETHNIC GROUPS; PHILIPPINES

E70 - Trade, marketing and distribution

Assessment of the supply key agricultural products in CALABARZON [Cavite, Laguna, Batangas, Rizal, Quezon, Philippines] and assessment to determine the opportunities of major markets in the National Capital Region and CALABARZON. **Gordoncillo, P.U., Quicoy, C.B., Delos Reyes, J.A., Bathan, B.M., Molina, I.R., Manipol, N.E.P., Pingul, M.O., Estadilla, R.J.C., Opulencia, MG.M., Mawiag, F.S., Sumaya, S.G., Buenaseda, R.D.Q., Salvador, A.C., Lucero, B.A.G.** *TR-1878. 258 leaves.*

Region IV-A [Cavite, Laguna, Batangas, Rizal, Quezon, Philippines] is a major food basket for the National Capital Region and provides the food requirement of its local people. It is important to assess the supply of key agricultural products produced and traded in CALABARZON and determine the market opportunities of major markets in the region and NCR to ensure that the marketing of these products is both effective and efficient. Market information plays a vital role in improving the efficiency of marketing where both sellers and buyers get access to relevant and updated price data and other market information. This study commissioned by the Department of Agricultural Regional Field Office IV-A aimed to appraise major agricultural markets and to pilot a marketing information system. It specifically aimed to draw the product and geographical flows of the major agricultural products traded in the selected markets in CALABARZON and NCR; analyze the trends in the production, consumption, and prices of selected agricultural products; assess the provision of support services in the agricultural marketing chain; evaluate the existing market information system in the area; and pilot a market information system in one selected market in CALABARZON. The study covered 10 agricultural markets in CALABARZON and NCR namely: Tagaytay Mahogany Market in Cavite; Mercado de Calamba in Laguna; Primark Lemery Market, Tanauan City Trading Post and Public Market, and Padre Garcia Livestock Auction Market in Batangas City Malll of Antipolo in Rizal; Sariaya Public Market and Lucena Fish Port Complex in Quezon; Divisoria Market in Manila City and Balintawak Market in Quezon City. Whereas, the agricultural products covered in the study include cereal-rice, and yellow corn (cracked and grits); root crops-ubi and cassava; vegetables-eggplant; okra, squash string bean, wild chili, garlic, onion (bulb, leeks, and spring), ginger, tomato, bitter gourd, black pepper, finger pepper; plantation crops-coffee and cacao; fruits-banana (Lakatan, Latundan, and Saba), pineapple (Formosa and Hawaiian) and carabao mango; livestock- beef and dairy cattle; poultry-chicken meat and chicken egg, swine- pork; and fisheries-roundscad, tilapia, milkfish and tuna. Demand estimation using market build-up method was employed by obtaining the volume procured of sampled retailers for the last seven days. At least 30 percent of the total retailers per commodity per market were randomly selected as respondents for the market build-up. Results revealed that majority of rice in CALABARZON were mostly sourced from Oriental Mindoro and Central Luzon Region, particularly in BUlacan and Nueva Ecija. Meanwhile, yellow corn mostly came from Batangas and Bulacan. Cassava in Divisoria, Tanauan, and Tagaytay were mostly sourced from Batangas and Oriental Mindoro, while cassava in Balintawak came from Isabela. Supply of cassava in Antipolo, Calamba and Sariaya were all sourced within their province. Ubi from Balintawak, Antipolo, Tagaytay, and Tanauan were also sourced from Batangas. Eggplant, bitter gourd, squash, okra and string beans in Balintawak and Divisoria were produced mostly in Bulacan, Nueva Ecija, Nueva Vizcaya, and Pangasinan. Majority of coffee sold in Balintawak, Tagaytay, Lemery and Tanauan were produced from Lipa City, Batangas. Cacao in Lemery and Tagaytay were both sourced within the respective province. Beef sold

in the major agricultural markets were procured mostlt from Padre Garcia Auction Market in Batangas. Pork, on the other hand, was sourced from Batangas province and Central Luzon region, particularly from Tarlac and Bulacan.

RICE; MAIZE; YAMS; CASSAVA; AUBERGINES; OKRAS; SQUASHES; KIDNEY BEANS; CHILLIES; GARLIC; CASSAVA; ONIONS; GINGER; TOMATOES; MOMORDICA CHARANTIA; PEPPER; COFFEE; THEOBROMA CACAO; BANANAS; PINEAPPLES; MANGOES; BEEF; DAIRY CATTLE; CHICKENS; PORK; FISHERIES; FARMERS; PRICES; DEMAND; MARKETS; PHILIPPINES

Screening for collusion in the Philippine chicken meat, chicken egg and pork markets. **Nerio, C.M.T., Gordoncillo, P.U., Elca, C.D., Curibot, J.P.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 135-147. (Jun 2019).*

Since chicken meat, chicken egg and pork are regularly consumed by majority of the Filipino population, changes in the quantity supplied and retail prices significantly affect buyers. Protecting the welfare of the consumers and even producers by promoting free and fair competition is of utmost concern. Firms entering into anti-competitive agreements such as market collusion can hurt consumers because of the high prices they are being charged. The paper screened for possibility of market collusion in the Philippine markets of chicken meat, chicken egg and pork, by observing significant breaks in the prices of industry data. Piecewise regression analysis was performed on the nominal retail prices of chicken meat, chicken egg, and pork from 1990 to 2017. Findings revealed that the variations in the retail prices showed statistically significant shifts corresponding to critical events in the industry like entry, exit and mergers within the industry, as well as the acceleration of technical smuggling in the country. While the paper is limited only to the initial work of detecting market collusion, the paper recommends that further scrutiny by concerned agencies be done in order to verify and address the anticompetitive behavior of firms.

CHICKEN MEAT; EGGS; PORK; MARKETS; SUPPLY; PRICES; ECONOMIC COMPETITION; CONSUMERS; PHILIPPINES

E73 - Consumer economics

Consumers' purchase intention towards genetically modified soybean products in Malaysia. **Seng, K.W.K., Son, W.C.V., Teng, P.K., Sharifuddin, J., Ali, F.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 94-106. (Jun 2018).*

In Malaysia, soybean products area convenient and a popular daily food product, however, the main raw material used to produce these soybean products has been partly changed from the traditional soybean to the imported GM soybean. While the GM soybean products are commercially sold in the market, not all the consumers take notice or are aware of it. There is lack of information sharing between GM soybean products' producers and consumers and the argument about the safety of GM product is still a big issue among consumers. As the GMOs are relatively new to Malaysian consumers, the National Biotechnology Directorate is stepping up its efforts to implement public awareness programs on biotechnology. Thus, this study will attempt to conduct the consumer research to provide insights on how likely consumers are willing to purchase genetically modified soybean. The purpose of this study is to determine the factors affecting consumers' intention to purchase genetically modified soybean products in Malaysia. Multistage and convenient sampling was used in selecting 215 respondents who were surveyed using self-administered questionnaires. Descriptive analysis, reliability test, exploratory factor analysis and binary logistic regression analysis were used to accomplish the objective of this study. The binary logistic result shows that product attribute, consumer attitude, and gender influenced consumers' intention to purchase genetically modified soybean in Malaysia. Understanding the consumer's intention will help the food producer and manufacturer to identify the consumer preferences for GM food products and will help prevent losses in market share of soybean products.

SOYBEANS; GLYCINE MAX; GENETICALLY MODIFIED ORGANISMS; PROCESSED PLANT PRODUCTS; CONSUMER BEHAVIOUR; CONSUMER SURVEYS; MALAYSIA

Stakeholders' satisfaction baseline survey for PNOC EC [Philippine National Oil Company Exploration Company. **Jimena, C.E.G.** *Philippine National Oil Company Exploration Corporation, San Miguel, Bauan, 4201, Batangas (Philippines). College, Laguna (Philippines). TR-1848. 2016. 106 leaves.*

This report explains the findings of the satisfaction study conducted to determine the level of satisfaction of all PNOC EC [Philippine National Oil Company Exploration Company] stakeholders on the company's implementation of its programs. Specifically, it aimed to: 1.describe the overall and stakeholder specific satisfaction level per business activity (i.e. petroleum exploration, coal exploration and production and port services); 2.quantify the overall and the stakeholder specific satisfaction level per business activity (i.e. petroleum exploration, coal exploration and production and port services); 3.determine the factors and relationships affecting the stakeholder satisfaction; and 4.identify gaps and opportunities for improvement to enhance stakeholder satisfaction. In this study, satisfaction refers to the act of fulfilling the need and managing expectations of the stakeholders in relation to their organization's mission and mandate (Market and Opinion

Research Institute, 2004). Based on the said research, there are several key drivers that affect the satisfaction of stakeholders and customers to the service provided by a company or institution. Four drivers were considered in this study. These are: 1.delivery and quality of services; 2.staff attitude and professionalism; 3.transparency to stakeholders; and 4.office/project operations and environment. To measure the stakeholders' satisfaction, several statements were rated by the respondents and key informants (KI). The sample for this study was derived from the population of all PNOC EC stakeholders. These are eight categories of PNOC EC stakeholders namely; ESB, NCT, SC 37, COC 122 COC 41, COC's 185 and 186, DOE and PNOC EC regulators and JV Partner operators. From the list, a total of 1,171 stakeholders was obtained . Stratified random sampling was done to account for the high differences in the number of stakeholders across categories. The stratum weights were pre-assigned by PNOC EC and later were verified by the research team to be plausible values, then considered for data analysis to adjust the individual weight of each stakeholder. The actual sample size was 362. Before the actual data gathering, the questionnaire underwent validity and reliability tests using Cronbach Alpha. For data analysis, frequency counts were used to compute the median ratings. Based on the four divers of satisfaction, results showed that the stakeholders rate the 2015 overall performance of PNOC EC as 'Excellent' (4.5). Stakeholders such as the NCT, SC 37 JV Partners and PNOC consistently gave PNOC EC 'Excellent' rating (4.75 to 5.0). COC 41 also rated the company: Excellent' (4.5). Other stakeholders such as DOE, COCs 185 and 186, COC 122 and ESB gave a rating of 'Very Good' (4.0). The driver, staff attitude and professionalism got the highest rating of 'Excellent' or 5.0 across stakeholders. This means that the stakeholders found the PNOC EC staff to be friendly, polite, approachable and open for feedback and suggestions. Moreover, they found that the staff responds to issues and concerns immediately if needed; dress up appropriately; are knowledgeable/skilled/ experts in their respective fields; and are professional and fair in dealing with the stakeholders. The stakeholders' high regard to PNOC EC staff is crucial in PNOC EC's operation. It may even spell success or the failure of the programs in their host communities. The driver with the highest median (Excellent or 4.5) is the office/project operations and environment. This means that the stakeholders believe that the PNOC EC adheres to health, safety and environment regulations and standards as required by law. As to the factors affecting stakeholders' satisfaction , two drivers were found to affect the stakeholders' satisfaction. These are staff attitude and professionalism, and transparency to stakeholders. This indicates the staff's behaviour and their transparency in dealing with their stakeholders are very important. With these findings, it is important the PNOC EC should sustain and enhance their performance in these drivers to ensure a continued 'Excellent' rating from their stakeholders. While the 2015 overall performance of PNOC EC was rated 'Highly satisfactory' or 4.5 by their stakeholders, there are also pressing issues and concerns which were raised. Thus, it is prudent and good practice for PNOC EC to address these issues and concerns. In doing so, the PNOC EC will continue to enjoy its high

integrity with their stakeholders and consequently sustain and may even improve their 'highly satisfactory' rating in the years to come.

OILS INDUSTRY; PETROLEUM; COAL; HARBOURS; CONSUMER BEHAVIOUR; PARTICIPATION; CONSUMER SURVEYS; RESEARCH

Stakeholders' satisfaction survey for PNOC [Philippine National Oil Company] 2016
Jimena, C.E.G. **Philippine National Oil Company, Taguig City (Philippines).** *College, Laguna (Philippines). TR-1845. 2016. 107 leaves.*

This report explains the findings of the satisfaction survey conducted to determine the level of satisfaction of all PNOC [Philippine National Oil Company] stakeholders on the company role as holding company as it transforms to operating company. Specifically, it aimed to: 1.Describe the overall and the stakeholder specific satisfaction level per stakeholder group (i.e. oversight agencies, SC 38 consortium and PNOC subsidiaries); 2.Quantify the overall and the stakeholder specific satisfaction level per stakeholder; 3.Determine the factors and relationships affecting stakeholder satisfaction; 4.Identify gaps and opportunities for improvement to enhance stakeholder satisfaction. In this study satisfaction refers to the act of fulfilling the need and managing expectations of the stakeholders in relation to their organization's mission and mandate (Market and Opinion research Institute, 2004). Based o the said research, there are several key drivers that affect the satisfaction of stakeholders and customers to the service provided by a company or institution. Five drivers were considered in this study. These are: 1.Delivery of services; 2.Quality and timeliness of the requirements/obligations; 3.Staff attitude and professionalism; 4.Transparency to all stakeholders; and 4.Quality of support provided to stakeholders To measure the stakeholders' satisfaction, several statements were rated by the respondents. Complete enumeration or census was the data collection method used. Before the actual data gathering, pretesting of the questionnaire was conducted the questionnaire was reviewed and later underwent validity and reliability test using Cronbach Alpha Standardized Coefficient to determine the questionnaires' reliability. Results showed that the questionnaire has a 90.54% high internal consistency and reliability. After the revisions, the reliability of the survey improved to ninety four percent (94%). A 90%-99% coefficient is the acceptable rate in research. Inputs and suggestions from the pretesting stage were also included to improve the survey instrument. Data encoding, analysis and preliminary report writing were conducted between November 7 to December 7, 2016, a coding manual and database entry EPI INFO the overall PNOC rating, the rating for the common questions for all drivers were used to compute the overall median rating. Likert-scale was used to measure the ratings of the respondents for each statement with 5 being 'Very Satisfactory'; 4,'Satisfactory'; 3,'Neutral'; 2,'Unsatisfactory'; 1,'Very Unsatisfactory'. For the respondents' perception on the PNOC's overall performance, the same scale was used. Furthermore, to

determine the factors affecting the satisfaction of the stakeholders, Spearman Rank –Order Correlation analysis was done. Variables found to have at least moderate association to the satisfaction rating is said to be critical in improving PNOC's stakeholders' satisfaction rating. Results showed that factors strongly related with the overall satisfaction rating are: As for the factors affecting stakeholder's satisfaction delivery of services (the PNOC delivers the requirements/obligations expected of them as needed and the PNOC provides clear requirements as expected of their subsidiaries), Quality and timeliness of requirements/services (the PNOC provides accurate requirements or well-presented/ clear reports), Staff attitude and professionalism (the PNOC staff is friendly and polite, and the PNOC staff is always available when needed), Transparency to all stakeholders (The information in the report (written and oral presentation) and the updates are sufficient) and Quality of support provided to stakeholders (the PNOC support/ coordination to stakeholders is always available). Results showed that based on the five drivers of satisfaction, the stakeholders rated PNOC's 2016 overall performance 'Very satisfactory' (4.6). The respondents from SC 38 gave the highest rating (4.8), followed by the oversight agencies (4.7) and the NOC subsidiaries (4.5). Among the drivers of satisfaction, the staff attitude and professionalism got the highest rating (4.8), followed by the quality and timeliness of the requirements (4.7) and quality of support to stakeholders, delivery of services (4.6), and transparency to stakeholders (4.3). With these findings, it is important that the PNOC should sustain and enhance their high overall performance rating based on the drivers to ensure a continued 'Very Satisfactory' (4.6) rating from their stakeholders. While they have a 'Very Satisfactory' rating, they need to look closely to the stakeholders recommendations and factors affecting the stakeholders' satisfaction. Thus, it is to the best interest for NOC to take into considerations these suggestions and maintains its 'Very satisfactory' rating in the years to come.

Stakeholders' satisfaction survey for PNOC EC [Philippine National Oil Company Exploration Corporation] CY [Calendar Year] 2017. **Jimena, C.E.G.** *Philippine National Oil Company Exploration Corporation, San Miguel, Bauan, 4201, Batangas (Philippines). College, Laguna (Philippines). TR-1849. 2017. 100 leaves.*

This report explains the findings of the satisfaction study conducted to determine level of satisfaction of all PNOC EC stakeholders on the conduct of projects being explored, developed and implemented by the company. Specifically, it aimed to: 1.quantify the overall and the stakeholder specific satisfaction level per business activity (petroleum exploration, coal exploration and production, and port services); 2.determine the factors and relationships affecting stakeholder satisfaction; 3.determine the progress or change in the level of satisfaction of stakeholders from the previous survey (2015 and 2016); and 4.identify opportunities for improvement to enhance stakeholders' satisfaction. In this study, satisfaction refers to the act of fulfilling the needs and managing expectations of the

stakeholders in relation o their organization's mission and mandate (Market and Opinion Research Institute, 2004). Based on the said research, there are several key drivers hat affect the satisfaction of stakeholders and customers to the service provided by company or institution. Four drivers were considered in this study. These are: 1.delivery and quality of services; 2.staff attitude and professionalism; 3.transparency to stakeholders and, 4.office/project operations and environment. To measure the stakeholders' satisfaction, several statements were rated by the respondents. The sample of his study was derived from the population of all PNOC EC stakeholders. There are eight categories of PNOC EC stakeholders namely: ESB, COC 122, SC 37, COC 41, COCs 185 and 186, DOE as a regulatory agency, PNOC as a holding company and JV Partners. From the list, a total of 2103 stakeholders served as population of the survey. Fifty-three of which were completely enumerated while 2061 served as the universe of the sampling procedure. Stratified random sampling was done to account for the high differences in the number of stakeholders across categories. With 95% confidence about the survey results and 4% error allowed, the theoretical sample size was 401 stakeholders. Upon stratification, proportional allocation was done across stakeholder groups along with the additional list provided by the management. The actual number of respondents is 440 out of the 2103 total number of stakeholders, and per stakeholder group as follows: ESB in Batangas (53), COC 122 (85) and SC 37 (25) in Isabela, COC 41 (152) and COC 185&186 (97) in Zambaonga Sibugay, POC (11) DOE (12) and JV Partners in Metro Manila [Philippines] (5). Qualitative and quantitative data to capture the areas for improvement (objective number 4) were recorded and transcribed with the consent of the respondents. Otherwise, highly trained faculty and research assistants carefully took note of their responses. The methods used to collect the data were census or complete enumeration and sampling via interview schedule. The questionnaire's validity and reliability has been established in 2016 using Cronbach Alpha Standardized Coefficient (90%-99% acceptable coefficient). In 2016, the instruments was found to be 94.65% reliable implying the stability of the questionnaire thus pre-testing was no longer necessary for this year and upcoming year. Data collection started in October 23 and ended in December 5, 2017. Data encoding followed right after the data collection while the preliminary report was drafted from December 18, 2017 to February 16, 2018. A coding manual and database entry using EPI INFO version 7.2 were used. Frequency counts were done to compute median ratings. Results showed that the median rating PNO EC's overall performance (2017) based on key drivers is 4.52 or 'Excellent' with driver 1.delivery of services and programs; driver 2.staff attitude and professionalism; and driver 3.transparency to partners rated as 'Excellent' or 4.54, 5 and 4.5 respectively. Among the eight stakeholder groups, only DOE and COC 185 and 186 gave PNOC EC a rating of 4 and 4.25 or 'Very Good'. Consistently, through the years (from 2015 to 2017), Driver 2 staff attitude and professionalism remains the top driver affecting the overall rating of PNOC EC as an organization. Furthermore, to compare the overall ratings for the last three years the Kruskal Wallis test was utilized to compare median ratings of the three years per statement

in the driver. Therefore, the study concludes that the overall satisfaction rating of PNOC EC for CY 2017 is 4.52 or Excellent or Highly Satisfactory as validated by the Kruskal Wallis test and the findings of the influential factors on satisfaction ratings using ordinal regression analysis. Qualitative supporting statements were generated and analyzed to contextualize the quantitative data measured using statistical tools mentioned. The said qualitative data are valuable to PNOC EC to sustain its consistently highly satisfactory or excellent ratings in the last three years. The said data will be utilized to form part of the continual improvement efforts of PNOC EC and as part of its commitment to quality and service excellence in delighting their various stakeholders across various operations. And thus realize its vision to be the leading energy exploration and production company in the Philippines and contribute to national development.

OILS INDUSTRY; PETROLEUM; COAL; HARBOURS; CONSUMER BEHAVIOUR; PARTICIPATION; CONSUMER SURVEYS; PHILIPPINES

F - PLANT SCIENCE AND PRODUCTION

F01 - Crop husbandry

Adaptability trial of super sweet sorghum. **Demafelis, R.B., Angeles, D.E., Samson, E.G., Ganancial, J.T., Beltran, A.K.M., Rivera, H.F.R., Demafelis, F.A.N., Rollon, G.D., Jr., Monteza, C.C.** *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1821. 2017. 162 leaves.*

The study was conducted to evaluate the performance of the super sorghum hybrids coded as B6, EN 12-12, each having distinct characteristics under the humid tropical conditions of the Philippines. It was tested against the commercial local variety from India, SPV 422. Three trials were established t assess the (1)performance evaluation of test cultivars; (2)response of plant to the effect of different planting distances; and (3)effect of increasing fertilizer rates on the agronomic and yield performance of sweet sorghum. Agronomic and yield data were gathered at milking stage at at crop's grain maturity. In terms of agronomic performance, , V1 (B6) performed best in term of stalk weight, stem diameter, and grain weight particularly during June planting and V3 (EN 12-12) for October and July planting. V2 (EN 12-11) produced the tallest but lightest stalks while V4 (SPV 422) competes for V1 (B6) and V3 (EN 12-12) in terms of biomass, grain, juice, and cane yield of the test cultivars but it was found out that using 68 x 10 cm planting distance produced tall plants or broad leaves due to the activation of phytochrome-mediated responses while a 75 x 15 cm planting distance generated thick stalks with high juice content and that wide space planting like 90 x 20 cm can be used to generate long leaves and internode. For the effect of fertilizer, using

116-84-84 kg/ha of NPK enables the plants to attain high cane and juice yield were observed whwn planting was done on June while a lower yield was measured when planting was conducted on July and October. Photoperiod in sweet sorghum causes poor agronomic performance and yield reduction due to early flowering. A lower yield has also resulted when plants were ratooned on December. Grain production, on the other hand, is susceptible to bird infestation. For ethanol production, V4 (SPV 422) is recommended due to its high juice volume and sugar content. V3 (EN-12-12), on the other hand, was also observed to contain high sugar concentration which can be utilized for ethanol production. Due to senescence, performance of crop during grain maturity was relatively lower than at milking stage.

SORGHUM BICOLOR; HYBRIDS; HUMID CLIMATE; TROPICAL CLIMATE; YIELD COMPONENTS; YIELD FACTORS; AGRONOMIC CHARACTERS; MATURITY; FLOWERING; ETHANOL; ADAPTABILITY

Assessing resiliencies, biodiversity of global significance and environmental goods and services of GIAHS [Globally Important Agricultural Heritage Systems]-designated Ifugao Rice Terraces [Philippines] in comparison to conventional rice paddies. **Borromeo, T.H., Altoveros, N.C., Dayo, M.H.F., Aguilar, C.H.M.** *College, Laguna (Philippines). TR-1907. 70 leaves.*

This study was carried out by the University of the Philippines-Los Baños through funding support from the World Agricultural Heritage Foundation (WAFH). In order to study the effects of modernization-associated pressures on traditional rice-based agro-ecosystems, three upland irrigated farms (viz. Nagcarlan, Julongan and Ambabag) in Kiangan, Ifugao Province, Philippines were chosen as study areas. Nagacdan and Julongan (GIAHS sites) were chosen for this purpose while Ambabag, (a non-GIAHS site) was also selected to provide contrast to the preceding two agro-ecosystems. Changes in cultural identity, resilience, provision of economic services, crop diversity and biodiversity losses were recorded and the driving factors that underpinned these changes were dissected and analyzed. Using standardized tools and methodologies, the study was able to document wild scale cultural and biodiversity losses, lowered resilience, a diminishing capacity to provide ecosystem services (ES) and a severely eroded traditional crop base. Identified driving factors were the easy access to modern varieties, chemical inputs, information and microfinancing, education, market economy and Christianization. The farmers also disclosed that all these changes were heralded by the Green Revolution during the late 1960s to 1970s when high yielding varieties (HYVs) were promoted along with the intensive use of chemical inputs. Since then, Tinawon rice varieties had been discarded on a continuous basis and replaced with HYVs because of their perceived economic benefits. Consequently, age-old Ifugao farming rituals were also forgotten, rice conservation and varietal selection

were no longer practiced, gender roles were reversed and there was an unfortunate shift from the traditional ugbbu system to paid labor. Moreover, the use of chemical inputs also resulted in the displacement of endemic fauna and the uncontrolled proliferation of introduced pests such as golden apple snail, giant earthworms and Asian swamp eels which wrought various forms of damage to rice crop and the terraces. The drive to earn more cash had also caused an increasing number of farmers to convert their swidden fields (habal) and some terraces to commercial gardens for high value vegetables. As for the woodlots (muyong), greatest diversity was observed for endemic trees and understory vegetation in barangay [village] Julongan. Unfortunately, field inspection in this village revealed that a significant number of endemic trees in the area had been girdled and left to die in preparation for the establishment of an arabica coffea plantation. Furthermore, since the muyong harbors large proportions of endemic species, it ensures constant water supply for the terraces, protects against soil erosion, mitigates the adverse effects of climate change, contributes to pollination and natural pest control and allows for a host of other essential processes in the agro-ecosystem. It can be concluded therefore, that these 3 farming communities are on the verge of a complete shift to a modern agricultural system-one that is yield-driven, highly influenced by market economy and marked by low bio-cultural diversity. Before this transformation becomes complete and all resources and the Ifugao culture becomes irreversibly lost, it is imperative that interventions of a multi-faceted nature be instituted the soonest. Finally, the following are recommended for further studies, scientific interventions and possible promulgation of policy aimed at conserving the Ifugao agro-ecosystem and the culture that is closely interlinked with it: 1. Provide a viable market and incentives for the cultivation of Tinawon rice using traditional farming rituals; 2. Carry out casual chain analysis to study direct and indirect drivers of ecosystem change and their impacts; 3. Conduct an economic valuation of ecosystem services; 4. Undertake ex situ and in situ conservation of indigenous crops in the area; 5. Develop policies and programs for the preservation of Ifugao culture based on inclusive discourse involving older farmers and their younger counterparts; 6. Carry out studies for the possible valorization of intangible Ifugao cultural heritage which is closely intertwined with the lives of people in the community; 7. Conduct studies to quantify financial losses due to pest infestation and into integrated pest control methods of these plants.

ORYZA SATIVA; RICE; VARIETIES; INDIGENOUS ORGANISMS; HIGHLANDS; AGROECOSYSTEMS; IRRIGATED LAND; FARMS; ECOSYSTEMS; BIODIVERSITY; LOSSES; FARMING SYSTEMS; PHILIPPINES

Combination of on-time planting and optimum nitrogen rate increased grain yield of thermo-genetic malesterile lines. **Palanog, M.O., Brena, S.R., Palanog, A.D.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019.*

Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 115. (Sep 2019).

Maximizing seed yield of parental seed production can help in attaining hybrid seed requirement of the country. However, it is empirical that yield-limiting factors should be addressed in order to optimize the parental seed production. Timing of planting that coincide with favourable climatic conditions particularly temperature and relative humidity and appropriate nutrient management are crucial factors to consider in optimizing seed production yield at male fertile environment. A field experiment was conducted to determine the appropriate planting schedule(s) (semi-monthly planting) and nitrogen levels: 50% N at planting + 50% N 15 DAT (T1), 50% N at planting + 25% N 15 DAT + 25% N 25 DAT (T2), 50% N at planting + 25% N 25 DAT + 25% N 35% DAT (T3), and 25% N at planting + 25% N 15 DAT + 25% N 25 DAT + 25% N 35% DAT (T4). Analysis of variance (ANOVA) showed a highly significant variation of grain yield response under various planting dates, significant variation in the planting dates x treatment interaction but no significant variation among nitrogen treatments. Among the planting dates, mid-November planting (P19) resulted to highest grain yield followed by early November planting (P18) while mid-February planting (P2) recorded the lowest grain yield. Grain yield was observed to be low on the planting dates where relative humidity was low and slight increase in temperature during the critical stages which resulted to low spikelet fertility. The combination of P19 planting date and Treatment 4 (P19T4) obtained the highest grain yield. Results of the study showed that appropriate planting date and nitrogen levels can enhance the grain yield of TGMS lines. The non-significant variation among nitrogen treatments possibly indicate that nitrogen fertilization is not a major consideration but rather multiple-nutrient management should be considered.

ORYZA SATIVA; PLANTING DATE; CROP MANAGEMENT; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES

Effect of seeding depths using multi-purpose seeden for dry direct seeding technology on the yield of rice under different rainfed areas of the Philippines. **Basuel, E.E., Suralta, R.R., Corales, A.M., Santos, R.C., Abon, J.E.O., Dingle, E.L., Bautista, E., Martin, E.C., Bueno, C., Banayo, N.P.M.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 112. (Sep 2019).*

Dry direct seeding is a promising technology in rice growing areas affected by water scarcity brought about by climate change. It also reduces production especially during crop establishment, increase income and hasten early harvesting to avoid late planting season.

This study evaluated the effects of seeding depths during dry direct seeding using multi-purpose seeder (MPS) for the growth and yield of rice under rainfed lowland system. Several experiments were conducted in the farmers’ fields in different rainfed lowland sites from different regions of the Philippines in 2018 wet season. The sites were characterized by different soil types such as clay loam, loam and silly loam. Using an MP seeder, seeding depths were set at either deep (5 cm) or shallow (2 cm) during direct dry seeding of crop establishments using Sahod ulan varieties. Our results showed that yields were not significantly different between the seeding depths regardless of sites. Yields were significantly different among sites only probably due to the differences in soil types and/or varieties. Our results indicate that dry direct seeding technology using MPS can use either 2 or 5 cm seeding depths during crop establishments of any preferred varieties suitable by farmers in their respective localities. The effect of soil types, prevailing soil moistures after crop establishments and other factors will be characterized and discussed.

ORYZA SATIVA; DIRECT SOWING; SOWING DEPTH; GROWTH; CROP YIELD; PHILIPPINES

Effects of soil texture, seeding rate and depth on dry direct-seeded rice under rainfed ecosystem. **Alibuyog, A.Y., Pojas, S.V., Pungtilan, B.S.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 87. (Sep 2019).*

Field and pot experiments were conducted in 2018 in the City of Batac, Ilocos Norte [Philippines] to identify the most suitable soil texture for dry-direct seeding under favorable rainfed condition. In the three soil textures (fine, medium, and coarse), two seeding under favorable rainfed condition. In the three soil, textures (fine, medium, and coarse), two seeding depths; 3-5 cm and 7-10 cm; and four rates seeding: 60, 80, 100, and 120 kg/ha were tested using NSIC Rc222. Results showed that fine-textured soil was not suitable for direct-seedling as manifested by early crop failure both in the field and pot experiments. Plants under the fine-textured soil showed good emergence, however, at early seedling in growth (11 DAE), seedlings started to show yellowing of leaves and died. In the pot experiment, coarse- and medium- textured soils had taller and more vigorous seedlings than those that were planted in fine-textured soil, specially at 26 DAE. At 19 and 47 DAE, plant height of NSIC Rc222 was also significantly affected by the seedling depth, with better seedling growth at 7 cm. For the field experiments, analysis showed that seedling rate had significant influence on the yield. NSIC Rc222 gave the highest yield at 100 kg/ha. Lower yield was obtained from lower seedling rates (60 and 80 kg/ha). On the other hand, increasing the seedling rate to 120 kg/ha resulted to yield decrease.

ORYZA SATIVA; RICE; SEED; SOWING RATES; DIRECT SOWING; SOIL TEXTURE

Guidebook on participatory varietal selection of white corn as grits for food. **Manguiat, P.H., Labios, J.D., Labios, R.V., Malayang, D.B.N.** *College, Laguna (Philippines). TR-1912. 2018. 74 pages.*

ZEA MAYS; MAIZE; VARIETIES; SELECTION; FOOD CONSUMPTION; PLANT PRODUCTION

Implications for industrial support and services: insights from the ornamental horticulture in Los Baños [Laguna, Philippines]. **De Guzman, R.P., Bernardo, E., Mendoza, J.J.O., Marcelino, M.C.E., Balladares, M.C.E., Medina, N.G., Cedillo, N.O., Ventura, A.N., Tayobong, R.P., Sanchez, F.C., Jr.** *30th National Research Symposium, , Pasay City (Philippines), 7 Nov 2018. College, Laguna (Philippines). TR-1911. 2018. p. 54-80.*

This study assessed the ornamental horticulture industry in Los Baños [Laguna, Philippines] through the use of sequential explanatory design to document aspects of business management and production technology related to ornamental horticulture. This research design is characterized by multiphase data collection and integration of the data collected from the survey, focus group discussion, and key informant interviews. Findings showed that ornamental horticulture is a financially rewarding business as viewed by the survey respondents and other industry players interviewed. Ornamental horticulture is the primary occupation of the respondents Foliage and flowering plants are the most saleable plants to other farm owners and contractors. Through ornamental crops are viewed to have high technical requirements, respondents do not follow standard procedures for the crop management and price setting. Crop production-and management-related issues are some of the challenges encountered by the respondents. In spite of these, they were able to maintain their business. Partly, this is due to the role of the horticultural groups they belonged to the university’s continued support. The current situation of the industry is not solely based on the socioeconomic structure of the ornamental growers but also influenced by the changing landscape of the industry happened in the past.

ORNAMENTAL PLANTS; HORTICULTURE; SPERMATOPHYTA; INNOVATION; CROP MANAGEMENT; INDUSTRY; PHILIPPINES

Multidimensional approach in assessing farmers' barriers to and factors influencing organic agriculture adoption. **Argañosa-Matienzo, EL., Atienza-Tenorio, M.** *Department of Agriculture 2nd Floor BSWM Bldg. Elliptical Rd., Diliman, Quezon City (Philippines). College, Laguna (Philippines). TR-1857. 2017. v.1: 288 leaves; v.2: 295 leaves.*

Organic agriculture (OA) is influenced by social, technological, economic, environmental and political/institutional (STEEP) factors. The multidimensional approach involves the

interconnectedness of factors requiring a systems approach to understand the link to OA adoption. This report highlights the determinants to OA adoption from a holistic and systems perspective using a multidimensional approach. Project sites were Tublay, Benguet, Sabtang, Batanes in Luzon: Dao, Capiz, Victorias City, Negros Occidental in Visayas, and Sta. Josefa, Agusan del Sur, Braulio E. Dujali, Davao del Norte in Mindanao [Philippines]. Survey interview, case study and participatory workshops were used. There were 360 respondents, 180 OA practitioners (30 per site). Likewise, 26 key respondents from partner agencies were interviewed. Case video of six practitioners and three best initiatives, for OA promotion were produced and distributed. For three Islands, practitioners had higher percentage in socio-demographic characters. Practitioners had higher percentage in socio-demographic characteristics. Practitioners are owners of bigger land holding, while non-practitioners had lower education limited farming experience, and lesser family labor. Major challenges include limited knowledge in production, marketing, and certification requirements, tenure, natural calamities and chemical contamination. Limited funding and change in leadership hindered adoption. Farmer avail and prefer information on OA from active sources. They established information network with LGU [local government unit]/technicians, farmers' organizations and local persons. Partner agencies produced/distributed IEC materials and network among themselves. They identified recommendations to improve IEC materials and network among themselves. They identified recommendations to improve IEC materials production, dissemination and information acquisition abilities. Training needs include organic agritourism, pest management, and ICS formulation. Farmer's socio-cultural characteristics, farming practices, awareness and perception level, information acquisition abilities are prerequisites for OA training design and IEC material production. Capacitating partner agencies on using innovative and participatory extension approaches will ensure OA adoption. Gender differential roles of farmers on access and control over agricultural resources and benefits, farm labor, and decision making, depends on thev purpose and type of major enterprise and household dynamics/arrangement. Gender responsiveness of introduced technologies and if interests of both gender are better served in organic agriculture programs were not given much attention. Solid inclusive policy and institutional support were influential factors in OA adoption in the six sites. Combination of best initiatives facilitated OA promotion and advocacy. Enabling STEEP factors included organizing farmer groups, building their capacities through learning sites and technology demonstration farms, provisions of production, processing and marketing facilities. strong LGU support and committed institutional partnership with local and international network, and policy support, integrating OA into overall agricultural policies and programs, and market development, are key to realizing the full benefits of OA. Assessing determinants to OA adoption are useful for unified planning, implementation and evaluation of sustainable OA in the country. Ensuring inclusive participation of multi-stakeholders through holistic systems approach ultimately benefit organic farming communities.

ORGANIC AGRICULTURE; FARMERS; GENDER; SOCIAL PARTICIPATION; SOCIOCULTURAL ENVIRONMENT; TECHNOLOGY; TECHNOLOGY TRANSFER; DIFFUSION OF INFORMATION; INNOVATION ADOPTION

Plant-based snacks made from local mushrooms find a big market. **Hubilla, E.K.** *Agriculture (Philippines). 0118-857-7. v. 24 (3) p. 60-61. (Mar 2020).*

EDIBLE FUNGI; VARIETIES; FOOD PROCESSING; PROCESSED PLANT PRODUCTS; MARKETS; CROP MANAGEMENT; PLANT ESTABLISHMENT

Promotion and utilization of IPB [Institute of Plant Breeding] Var 6 corn grits in selected schools in Los Baños, Laguna [Philippines]: School-based Feeding Program quality protein white corn grits. **Pua, L.B., Beltran, M., Bautista, M.A., Gabatin, A.L., Salazar, A.M., Calumpang, S.M.F.** *Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Agriculture and Food Science. Philippines Univ. Los Baños, College Laguna (Philippines). Inst. of Human Nutrition and Food. Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Human Ecology. College, Laguna (Philippines). TR-1913. 2017. 17 leaves.*

ZEA MAYS; MAIZE; VARIETIES; FOOD CONSUMPTION; NUTRITIVE VALUE; FEEDING; EDUCATIONAL INSTITUTIONS; PHILIPPINES

Response of popular and recently-released irrigated lowland rice varieties to nitrogen rates and plant spacing. **Malabayabas, M.D., Espiritu, A.J., Patricio, H.J.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 108. (Sep 2019).*

A study was conducted at PhilRice CES to determine the effect of nitrogen (N) rate and plant spacing on grain yield of popular and recently-released irrigated lowland rice varieties. Twenty-one-day- old seedlings of NSIC Rc 222, NSIC Rc 402, NSIC Rc 438 and NSIC Rc 442 were transplanted at plant spacing of 20 x 20 cm and 15 x 30 cm. The N fertilizer rates were 0, 50, 90, 130, 170 and 210 kg/ha in 2018 wet season (WS) and 0, 90, 130, 170, 210, and 250 kg/ha in 2019 dry season (DS). In 2018 WS, Rc 222 and Rc 402 had significantly higher yields at plant spacing of 15 x 30 cm while Rc 438 and Rc 442 had comparable yields in both plant spacing across N rates. At 20 x 20 cm, Rc 442 had significantly higher yield than Rc 402 and Rc 438 but not significantly different from that of Rc 222. On the other hand, Rc 222 had significantly higher yield than Rc 438 and Rc 442 at 15 x 30 cm, but not significantly different from the yield of Rc 402. Grain yields across varieties and spacing was significantly reduced with higher N rate of 130 to 210 kg/ha. In 2019 DS, Rc 402, Rc 438 and Rc 442 had

significantly higher yields at 90 kg N/ha and these were comparable with the yields at higher N rates. On the other hand, Rc 222 showed higher yield at 130 kg N/ha. Across varieties and N rates, grain yields were significantly higher at spacing of 20 x 20 cm. There was no significant interaction between variety and spacing during 2019 DS. The results clearly indicate seasonal and varietal response to N rate and plant spacing. Other parameters aside from yield will be included to elucidate the initial results.

ORYZA SATIVA; VARIETIES; LOWLAND; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; SPACING; GRAIN; YIELDS

Rooting response of glabrous and pubescent leaf type accessions of Pa'uohi' iaka (Jacquemontia sanduicensis A. Gray) using single and four-node stem cuttings. **Antesco, D.K.S., Baldos, O.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 109. (Sep 2019).*

Pa'uohi'laka (Jacquemontia sandwicensis A. Gray) is a coastal endemic plant of Hawaii with potential use as a hanging basket plant. Findings of our previous study indicated that the six accessions collected from the three islands (Maui, Oahu and Hawaii) have its own distinct set of morphological characteris with two groupings based on leaf pubescence. The galbrous; Ahihi-Kinau, Lyon Arboretum and Shidler College and pubescent: McGregor Point, Puhala Bay and South Point leaf type accessions. The rooting characteristics of these accessions were evaluated for successful germplasm maintenance and other evaluation stidues. The aim of the study is to evaluate rooting responsiveness of the six accessions. Compare the rooting response of glabrous and pubescent leaf type accessions. Test the feasibility of suing single-node stem cutting to increase number of plants propagated with less planting material. Finally, to test the rooting response of stem cuttings with and without leaves. The experiment was laid out in split-split-plot design with the two propagation dates (March and October 2018) as the main plot. The six different accessions are the split-plot and the two different length of stem cuttings (single and four-nodes) as the split-split plot. The set up was replicated four times with ten stem cuttings in each replication. Stem cuttings were propagated using a mix of 1:1 (by volume) perlite and vermiculite. Misting irrigation was set at ten seconds every six minutes. After 21 days, results indicated that out of the six accrions, the glabrous leaf type accessions; Ahihi-Kinau, Shidler College and Lyon Arboretum have significantly higher number of leaves retained leading to favourable rooting response. Four-node stem cuttings and with leaves rooted significantly and successfully compared to single-node stem cuttings. Based from our result, the type of leaves, its presence, and the stem cutting length are crucial in successful propagation of Pa'uohi'laka.

ORNAMENTAL PLANTS; STEMS; CUTTINGS; ROOTING; ROOTS

Seed production performance of different soybean (Glycine max L.) varieties under varying row spacing. **Gauna, G.B.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 110. (Sep 2019).*

A study was conducted at the BPI-LBNCRDC [Bureau of Plant Industry -Los Baños National Crop Research and Development Center], Los Baños, Laguna [Philippines] to compare different grain soybean (Glycine max L.) varieties on their agronomic and seed production performance under different row spacing and to identify which among the varieties have average adaptability in terms of seed yield to row spacing. BPI Sy4 and NSIC SY9 were planted at row spacing of 30, 45, and 60 cm. The quantitative traits used to evaluate the grain soybean varieties include days to 50% flowering, plant height, number of pods per plant, number of seeds per pod, pod length, number of secondary branches, leaf area index, seed weight, and seed yield. Results of the study revealed the following: NSIC Sy9 produced flowers early and taller in height as compared to BPI Sy4. Longer pods were exhibited by BPI Sy4 at a row spacing of 45 cm. There were no significant effect of varieties and row spacing on the number of branches, seeds/pod and 1,000 seed weight. The variety NSIC Sy9 produced more pods per plant than BPU Sy4. At 30 cm row spacing, both BPI Sy4 and NSIC Sy9 have statistically significant leaf area indices. With closer row spacing (30 cm), the highest grain yield was obtained from both BPI Sy4 and NSIC Sy9.

GLYCINE MAX; VARIETIES; SPACING; CROP PERFORMANCE; AGRONOMIC CHARACTERS; GRAIN; YIELDS

Segmentation of the ornamental farmers in Laguna [Philippines] for targeted capacity-building programs. **Marcelino, M.C.E., Bernardo, E.L., Mendoza, J.J.O., De Guzman, R.P., Balladares, M.C.E., Cedillo, N.O., Ventura, A.N., Sanchez, F.C., Jr., Medina, N.G., Tayobong, R.P.** *30th National Research Symposium, , Pasay City (Philippines), 7 Nov 2018. College, Laguna (Philippines). TR-1911. 2018. p. 82-105.*

Policies and programs of government agencies are towards the benefit of stakeholders. However, the implementation usually is hindered by the understanding and willingness of the receiving end. The reception is usually affected by the socio-demographic characteristics and the personal characteristics of the individual that can be affected by the program. Hence, targeted policies or population, specific implementation and must be considered. As an industry with a valuable potential, the programs and policies to the

ornamental farmers can also be considered for population-specific implementation. This study aims to segment the population or ornamental farmers in selected towns in Laguna, Philippines. Using a survey data on ornamental farmers conducted in Laguna, hierarchical clustering was performed as data mining procedure to exhaust segments with inherent inter-class heterogeneity among farmer characteristics. The optimum number of segments per municipality was two segments. After determining the segments, it was found that trainings for business practices, financial management, and technology transfer are very much needed to be implemented on specific farmer clusters within municipalities and not on the entire province. The results imply that existing capacity-building programs can realize their full potential if the participants are targeted based on their specific characteristics and not just simply implemented to the entire population of participants.

ORNAMENTAL PLANTS; HORTICULTURE; SPERMATOPHYTA; FARMS; DEVELOPMENT PLANS; INNOVATION; CROP MANAGEMENT; FARMERS; PHILIPPINES

Source of potassium affects the growth and fruit physico-chemical properties of container-grown watermelon. **Mercado, D.E., Valleser, V.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 111. (Sep 2019).*

This study aimed to compare the effects of K2SO4 and KCl fertilizers and their combinations as source of potassium on the growth, fruit mass and quality of container-grown 'Sweet 16' watermelon. K2SO4 and KCl rates (controle/no potassium applied; 100%KCl + 0%K2SO4; 75%KCl + 25%K2SO4; 50%KCl + 50%K2SO4; 25%KCl + 75%K2SO4; and 0%KCl + 100%K2SO4) with reference to nutrient recommended rate served as treatments and replicated into three. These K rates were applied in four equal split doses. Moreover, other nutrients were supplied to all treatments in blanket from following the recommended rate for watermelon. 'Sweet 16' watermelon seedlings were grown in 8' x 14' polyethylene bag with 8 kg of growth media (1:3 soil:vermicast). Harvesting of 'Sweet 16' watermelon commenced at 72 days after planting. Results revealed that 100% K2SO4 and 75% K2SO4 + 25% KCl treatments augmented the growth, fruit weight and fruit quality of watermelon. This study imply that higher rate of K2SO4 as source of K will improve the growth, fruit weight and fruit quality of container-grown watermelon.

CITRULLUS LANATUS; WATERMELONS; POTASH FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; FRUITS; QUALITY; PLANT CONTAINERS; PLANTING

Status and assessment of the ornamental sector in selected towns of Laguna Province, Luzon Island, Philippines. **Sanchez, F.C., Jr., Bernardo, E.L., Marcelino, R.T., Balladares,**

M.C.E., Ventura, A.N., Mendoza, J.J.O., Cedillo, N.O., Medina, N.G., de Guzman, R.P., Tayobong, R.R.P. *College, Laguna (Philippines). TR-1911. 2018. 127 leaves.*

Ornamental farming was once described to be a sunshine industry because of the potential income that it could generate from exports and from local consumption. However, information on ornamental farmers, their production and business practices, and their outlook towards the industry is practically unknown. The lack of government support in many facets of ornamental farming has also made the industry a less attractive option for enterprising individuals. This project involved the development of a survey instrument and data monitoring system and the establishment of baseline data on socio-economic status, production technology, and other business management variables related to the ornamental industry in Laguna [Philippines] . The first study component assessed the ornamental horticulture industry in Los Baños through the use of a pre-designed questionnaire to document aspects of business management and production technology related to ornamental horticulture with the aim of fine-tuning the developed questionnaire. The research design was characterized by multiphase data collection and integration of data collected from the survey, focus group discussion, and key informant interviews. Findings showed that ornamental horticulture was the primary occupation of the respondents. Foliage and flowering plants were the most saleable plants to the other farm owners and tractors. Through growing ornamental crops were viewed to have the high technical requirements, respondents don not follow standard procedures for crop management and price setting. Crop production- and management-related issues were some of the challenges encountered by the respondents. In spite of these, they were able to sustain their businesses. Partly, this may have been due to the role of the horticulture groups they belonged to and UPLB's continued support. The current situation of the industry was not solely based on the socioeconomic structure of the ornamental growers but was also pre-determined by the changing landscape of the industry. Pioneers in the industry have observed that income from ornamental farming has waned over the years, but the number of farmers and sellers seems to be increasing. The authors interpret this as indication the ornamental farming remains a profitable and financially-rewarding? Our research set out to profile ornamental farmers in four municipalities of Laguna-Calamba, Los Baños, Bay and Calauan and to identify factors that effect their perception into saying that ornamental farming is lucrative. The second component utilized the finalized questionnaire using what the project team learned from the first study component of this project. Using stepwise logistic regression, the authors found that 1)diversity products offered, 2)recycling of potting mix, and 3)use of cooling of ventilation systems were significant variables that would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. An increase in the number of farms, however, would decrease the likelihood of ornamental farming to be perceived as profitable. Results from our survey indicate the need

for targeted intervention and R and D built around the four variables the authors have identified.

ORNAMENTAL PLANTS; FLORICULTURE; FARMERS; PROFIT; PROFITABILITY; INDUSTRY; PHILIPPINES

Use of super absorbent polymer in growing media mixture for vinca (Catharanthus roseus G. Don) under drought condition. **De Guzman, D.I.R., Tayobong, R.R.P., Magdalita, P.M., Medina, N.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 113. (Sep 2019).*

Super Absorbent Polymers (SAP) can absorb enormous amount of water and commonly found in commercial hygiene products like diaper and for other industrial uses. Its ability to hold and release water has high potential use for horticulture especially in areas with drought season. To determine the possible use of recycled SAP from diapers, an initial study was conducted to determine the effect of SAP and its ratio as part of growing media mixture for vinca (Catharanthus roseus G. Don) subjected to drought condition. All the treatments have the same growing media mixture (1:1 burnt rice hull and soil) but with varying ratio of SAP: (T1) 0%. (T2) 25% (T3) 50% and (T4) 75% v/v. All of the plants were maintained in a greenhouse at UPLB [University of the Philippines Los Baños] before subjected to drought condition: no watering under full sunlight for one month. Vinca in growing media mixture with SAP showed better growth and development compared to control except for T4 (75% SAP) where all the plants did not survive after two weeks. The plants in T2 (25% SAP) and T3 (50% SAP) significantly showed delayed sign of wilting and continuously grow and produce came out as the best ratio as the plants showed the best growth rate, flowering and longest period to survive the drought condition.

CATHARANTHUS ROSEUS; ORNAMENTAL PLANTS; POLYMERS; GROWING MEDIA; DROUGHT; GROWTH; FLOWERING

What makes ornamental farming profitable? what the survey says. **Bernardo, E.L., Mendoza, J.J.O., Marcelino, M.C.E., Balladares, M.C.E., De Guzman, R.P., Medina, N.G., Cedillo, N.O., Ventura, A.N., Tayobong, R.P., Sanchez, F.C., Jr.** *30th National Research Symposium, , Pasay City (Philippines), 7 Nov 2018. College, Laguna (Philippines). TR-1911. 2018. p. 107-127.*

Ornamental farming was once described to be a sunshine industry because of the potential income that it could generate from exports and from local consumption. However, the lack

of government support in many facets of ornamental farming has made the industry a less attractive option for enterprising individuals. Further, pioneers in the industry have observed that income from ornamental farming has waned over the years, but the number of farmers and sellers seems to be increasing. The authors interpret this as indication that ornamental farming remains a profitable venture. But what factors make it profitable and financially-rewarding? Research set out to profile ornamental farmers in four municipalities of Laguna—Calamba, Los Baños, Bay, and Calauan [Philippines] and to identify factors that affect their perception in saying that ornamental farming is lucrative. Using stepwise logistics regression, researchers found that 1)diversity of products offered, 2)recycling of potting mix, and 3)use of cooling or ventilation systems were significant variables that would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. An increase in the number of farms, however, would increase the likelihood of a farmer to perceive ornamental farming as a profitable business. Results from the survey indicate the need for targeted intervention and R and D built around the four variables identified.

ORNAMENTAL PLANTS; HORTICULTURE; SPERMATOPHYTA; INNOVATION; PLANT PRODUCTION; CROP MANAGEMENT; PROFITABILITY; FARMING SYSTEMS; FARMERS; PHILIPPINES

Yield performance of cassava (Manihot esculenta Cranz) as influence by different methods of planting under Jassan series. **Gonzaga, N.R., Gonzaga, A.B.Jr., Sarausa, D.M., Alcarde, M.L., Razalo, N.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 114. (Sep 2019).*

Cassava production is one of the major activities for livelihood involving local growers in Claveria Misamis Oriental [Philippines]. Different planting methods are employed by local growers, thus yielding different production results. Present study was carried out to reveal information on the effect of planting methods on several key growth and yield characters of the test crop. Two cultivars (Yborn and Rayong 72) and three planting methods (vertical, slanting, horizontal) were imposed as treatment variables. The planting methods evaluated were: (1)vertical planting forming 90 degrees angles (2)horizontal planting forming 180 degrees angles and (3)slanting forming 45 degrees angles. Slanting position significantly influenced plant height, chlorophyll content, root length and percent recovery relative to vertical and horizontal planting methods. However, vertical planting recorded the maximum stem diameter as compared to horizontal and slanting position. Ybom planted in slanting position resulted to higher fresh roots yield (44.33 t/ha), dry root yield (22.52 t/ha), and Return on investment (fresh 111.54%) (Dry 185.35%) as opposed to Rayong 72,

respectively. Results suggest that slanting planting using Ybom and horizontal planting with Rayong 72 are the recommended planting methods under the given study site.

MANIHOT ESCULENTA; CASSAVA; VARIETIES; PLANTING; CROP PERFORMANCE; CROP YIELD

F02 - PLANT PROPAGATION

Coconut tissue culture: protocols for propagation via somatic embryogenesis. **Pateña, L.F., Aggangan, N.S., Barba, R.C.** *Department of Agriculture, RDMIC Bldg., Elliptical Rd. Cor. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research Department of Agriculture, Lipa, Batangas (Philippines). Lipa Agricultural Research and Experiment Station Philhybrid, Inc., Atlanta Centre, 31 Annapolis Street, San Juan City (Philippines). College, Laguna (Philippines). TR-1881. 2018. 22 leaves.*

COCOS NUCIFERA; COCONUTS; TISSUE CULTURE; SOMATIC EMBRYOGENESIS; PRODUCTION; PLUMULE

Plant regeneration of sugarcane (Saccharum officinarum L.) calli in vitro and its response to gamma irradiation. **Hapsoro, D., Inayah, T., Yusnita.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciecnes. 0859-3132. v. 24(1) p. 58-66. (Jun 2018).*

One way of mutation breeding in sugarcane is to expose in vitro growing calli to gamma ray, regenerate the calli into plants, and then evaluate the plants. This research sought to study in vitro plant regeneration of sugarcane (Saccharum officinarum L.) calli and to determine LD50 of gamma ray for irradiation of embryogenic calli. The research was conducted at The Plant Laboratory, The University of Lampung, Lampung, Indonesia in 2014. Leaf rolls of sugarcane were cultured on callus-inducing (CI) medium containing MS salts, 30 g L-1 sucrose, 100 mg L-1 myo-inositol, 150 m L-1 coconut water, 0.1 mg L-1 thiamine-HCl, 0.5 mg L-1 pyridoxine-HCl, 0.5 mg L-1 nicotinic acid, 2 mg L-1 glycine, and 3 mg L-12,4-D. The embryogenic calli were cultured on shoot-inducing (SI) medium which was the same as the CI medium, except that the SI medium used 2.5 mg L-1 benzyladenine and no coconut water. Shoots were rooted on root-inducing (RI) medium containing different concentrations of indolebutyric acid (IBA) (0,2, 5, 7.5, 10 mg L-1). The RI medium was the same as the SI medium except for the plant growth regulators. The most effective IBA concentration for rooting of shoots was 5 mgL-1. Plantlets with highest number of roots showed highest survival rate (68.4%). A radio sensitivity study by irradiating embryogenic calli with gamma ray (0, 5, 10, 15, 20, 25, 30, 40, 50, 60 Gy) showed that the LD50 was 17 Gy. The irradiated calli were successfully regenerated into plantlets and acclimatized to

external environment. Results of these studies could be very useful for mutation breeding of sugarcane.

SACCHARUM OFFICINARUM; SUGARCANE; IN VITRO REGENERATION; EMBRYONIC DEVELOPMENT; SEEDLINGS; GAMMA IRRADIATION; BREEDING METHODS

Use of super absorbent polymer in growing media mixture for vinca (Catharanthus roseus G. Don) under drought condition. **De Guzman, D.I.R., Tayobong, R.R.P., Magdalita, P.M., Medina, N.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 113. (Sep 2019).*

Super Absorbent Polymers (SAP) can absorb enormous amount of water and commonly found in commercial hygiene products like diaper and for other industrial uses. Its ability to hold and release water has high potential use for horticulture especially in areas with drought season. To determine the possible use of recycled SAP from diapers, an initial study was conducted to determine the effect of SAP and its ratio as part of growing media mixture for vinca (Catharanthus roseus G. Don) subjected to drought condition. All the treatments have the same growing media mixture (1:1 burnt rice hull and soil) but with varying ratio of SAP: (T1) 0%. (T2) 25% (T3) 50% and (T4) 75% v/v. All of the plants were maintained in a greenhouse at UPLB [University of the Philippines Los Baños] before subjected to drought condition: no watering under full sunlight for one month. Vinca in growing media mixture with SAP showed better growth and development compared to control except for T4 (75% SAP) where all the plants did not survive after two weeks. The plants in T2 (25% SAP) and T3 (50% SAP) significantly showed delayed sign of wilting and continuously grow and produce came out as the best ratio as the plants showed the best growth rate, flowering and longest period to survive the drought condition.

CATHARANTHUS ROSEUS; ORNAMENTAL PLANTS; POLYMERS; GROWING MEDIA; DROUGHT; GROWTH; FLOWERING

Utilization of the technology of producing true-to-type and certified virus-free garlic (Allium sativum L.) for economic production of planting materials for the farmers. **Pateña, L.F., Barba, R.C., Dolores, L.M., Garcia, R.N., Madamba, J.A.B.** *Department of Agriculture, RDMIC Bldg., Elliptical Rd. Cor. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1905. 2018. 92 leaves.*

The Institute of Plant Breeding (IPB), College of Agriculture and Food Science (CAFS), University of the Philippines Los Baños (UPLB), conducted a three-year (2014-2017), with

one year extension (2017-2018), DA-BAR [Department of Agriculture-Bureau of Agricultural Research]-funded research project on the 'Utilization of the Technology of Producing True-to-Type and Certified Virus-free Garlic (Allium sativum L.) for Economic Production on Planting Materials for the Farmers'. For the duration of the project , 36 accessions were collected and 21 were characterized. All materials collected were entered in the PCTCL Passport data for plant materials for in vitro culture. Bulbs were characterized based on the standard criteria used in the IPGRI, ECP/GR, AVRDC Descriptors for Allium (Allium spp.) (2001), PCTCL Form 2014.2: Characterization of plant materials. The protocol of Pateña et al. (2005) was adopted for the in vitro culture of the different accessions. Fifteen accessions, comprising 6 cultivars (Tan Bolter, Mindoro, Ilocos White, Batangas Brown, Taal and Batanes [Philippines]) are currently being maintained all the PTCL, IPB. The culture being maintained were subjected to thermo-therapy, meristem, culture, or a combination of both technique. ELISA [Enzyme-Linked Immunosorbent Assy] was used to test presence/absence of five different viruses namely, Onion yellow dwarf virus (OYDV), Shallot latent virus (SLV), Gar V-C, Garlic common latent virus (GCLV) and Leek yellow stripe virus (LYSV). The SSR markers were used to test the genetic fidelity of tissue-cultured materials. The absence of any polymorphisms in all of the SSR markers used indicates that the local garlic accessions used in this study do not possesses any molecular differences at the SSR local tested in spite of having phenotypical variation. Furthermore, all the Ilocos White accessions grown in different locations showed similar SSR band patterns. Initial work on the determination of genetic fidelity of tissue-cultured garlic using cytology was done using Ilocos White from Lubang Island (81G) and the IBS CAS, UPLB Cytological Technique. This IBS protocol was used in the comparative karyomorphology of the tissue-cultured and field-planted garlic accessions. Both the native and imported garlic accessions revealed 2n=16 chromosome number, diploid, as disclosed by 8 pairs of chromosomes laid out. Results also showed no genetic variability with tissue-cultured garlic up to eight subculture cycle, the oldest samples tested. This result is significant since shoots may now be multiplied up to eight subculture cycles with no genetic variability. Transfer of technology of issue-cultured garlic was tested in Iloiolo and Ilocos Norte with the latter being more successful. The farmmer-cooperators' performance in Ilocos Norte was highly commendable and that the garlic farmers in Batac City and the municipalities of Parasuquin and Burgos were ready to embrace new farm technologies. Based on the current PTCL capacity and production costs, it was determined that in the cost producing in vitro G0 bulbets from multiplied shoots in is PhP81.14/bulblets. For G1 bulblets, each would cost PhP114.79 while G2 bulblets would cost PhP255.57. These costs are beyond the reach of farmers as they are willing to spend up to PhP13500 for planting materials each cropping season. This only translates to 166 G0 bulblets, 117 G1 bulblets, 52 G2 bulblets or 26 G3 bulbs, which are not enough to fill the planting requirements for a 2500 sq.m. lot. Challenges therefore remain relative to bringing the cost of true-to type, certified virus-free garlic bulbs for planting which necessitates continuing the improvement of research protocols to shorten, the gestation period from 3

years to one year through optimization of the tissue culture process, as well as considering institutional strategies aimed at production-related interventions that make use of economies of scale.

ALLIUM SATIVUM; GARLIC; VIRUSES; PLANT DISEASES; FARMERS; TECHNOLOGY TRANSFER; CHROMOSOMES; DISEASE CONTROL; DISEASE RESISTANCE; COSTS; BULBS; TISSUE CULTURE

F03 - SEED PRODUCTION

Effect of seed piece pre-treatment and Mukovam R application methods on germination and growth rate of Saccharum sp. **Metrillo, J., Dela Cruz, C.DV., Crisostomo, S.D., Reaño, C.E.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 87. (Sep 2019).*

The experiment was conducted to determine the effect of seed piece pre-treatments and Mykovam R application methods on germination and growth rate of Saccharum sp. Five (5) treatments were: T0 (control or without pre-treatment and Mykovam R application), T1 (fungicide pre-treated; Mykovam R coated), T2 (fungicide pre-treated; Mykovam R side-dressed), T3 (hot water pre-treated; Mykovam R coated) and T4 (hot water pre-treated; Mykovam R side-dressed). Results of two-way ANOVA at a = 10% showed that interaction between the effects of seed piece pre-treatments and Mykovam R application methods on germination and growth rate were insignificant (p-value=0.4211 and 0.4385, respectively). Moreover, multiple comparisons using Tukey's test showed that for both germination and growth rate, only seed pieces with application of Mykovam R was significantly different regardless of pre-treatments and application methods. Germination was earliest inT2 with 6.85 average days and growth rate was highest in T1 with average growth rate of 0.78 cm/day. Root infection analysis of VAM (vesicular arbuscular mycorrhiza) showed positive infection on seed pieces with application of Mykovam R. Highest average root infection of VAM was observed in T4 with 38.33% average root infection. Thus, application of Mykovam alone can enhanced sugarcane growth rate and germination rate regardless of seed piece pre-treatments and Mykovam R application methods. Also, roots of fungicide pre-treated seed pieces will still be infected by Mykovam R.

SACCHARUM; SPECIES; SEED TREATMENT; FUNGICIDES; VESICULAR ARBUSCULAR MYCORRHIZAE; GERMINATION; SEEDS; APPLICATION METHODS

Establishment of organic seed production system. **Maghirang, R.G., Cacal, M., Ladia, V.Jr., Oraye, C.D., Bengoa, J.C., Rodriguez, M.C.P., Sabanal, A.Q.C., Rodulfo, G., Onde, G., Onde,**

M. *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1883. 2018. 95 leaves.*

AUBERGINES; TOMATOES; CUCUMBERS; KIDNEY BEANS; LETTUCES; PEPPER; SQUASHES; MOMORDICA CHARANTIA; ORGANIC AGRICULTURE; SEED PRODUCTION

Seed production of open pollinated vegetable varieties for home gardens and quick disaster-response. **Maghirang, R.G.** *College, Laguna (Philippines). TR-1751. 2016. 29 leaves.*

VEGETABLES; VARIETIES; OPEN POLLINATION; SEED PRODUCTION; DEFENCE MECHANISMS; CLIMATIC CHANGE; DOMESTIC GARDENS

F04 - Fertilizing

Agriculture and forestry biotechnology program: production and promotion of effective plant growth promoting endophytic bacterial inoculant (nutrio technolgy) as foliar spray biofertilizer for sugarcane, white corn, eggplant and legumes (project ID No. 16210). **Padilla, V.M., Marfori, E.C., Mendoza, D.M., Zarate, J.T., Benzon, H.R.L., Violanta, R.P., Vergara, A.L.B.** *College, Laguna (Philippines). TR-1902. 2019. 33 leaves.*

SUGARCANE; MAIZE; AUBERGINES; LEGUMES; FOLIAR APPLICATION; PLANT PRODUCTION; BIOFERTILIZERS; FERTILIZER APPLICATION

Combination of on-time planting and optimum nitrogen rate increased grain yield of thermo-genetic malesterile lines. **Palanog, M.O., Brena, S.R., Palanog, A.D.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 115. (Sep 2019).*

Maximizing seed yield of parental seed production can help in attaining hybrid seed requirement of the country. However, it is empirical that yield-limiting factors should be addressed in order to optimize the parental seed production. Timing of planting that coincide with favourable climatic conditions particularly temperature and relative humidity and appropriate nutrient management are crucial factors to consider in optimizing seed production yield at male fertile environment. A field experiment was conducted to determine the appropriate planting schedule(s) (semi-monthly planting) and nitrogen levels: 50% N at planting + 50% N 15 DAT (T1), 50% N at planting + 25% N 15 DAT + 25% N 25 DAT (T2), 50% N at planting + 25% N 25 DAT + 25% N 35% DAT (T3), and 25% N at planting + 25% N 15 DAT + 25% N 25 DAT + 25% N 35% DAT (T4). Analysis of variance

(ANOVA) showed a highly significant variation of grain yield response under various planting dates, significant variation in the planting dates x treatment interaction but no significant variation among nitrogen treatments. Among the planting dates, mid-November planting (P19) resulted to highest grain yield followed by early November planting (P18) while mid-February planting (P2) recorded the lowest grain yield. Grain yield was observed to be low on the planting dates where relative humidity was low and slight increase in temperature during the critical stages which resulted to low spikelet fertility. The combination of P19 planting date and Treatment 4 (P19T4) obtained the highest grain yield. Results of the study showed that appropriate planting date and nitrogen levels can enhance the grain yield of TGMS lines. The non-significant variation among nitrogen treatments possibly indicate that nitrogen fertilization is not a major consideration but rather multiple-nutrient management should be considered.

ORYZA SATIVA; PLANTING DATE; CROP MANAGEMENT; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES

Effect of different fertilizer rates on the growth and yield of corn (Zea mays L.) using Fertigroe N, P and K nanofertilizers. **Lorenzo, J.C.A., Ang, M.A., Reyes, J.A.B., Lalap, A.A., Gauna, G.B., Villegas, G.M.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 85. (Sep 2019).*

The development of nanotechnology has been an emerging multidisciplinary field that can have vast potential impact on the society specifically in the areas of agriculture. Nanofertilizers have been known to have a slow and steady release of nutrients needed by the plant and therefore reduce the loss of nutrients and improve nutrient use efficiency. A research was conducted to investigate the effect of different rates of FertiGroe nanofertilizers N, P and K on the growth and yield of corn during dry season. The agronomic and physiological parameters measured indicated that plants applied with 50% optimization rate (OR) have significant effect on days to emergence, days to tasseling, days to silking, stalk diameter, leaf length, plant height, dry matter yield and biological yield. Based on the data obtained, plants applied with 50% OR FertiGroe N, P and K showed significant difference compared with other treatments. Other treatments applied with fertilizer higher than 50% OR showed negative effects. In fact, stunted growth was also observed probably due to toxicity effect of excessive nutrients. The resulting yield of the different treatments is significant different from the control but not significant different from each other. Thus, it is suggested to not use higher fertilizer rates than the recommended and conduct and experiment for another season to further support the claims on this study and recommended a final rate to attain best potential yield of corn.

ZEA MAYS; FERTILIZER APPLICATION; APPLICATION RATES; NPK FERTILIZERS; GROWTH; CROP YIELD; TECHNOLOGY

Effects of different levels of phosphorus on the growth and yield of Adlay (Coix lacryama-jobi L.) in Bukidnon [Philippines]. **Planas, J.Y., Capada, J.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 85. (Sep 2019).*

A field experiment was conducted at the Agricultural Experiment Center, CMU, Musuan, Bukidnon to (1)evaluate the effects of the different rates of phosphorus on the soil chemical properties at harvest, (2)evaluate effects of the different rates of phosphorus on the growth and yield of adlay, and (3)determine the cost and return analysis of adlay applied with different rates of phosphorus. The field experiment was laid out in a Randomized Complete Block Design with six treatments replicated three times. The treatments used in the study were as follows: treatment 1: 50 kg of N/ha – 0 kg of P2O5/ha – 15 kg of K2O/ha, treatment 2: 50 kg of N/ha – 30 kg of P2O5/ha – 15 kg of K2O/ha, treatment 3: 50 kg of N/ha – 60 kg of P2O5/ha – 15 kg of K2O/ha, treatment 4: 50 kg of N/ha – 80 kg of P2O5/ha – 15 kg of K2O/ha, treatment 5: 50 kg of N/ha – 100 kg of P2O5/ha – 15 kg of K2O/ha and treatment 6: 50 kg of N/ha – 120 kg of P2O5/ha – 15 kg of K2O/ha. Results of the study shows that the soil chemical properties such as pH, exchangeable P and extractable K was not affected by the different rates of phosphorus, however, the soil organic matter content was significantly affected by the treatments. Number of productive tillers and grain yield both increases with the application of 50-80-15 kg N-P2O5 and K2O/ha. Cost and return analysis shows that treatment applied with 50-60-15 kg of N-P2O5 and K2O/ha obtained the highest return on investment thus the most economical among the six treatments.

COIX LACHRYMA JOBI; PHOSPHATE FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; GROWTH; CROP YIELD

Effect of irrigation and fertilization on the vegetation growth of Lakatan banana (Musa acuminata). **Aguilar, E.A., Divina, F.A.II., Aggangan, N.S., Paelmo, R.F., Gueco, L., Elleva, L.I.F., Garcia, G.R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 86. (Sep 2019).*

Lakatan banana is an economically important fruit crop in the Philippines. It's aroma and sweetness when ripe makes it is a popular local dessert. It can grow in a wide range of soil

and environment, but proper management is key to profitable production. The growth, yield and fruit quality are prevalent weather. Phonological studies are essential for monitoring the impacts of environment and climate change particular, but these are wanting local tropical crops like Lakatan banana. Field experiment was established at the Central Experimental Station of UPLB [University of the Philippines Los Bañnos] to determine the effect of irrigation and different fertilizer treatments on the growth and yield of Lakatan. The experiment followed the split plot design with five replications with Irrigation as the main plot and fertilizer as sub-plot. Automatic weather station and field sensors monitor the prevailing microclimate in the experimental area. Regardless of treatment, rate of leaf emergence was lower during the dry months. Banana has a predefined number of leaves before flower emergence and fruiting is terminal. Thus, a delay in leaf emergence translate into a delayed flowering. Under uncertain weather conditions, longer exposure in the field increases the risk of being affected by stressors, including typhoons and pests and diseases. Pseudostem girth which in previous studies has shown strong correlation with bunch yield peaked at 135 DAP, across all treatments, but similar with other growth parameters plant height and number of green leaves were higher in irrigated with high fertilization treatment. For the same growing degree days (GDD), irrigated with high fertilization rate produced more leaves compared with the other treatments.

MUSA ACUMINATA; IRRIGATION; FERTILIZER APPLICATION; APPLICATION RATES; CROP MANAGEMENT; GROWTH; CROP YIELD; FRUITS

Effect of nutrient application to yield performance of table-type tomato in Ilocos Norte, Philippines. **Pontesor, A.L., Aquino, A.L., Magnaye, A.M.A., Sta Cruz, P.C., Dela Cruz, R.G., Mendoza, N.D., Sta Cruz, P.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 86. (Sep 2019).*

Proper nutrient management allows appropriate of nutrients for optimal tomato productivity, while minimizing the risk of nutrient losses and adverse environmental effects. It starts with proper fertilizer rate that depends on crop nutrient requirement and inherent capacity of the soil to supply nutrients. A nutrient omission plot experiment was conducted in Sarrat, Ilocos Norte [Philippines]in 2018-2019 to determine yield response of table-type tomato, which will also be used to generate data sets for calculation of site-specific fertilizer recommendation for table-type tomato, and to determine the limiting nutrients for high tomato yield. Tomato var. 'Magilas' was planted under different fertilizer treatments: Control (zero fertilizer), recommended fertilizer rate (165-95-215 kg/ha), significantly out yielding those at omission plots by 6-8 t/ha. However, fewer fruits per kilo were obtained

from full fertilizer plots and also minus P plots, but this implies bigger and heavier fruits were harvested. Despite having lower yield than full fertilizer plots, minus N plots had highest harvest index (0.53), which could be attributed to the plants' decreased in yields between full fertilizer plots and both minus P (31%) and minus N (34%) plots than for minus K (24%) plot suggests that these macronutrients are essential for attaining high yield but are very limiting in amounts in the soils of the experiment site.

LYCOPERSICON ESCULENTUM; TOMATOES; NPK FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; CROP YIELD

Effect of seed piece pre-treatment and Mukovam R application methods on germination and growth rate of Saccharum sp. **Metrillo, J., Dela Cruz, C.DV., Crisostomo, S.D., Reaño, C.E.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 87. (Sep 2019).*

The experiment was conducted to determine the effect of seed piece pre-treatments and Mykovam R application methods on germination and growth rate of Saccharum sp. Five (5) treatments were: T0 (control or without pre-treatment and Mykovam R application), T1 (fungicide pre-treated; Mykovam R coated), T2 (fungicide pre-treated; Mykovam R side-dressed), T3 (hot water pre-treated; Mykovam R coated) and T4 (hot water pre-treated; Mykovam R side-dressed). Results of two-way ANOVA at a = 10% showed that interaction between the effects of seed piece pre-treatments and Mykovam R application methods on germination and growth rate were insignificant (p-value=0.4211 and 0.4385, respectively). Moreover, multiple comparisons using Tukey's test showed that for both germination and growth rate, only seed pieces with application of Mykovam R was significantly different regardless of pre-treatments and application methods. Germination was earliest inT2 with 6.85 average days and growth rate was highest in T1 with average growth rate of 0.78 cm/day. Root infection analysis of VAM (vesicular arbuscular mycorrhiza) showed positive infection on seed pieces with application of Mykovam R. Highest average root infection of VAM was observed in T4 with 38.33% average root infection. Thus, application of Mykovam alone can enhanced sugarcane growth rate and germination rate regardless of seed piece pre-treatments and Mykovam R application methods. Also, roots of fungicide pre-treated seed pieces will still be infected by Mykovam R.

SACCHARUM; SPECIES; SEED TREATMENT; FUNGICIDES; VESICULAR ARBUSCULAR MYCORRHIZAE; GERMINATION; SEEDS; APPLICATION METHODS

Efficiency of Carrageenan PGP and legume seed inoculant on yield and yield component of mungbean (Vigna radiata L.) in Northern Mindanao [Philippines]. **Duna, L.V., Tigbao, J.R., Salvani, J.B., Aurigue, F.R., Zarcilla, M.O., Batiller, J.L.M., Bedro, J.V.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 88. (Sep 2019).*

A field experiment was conducted in Dalwangan, Malaybalay City [Philippines] and Manolo Fortich Bukidnon to determine the effect of Carrageenan PGP and legume inoculants on the yield and yield components of two mungbean varieties in two seasons. Treatments were: Farmers practice (No fertilizer application/Control), Carrageenan PGP alone (100ppm per liter applied 4x at 7 days interval from seedling emergence), Legume inoculants alone (Nitro Plus), and Carrageenan PGP + Legume inoculants. Mungbean yield and yield parameters was significantly influenced by Carrageenan PGP and inoculants application regardless of variety and season. The highest seed yield was observed in the application of Carrageenan PGP + Legume inoculants with 1,293 kg/ha from 643 kg/ha(farmers practice) in wet season and in dry season with 381 kg/ha from 174 kg/ha. Moreover, significant increase in number of pods, number of seeds per pod and pod length that influenced the increased in yield by 50% and 54% in wet and dry season was noted. Further, plant applied with Carrageenan PGP had consistently low incidence in Cercospora leaf spot and pot borer infestation. Moreover, cost benefit analysis using Carrageenan PGP and inoculants significant increased net income to 205%. This study confirmed that Carrageenan PGP increased yield on mungbean and environmental free product whom can support promotion of sustainable agriculture in the country.

VIGNA RADIATA RADIATA; VARIETIES; CARRAGEENANS; SEED; INOCULATION; FERTILIZER APPLICATION; APPLICATION RATES; WET SEASON; DRY SEASON; CROP YIELD; YIELD INCREASES

Efficiency of Carrageenan PGP and legume seed inoculant on yield and yield components of peanut (Arachis hypogaea L.) in Northern Mindanao [Philippines]. **Duna, L.V., Tigbao, J.R., Salvani, J.B., Aurigue, F.B., Zarcilla, M.Q., Batiller, J.L.M., Bedro, J.V.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 89. (Sep 2019).*

A field experiment was conducted in Dalwangan, Malaybalay City and Manolo Fortich Bukidnon [Philippines] to determine the effect of Carrageenan PGP on the yield and yield

components of two peanut varieties in two seasons. Treatments were: Farmers practice (No fertilizer application/Control), Carrageenan PGP alone (100ppm per applied 4x at 7 days interval from seedling emergence), Legume inoculants alone (Nitro Plus), and Carrageenan PGP + Legume inoculants. Yield and yield parameters of peanut was significantly associated with Carrageenan PGP and inoculant application regardless of season and variety. Significant increase in number of pods per plant and pod length was observed in peanut applied with both Carrageenan and legume seed inoculants. Highest seed yield were obtained in both seasons with Carrageenan PGP + legume and inoculants of 4,251 kg/ha (37% increased) in wet season and 2,584.9 kg/ha (32% increased) in dry season compared to farmers practice 2,645 kg/ha and 1,740 kg/ha, wet and dry season, respectively. Low incidence of Cercospora leaf spot and peanut rust in both variety and season was also observed in plants applied with Carrageenan PGP. Further, increased in net income to 318% was obtained using Carrageenan PGP and legume seed inoculant. This study confirmed the efficiency of Carrageenan PGP and legume seed inoculants in increasing yield and income of peanut farmers.

ARACHIS HYPOGAEA; GROUNDNUTS; CARRAGEENANS; SEED; INOCULATION; FERTILIZER APPLICATION; APPLICATION RATES; CROP YIELD; YIELD INCREASES

Establishing soil phosphorus critical level for potato (Solanum tuberosum L.) in Andisol of Lembang, Indonesia. **Debaba, G.H., Hartono, A., Sudadi, U., Indriyati, I.T.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 11-20. (Jun 2019).*

A greenhouse experiment on soil diagnosis on phosphorus (P) fertilizer trial was conducted for potato in Andisol of Lembang district at Assessment Institute for Agricultural Technology (BPTP) from February to June 2018 in Indonesia. The treatments consisted of seven level of P fertilizer amount (0, 25, 50, 75, 100, 125, and 150 kg/ha) with three replications for low and high P soil arranged in completely randomized design. Bulk soil samples were collected from agricultural land and categorized as low and high P soil with respect to the soil's native fertility status. Soil test P was extracted by Olsen method. The result showed that P fertilizer significantly affected tuber yield. Correlation and calibration result of Olsen soil test P with relative tuber yield result indicated that 68.8 mg P kg and 191 mg P kg was critical level for potato production in Andisol for low and high P soils respectively. Result showed that at values less than these critical level of extractable P, P fertilizer should be applied to increase potato tuber yield. The application of phosphorus fertilizer at different amount increased tuber yields of potato by 21.8-40.1% and 15.3-28.4% for low and high P soil respectively as compared to the control yield. Available soil test phosphorus extracted by Olsen method three weeks after planting significantly responded to P fertilizer rate.

SOLANUM TUBEROSUM; PHOSPHATE FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; SOIL ANALYSIS; TESTING; TUBERS; YIELDS; INDONESIA

Evaluation of different fertilizer combination and timing in dry direct seeded rice under rainfed lowland. **Banayo, N.P.M., Bueno, C., Carandang, R., Suralta, R., Abon, J.E., Corales, A., Basuel, E., Kato, Y., Sta. Cruz, P.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 89. (Sep 2019).*

Field experiments were established at International Rice Research Institute (IRRI) [Philippines] in 2017 wet season to evaluate the effect of fertilizers applied in dry direct seeding of rice in rainfed lowland conditions. Ten fertilizer treatments with rates of 100 kg N ha-1 – 40 kg P2O5/ha – 40 kg K2O/ha were imposed having different kinds of fertilizer combinations using complete fertilizer (14-14-14), urea (46-0-0), ammonium sulphate (21-0-0), solophos (0-18-0), and muriate of potash (0-0-60) during basal application, active tillering (AT) and panicle initiation (PI). In 2018WS, top five performing treatments were validated in the farmers field. Results shows that 29 days after sowing, DAS of 2017 WS, plots with basal application after seeding had the most number of tillers linear/m (135-15 vs. 90-92), biomass (78-85 g/m vs. 31-34 g/m), canopy covers (NDVI values 62-67 vs 40-44)) and leaf area index (1.05-1.35 vs 0.44-0.50) as compared to those with delay application of fertilizer. Grain yield shows that basal application of urea (46-0-0, NPK) in combination with solophos (0-18-0) and Muriate of potash (0-0-60) prior to sowing (0 DAS) gave higher yield (4.6 t/ha) compared to other treatment and control (2.65 t/ha). In 2018 WS validation in the farmers field, soil types such as clay loam, loam, and silty loam gave different response to urea, ammonium sulphate, and complete. In Bukay Pait with clay loam soil, complete fertilizer in combination of urea (3.74 t/ha) was significantly higher with other treatments while ammonium sulfate had the lowest yield (2.67 t/ha). In Nipaco and Tayug with silty loam soil type, application of complete as basal was significant different to other treatments having 4.2 t/ha and 3.8 t/ha, respectively. In conclusion, fertilizer application during sowing or basal application helps improve the yield of dry direct seeded rice.

ORYZA SATIVA; NPK FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; APPLICATION METHODS; DIRECT SOWING; RAINFED FARMING; LOWLAND

Fertigroe R nanofertilizers enhanced yield of Robusta coffee (Coffea canephora Pierre). **Salazar, B.M., Gonzaga, A.B.Jr., Cosico, V.L.N., Dollen, A.T., Salazar, B.T.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019.*

Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 90-91. (Sep 2019).

Nanofertilizers minimize nutrient losses and increase crop uptake through targeted delivery, and slow controlled, or conditional release (Guru et al., 2015). Recently, UP Los Baños [Philippines] has developed FertiGroe R NPK nanofertilizers encapsulated with advanced polymeric materials. Initial results of nutrient-release kinetics studies provide evidence of enhanced NPK delivery via slow release. In this study, the effects of FertiGroe R on the yield of Robusta coffee IC8 clones were evaluated from November 2017 to March 2019 of University of Science and Technology in Southern Philippines – Claveria Campus, Claveria, Misamis Oriental. The experiment was laid out in randomized complete block design with the type of fertilizer materials (conventional, CF and FertiGroe R nanofertilizer, NF) and dosage of fertilizer (25, 50, 75, 100, or 125% gauged against the recommended NPK rate, RR of 192 g N, 96 g P, and 192 g K per plant) as treatments. Rejuvenated coffee trees of uniform growth and planted at 4 m x 4 m were selected, characterized, and randomized based on baseline productivity parameters and prevalent phonological stage. A treatment was replicated thrice, with three trees per replicate. Fertilizers were applied when berries are 10% and 50% of final size. Agronomic parameters were measured before and after fertilizer application. Trees supplemented with nanofertilizers, regardless of dosage, yielded 9.5% more coffee berries than those applied with conventional fertilizers. Fresh berry yield was highest in NF75 trees (8 t/ha), albeit statistically comparable to CF100 and CF125 trees. Highest dry berry yield also came from NF75 (3.32 t/ha), while lowest dry berry yield came from control trees (1.26 t/ha). In general, NF application resulted in 8% more green bean yield compared to those applied with CF. Specifically, green bean recovery was highest in NF75 trees (1.51 t/ha), which was 24% greater than those supplied with CF.

COFFEA CANEPHORA; NPK FERTILIZERS; FERTILIZER APPLICATION; TECHNOLOGY; APPLICATION RATES; APPLICATION METHODS; CROP YIELD; YIELD INCREASES

Formulation and application of multi-strain inoculant for agroforestry production (Theobroma cacao L. and Coffea liberica H.) production: formulation and application of multi-strain inoculant for agroforestry production. **Pampolina, N.M., Garcia, M.U., Anarna, J.A., Manalo, D.DC.** *Lipa Agricultural Experiment Station, Lipa, Batangas (Philippines). Quezon Agricultural Experiment Station, Tiaong, Quezon (Philippines). Rizal Agricultural Experiment Station, Tanay, Rizal (Philippines). College, Laguna (Philippines). TR-1915. 2018. 119 leaves.*

Among the driving force in poor agricultural production is infertile soil generally due to forest conservation and frequent chemical fertilization resulting to loss of beneficial soil microbes link to nutrient supply. This project was conceived to address this concern by

formulating a multi strain inoculant intended for application to agricultural and agroforestry crops. This report presents promising outcome of reintroducing suitable microorganisms to agricultural (pinakbet) crops with attempts to practice agroforestry using coffee and cacao. A total of 105 isolates of beneficial microorganisms were isolated from different crops and purified. The best isolates were screened under nursery condition using plant height, diameter, and biomass as parameters, evaluated under different farm levels to determine effective isolates that are developed into multi strain inoculant. Isolates that promote better behaviour were further mass produced with Centrosema pubescens Benth. and Leucaena leucocephalla as hosts and harvested as multi inoculant. The field performance of tested crops in terms of harvest was evaluated using RGBD by comparing effectiveness of multi strain inoculant with farmer's practice and statistically analyzed. The performance of multi strain was further demonstrated on selected crops with farm cooperators in the region. Results suggest efficacy of the inoculant in increasing yield and prolonging life span of crops, thereby providing additional harvest and income. It is recommended that additional field strains in other site conditions outside the region will be best to verify efficiency and efficacy as an alternative biofertilizer to inorganic source for farmers. The formulation of multi inoculant must be further optimized to determine mechanism of action by diverse soil microbiota through community analysis.

THEOBROMA CACAO; COFFEA LIBERICA; AGROFORESTRY; SOIL MICROORGANISMS; FERTILIZER APPLICATION; FERTILIZERS; INOCULATION; BIOFERTILIZERS

Growth, yield and kernel quality of sweet corn (Zea mays var. Saccharata Stuart) under different fertilizer management schemes. **Capon, D.S., Nitural, P.S.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 116-117. (Sep 2019).*

Sweet corn is classified as one of the most promising high valued horticultural crop in the Philippines because of its short maturity and faster economic returns particularly for small farmers. It has been grown commercially, a profitable farming enterprise and a good cash crops with high year- round price. It has a short growth duration, thus, can grow four or more cropping a year. Similarly, there is high demand for sweet corn in the market and is expected to increase in the future. However, productivity and sustainability is the main challenge face by many farmers/growers due to heavy reliance use on inorganic fertilizer and synthetic pesticides has given rise to many ecological and health problems. Development of production management practices is needed to meet the increasing demand in the market as well to address the challenges for a safe and nutritious food for human consumption. Thus, this study was conducted to evaluate the effect of different

fertilizer management practices on growth, yield and kernel quality of sweet corn. Results showed that growth parameters (plant height, leaf area, growth rate, and dry matter yield) and yield and yield components (ear height, ear weight of ear/plant with and without husk, fresh ear yield/plot with and without husk, and stover) were significantly increased with application of organic, organic-based and conventional fertilizer management practices. Application of conventional fertilizer management practice resulted to highest increase in starch and sugar content, while application of organic-based fertilizer management practice gave the highest protein content in the sweet corn kernel.

ZEA MAYS; FERTILIZER APPLICATION; ORGANIC FERTILIZERS; APPLICATION RATES; GROWTH; CROP YIELD; KERNELS; QUALITY

Multi-location field trials of Radiation-Modified Kappa Carrageenan as inducer of resistance against major pests and diseases in rice. **Magsino, G.L.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1839. Oct 2017. 101 leaves.*

Efficacy of Radiation-Modified Kappa Carrageenan PGP as plant growth promoter and inducer of resistance against major pests and diseases in rice was evaluated under farmer fields in UPLB-CES [University of the Philippines Los Baños-Central Experiment Station] and Victoria, Laguna, Nueva Ecija, Bulacan, Iloilo and Zamboanga del Sur [Philippines]. Results have shown that supplementing farmer's practice on fertilizer application with 1.6li/ha, 3.0 li/ha and 4.8li/ha Carrageenan PGP sprayed three times per cropping season at 14, 30 and 45 DAT increased plant height, number of filled grains and grain yield while reducing number unproductive panicle length, number of filled grains and grain yield while reducing number of unproductive tillers and unfilled grains. Supplementing Carrageenan PGP, especially the 3.0 li/ha/application dosage, to farmer's practice produced 4.12% to34.78% greater yield during the Wet Season and 8.30% to 66% yield increase during Dry Season. Incidences of Tungro, bacterial leaf blight and other diseases were found to be less than 5% across all trial sites. Consistent high counts of beneficial arthropods such as spiders, ladybeetles, dragonflies and damselflies were observed in fields sprayed with Carrageenan PGP. The consistent presence of the natural enemies in the field were able to manage the population of pests including green leafhopper, brown planthopper and stemborers, The outstanding performance of Carrageenan PGP as plant growth promoter and inducer of resistance to insect pests and diseases was highlighted in the Farmer's Field Days conducted at each trial site. Farmers from different communities and organizations around the area were invited in the field days that serve as the initial step in the technology transfer. Research results of UPLB and Iloilo trials per Experimental Use Permit (EUP) Guidelines

were submitted to FPA and provisional registration was issued last August 2017 and full product registration by the first quarter of 2018.

ORYZA SATIVA; RICE; CARRAGEENANS; PESTS OF PLANTS; RADIATION; PEST RESISTANCE; DISEASE RESISTANCE; FIELD EXPERIMENTATION; TUNGRO DISEASE; BLIGHT; APPLICATION RATES; FERTILIZER APPLICATION

Nutrient expert sup R cassava: sustainable yield intensification in Philippine Cassava Systems. **Ocampo, A.M., Manguiat, P.H., Santos, P.J.A., Pampolino, M., del Rosario, E.** *Department of Agriculture, RDMIC Bldg., Elliptical Rd. Cor. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. Regional Integrated Agricultural Research Centers (Philippines). International Plant Nutrition Institute Southeast Asia Program, (Malaysia). College, Laguna (Philippines). TR-1901. 2018. 30 leaves.*

CASSAVA; VARIETIES; FERTILIZER APPLICATION; NUTRITIVE VALUE; NUTRIENT UPTAKE; PRODUCTION

RCM [Rice Crop Manager] N fertilizer trials for irrigated rice. **Alonzo, C.D.K., Deomano, K.L.T., Collado, W.B.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 106. (Sep 2019).*

Nitrogen is the most limiting element in almost all soils. Proper application of N fertilizer is vital in improving crop growth and grain yields. Thus, the Rice Crop Manager, a web-decision support tool, designed to provide field- and season-specific nutrient management recommendations to rice (Oryza sativa), is continuously being enhanced. This particular study aimed to determine the effect of additional and reduced N fertilizer during the active tillering (AT) and panicle initiation (PI) stages on grain yield when RMC target yield is lower than 6 t/ha and higher than or equal to 6 t/ha, respectively. The trails were conducted during the 2016 RCM Research Season 6 in different locations. The treatments were Farmer's Practice (FP), RCM current recommendation (RCM), and modified RCM (RCM2). The plot sizes for RCM and RCM2 ranged from 300-700 m2. Grain yield data were gathered from a 5 m2 sampling area and converted to 14% moisture content. Results shows that in Mindanao sites, addition of 24 kg N/ha provided a 0.3 t/ha yield advantage relative to the RCM treatment and a 0.5 t/ha to that of the FP. While no significant differences on grain yield among treatments in the Luzon sites. The total amount of N applied were 66 kg/ha, 97 kg/ha, 121 kg/ha for FP, RCM, and RCM2, respectively. The reduction of 23 kg N/ha (RCM2) to that of the RCM current recommendation and the FP showed comparable grain yields. When the RCM target yield is 6t/ha, the RCM current recommendation was enough for

Luzon areas in achieving the targeted yield. For the RCM target yield is 6t/ha, the reduction of N provided comparable grain yield with that of the RCM current recommendation. Although the targeted yield was not met, further studies must be conducted to ascertain the effect on grain yield of added N.

ORYZA SATIVA; IRRIGATED RICE; FERTILIZER APPLICATION; TECHNOLOGY; NITROGEN FERTILIZERS; APPLICATION RATES; GROWTH; CROP YIELD; TILLERING; INFLORESCENCES

Refining site-specific nutrient management for sustainable cassava production in the Philippines. **Ocampo, A.M., Ruazol, A.A., Liar, L.R., Pampolino, M.F., Mateo, N.O.B., delos Santos, E.G., Santos, P.J.A., Rescalsota, J.C., Oberhur, T.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 107-108. (Sep 2019).*

Cassava is an intensive nutrient miner, especially K. Moreover, yield response to fertilization are influenced by variety and site characteristics. As such, sustainable cassava production needs a fertilizer management that accounts for these factors. Site-specific nutrient management (SSNM), as refined by validation trials across sites and varieties, might be an efficient approach for sustainable yet high yielding cassava production. This study aims to assess the influence of variety in cassava yield response to fertilization, and to assess the efficiency of SSNM in sustaining high cassava yield across seasons. Four fertilization treatments namely, full NPK rate (200-100-350), cassava national fertilizer recommendation/NFR (56-56-56), SSNM prototype (180-70-250), and unfertilized control as main-plots and two varieties as subplots in split-plot design were established in regions throughout the country. Different attainable yield obtained across sites are indicative of soil related constraints and opportunities. Significant differences were also noted in the P and K removal in different varieties. During on-station trials, SSNM yield ranged from 29.8-37.4 (t/ha) and full NPK gave 33.6-39.8. For the first season of on-farm trials, SSNM yield averaged 33.83 (t/ha) while full NPK gave 32.76. Both analyzed results indicate that SSNM did not differ with full NPK and surpassed the NFR. SSNM prototype yield surpassed full NPK and NFR by 3.2% and 13.*5 respectively and gave 7.01 (t/ha) yield over unfertilized control. Varieties, fertilizer treatments, and their interactions influenced cassava fresh root yield. Varying response to fertilization were also noted in different regions. The second season of on-farm trials is also expected to affirm and refined these results. With SSNM increasing cassava yield across trials and seasons, SSNM is an efficient approach towards sustainable cassava production in the country.

MANIHOT ESCULENTA; CASSAVA; NPK FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; TIMING; NUTRITIONAL REQUIREMENTS

Relationship between fertilizer level and SPAD leaf chlorophyll reading of Robusta coffee (Coffea canephora Pierre) clonal seedling. **Rosas, A.L.L., Salazar, B.M.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 108. (Sep 2019).*

A study was conducted at the Institute of Crop Science, College of Agriculture and Food Science, University of the Philippines Los Baños from February to May 2018 to determine the applicability of SPAD-502 Plus chlorophyll meter as a tool to aid in nitrogen (N) fertilizer management of Robusta coffee (Coffea canephora Pierre) clonal seedlings. Conventional fertilizer (CF) of FertiGroe R nanofertilizer (NF) was used as N and P nutrient sources to meet the coffee seedling nitrogen requirement of 3.05 g N and 18.40 P. Without fertilization or by using 50% RR of NF (NF50), Robusta seedlings grown under 60% shade produced a leaf pair in 24 d, in contrast to the reported duration of 30 d. This was further shortened to 18 d when CF50 was applied. While there was no substantial difference on the effect of CF and NF in SPAD reading, the leaf development stage of the newly emerging leaf was found to be linearly correlated to the SPAD reading of the youngest fully expanded leaf. Increasing SPAD value were observed with increasing N levels up to full RR of CR and NF. Finally, the study came up with empirical equation which can be used as a guide in N fertilizer management of coffee clorial seedlings: Y = 44.88 + 0.14X for CF, and Y = 43.41 + 0.14X for NF, where Y is the SPAD reading and X is the N fertilizer level.

COFFEA CANEPHORA; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; LEAVES; CHLOROPHYLLS

Response of popular and recently-released irrigated lowland rice varieties to nitrogen rates and plant spacing. **Malabayabas, M.D., Espiritu, A.J., Patricio, H.J.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 108. (Sep 2019).*

A study was conducted at PhilRice CES to determine the effect of nitrogen (N) rate and plant spacing on grain yield of popular and recently-released irrigated lowland rice varieties. Twenty-one-day- old seedlings of NSIC Rc 222, NSIC Rc 402, NSIC Rc 438 and NSIC Rc 442 were transplanted at plant spacing of 20 x 20 cm and 15 x 30 cm. The N fertilizer rates were

0, 50, 90, 130, 170 and 210 kg/ha in 2018 wet season (WS) and 0, 90, 130, 170, 210, and 250 kg/ha in 2019 dry season (DS). In 2018 WS, Rc 222 and Rc 402 had significantly higher yields at plant spacing of 15 x 30 cm while Rc 438 and Rc 442 had comparable yields in both plant spacing across N rates. At 20 x 20 cm, Rc 442 had significantly higher yield than Rc 402 and Rc 438 but not significantly different from that of Rc 222. On the other hand, Rc 222 had significantly higher yield than Rc 438 and Rc 442 at 15 x 30 cm, but not significantly different from the yield of Rc 402. Grain yields across varieties and spacing was significantly reduced with higher N rate of 130 to 210 kg/ha. In 2019 DS, Rc 402, Rc 438 and Rc 442 had significantly higher yields at 90 kg N/ha and these were comparable with the yields at higher N rates. On the other hand, Rc 222 showed higher yield at 130 kg N/ha. Across varieties and N rates, grain yields were significantly higher at spacing of 20 x 20 cm. There was no significant interaction between variety and spacing during 2019 DS. The results clearly indicate seasonal and varietal response to N rate and plant spacing. Other parameters aside from yield will be included to elucidate the initial results.

ORYZA SATIVA; VARIETIES; LOWLAND; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; SPACING; GRAIN; YIELDS

Response of promising rice CSSL IAS66 and its parents under different nitrogen levels. **Hanh, N.H., Cuong, P.V., Hanh, T.T., Hoan, N.V.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 1-10. (Jun 2019).*

Pot experiments were conducted on rice to estimate the relationship among dry weight, translocation of non-structural carbohydrates (NSC), and grain yield in IAS66, a chromosome segment substitution line (CSSL) derived from a cross between the indica cultivar IR24 and the japonica cultivar Asominori, in comparison with its parental cultivars (IR24 and Asominori) under non-nitrogen (N0), normal nitrogen (N1), and high nitrogen (N2) conditions in the spring season 2017 in a greenhouse at the Faculty of Agronomy, Vietnam National University of Agriculture, Vietnam. Increasing the nitrogen level increased the photosynthetic rate in terms of the CO2 exchange rate (CER) and leaf area, which lead to both greater dry weight and NSC transportation from culms and leaves sheaths (stem) to panicles in all genotypes. However, the rate of increase in dry weight and NSC in the panicles at the maturing stage observed in IAS66 was higher than that in its parental cultivars. As nitrogen increased from the N1 to N2 levels, the grain yield significantly increased because the number of panicles per plant increased, but the other yield components including the number of spikelets per panicle, grain-filling, and 1000-grain weight were not significantly different. Grain yield of IAS66 was 11.4% higher than that of the recurrent parent IR24 at the same high nitrogen levels and the rate of grain yield increase in IAS66 was significant higher than that of its parental cultivars.

ORYZA SATIVA; VARIETIES; NUTRIENT TRANSPORT; GRAIN; YIELDS; NITROGEN; NUTRIENT UPTAKE; APPLICATION RATES

Source of potassium affects the growth and fruit physico-chemical properties of container-grown watermelon. **Mercado, D.E., Valleser, V.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 111. (Sep 2019).*

This study aimed to compare the effects of K2SO4 and KCl fertilizers and their combinations as source of potassium on the growth, fruit mass and quality of container-grown 'Sweet 16' watermelon. K2SO4 and KCl rates (controle/no potassium applied; 100%KCl + 0%K2SO4; 75%KCl + 25%K2SO4; 50%KCl + 50%K2SO4; 25%KCl + 75%K2SO4; and 0%KCl + 100%K2SO4) with reference to nutrient recommended rate served as treatments and replicated into three. These K rates were applied in four equal split doses. Moreover, other nutrients were supplied to all treatments in blanket from following the recommended rate for watermelon. 'Sweet 16' watermelon seedlings were grown in 8' x 14' polyethylene bag with 8 kg of growth media (1:3 soil:vermicast). Harvesting of 'Sweet 16' watermelon commenced at 72 days after planting. Results revealed that 100% K2SO4 and 75% K2SO4 + 25% KCl treatments augmented the growth, fruit weight and fruit quality of watermelon. This study imply that higher rate of K2SO4 as source of K will improve the growth, fruit weight and fruit quality of container-grown watermelon.

CITRULLUS LANATUS; WATERMELONS; POTASH FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; FRUITS; QUALITY; PLANT CONTAINERS; PLANTING

Spoilage rate of cooked rice harvested from rice plants 10 years of continuous application of organic and inorganic fertilizers. **Espiritu, A.E., Bandonill, E.H., Javier, E.F.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 111. (Sep 2019).*

With the increasing demand for quality rice, there is a growing interest on the use of organically grown rice which is perceived to be healthier and safer. However, issues and concern as to whether rice grown organically easily deteriorates relative to that of the conventionally grown rice become the point of contention among consumers. Hence, a preliminary sensory index for cooked rice was conducted to assess the effect of different fertilizers on the spoilage rate of cooked rice, 10 years after continuous fertilizer application. Treatments include: (1) pure organic materials (OF) which included rice straw

(RS), rice straw with Effective Microorganism Inoculants (RSEM), chicken manure (CM), wild sunflower (WSF), and commercial organic fertilizer (COF); (2) organic materials with recommended chemical fertilizers (OF + NPK) and; (3) organic materials with half the recommended chemical fertilizers (OF + 1/2 NPK). Preliminary results showed that at 15 hours (H), a very perceptible off-oder was observed for the control and sample with WSF + NPK. Consequently, the SI of the samples had lowered drastically to 1.2 – 1.5 indicating the spoilage at 15H. At 18H, samples treated with RS, RSEM, COF, including RS + NPK, and 1/2 NPK were observed to have off-odor and low SI of 1.3 – 1.8 indicating the samples’ spoilage. At 21H, samples treated with CM and WSF had SI of 1.6 and 1.1 respectively indicating spoilage. Likewise, RSEM + NPK, CM + NPK and OF + 1/2 NPK had an SI ranging from 1.1 to 1.7 indicating spoilage at 21H. Noticeably, COF + 1/2 NPK remained unspoiled at 21H. Generally, samples treated with OF except for CM and WSF tend to spoil at a faster rate (18H) compared with OF + NPK and inorganic fertilizer alone (21H). A follow-up study should be conducted to make the findings conclusive.

ORYZA SATIVA; FERTILIZER APPLICATION; ORGANIC FERTILIZERS; INORGANIC FERTILIZERS; RICE; COOKING; DETERIORATION

Sustaining soil characteristics and nutrients through site-specific nutrient management in cassava production areas for higher yields the Philippines. **Ocampo, A.M., Manguiat, P.H., Santos, P.J.A., Pampolino, M., del Rosario, E.** *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1899. [2017]. 54 leaves.*

Increasing demand in the food and the feed industry for cassava has made it first in terms of area harvested among root crops and other staple vegetables in the Philippines (PSA 2017). Yet due to lack of appropriate fertilizer practice, the mean fresh root yield of cassava in country was only 12.51 (tons/ha), way below that of 32.68 of Laos, the highest in South East Asia (FAO, 2018). To increase Philippine cassava yield without undermining soil sustainability, this project aimed to determine the cassava yield responses, to fertilization as influenced by variety while monitoring soil status and crop nutrient removal and to show the efficiency of SSNM (site-specific nutrient management)-based fertilization for cassava. The average exploitable yield gap for cassava across the country was 10.53 +-3.82 t/ha representing significant opportunities to further increase cassava production. Comparing the four fertilization treatments namely, full NPK rate (200-100-350), cassava national fertilizer recommendation/NFR (56-56-56), SSNM prototype (180-70-250), and unfertilized control, data from both on-strain and on-farm trials showed that there is no significant difference in the yield of the full NPK and SSNM treatment as it also surpassed that of the NFR. On-station trials gave a yield of 35.24 t/ha for SSNM and 23 t/ha for the control while on the FPE, SSNM gave 33.39 t/ha for SSNM and 22.61 t/ha for control, across all sites and

varieties. Differences in fresh root yield across treatments were influenced by variety and location. Results also confirmed that cassava heavily consumes K, followed by N and then P. Variety also affects N and K removal. Summarizing the results of omission plot trials the amount of fertilizer needed is 17 kg N, 4.5 kg P, and 27 kg K to produce one ton of cassava dry root yield per hectare. Despite the medium to high soil fertility of all sites, cassava still responded to fertilization. The SSNM prototype yield surpassed full NPK and NFR by 3.2% and 13.8% respectively. As such, SSNM-based fertilization is an efficient way of cassava fertilization. By optimizing the SSNM prototype recommendation based upon the influence of variety and site characteristics, appropriate quick fertilizer guides can be developed to increase cassava production in the country.

MANIHOT ESCULENTA; CASSAVA; HIGH YIELDING VARIETIES; SOIL FERTILITY; FERTILIZER APPLICATION; NPK FERTILIZERS; APPLICATION RATES; PHILIPPINES

Trinitario cacao (Theobroma cacao L.) trees exhibited better yields with Fertigroe R nanofertilizers. **Salazar, B.M., Besas, U.P., Cosico, V.L.N., Valencia, A.M., Salazar, B.T.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 112. (Sep 2019).*

Nanotechnology is one of the emerging smart technology systems with vast applications in agriculture. UP Los Baños [Philippines] recently developed FertiGroe R NPK nanofertilizers, which are single-nutrient fertilizers encapsulated by advanced polymeric materials. Under nutrient-release kinetics studies, FertiGroe R enhanced NPK delivery via slow release. Hence, a study was conducted in Antocan's Farm, Pandapan, Tagum City from January 2018 to April 2019 to evaluate the effects of FertiGroe R on the growth, development, and yield of Trinitario cacao clones. Laid out in randomized complete block design, UF 18 cacao clones of uniform growth and planted in 3 x 3 m under coconut trees, were supplemented with conventional fertilizer (CF) or FertiGroe R nanofertilizers (NF) at different dosages (25, 50, 75, 100, or 125% of the recommended rate, RR, of 170 g N, 20 g P, and 200 g K per plant). The timing of fertilizer application was gauged against Biologische Bundesantalt, Bundessortenamt and CHemischeIndustrie, Germany (BBCH) scale, which quantifies the developmental changes of cacao from inflorescence stage to harvest-ready stage. Fertilizers were applied at BBCH 71 (pods are 10% of final size) and BBCH 75 (pods are 50% of final size). Agronomic parameters were gathered before and after fertilizer application. Results show that the number of beans per pod ranged from 30 – 46 across treatments. More beans per pod were observed from CF125 trees while the least came from CF50 trees. Yield ranged from 200 – 1097 kg/ha, with lowest yields coming from unfertilized trees and the highest from NF50 trees. On the average, cacao trees fertilized with nanofertilizers had 70%

higher bean yield (542 kg ha-1 vs. 316 kg/ha) than those supplemented with conventional fertilizers.

THEOBROMA CACAO; ORGANIC FERTILIZERS; NPK FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; GROWTH; CROP YIELD

Yield of buyok-buyok (Momordica cpchinchinensis Spreng.) in response to different fertilizer applications. **Tayobong, R.R.P., Odejar, F.M., Sanchez, F.C.Jr., Balladares, C.E., Medina, N.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 114. (Sep 2019).*

Buyok-buyok/Sogod-sogod/Balbas bakiro (local names) or Gac (international name) (Momordica cochinchinensis Spreng.) is a dioecious perennial vine under the cucurbit family which produces spiny large spherical fruits with vibrant red color when ripe. It is indigenous to the Philippines and other Southeast Asian countries and considered as a 'super' fruit due to its high levels of lycopene, beta-carotene, and Vitamin E which are considered important for human health and wellness. Plants from seeds collected from the wild were grown in the field at the central experiment station of UPLB [University of the Philippines Los Baños] Philippines] and applied with different fertilizers to observe the plant's response in terms of fruit yield. The plants were maintained in fence type trellis and received different fertilizer schemes: (T1) no fertilizer application; (T2) basal application of 10g/hill complete fertilizer (14-14-14) and side dressing of 5g urea (46-0-0) + 5g muriate of potash (0-0-60) per plant every other week (Philippine recommendation); and (T3) side dressing of 3g urea (46-0-0) + 0.75g solophos (0-18-0) + 1.5g muriate of potash (0-0-60) per plant per plant every other week (Vietnam recommendation). Almost all plants flowered at the same time (~8 MAP) but plants with T3 application had the most number of fruits (73 pcs) compared to T1 (45 pcs) and T2 (23 pcs). T1 and T3 plants retained most of its fruits (31% and 34% fruit drop, respectively) while T2 dropped 52% of its fruit. Due to low number of fruits, T2 developed heavier fruits (654g) with later maturity (68 DAF) compared to fruits of plants with T1 (457g) and T3 (497g). The fruit of T1 and T3 turned vibrant red almost six days earlier compared to T2. In terms of total fruit yield, plants with T3 turned vibrant red almost six days earlier compared to T2. In terms of total fruit yield, plants with T3 application had the highest yield (36kg) compared to T1 (21kg) and T2 (15kg).

MOMORDICA; SPECIES; FERTILIZER APPLICATION; APPLICATION RATES; APPLICATION METHODS; FRUITS; CROP YIELD

Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines. **Ella, V.B., Glaser, S.D., Oroza, C., Fajardo, A.L., Duka, M.A., Gonzales, J.A., Chen Lester Wu, Galoso, R., dela Cruz, K.M., Sadsad, J., Reyes, M.J., Fernandez, C.G., Zanchez, Z., Martinez, C., Bonoan, R., Tejada, A., Jr., Bacani, A.J., de la Cruz, C., Eusebio, V., Labrador, M.A.T., Marinas, R.** *College, Laguna (Philippines). TR-1880. 2018. 172 leaves.*

IRRIGATION; WATER MANAGEMENT; SENSORS; INFORMATION SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 1: pilot testing of the WSN technology in drip-irrigated upland crop production systems. **Fajardo, A.L., Wu, C.R., Sanchez, Z.D.C., Martinez, C.G., Glaser, S.D., Oraza, C.A., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 67-107.*

TRICKLE IRRIGATION; HIGHLANDS; UPLAND CROPS; PLANT PRODUCTION; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 2: pilot-testing of the WSN technology in lowland rice production systems with alternative wetting and drying technology. **Gonzales, J.A., Galoso, J.R.M., Tejada, A.T., Fernandez, C.G.P., Dela Cruz, K.M.S., Lampayan, R.M., Glaser, S.D., Oraza, C.A., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 108-127.*

ORYZA SATIVA; LOWLAND; PLANT PRODUCTION; IRRIGATION; IRRIGATION SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; SENSORS

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 3a. developmemt of water balance models and optimum irrigation operations schemes in upland cropping systems. **Duka, M.A., Sadsad, J.S., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 128-147.*

UPLAND CROPS; PLANT PRODUCTION; TRICKLE IRRIGATION; TECHNOLOGY TRANSFER; IRRIGATION; IRRIGATION WATER; WATER MANAGEMENT; SENSORS; INFORMATION SYSTEMS

Development of wireless sensor network-based water information system for efficient irrigation water management in the Philippines (IIID-2016-008): component 3b. development of water balance models and optimum irrigation operation schemes in lowland cropping systems. **Duka, M.A., dela Cruz, K.M.S., Lampayan, R.M., Ella, V.B.** *Development of wireless sensor network-based Water Information System for efficient irrigation water management in the Philippines, Ella, V.B.Glaser, S.D.Oroza, C.Fajardo, A.L.Duka, M.A.Gonzales, J.A.Chen Lester WuGaloso, R.dela Cruz, K.M.Sadsad, J.Reyes, M.J.Fernandez, C.G.Zanchez, Z.Martinez, C.Bonoan, R.Tejada, A., JrBacani, A.J.de la Cruz, C.Eusebio, V.Labrador, M.A.T.Marinas, R..- College, Laguna (Philippines). TR-1880. 2018. p. 148-172.*

LOWLAND; CROPPING SYSTEMS; INFORMATION SYSTEMS; WATER BALANCE; IRRIGATION; TECHNOLOGY TRANSFER; TECHNOLOGY; SENSORS

Effect of irrigation and fertilization on the vegetation growth of Lakatan banana (Musa acuminata). **Aguilar, E.A., Divina, F.A.II., Aggangan, N.S., Paelmo, R.F., Gueco, L., Elleva, L.I.F., Garcia, G.R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 86. (Sep 2019).*

Lakatan banana is an economically important fruit crop in the Philippines. It's aroma and sweetness when ripe makes it is a popular local dessert. It can grow in a wide range of soil and environment, but proper management is key to profitable production. The growth, yield and fruit quality are prevalent weather. Phonological studies are essential for monitoring the impacts of environment and climate change particular, but these are

wanting local tropical crops like Lakatan banana. Field experiment was established at the Central Experimental Station of UPLB [University of the Philippines Los Bañnos] to determine the effect of irrigation and different fertilizer treatments on the growth and yield of Lakatan. The experiment followed the split plot design with five replications with Irrigation as the main plot and fertilizer as sub-plot. Automatic weather station and field sensors monitor the prevailing microclimate in the experimental area. Regardless of treatment, rate of leaf emergence was lower during the dry months. Banana has a predefined number of leaves before flower emergence and fruiting is terminal. Thus, a delay in leaf emergence translate into a delayed flowering. Under uncertain weather conditions, longer exposure in the field increases the risk of being affected by stressors, including typhoons and pests and diseases. Pseudostem girth which in previous studies has shown strong correlation with bunch yield peaked at 135 DAP, across all treatments, but similar with other growth parameters plant height and number of green leaves were higher in irrigated with high fertilization treatment. For the same growing degree days (GDD), irrigated with high fertilization rate produced more leaves compared with the other treatments.

MUSA ACUMINATA; IRRIGATION; FERTILIZER APPLICATION; APPLICATION RATES; CROP MANAGEMENT; GROWTH; CROP YIELD; FRUITS

F08 - Cropping patterns and systems

Analysis of income and factors determining the adoption of integrated rice-fish farming system in Seyegen Districts Sleman Regency, Yogyakarta, Indonesia. **Syaukat, Y., Julistia, D.R.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 66-79. (Jun 2019).*

Integreted rice-fish farming is a potential alternative farming to increase farmers' income in overcoming increasingly competitive land use. Rice-fish farming has been applied in Margoluwih Village, Seyegan District, Sleman Regency, Yogyakarta [Indonesia] Province for a few years. This study aims to analyze the use of inputs and production costs in rice-fish (minapadi) farming compared to monoculture rice farming, to estimate the income of rice-fish farming and monoculture rice farming, and to identify factors that influence farmers' decision in adopting the integrated rice-fish farming. The study was conducted at Margoluwih Village, Sayegan District, Sleman Regency, Yogyakarta in March 2017. A total of 50 farmers were surveyed, comprising of 25 rice-fish farmers and 25 monoculture rice farmers. The methods used to achieve these objectives are descriptive analysis, income analysis, and logistic regression analysis. The results show that rice-fish farming requires inputs such as fish seeds, fish feed, prebiotics, and molasses of sugarcane while monoculture farming does not require such inputs, but monoculture farming uses

pesticides and herbicides to overcome pest attacks and applies more chemical fertilizers than rice-fish farming. The labor time devoted to ricefish farming is also higher than in monoculture farming. The total cost of rice-fish farming per hectare in one production season is Rp 63.47 million, while the total cost of monoculture rice farming amounted to Rp 17.55 million. However, rice-fish farming significantly earn more income compared to monoculture farming with an average value of Rp 28.45 and Rp 3.19 million per hectare in one growing season, respectively. Income is believed to be the main factor in determining the adoption, while social factors that influence farmer's decision to adopt rice-fish farming are age of farmer and experience of rice cultivation.

ORYZA SATIVA; FISHES; FARMING SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; FARM INCOME; FARM INPUTS; COSTS; INDONESIA

Establishment of organic seed production system. **Maghirang, R.G., Cacal, M., Ladia, V.Jr., Oraye, C.D., Bengoa, J.C., Rodriguez, M.C.P., Sabanal, A.Q.C., Rodulfo, G., Onde, G., Onde, M.** *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1883. 2018. 95 leaves.*

AUBERGINES; TOMATOES; CUCUMBERS; KIDNEY BEANS; LETTUCES; PEPPER; SQUASHES; MOMORDICA CHARANTIA; ORGANIC AGRICULTURE; SEED PRODUCTION

Multidimensional approach in assessing farmers' barriers to and factors influencing organic agriculture adoption. **Argañosa-Matienzo, EL., Atienza-Tenorio, M.** *Department of Agriculture 2nd Floor BSWM Bldg. Elliptical Rd., Diliman, Quezon City (Philippines). College, Laguna (Philippines). TR-1857. 2017. v.1: 288 leaves; v.2: 295 leaves.*

Organic agriculture (OA) is influenced by social, technological, economic, environmental and political/institutional (STEEP) factors. The multidimensional approach involves the interconnectedness of factors requiring a systems approach to understand the link to OA adoption. This report highlights the determinants to OA adoption from a holistic and systems perspective using a multidimensional approach. Project sites were Tublay, Benguet, Sabtang, Batanes in Luzon: Dao, Capiz, Victorias City, Negros Occidental in Visayas, and Sta. Josefa, Agusan del Sur, Braulio E. Dujali, Davao del Norte in Mindanao [Philippines]. Survey interview, case study and participatory workshops were used. There were 360 respondents, 180 OA practitioners (30 per site). Likewise, 26 key respondents from partner agencies were interviewed. Case video of six practitioners and three best initiatives, for OA promotion were produced and distributed. For three Islands, practitioners had higher percentage in socio-demographic characters. Practitioners had higher percentage in socio-demographic characteristics. Practitioners are owners of bigger land holding, while non-practitioners had lower education limited farming experience, and lesser family labor. Major challenges

include limited knowledge in production, marketing, and certification requirements, tenure, natural calamities and chemical contamination. Limited funding and change in leadership hindered adoption. Farmer avail and prefer information on OA from active sources. They established information network with LGU [local government unit]/technicians, farmers' organizations and local persons. Partner agencies produced/distributed IEC materials and network among themselves. They identified recommendations to improve IEC materials and network among themselves. They identified recommendations to improve IEC materials production, dissemination and information acquisition abilities. Training needs include organic agritourism, pest management, and ICS formulation. Farmer's socio-cultural characteristics, farming practices, awareness and perception level, information acquisition abilities are prerequisites for OA training design and IEC material production. Capacitating partner agencies on using innovative and participatory extension approaches will ensure OA adoption. Gender differential roles of farmers on access and control over agricultural resources and benefits, farm labor, and decision making, depends on thev purpose and type of major enterprise and household dynamics/arrangement. Gender responsiveness of introduced technologies and if interests of both gender are better served in organic agriculture programs were not given much attention. Solid inclusive policy and institutional support were influential factors in OA adoption in the six sites. Combination of best initiatives facilitated OA promotion and advocacy. Enabling STEEP factors included organizing farmer groups, building their capacities through learning sites and technology demonstration farms, provisions of production, processing and marketing facilities. strong LGU support and committed institutional partnership with local and international network, and policy support, integrating OA into overall agricultural policies and programs, and market development, are key to realizing the full benefits of OA. Assessing determinants to OA adoption are useful for unified planning, implementation and evaluation of sustainable OA in the country. Ensuring inclusive participation of multi-stakeholders through holistic systems approach ultimately benefit organic farming communities.

ORGANIC AGRICULTURE; FARMERS; GENDER; SOCIAL PARTICIPATION; SOCIOCULTURAL ENVIRONMENT; TECHNOLOGY; TECHNOLOGY TRANSFER; DIFFUSION OF INFORMATION; INNOVATION ADOPTION

Site characterization of coffee production areas under coffee-based agroforestry systems in La Trinidad Tublay and Atok, Benguet (Philippines). **Laurean, C.P., Fagyan, A.W., Pablo, J.P., Bao-idang, C.C., Moreno, N.A., Ramos, L.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 110. (Sep 2019).*

Coffee production is one of the major livelihood in the province of Benguet [Philippines] and other provinces in the Cordillera region however no study on soil fertility assessment had been done on coffee-based agroforestry systems. The study was conducted to determine the morphological and chemical properties of soil planted with coffee under diverse shade trees on the major coffee production areas. The soil in the experiment sites are classified as Puguis Gravelly Loam in La Trinidad and Ambassador Silt Loam in Tublay and Atok, Benguet. A 1 m2 pit was dug on the foot slope, back slope and summit on each agroforestry system for the soil profile description. Based on the soil assessment, the experiment sites in Tublay and Atok where coffee trees are grown under alnus and mango, chayote and pine respectively have profiles that are dark yellowish to strong brown on the surface and yellowish red on the substratum. The areas in the La Trinidad where coffee were grown under alnus and pine have profiles that are brownish to dark brown on the surface and yellowish brown on the substratum and have gravels with fine friable structure. Most of the coffee growing areas have 15-30% slope, well drained, clay loam to silty clay loam texture, very deep soil which permits favourable rooting, and have high cation exchange capacity. The soils were extremely acidic ranges from 3.91 to 4.32 except for soils planted with coffee under alnus in Tublay and Atok which are very strongly acidic with pH of 4.69 and 4.89 respectively.

COFFEA; SOIL TYPES; SOIL CHEMICOPHYSICAL PROPERTIES; SOIL FERTILITY; SOIL; SOIL PROFILES; AGROFORESTRY; CROPPING SYSTEMS; PHILIPPINES

F30 - Plant genetics and breeding

Adaptability trial of super sweet sorghum. **Demafelis, R.B., Angeles, D.E., Samson, E.G., Ganancial, J.T., Beltran, A.K.M., Rivera, H.F.R., Demafelis, F.A.N., Rollon, G.D., Jr., Monteza, C.C.** *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. College, Laguna (Philippines). TR-1821. 2017. 162 leaves.*

The study was conducted to evaluate the performance of the super sorghum hybrids coded as B6, EN 12-12, each having distinct characteristics under the humid tropical conditions of the Philippines. It was tested against the commercial local variety from India, SPV 422. Three trials were established t assess the (1)performance evaluation of test cultivars; (2)response of plant to the effect of different planting distances; and (3)effect of increasing fertilizer rates on the agronomic and yield performance of sweet sorghum. Agronomic and yield data were gathered at milking stage at at crop's grain maturity. In terms of agronomic performance, , V1 (B6) performed best in term of stalk weight, stem diameter, and grain weight particularly during June planting and V3 (EN 12-12) for October and July planting. V2 (EN 12-11) produced the tallest but lightest stalks while V4 (SPV 422) competes for V1 (B6)

and V3 (EN 12-12) in terms of biomass, grain, juice, and cane yield of the test cultivars but it was found out that using 68 x 10 cm planting distance produced tall plants or broad leaves due to the activation of phytochrome-mediated responses while a 75 x 15 cm planting distance generated thick stalks with high juice content and that wide space planting like 90 x 20 cm can be used to generate long leaves and internode. For the effect of fertilizer, using 116-84-84 kg/ha of NPK enables the plants to attain high cane and juice yield were observed whwn planting was done on June while a lower yield was measured when planting was conducted on July and October. Photoperiod in sweet sorghum causes poor agronomic performance and yield reduction due to early flowering. A lower yield has also resulted when plants were ratooned on December. Grain production, on the other hand, is susceptible to bird infestation. For ethanol production, V4 (SPV 422) is recommended due to its high juice volume and sugar content. V3 (EN-12-12), on the other hand, was also observed to contain high sugar concentration which can be utilized for ethanol production. Due to senescence, performance of crop during grain maturity was relatively lower than at milking stage.

SORGHUM BICOLOR; HYBRIDS; HUMID CLIMATE; TROPICAL CLIMATE; YIELD COMPONENTS; YIELD FACTORS; AGRONOMIC CHARACTERS; MATURITY; FLOWERING; ETHANOL; ADAPTABILITY

Advancement of science for the sustainable utilization and conservation of forest genetic resources of falcata (Falcataria moluccana (Miq.) Barneby and J.W. Grimes) and Yemane (Gmelina arborea Roxb). **Tolentino, E.L., Jr., Casas, J.V., Gumpal, E.C., Maldia, L.SJ., Quimado, M.O., Ata, J.P., Tinio, C.E.** *Department of Environment and Natural Resources Ecosystem Research and Development Service Region 13 (Philippines). Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1874. 2018. 157 leaves.*

The three-year project was conducted primarily to build the level of understanding and techniques on the best use of available genetic base of key plantations species, Falcataria moluccana (Miq.) Barneby and J.W. Grimes, and Gmelina arborea Roxb., in order to achieve a 30% increase in yield from plantations from the current 2013 yield which is approximately 60 cu m/ha. FGR materials of the two species were collected all over the country. Seeds from total of 133 mother trees (MTs) of falcata and 166 mother trees of gmelina were collected during the first year of the project and placed in the field trials. The two partner institutions-the Cedntral Mindanao University and the Isabela State University raised the seedlings in the nursery in the second year ane eventually established the field trials (FT) prior to the third-year operation of the project. The gmelina FTs were established in Cabagan and Echague, Isabela, Falcata FTs were established in CMU, Maramag, Bukidnon,

Baliangao, Misamis Oriental [Philippines]. An incomplete block design was used to lay-out the seedling of the various mother trees (MTs) in the FTs. Survival, height and diameter were assessed in the FTs. Additinal information of the pest and disease resistance were noted. Leaf samples from a total of 330 trees of G. arborea and 363 trees of F. moluccana from various stands/plantations in the country were collected for molecular genetic characterization. Selected mother tree in each species used in the establishment of field trials were included in the genetic analysis. DNA extraction and marker amplifications were conducted. Based on the Bayesian and model-based clustering analysis implemented in STRUCTURE analysis the genetic structure was evaluated using the multilocus genotypes of each individual. The model assumes the presence of ancestral genetic cluster (K), which the number may ne unknown, and by Markov Chain Monte Carlo (MCMC) simulations individual multi-locus genotypes are assigned probabilistically to pre-determined values of K. Various trainings on tree improvement, forest genetics, seed and nursery technologies and field trials establishment and management wre carried out with the partner institutions (CMU and ISU). A total of 12 ha of FTs were established by the project 2, hectares more of the 10 ha initially targeted by the project 4 ha for gmelina by ISU and 6 ha for falcata by CMU. The gmelina FTs were established in Cabagan and Echague, Isabela while the falcata FTs were established in Cabagan and Echague, Isabela whiule the falcata FTs were established in Central Mindanao University in Maramag, Bukidnon, Baliangao, Misamis Occidental, Buda, Marilog District, Davao City, and Talisayan, Misamis Oriental. The two gmelina FTs were both hit by the two consecutive typhoons in 2016, which has adversely affected survival and growth forms. The Echegue FT has the following results: survival is still quite high for many seedlings but was not as high for many MTs cpmpared to the MTs in Cabangan. The falcata seedlings from the various MTs planted at the CMU FT have exhibited excellent survival rates after one year. For the Baliangao Misamis Occidental, survival percent at 65%. Survival and growth forms gmelina seedlings have been significantly affected by the two typhoons that directly crossed Northern Luzon, i.e. Typhoon Karen and Typhoon Lawin. The falcata FTs at this stage has has not provided very consistent information on the top performing MTs, but has been shown that better growth performance (e.g. height and diameter) could be obtained when the FGR is marched to particular sites. No consistent mother three for either species scored high in the parameters so far evaluated. This would indicate the need for further observations to elicit the true difference between the mother trees and allow at the best performing mother trees to exhibit their genetic potentials. In terms of genetic diversity, there was notable decrease of 20 to 30 percent in G. arborea in the sampled stands compared to the natural populations of the species as assessed by a previous study, although modest divergence was found among genetic clusters. Genetic diversity is the backbone of plantation forestry and forest restoration tree improvement programs. Without the diverse FGRs, it is impossible to proceed with any tree improvement program. For three years, the project was able to hold nine trainings sessions on various aspects of silviculture, tree improvement and genetics. A

total of 302 trainees have undergone these various trainings which is general aimed to capacitate would-be researchers in tree improvement.

GMELINA ARBOREA; FORESTS; GENETIC RESOURCES; PLANTATIONS; GENETIC VARIATION; SEEDLINGS; SURVIVAL; RESOURCE CONSERVATION

Agronomic characterization of M4 mutant lines of Pinilisa under irrigated wetland condition. **Empeynado, C.K.DC., Barrientos, D.S., Vizmonte, P.T.Jr.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 117-118. (Sep 2019).*

The study was conducted at the Department of Crop Science, College of Agriculture, Central Luzon State University, Science City of Muñoz, Nueva Ecija [Philippines]. The study aimed to (1) identify and selected desirable mutants for further testing; (2) evaluate the response of mutant lines to pest and diseases and; (3) determine the relationship of mutant lines in terms of agronomic characteristics. The experiment was set up in five blocks following the Augmented Design with twenty-five mutant lines and three check varieties replicated per block. Agronomic characterization of M4 generation mutant lines revealed better mutants compare to Pinilisa in terms of days to 50% flowering, days to maturity, percent filled spikelet per panicle, number of filled spikelet per panicle, number of productive tillers, 1000 grain weight and computed yield at 14% MC. Mutants are shorted than Pinilisa. Mutants have longer grain length but lower grain width than Pinilisa. The results showed that most of the mutants characterized had 1% and 3% rating on stemborer infestation and four mutants had 0% rating of infestation. Pinilisa's infestation rating is 9%. The maturity of the mutant lines ranges from 111-121 days after sowing (DAS). Yield (t/ha) of mutants ranges from 4.48 t/ha to 8.18 t/ha. All mutants characterized are identified as promising lines. Correlation analysis showed that three is a strong linear relationship between occurrence of pest and diseases, 1000 grain weight and grain yield while a moderate linear relationship between days to 50% flowering, days to maturity, grain length and number of filled spikelet per panicle. Grain yield has a strong linear relationship between 1000 grain weight.

ORYZA SATIVA; MUTANTS; AGRONOMIC CHARACTERS; IRRIGATED LAND; PESTICIDE RESISTANCE; CROP PERFORMANCE; GRAIN; YIELDS; EVALUATION; TESTING

Agronomic performance of soybean (Glycine max (L.) Merr.) advanced breeding lines multi-environment trials. **Maghirang, R.G., Ladia, V.A.Jr., Ocampo, E.T.M., Enicola, E.E., Mateo, J.M.C., Dueña, J.R., Santos, M.M.L., Makiling, F.C., Onde, M.G.G., Calderon, V.F., Baguno, J.M., Duna, L.V., Tigbao, J.R., Regulacion, A.N., Anticola, R.M., Auxtero, T.B., Juyno, C.B.,**

Gimo, G.T. *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 18. (Sep 2019).*

Multi-environment trial (MET) is an important consideration in any breeding program to assess the presence of genotype x environment interaction (GEI). The objective of this research was to evaluate the productive performance of soybean advanced breeding lines in multi-environment trials, and to identify the ideal genotypes for each of the growing environments. A randomized complete block experimental design with four replicates was carried out for the evaluation of 20 soybean genotypes in six environments during the 2018-2019 dry season planting. Initial data from the three environments are presented in this paper. GEI was not present in the combined analysis but genotypes are significant in each environment. Changes in the ranking of genotypes among locations was also observed. Region 4A was the highest yielding environment among the testing locations. The genotype SY 2008-05-179 showed the highest mean yield (2.15 t/ha) in Region 2 while Tiwala 8 showed the highest mean yield (2.73 t/ha) in Region 4A and SP 963-1 had the highest mean yield (1.8 t/ha) in Region 10. Top performing genotypes in Region 2 were SY 2008-05-179, SP 963-5, SP 963-9, CLSoy 1 and SP 963-2. For Region 4A, the top yielding genotypes were Tiwala 8, SP 963-1, SP 963-9, SP 963-6 and SY 2008-05-177 while in Region 10, the top yielders were SP 963-1, SY 2008-05-177, SP 963-9, SP 963-5 and CLSoy 1. Top performing genotypes in each region will be tested further in on-farm trails to select the ideal genotypes recommended in each growing environment.

GLYCINE MAX; SOYBEANS; PROGENY; FIELD EXPERIMENTATION; CROP YIELD; GENOTYPE ENVIRONMENT INTERACTION

Allele mining of allele-specific SNP/indel markers of yield related traits in Philippine rice (Oryza sativa L.) landraces. **Badajos, A.T., Enriquez, J.O.S., Caguiat, J.O.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 118-119. (Sep 2019).*

Improvement of rice grain yield is made possible by accumulation of beneficial alleles from plant genetic resources through marker assisted selection. Allele mining is an important molecular approach towards identification of allelic diversity that affects plant phenotype and vital for the introgression of useful alleles for efficient utilization of genetic resources in plant variety development. Two hundred forty Philippine modern and traditional rice genotypes were evaluated to mine yield related genes and their useful alleles for rice grain

number, grain size, 1000-grain weight, spikelet number, tillering, panicle branching, plant height and heading date with the objected to assess presence and diversity of established yield enhancing genes and analyze its effects. Eight reported genes (Gn1a, SCM2, Ghd7, SPIKE, GS5, OsSPL14 and TGW6) associated with rice grain yield were used for PCR amplification. It was found that Gn1a, SPIKE, OsSPL14 and Ghd7 can be used in identifying alleles enhancing grain number, spikelet number, plant height and heading date from a divers genomic resources. Gn1a-indel1 (99 bp) of Gn1a and Ghd7-05snp (201 bp) of Ghd7 associated with grain number, plant height and heading date were the most abundant alleles across the evaluated panel and can be utilized for a more targeted yield improvement strategy of Philippine rice germplasm and development of superior high-yielding rice varieties.

ORYZA SATIVA; GENOTYPES; GENETIC MARKERS; GENES; SELECTION; AGRONOMIC CHARACTERS; GRAIN; YIELDS

Combining ability of selected parent lines for heterosis breeding and development of three-line hybrid rice. **Gramaje, L.V., Luciano, V.P., Corpuz, M.V., Caguiat, J.D., Waing, F.P., Desamero, N.V.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 119. (Sep 2019).*

Combining ability analysis hasten the selection of parents for crossing to generate outstanding hybrids. In this study, two sets of experiments were conducted using four CMS x 15 restorer lines to generate hybrids from new prospected restorer (R) parents, and eight CMS crossed to six usable R-lines using the line x tester mating design. It specifically aimed to (1) quantify the level of heterosis of the generated hybrids, (2) determine the general and specific combining ability of the 33 parents for different yield enhancing traits, (3) determine the yield performance of hybrids and identify best female and male parents. In set 1, top three hybrids namely; TCN-154 (PR29A x PR39908-H006-2-1-3-3-1-3), tCN-1 kg/ha, with yield advantage ranged from 36.6 to 52.85% over NSIC Rc222 inbred check, and 16.59% to 30.39% over M20 as hybrid check. PR29A and G102-3-1-1 was selected as best CMS and restorer based on their testcross and line mean. For set 2, five hybrids namely; CA1181, CA1117, CA1182, CA1053 and CA11175 obtained grain yield ranged from 8.4 t/ha to 13.3 t/ha, and matured from 108 to 113 days. Among the CMS lines, IR68897A obtained the highest tester mean of 9.9 t/ha, and PR34142-5-1-3-2R got the highest line mean of 7.67 height, productive tiller count, and panicle length, filled grains per panicle, total spikelet count, spikelet fertility, and 1000 grain weight. Correlation analysis revealed that GCA effect and per se performance of lines had positive relationship. Furthermore, lines the did not show its high per se performance to all the traits can also be a good combiner.

ORYZA SATIVA; HYBRIDS; HETEROSIS BREEDING; GENOTYPES; AGRONOMIC CHARACTERS; CROP YIELD; COMBINING ABILITY

Comparative field performance of recombinant inbred rice lines with pyramided saline-submergence tolerance under flash-flooding condition. **Sumabat, R.M.A., Concepcion, J.S., Desamero, N.V.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 119-120. (Sep 2019).*

Prevalence of typhoon and sea water intrusion posts a significant effect in rice production especially in coastal rainfed-lowland areas and grain yield under submergence stress and non-lines (RILs) were evaluated for field performance and grain yield under submergence stress and non-stress conditions, established in Randomized Complete Block Design (RCBD) with 2 replicates. Significant genotype by environment (GxE) interaction observed in plant height, flowering, and grain yield. Flowering of breeding lines ranged from 78 to 94 days after sowing (DAS), averaging to 87 DAS, which was significantly delayed by 4 – 21 days due to submergence stress. Nine RILs (29%) flowered earlier by 1 – 3 days compared to IR64-Sub1 (97 DAS) under submergence stress. Grain yield of RILs under favourable condition ranged from 5.949 t/ha to 8.338 t/ha averaging to 7.316 t/ha. All RILs yielded higher than IR64-Sub1 (5.785 t/ha), while 13 RILs (42%) yielded higher than IR64 (7.736 t/ha) by 1% - 16% under favourable condition. Under submergence stress, grain yield was reduced by 16% (1.230 t/ha) to as much as 81% (5.671 t/ha). Four RILs (13%) yielded higher by 8% (0.324 t/ha) to 47% (1.982 t/ha) compared to IR64-Sub1 (4.171 t/ha). Survival of RILs ranged from 26% to 81% averaging to 51% at 21 days after de-submergence. Nine RILs (29%) were identified and selected based on grain yield and agronomic performance. Selected lines are potential nominees to National Cooperative Testing for Submergence and Saline-Prone Ecosystems.

ORYZA SATIVA; INBRED LINES; CROP PERFORMANCE; FIELDS; WATER TOLERANCE; FLOODING; EVALUATION; SELECTION

Comparative transcriptome analysis of papain-lite cystine protease-mediated resistance against Xanthomonas oryzae pv. oryzae in rice. **Nino, M.C., Cho, Y.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 120. (Sep 2019).*

High throughput transcriptome investigations of plant immunity highlight the complexity of gene networks leading to incompatible interaction with the pathogen. Accumulating findings implicate papain-like cysteine proteases (PLCPs) as central hub in plant defence. While diverse roles of PLCPs in different pathosystems have become more evident, information on gene networks and signaling pathways necessary to orchestrate downstream responses in unavailable. To understand the biological significance of cysteine protease against Xanthomonas oryzae pv. oryzae (Xoo), PLCP-overexpression and knockdown transgenic rice were generated. Pathogenicity test revealed the attenuation of Xoo K3a virulence in transgenic lines which is ascribed to high hydrogen peroxide and free salicylic acid accumulation. Next-generation sequencing of RNA from transgenic and wild type plants identified 1,597 combined differentially expressed genes, 1,269 of which were exclusively regulated in the transgenic libraries. It was found that PLCP aids rice to circumvent infection through extensive activation of transduction signal and transcription factors that orchestrate downstream responses including up-regulation of multiply pathogenesis-related proteins and biosynthesis of secondary metabolites.

ORYZA SATIVA; TRANSGENIC PLANTS; NUCLEOTIDE SEQUENCE; RNA; PATHOGENICITY; BLIGHT; XANTHOMONAS

Development and characterization of iron- and zinc-biofortified rice events in NSIC Rc 238 background. **Bueno, G.M.S., Soriano, J.C.V., Tsakirpaloglou, N., Trijatmiko, K.R., Slamet-Loedin, I.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 120. (Sep 2019).*

Iron (Fe) and zinc (Zn) deficiencies are highly prevalent micronutrient deficiencies affecting billions of people worldwide. Fe deficiency is the major cause of anemia while Zn deficiency is the major cause of stunting in children. Rice biofortification is one sustainable approach to help alleviate Fe and Zn deficiencies. In this study, 443 transgenic events in NSIC Rc238 background were generated and screened for single-copy insertion, high Fe and Zn content, and good grain yield. The 6 best-performing single-copy high Fe- and Zn- rice events from 2 constructs containing a gene encoding Fe storage-protein from common bean or apple and a gene encoding enzyme involved in the biosynthesis of Fe and Zn chelator from rice were evaluated under confined test (CT) conditions to select the best event for product development. Based on high Fe and Zn grain levels as well as good agronomic performance shown during CT2017, 3 best-performing events (Rc238-IRS1030-008, Rc238-IRS1030-031 and Rc238-IRS1030-039) were selected and further evaluated in CT2018. These 3 events showed significantly higher Fe and Zn concentrations in polished grains (9-14 ppm Fe and 20-42 ppm Zn) compared to control (2-4 ppm Fe and 15-18 ppm Zn) and having no

significant difference in yield. Further evaluation is currently underway in CT2019 to select the best event for the development of high iron and zinc rice.

ORYZA SATIVA; GENES; BIOSYNTHESIS; IRON; ZINC; FOOD ENRICHMENT; CROP PERFORMANCE; GRAIN; YIELDS

Development of biofortified rice through mutation breeding. **Marfori-Nazarea, C.M., Amparado, A., Inabangan-Asilo, M.A., Angeles, N., Maghirang, E., Tesoro, F.F., Swamy, B.P.M., Reinke, R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 121. (Sep 2019).*

Biofortification of rice with enhanced levels of Zinc (Zn) in its polished form may be a cost-effective and sustainable solution to assist in combating Zn malnutrition. The main purpose of mutation is to induce useful genetic variations in a short period of time and develop varieties with useful agronomic and nutritional traits. In this study, nine popular rice varieties: IR64, IRRI154, BR29, IRRI195, IR07F290. Cihering, IR87707-446-B-B, IRRI123, IRRI156 and two Zn donor lines: Kaliboro and Jamir were subjected to 0.8 and 0.1% Ethyl Methyl Sulfonate (EMS) pre-treatment as a mutagen. Out of 11 populations, a total of 16,298 were transplanted and 1,084 individual M1 plants were harvested. The seedlings from M2 to M4 were advanced under irrigated. Zn-deficient and saline soil conditions. EMS-treated plants showed differences in terms of morphological characteristics among its sister lines in the same population. Selections were carried out from M2 to M5 generation based on the desirable agronomic, yield and yield component traits. The M5 seedlings coming from the stressed and normal condition were transplanted in irrigated plots. Based on the grain Zn content measured using X-ray fluorescence (XRF), lines with high Zn content will be forwarded. M6 will be planted in 2019 WS in replicated trail and grain Zn will be further analyzed. This study aims to incorporate Zn biofortification in rice through mutation breeding.

ORYZA SATIVA; VARIETIES; BREEDING METHODS; INDUCED MUTATION; ZINC; FOOD ENRICHMENT

Development of BioMAGIC population in rice: applications and use in breeding for disease resistance. **Jubay-Baer, M.L., Singh, R.K., Bonifacio, J.R., Borja, F.N.N., Swamy, B.P.M., Leung, H.T.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 121. (Sep 2019).*

Rice is prone to different types of biotic stresses resulting to significant yield losses. Breeding for disease resistance is traditionally done through biparental crosses. However, native trait stacking is difficult to achieve whenever breeders are working for multiple traits. In this study, a Multi-parent Advanced Generation Inter-Cross (BioMAGIC) population with biotic stress resistance was developed using 8 founders that have multiple resistance to insect pests and diseases. The population was subjected for initial screening to blast, rice tungro virus (RTV), brown plant hopper (BPH), green leaf hopper (GLH) and two races of bacterial blight (PXO 61 and PXO 86). Results showed that out of 684 lines, 50% of the lines scored resistant to blast, 76% to different races of BLB such as PXO61, 29% to PXO 86, 28% to GLH, 14% to BPH and 2% to RTV. Fifty two lines with multiple disease resistance were sequenced at 10X depth using Illumina (HiSeq X-Ten). These lines were found to have known genes/QTL for BPH3, BPH17, Xa4, Xa7, xa13, Xa21, Pita and Pi54. For a better understanding of the extent of adaptation of this highly recombined population, 19 genotypes were tested in 3 locations (IRRI, Iloilo and Bukidnon) during 2018WS in the Philippines. Individual and combined analysis of variance revealed significant genotypic effects and genotype and environmental (GxE) interactions for grain yield. Among the lines, IR116262:26-B24-9-10-1 was most stable for grain yield across locations. This line outperformed inbred checks and all the founders and showed resistant reaction of GLH, PXO61, PXO86, blast and has genes/QTLs for Xa4, Xa7 and Pita. In addition to offering disease resistance, BioMAGIC lines will serve as useful donors for varietal development of economically important biotic traits and precisely identifying QTLs for multiple traits.

ORYZA SATIVA; BREEDING METHODS; DISEASE RESISTANCE; GENOTYPE ENVIRONMENT INTERACTION; STRESS

Dissection of epistatic inferaction's for agronomic, grain zinc and iron concentration in a recombinant inbred population of rice (Oryza sativa). **Calayugan, M.I.C., Borromeo, T.H., Hernandez, J.E., Altoveros,N.C., Amparado, A., Inabangan-Asilo, M.A., Swamy, B.P.M.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 122. (Sep 2019).*

Biofortification breeding of rice with good agronomic and high grain zinc (Zn) is one of the sustainable and cost-effective approaches in alleviating Zn malnutrition. Grain Zn is a genetically complex trait and significantly influenced by environmental factors resulting in slow progress in breeding for high Zn rice. Hence, genetic dissection of agronomic and grain Zn can assist in more precise and faster development of high Zn rice variaties. Epistasis makes a substantial contribution to the genetic control of quantitative traits. In this study,

genetic linkage map was constructed based on 458 polymorphic SNP markers in 197 recombinant inbred lines (RILs) derived from a cross between 'IR14M141' and 'Jamir' (AUS type cultivar) to investigate the epistatic interactions for days to flowering (DF), plant height (PH), number of tillers (NT), number of panicles (NP), panicle length (PL), thousand grain weight (TGW), grain length (GL), grain width (GW), grain yield (YLD), grain iron (Fe) and Zn, Epistatic interactions between marker loci was performed for single and multi-environment analyses with stringent threshold LOD of 5.0 using the ICIM-EPI method of ICIM v.4.1 software. The single environment analysis detected 14 significant di-genic interactions: ten in 2017 Dry Season and four in 2017 Wet Season. Three, one, four, two, two, one, and one di-genic interactions were identified for DF, PH, PL, YLD, TGW, GL, GW, and Zn, respectively, whose phenotypic variance explained (PVE) ranged from 9.54 to 31.34% in 2017 DS and from 16.33 to 46.76% in 2017 WS. Moreover, epistatic multi-environment analysis identified 126 di-genic interactions for all traits distributed on all the 12 chromosomes. Each of the interactions individually accounted for 1.85 – 12.22% of the phenotypic variation. These results indicate that epistatic interaction plays an important role in controlling the expression of complex traits. Thus, utilization of marker assisted selection in rice breeding must take epistatic effects into consideration.

ORYZA SATIVA; INBRED LINES; GENE INTERACTION; GRAIN; ZINC; FOOD ENRICHMENT; BREEDING METHODS

Development of work instruction on the multiplication, processing and storage of transgenic materials at the genetic transformation laboratory. **Gonzales, R.S., Trijatmiko, K.R., Slamet-Loedin, I.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 122. (Sep 2019).*

Development of new rice plants through genetic modification is one method being harnessed to combat human micronutrient deficiencies and improve tolerance to abiotic stress. The Genetic Transformation Laboratory (GTL) at IRRI produces new plants with the desired traits through the process of transformation. To ensure that these transformed plants can be thoroughly studied; seed production and maintenance of the viability of the seeds must be done property on the T0 plants. Thus there is a need to develop a work instruction which should comply with both the Biosafety and Stewardship regulations on regulated materials. This Work Instruction (WI) describes the activities to be followed in the management and handling of transgenic materials during multiplication, processing and storage of early seed generations. The GTL lab was awarded the Excellence through Stewardship accreditation last December 2018 because of its successful implementation of this WI as well as the required support procedures.

ORYZA SATIVA; TRANSGENIC PLANTS; GENETIC TRANSFORMATION; SEEDS; SAFETY

DOI [Digital Object Indentifiers]: a new era for germpalsm tracking. **Ferrer, M.C., Duldulao, M.D., Caguiat, X.G.I., Niones, J.M., Sabran, M., Hidayatun, N., Kurniauan, H., Dorji, R., Archak, S., Nzuraini, S., Munkombwe, G., Caneda, A.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 84-85. (Sep 2019).*

Genebank collections around the world hold the raw genetic materials needed to breed new and better plant type to feed the growing population. Many holders of these plant genetic resources have their own documentation and management system, however, there are no standardized or shaved method for assigning unique identifiers relative to the accessions. The Digital Object Identifiers (DOIs) has been implemented as agreed method for the assignation of global identifiers to standardize the method of providing accessions’ permanent unique identifiers. The use of DOI allows the materials to be tracked as these genetic resources are being shared, duplicated, and used among institutions. Through DOI, the impact of genebank collections in utilization in research and breeding programs are monitored including its conformance to the legal obligations stated in the SMTA. Recently, a multi-country construction of a test platform for the development and allocation of unique identifiers of rice germplasm was implemented in Asia. This initiative was organized by the Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development (ICABIOGRAD), in collaboration with the secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the International Rice Research Institute (IRRI), in participation of genebank curators from Bhutan, India, Indonesia, Malaysia, Philippines, and Zambia. Currently, PhilRice selected accessions have been assigned DOI and its database was updated and adjusted in synchronization with Global Information System (GLIS) on PGRFA. This innovative technology is of great importance to expand the toolbox for easy access of germplasm and germplasm-related information to enhance utilization.

ORYZA SATIVA; RICE; GENETIC RESOURCES; GERMPLASM; INFORMATION SYSTEMS

Estimation of rice blast resistance genes in weedy rice based on a standard differential system. **Niones, J.T., Martin, E., Manangkil, J.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 123. (Sep 2019).*

In many rice –growing countries, including the Philippines, weedy rice is being considered as treat to rice production as they compete with the cultivated rice resulting to yield reduction and other production losses. On the other hand, some weedy rice biotypes exhibited resistance against rice diseases, thus make them potential source of disease resistance genes. In this study, we examined the genetic variation in rice blast resistance among selected weedy rice biotypes by using the standard blast differential system consisting of the standard blast isolates and differential varieties. The presence of known rice blast major R genes among weedy rices was also evaluated using DNA markers. Fifteen weedy rice accessions showed resistance against 12 standard differential rice blast isolates. Using R-gene locus specific DNA markers, Pi2/9/zt, Pii, Pia and Pik alleles were detected in 12 weedy rice biotypes. Weedy rice biotype Suk 2-5, showed resistance against 12 differential blast isolates and harboured Pi2/Pi9/zt genes. Pi2 Pi9 and Pi-zt alleles are known for broad spectrum resistance to most blast races. These weedy rice accessions are useful genetic resources for improving blast resistance in rice. Genetic analysis of resistance will be conducted to examine the basis of weedy rices’ broad spectrum resistance against rice blast.

ORYZA SATIVA; BLIGHT; GENETIC RESOURCES; DISEASE RESISTANCE; GENES; GENETIC RESOURCES; GENETIC VARIATION; BIOTYPES; GENETIC MARKERS

Evaluation of diversity of plant genetic resources grown in Myanmar home garden: distribution and utilization of Hibiscus genus plant 'chinbao'. **Nagashima, M., Irie, K., Yoshida, S., Kikuno, H., Saw, O.M., Soe, T.T., Watanabe, K.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 104-111. (Jun 2019).*

The main objective of the survey was to collect accessions of Chinbao (Generic name of five species in the genus Hibiscusthat used as vegetables in Myanmar) (Nagashima et al., 2016) and clarified current status of those in Myanmar. From 2014 to 2018, a total of 342 samples were collected in Myanmar, including 244 Hibiscus sabdariffa samples, 58 samples of Hibiscus cannabinus, 30 samples of Hibiscus radiatus, 8 samples of Hibiscus acetosella and 2 samples of Hibiscus surattensis. In Myanmar, H. sabdariffa is the most dominant among the five species. Next, the frequency of appearance was higher in order of H. cannabinus, H. radiatus, H. acetosella, H. surattensis. The frequency of appearance of H. cannabinus was distinctly different between the peninsula and the centraldry area. Clear differences in utilization of H. radiatus and H. acetosella between the northern west mountainous area (Chinstate) to other area were noted.

HIBISCUS; VEGETABLES; GENETIC RESOURCES; BIODIVERSITY; EVALUATION; ETHNOBOTANY; NOMENCLATURE; MYANMAR

Field performance and adaptability of newly released varieties under PhilRice [Philippine Rice Research Inst.] Philippines. **Parina, C.J.E., Sevilla, C.U.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 91. (Sep 2019).*

Philippine Rice Research Institute (PhilRice), is one of the institutions that helps to develop high-yielding rice varieties and every year it releases new variety that would help farmers to produce enough rice for consumption. PhilRice Negros conducted a varietal demonstration trial to determine which among the newly-released varieties will be adapted by farmers in Negros. PhilRice Negros belongs to the soil series Guimbalaon which needs organic matter incorporation to be suitable for rice production. Pests and diseases such as yellow stemborer, rice black bug, rice bug, tungro, rice blast and bacterial leaf blight are some of the limiting factors that could negatively affect the yield performance of the varieties. The yield performance and pest reactions of newly released varieties were evaluated and best performing varieties were selected for recommendations. In addition, Farmers' preference was also measured based on the crop stand in the field during Station's Lakbay Palay. Among the 12 varieties evaluated, NSIC Rc354 obtained the highest yield for 2019DS followed by NSIC Rc360 and NSIC Rc442 with a mean yield of 6.42,5.88 and 5.78 t/ha, respectively. In addition, NSIC Rc360, 354 and 400 were the preferred rice varieties by the farmers based on the phenotypic characteristics of the variety. Thus, topped varieties will be recommended to Business and Development Unit in the station for seed production so that it will be available to the farmers.

ORYZA SATIVA; VARIETIES; DISEASE RESISTANCE; PEST RESISTANCE; FIELDS; CROP PERFORMANCE; YIELD INCREASES; CROP YIELD; EVALUATION; EXPERIMENTATION

Guidebook on participatory varietal selection of white corn as grits for food. **Manguiat, P.H., Labios, J.D., Labios, R.V., Malayang, D.B.N.** *College, Laguna (Philippines). TR-1912. 2018. 74 pages.*

ZEA MAYS; MAIZE; VARIETIES; SELECTION; FOOD CONSUMPTION; PLANT PRODUCTION

Intra-specific genetic diversity in water yam (Dioscorea alata L.) accessions collected from Myanmar, Papua New Guinea and Japan. **Olu-Olusegun, F., Babil, P., Kikuno, H., Irie, K., Toyohara, H., Shiwachi, H.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 107-117. (Jun 2018).*

Understanding germplasm diversity is valuable in improving underutilized water yam (Dioscorea alata L.) diversity. In this study, we investigated intra-specific genetic diversity based on morphological traits, SSR polymorphisms and ploidy levels in water yam accessions collected from Myanmar, Papua New Guinea (PNG)and Japan. The results of agro-morphological analysis showed that the distance between leaf lobes, petiole color, and wrinkles on the tuber surface strongly contributed to grouping. Furthermore, SSR polymorphisms were observed in all 12 microsatellite loci analyzed, revealing a mean polymorphic information content of 0.63, with total of 58 alleles detected. Analysis of molecular variance indicated 98% variation within populations and 2% among populations. Meanwhile, ploidy analysis revealed three ploidy levels:29 diploids (2n = 40), 8 triploids (2n = 60) and 4 tetraploids (2n = 80). Notably, only diploids were observed among accessions from Japan. In all three levels of analysis, no association with geographical origin was observed. Moreover, intra-specific diversity from each origin was relatively close, except during ploidy analysis. These findings suggest, for the first time, that accessions from Japan are as diverse as those from Myanmar and PNG.

DIOSCOREA ALATA; GENETIC VARIATION; AGRONOMIC CHARACTERS; GENETIC MARKERS; GENETIC POLYMORPHISM; MYANMAR; PAPUA NEW GUINEA; JAPAN

Meta-comparison of associated agronomic traits and QTLs with high-temperature tolerance in rice (Oryza sativa L.). **Manigbas, N.L., Grospe, J.L., Madrid, L.B.** *Philippine Agricultural Scientist (Philippines). Formerly The Philippine Agriculturist. 0031-4454. v. 101(1) p. 7-19. (Mar 2018).*

To identify associated agronomic traits and quantitative trait loci (QTLs) with high-temperature tolerance in rice (Oryza sativa L.), three backcross inbred populations (BC2F4) of NSIC Rc150/Dular, Gayabyeo/Nagina22 and Gayabyeo/Dular were screened during the 2014 dry season. Analysis of microclimate conditions of near canopy such as temperature, relative humidity, and dew point temperature using Micrometeorological Instrument for Near Canopy Environment of Rice (MINCER) confirmed the presence of high-temperature stress during heading and maturity stages. MINCER data showed high temperatures (37.04 +- 0.14 degrees C), accompanied by dry to high humidity (89.0-35.03 +- 1.82%) condition. Pearson correlation and multiple linear regression analysis were used to evaluate phenotypic traits associated with fertility. Dehiscent high-temperature was correlated with spikelet fertility in NSIC Rc150/Dular and Gayabyeo/Nagina22. Number of spikelets showed significant correlation with fertility in the cross between Gayabyeo/Nagina22 and Gayabyeo/Dular. The variability explained by the associated traits to the high-temperature tolerance in NSIC Rc150/Dular was 56%, which was higher than the variability (54.0%) in Gayabyeo/Dular populations. The lowest variability (40.0%) explained by the associated

traits was observed in Gayabyeo/Nagina22. In a previous study, QTLs were identified on chromosomes 1, 3, 4, 5 and 10 (Grospe et al. 2016). The present study further identified QTLs in different mapping populations using the inclusive composite interval mapping (ICIM) method with IciMapping 4.0 software. Four major QTLs, which were associated with high-temperature tolerance in the new mapping population of Gayabyeo/Dular, were identified, namely, qHTfert3 (17.5%), qHTtof10.1 (14.1%), qHTtof10.2 (15.2%) and qHTspk4 (15.35%). Rice Genome Browser was used to identify the neighboring and coincided genes with the identified QTLs. The co-located/coincided/co-located genes in NSIC Rc150/Dular were qHfert1 (RM9) - LOC_Os01g41200, qHTfert3 (RM16238) - LOC_Os03g64190, qHTfert4 (RM348) - in LOC_Os04g54890, qHTtof10 (RM25213) - LOC_Os10g18740, qHTdht3 (RM16238) - LOC_Os03g64190, qHTdht3 (RM3586) - LOC_Os03g63950, qHTdht4 (RM16742) - LOC_Os04g28100, qHTdht5 (RM480) - LOC_Os05g47660, qHTdht10 (RM25213) - LOC_Os10g18740, qHThd3 (RM16102) - LOC_Os03g59480, and qHThd3 (RM16238) - LOC_Os03g64190. The co-located/coincided/co-located genes in Gayabyeo/Dular were qHTtof10.1 (RM4455) - LOC_Os10g22510 and qHTspk4 (RM17486) - LOC_Os04g52300. This study inferred that QTLs for high-temperature tolerance are cross specific, hence QTLs varied depending on parental combination. Moreover, these can be used in fine mapping of novel genes and rice breeding in marker-assisted selection (MAS) for high-temperature tolerance in rice.

ORYZA SATIVA; GENES; LOCI; GENETIC MAPS; GENETIC MARKERS; SELECTION; AGRONOMIC CHARACTERS; TEMPERATURE; HEAT TOLERANCE; BREEDING METHODS

Plant genetic resources data management, analysis and information generation at the National Plant Germplasm Repository. **Huelgas, V. C., Borromeo, T.H., Altoveros, N.C., Gueco, L.S., Descalsota, J.C., Aguilar, C.H.M., Gentallan, R.P.Jr., Bon, S.G., Damasco, O.P., Endonela, L.E., De Chavez, H.DR.** *College, Laguna (Philippines). TR-1858. 2017. 50 leaves.*

PLANT GENETIC RESOURCES; DATA PROCESSING; DATA ANALYSIS; INFORMATION MANAGEMENT; INFORMATION PROCESSING; INFORMATION SYSTEMS; GERMPLASM; INFORMATION STORAGE

Reactions of rice varieties to major diseases under Bicol [Philippines] condition. **Guarin, K.M.B., Rillon, J.P., Broceros, R.C., Mananghil, O.E., Padolina, T.F., Orbon, C.A.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 106-107. (Sep 2019).*

Planting of resistant variety is one of the primary strategies when dealing with diseases of rice. Every year, new breed of rice undergo several controlled trials throughout the country to ensure their resistances and adaptabilities. However, results from such trials alone may not directly reflect the performances of the varieties once released to local farmers' field since environmental conditions and farming techniques vary from one place to another. Thus, a varietal evaluation was conducted to determine the reactions of existing and newly released varieties to prevailing disease pressures under Bicol [Philippines] conditions. During 2018 wet season, 24 rice varieties were established in 8 trial sites of Bicol Region. Results revealed that four varieties (NSIC Rc 430, Rc 480, Rc 472 and Rc 474) were resistant to bacterial leaf blight, 11 varieties (NSIC Rc 440, Rc 354, Rc 216, Rc 238, Rc 438, Rc 226, Rc 442, Rc 476, Rc 472, Rc 434, Rc 474) resistant to sheath blight, and 13 varieties (NSIC Rc 440, Rc 226, Rc 436, Rc 238, Rc 216, Rc 442, Rc 354, Rc 408, Rc 368, Rc 250, Rc 380, Rc 480 and Rc 478) resistant to tungro. These varieties showed resistances towards major disease pressures indicating suitability for cultivation under Bicol conditions.

ORYZA SATIVA; VARIETIES; SELECTION; EXPERIMENTATION; BLIGHT; TUNGRO DISEASE; PHILIPPINES

Restoring crop diversity at the National Germplasm Repository: Project 7: documentation and data management and web-based publication of the National Plant Genetic Resources Repository Non-confidential Data and On-line Access to the Genetic Resources. **Huelgas, V.C.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1852. 2017. 90 leaves.*

The report of the project focused on the results of the three main activities: Activity 1 – System documentation of PHLGRIS, the NPGRL genetic resources data and information management system, Activity 2 – Data collection an uploading and maintenance of the PHLGRIS, and Activity 3 – Publication of the NPGRL non-confidential data and public access to the genetic resources held the national repository through internet. The NPGRL multi-crop data and information system (PHLGIS) description and user manual was written in English. It consisted of fourteen chapters which describes all of the procedural steps, supported by screen shots, in browsing or accessing the data up to printing of query results. Search function is provided in the form to permit specific selection of accessions and traits. The selection can be migrated to MS Excl or can be directly printed. Requests for certain accessions are allowed and are subject for approval of the NPGRL material transfer agreement (MTA) and/or standard material transfer agreement (SMTA) which can be downloaded from the system. The different characterization descriptors and states of various crops such as legumes, vegetables, cereals, feed and industrial crops, medicinal plants, fruits (tree fruit, small fruits), tree nuts, and in-vitro culture were accommodated in

the system different characterization data tables and dorms were prepared for different crops as their data varied. The characterization data pages were that of 46 crops (cereals, vegetables leagues, fruits, root crops, tree nuts, medicinal plants including those conserved in vitro). There were 26-99 attributes for every crop. A total of 23, 46 entries visible in 225 forms and called from 56 tables are in the system. These are accessible through passport, characterization, regeneration, viability, moisture content, documentation and distribution functionalities of PHLGRIS. A total of 1442 photographs of various accessions of 15 different crops that belong to 4 crop groups were taken wherein 924 were refined for hyperlinking to specified accession I the database system that was constructed. Two trainings were conducted on the use of PHLGRIS for the NPGRL curators and staff and the users (breeders, pathologists, geneticists, entomologists, physiologists, tissue culturist). The overall result of the training based on the evaluation of the curators and participants was rated very satisfactory in terms of its user interface and functionalities, and the form pages of the system were rated from the satisfactory to very satisfactory by the majority. NPGRL has already passed the system unto the UPLB ITC for uploading of the system into the internet under the domain of the UPLB [University of the Philippines Los Baños] website. However, there were incompatibilities with the UPLB internet system that PHGRIS needs reconstruction to suit the it. The former staff of the project who is now a regular staff of the genebank is the one on charge of the changes. Thus, the system, at the moment is accessible through the local network.

CROPS; GERMPLASM; PLANT GENETIC RESOURCES; GENETIC RESOURCES; DATA PROCESSING; INFORMATION STORAGE; DATABASES; INFORMATION SYSTEMS

Understanding flowering behavior, pollen density and dispersal of parent lines of Mestiso 73 in radiation to hybrid rice seed production. **Ferriol, A.G.S., Brena, S.R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 113. (Sep 2019).*

For hybrid rice seed production to succeed, a sufficient number of pollen grains must be deposited on the stigma lobes of each spikelet of the seed (male sterile) parent. Thus, poor dehiscence of pollens from anthers causes a decreased yield of grain crops. Pollen dispersal during flowering period is one of the most important factors for outcrossing. The study was conducted to determine pollen density, dispersal and flowering pattern for enhanced flowering synchrony and outcrossing between parental lines in the production of hybrid rice seeds. The experiment was conducted in 2018 wet season in PhilRice CES, Maligaya, Science City of Muñoz [Philippines] in a randomized complete block in split-plot design with three replications using six row ratios of female and male: 2:8, 2:10, 2:12, 3:8, 3:10, 3:12. Wooden

laths were installed at 95cm, 85cm and 75cm relative to the height of S-line plant. Glass slides with petroleum jelly were placed in the wooden laths for pollen collection from 9am, 10am and 11am. For each collection peroid, the number of pollen grains was highest in the upper portion of the panicle (95 cm) and least in the lowest portion (75cm) of the panicle. Comparison of means of the number of pollen collected in glass slide shows that the average number of pollen dispersed was significantly higher in rows of sterile plants near the pollen parents. Duration of anthesis per panicle was observed longer in pollen parents (7 to 10 days) than male-sterile parents (6 to 9 days). Among treatments, highest pollen density was observed from 10AM in 3:8 row ratio (8793), followed by 3:10 (7,987), 2:10 (7,804), 2:8 (6,353), 2:12 (4736), and lastly in 3:12 (4529). Pollen traveled 120 cm away from the pollen source in 2:12 (800) and 3:12 (900) row ratios. In relation to hybrid seed production, planting lesser density of S-line rows allows more pollen grains of P-line to travel easily to the stigma and fertilize the lobes of seed parent, resulting in high percentage seed set. Thus, supplemental pollination should be done as soon as flower opening is observed in the S-lines (9am) until the time of peak dehiscence of pollen grains of P-line (10-11am) to increase out-crossing rate.

ORYZA SATIVA; HYBRIDS; SEED PRODUCTION; FLOWERING; POLLEN; POLLINATION

Understanding Philippine flora: the man [Dr. Grecebio Jonathan D. Alejandro] behind the barcoding of endemic species. **Taculao, P.B.S.** *Agriculture (Philippines). 0118-857-7. v. 24 (3) p. 56-57. (Mar 2020).*

FLORA; CLASSIFICATION; TAXONOMY; DNA; NUCLEOTIDE SEQUENCE; BIODIVERSITY; PHYLOGENY; DRUG PLANTS; PHILIPPINES; ORNAMENTAL PLANTS

F40 - Plant ecology

Invasive alien plant species (IAPS) of Malagos watershed in Calinan, Davao City and Mt. Musuan, Bukidnon (Philippines). **Abas, C.G.S., Alviola, G.L., Dy, E.J.D.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 99-110. (Jan-Dec 2016).*

This study compared the species richness and diversity of Invasive Alien Plant Species (IAPS) between Malagos Watershed, Calinan, Davao City, a landscape watershed near an urban area and Mt. Musuan, Bukidnon [Philippines], a lower montane ecological research site. Whittaker plots were used in sampling. Identified IAPS in Malagos Watershed, were Sphaerostephanos sp., Elephantopus scaber Linn., Colocasia esculenta (L.) Nakai, and Asystasia gangetica CV. Present in both sites were Piper aduncum L., Gmelina arborea Roxb, Spathodea campanulata Beauv., and Chromolaena odorata (L.) King. Also encountered in

the Mt. Musuan plots were Acacia mangium Willd., Flagellaria indica L., Lantana camara L., Leucaena leucocephala, Lygodium japonicum, Mikania micrantha, Salvinia molesta, and Swietenia macrophylla. The IAPS in Malagos Watershed obtained a Simpson index of D-1 = 0.5110; evenness of 0.4502; biodiversity index of H = 0.946. Mt. Musuan obtained D-1 = 0.80317; evenness of 0.74727; H = 2.48491.

PLANTS; SPECIES; IDENTIFICATION; BIODIVERSITY; WATERSHEDS; BOTANICAL COMPOSITION; PHILIPPINES

F60 - Plant physiology and biochemistry

Ecotypes and hypericin content of Hypericum pulogense Merrill. **Cardenas, L.B., Cajano, M.A.O.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 111-118. (Jan-Dec 2016).*

Hypericum pulogense Merr. was first described by Merrill and Merritt in 1910. A number of the over 400 species of Hypericum have long been known for their curative properties worldwide; hence, the interest in this indigenous species. In the tropics, the genus thrives in higher elevation of low temperature. Mount Pulag where it grows presents distinct vegetation zones. In the mossy forest and grassland zones, three ecotypes were encountered within a 3-km trail of 300-m gradation in elevation. As expected, there was pronounced variation in both plant size and habit among these ecotypes. Anatomical observation showed the presence of translucent ducts in their leaves. However, the red colored hypericin was absent in these ducts. This was confirmed by thin layer chromatography of the plant extracts. Hypericin is considered the plant constituent responsible for the antidepressant activity of the commercially valued St. John's wort, Hypericum perforatum L. Other constituents of H. perforatum with reported biological activities are phloroglucinol derivatives and essential oil components. The observed H. pulogense emitted the characteristic odor that may be due to these constituents. This study presents the first report on the potential medicinal property of the local representative of the genus Hypericum.

HYPERICUM; SPECIES; DRUG PLANTS; INDIGENOUS ORGANISMS; ECOTYPES; PLANT EXTRACTS; THIN LAYER CHROMATOGRAPHY; MEDICINAL PROPERTIES

F61 - Plant physiology - nutrition

Response of promising rice CSSL IAS66 and its parents under different nitrogen levels. **Hanh, N.H., Cuong, P.V., Hanh, T.T., Hoan, N.V.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 1-10. (Jun 2019).*

Pot experiments were conducted on rice to estimate the relationship among dry weight, translocation of non-structural carbohydrates (NSC), and grain yield in IAS66, a chromosome segment substitution line (CSSL) derived from a cross between the indica cultivar IR24 and the japonica cultivar Asominori, in comparison with its parental cultivars (IR24 and Asominori) under non-nitrogen (N0), normal nitrogen (N1), and high nitrogen (N2) conditions in the spring season 2017 in a greenhouse at the Faculty of Agronomy, Vietnam National University of Agriculture, Vietnam. Increasing the nitrogen level increased the photosynthetic rate in terms of the CO2 exchange rate (CER) and leaf area, which lead to both greater dry weight and NSC transportation from culms and leaves sheaths (stem) to panicles in all genotypes. However, the rate of increase in dry weight and NSC in the panicles at the maturing stage observed in IAS66 was higher than that in its parental cultivars. As nitrogen increased from the N1 to N2 levels, the grain yield significantly increased because the number of panicles per plant increased, but the other yield components including the number of spikelets per panicle, grain-filling, and 1000-grain weight were not significantly different. Grain yield of IAS66 was 11.4% higher than that of the recurrent parent IR24 at the same high nitrogen levels and the rate of grain yield increase in IAS66 was significant higher than that of its parental cultivars.

ORYZA SATIVA; VARIETIES; NUTRIENT TRANSPORT; GRAIN; YIELDS; NITROGEN; NUTRIENT UPTAKE; APPLICATION RATES

F62 - Plant physiology - growth and development

Fruit growth, endocarp lignificantion, and boron and calcium concentrations in Nam Hom (aromatic) coconut during fruit development. **Nikhontha, K., Krisanapook, K., Insabai, W.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 21-31. (Jun 2019).*

Fruit growth, endocarp lignification, and boron and calcium concentrations in 'Nam Hom' coconut during fruit development were studied. This study was conducted at Ban Paew district, Samut Sakhon [Thailand] province between January 2014 -September 2015. Whole fruit shape during the first 4 months (mo) after flowering was oval and turned to semi-oval at 8 mo. The shell was a round shape from 5 mo onwards. The endocarp (shell) started to accumulate lignin 2 mo after flowering but accumulation was highest and constant over the

4-8 mo period. Lignin accumulation started from the stylar end and progressed to the stem end. It was completed in the shell by 6 mo. This stage was accompanied by a decrease in water content. The concentrations of cellulose and hemicelluloses in the coconut shell increased rapidly from 2 to 6 mo then remained constant. The amount of fiber in the coconut husk increased with fruit age and was highest at the final harvest. Coconut husk had greater concentrations of both calcium and boron than occurred in the shell. Calcium concentration in the coconut husk decreased only slightly throughout fruit development while calcium concentration in the coconut shell decreased markedly with age. Boron concentration in the coconut husk decreased with fruit age whereas the highest concentration in the shell occurred at 4 mo and then subsequently decreased. These data indicated that the possible role of boron and calcium are likely to be necessary for shell formation and endocarp lignifications of coconut.

COCOS NUCIFERA; FRUITS; GROWTH; PERICARP; LIGNIFICATION; BORON; CALCIUM

Growth and flowering of cut chrysanthemum as affected by source and time of light-emitting diodes. **Cho, K.C., Jeong, D.U., Byeon, J.Y., Gu, M., Han, T.H., Koh, G.C., Hwang, I.T., Ki, G.Y., Kim, H.K., Kim, B.S., Jung, S.K., Choi, H.S.** *Philippine Agricultural Scientist (Philippines). Formerly The Philippine Agriculturist. 0031-4454. v. 101(1) p. 28-35. (Mar 2018).*

The study examined the effects of light sources and light time on the growth and flowering responses of cut 'Baekma' and 'Jinba' chrysanthemum [Dendranthema grandiflorum (Ramat.) Kitamura] under in vitro and greenhouse conditions in South Korea. In vitro shoot explants were treated with light-emitting diodes (LEDs) sources with white, red (660 nm), blue (450 nm), and red-blue for 5 wk. In a greenhouse experiment, 4-h supplemental lighting was provided with incandescent bulb, red LEDs, or white LEDs staining at 20:00, 22:00, 00:00, or 02:00 h, with 12 h of day length, for 8 wk in 'Baekma' and for 7 wk in 'Jinba', depending on their typical weeks to flowering. In vitro red LED treatments extended stems of 'Baekma' (2.9 cm) and 'Jinba' (3.7 cm) adventitious shoots. In the greenhouse, growth and flowering of 'Jinba' were little influenced by source and time of light. Total fresh weight (FW) and chlorophyll content of 'Baekma' flowers were high under white LEDs at 22:00 h in the greenhouse, resulting in successfully delayed flowering and enlarged flower size.

CHRYSANTHEMUM; GROWTH; FLOWERING; CUT FLOWERS; LIGHT REGIMES; TIME; LIGHT REQUIREMENTS

Phenology and floral biology of roseleaf raspberry (Rubus rosifolius Sm.) under medium and low elevation condition. **Kitma, S.J.E., Protacio, C.M.** *Philippine Agricultural Scientist*

(Philippines). Formerly The Philippine Agriculturist. 0031-4454. v. 101(1) p. 36-44. (Mar 2018).

Roseleaf raspberry (Rubus rosifolius Sm.), a thorny weed in the highlands of Quezon province, Philippines, has shown potential in the food industry. Analysis of the phytochemical content of its fruit revealed promising medicinal properties. However, attempts to produce fruits at low elevation have failed, while the specific influence of agrometeorological conditions in lower altitudes is yet to be studied. We investigated the phenological characteristics of roseleaf raspberry plants at different elevations: in their native setting at 774 m above sea level (masl) and at low elevation (31 masl). Plants started producing flowers at the end of October and became more profuse in the later months. An observed critical feature of individual roseleaf raspberry flowers across elevations was poor overlap of anther dehiscence and stigma receptivity. Fruit set failure and flower abortion were abnormalities found to cause low fruit production as well as poor fruit quality among plants at low elevation. Excessive heat accumulation in flowers and insufficient carbohydrate supply in the shoot apices are possible causes of these abnormalities.

RUBUS; SPECIES; RASPBERRIES; PHENOLOGY; ACQUIRED CHARACTERS; FLOWERS; FLOWERING; ALTITUDE; SITE FACTORS; FRUITING

Relationship between fertilizer level and SPAD leaf chlorophyll reading of Robusta coffee (Coffea canephora Pierre) clonal seedling. **Rosas, A.L.L., Salazar, B.M.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 108. (Sep 2019).*

A study was conducted at the Institute of Crop Science, College of Agriculture and Food Science, University of the Philippines Los Baños from February to May 2018 to determine the applicability of SPAD-502 Plus chlorophyll meter as a tool to aid in nitrogen (N) fertilizer management of Robusta coffee (Coffea canephora Pierre) clonal seedlings. Conventional fertilizer (CF) of FertiGroe R nanofertilizer (NF) was used as N and P nutrient sources to meet the coffee seedling nitrogen requirement of 3.05 g N and 18.40 P. Without fertilization or by using 50% RR of NF (NF50), Robusta seedlings grown under 60% shade produced a leaf pair in 24 d, in contrast to the reported duration of 30 d. This was further shortened to 18 d when CF50 was applied. While there was no substantial difference on the effect of CF and NF in SPAD reading, the leaf development stage of the newly emerging leaf was found to be linearly correlated to the SPAD reading of the youngest fully expanded leaf. Increasing SPAD value were observed with increasing N levels up to full RR of CR and NF. Finally, the study came up with empirical equation which can be used as a guide in N

fertilizer management of coffee clorial seedlings: Y = 44.88 + 0.14X for CF, and Y = 43.41 + 0.14X for NF, where Y is the SPAD reading and X is the N fertilizer level.

COFFEA CANEPHORA; NITROGEN FERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; LEAVES; CHLOROPHYLLS

Understanding flowering behavior, pollen density and dispersal of parent lines of Mestiso 73 in radiation to hybrid rice seed production. **Ferriol, A.G.S., Brena, S.R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 113. (Sep 2019).*

For hybrid rice seed production to succeed, a sufficient number of pollen grains must be deposited on the stigma lobes of each spikelet of the seed (male sterile) parent. Thus, poor dehiscence of pollens from anthers causes a decreased yield of grain crops. Pollen dispersal during flowering period is one of the most important factors for outcrossing. The study was conducted to determine pollen density, dispersal and flowering pattern for enhanced flowering synchrony and outcrossing between parental lines in the production of hybrid rice seeds. The experiment was conducted in 2018 wet season in PhilRice CES, Maligaya, Science City of Muñoz [Philippines] in a randomized complete block in split-plot design with three replications using six row ratios of female and male: 2:8, 2:10, 2:12, 3:8, 3:10, 3:12. Wooden laths were installed at 95cm, 85cm and 75cm relative to the height of S-line plant. Glass slides with petroleum jelly were placed in the wooden laths for pollen collection from 9am, 10am and 11am. For each collection peroid, the number of pollen grains was highest in the upper portion of the panicle (95 cm) and least in the lowest portion (75cm) of the panicle. Comparison of means of the number of pollen collected in glass slide shows that the average number of pollen dispersed was significantly higher in rows of sterile plants near the pollen parents. Duration of anthesis per panicle was observed longer in pollen parents (7 to 10 days) than male-sterile parents (6 to 9 days). Among treatments, highest pollen density was observed from 10AM in 3:8 row ratio (8793), followed by 3:10 (7,987), 2:10 (7,804), 2:8 (6,353), 2:12 (4736), and lastly in 3:12 (4529). Pollen traveled 120 cm away from the pollen source in 2:12 (800) and 3:12 (900) row ratios. In relation to hybrid seed production, planting lesser density of S-line rows allows more pollen grains of P-line to travel easily to the stigma and fertilize the lobes of seed parent, resulting in high percentage seed set. Thus, supplemental pollination should be done as soon as flower opening is observed in the S-lines (9am) until the time of peak dehiscence of pollen grains of P-line (10-11am) to increase out-crossing rate.

ORYZA SATIVA; HYBRIDS; SEED PRODUCTION; FLOWERING; POLLEN; POLLINATION

F63 - Plant physiology - reproduction

Seed production of open pollinated vegetable varieties for home gardens and quick disaster-response. **Maghirang, R.G.** *College, Laguna (Philippines). TR-1751. 2016. 29 leaves.*

VEGETABLES; VARIETIES; OPEN POLLINATION; SEED PRODUCTION; DEFENCE MECHANISMS; CLIMATIC CHANGE; DOMESTIC GARDENS

F70 - Plant taxonomy and geography

Checklist of the orders and families of medicinal plants in the Philippines. **Carag, H.M., Buot, I.E.Jr.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 27(1) p. 79-83. (Jan-Dec 2017).*

A checklist of the orders and families of Philippine medicinal plants is prepared to provide an up-to-date reference for students, teachers, and researchers alike. The accepted names, families, and orders in this checklist follow the recent classification of angiosperms largely based on DNA sequence data by the Angiosperm Phylogeny Group (APG). Available and comprehensive references on Philippine medicinal plants were used to come up with the checklist. These were complemented and updated by online resources retrieved from search engines like Google Scholar and Science Direct. The authors likewise included an alphabetical listing of older and conserved family names. Results indicated a total of 48 orders out of the world total of 64 (75%) and 182 families of the world's 416 (44%) which were classified according to the APG groupings (Magnoliids, Asterids Commelinids, Fabids, Malvids, Lamiids, and Campanulids) and further organized into subclasses and classes of the presently used Cronquist system (Magnoliidae, Liliidae, Commelinidae, Rosidae, and Asteridae) for convenience and practical use. Moreover, the list recorded 1008 medicinal plant species and the common diseases each species is utilized for. The checklist does not only prove the rich medicinal flora of the Philippines but as well as the extensive knowledge of the local 'herbolarios'. Thus, its proper documentation and promotion are imperative to maximize its potential in contributing to the country’s health sector.

DRUG PLANTS; ANGIOSPERMS; CLASSIFICATION; TAXONOMY; PHYLOGENY; PHILIPPINES

Plant diversity of the Las Pinas-Parañaque critical habitat and ecotourism area, Metro Manila, Philippines (research note). **Alba, N.A., Recto, E.M., Combalicer, A.A.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 27(1) p. 111-131. (Jan-Dec 2017).*

This study was conducted to highlight the diversity of true, associated, and beach type mangrove and other tree species in the Las Pinas-Paranaque Critical Habitat and Ecotourism Area (LPPCHEA). Information on the distribution and abundance of mangrove and other tree species present in the area is a requisite for its sustainable management. Sampling of mangrove and other tree species was conducted from September to December 2008. A total of 75 plots were randomly established in Long Island (48 plots) and Freedom Island (27 plots). Transect line plot technique was used to assess the tree species. Tree parameters were analyzed through the use of environmental indicators such as relative density, Shannon Diversity Index, and Shannon Equitability Index. A total of 8 true and associated mangrove species and 3 beach type species were identified within the critical habitat. These included Avicennia marina (Forsk.) Vierh, Lumnitzera racemosa Wild. 1803, Sonneratia alba J. Smith, Rhizophora spp., Bruguiera sexangula (Lour.) Poiret 1816, Thespesia populnea (L.) Sol. Ex Correa, Morinda citrifolia L., Excoecaria agallocha Linn. 1759, Acacia farnesiana (L.) Willd, Premna odorata Blanco, and Terminalia catappa L. for beach type species. In terms of density A. marina and Rhizophora spp. had the highest relative density for mature true and associated mangrove and beach type species (58.25% and 18.85%, respectively), while seedlings of A. marina were the highest at LPPCHEA (95.13%), followed by L. racemosaa (1.20%). In the case of saplings, Leucaena leucocephala (Lam.) de Wit had the highest in number at Freedom Island, while A. marina saplings occupied the highest density at Long Island. The computed Shannon Diversity Index H for mature true and associated mangrove and beach type mangrove and other forest tree species was found at 0.602, 0.126 for seedlings, and 0.790 for saplings. Thus, mature forest trees and saplings found in LPPCHEA had more diverse distribution than seedlings. However, in the case of species EH is observed below 0.5. This is true in mature, seedlings, and saplings of true, associated, and beach type mangrove species and other forest tree species. Their values were computed on 0.195, 0.044, and 0.264, respectively.

MANGROVES; TREES; SPECIES; BIODIVERSITY; GEOGRAPHICAL DISTRIBUTION; PHILIPPINES

H - PLANT PROTECTION

H10 - Pests and plants

Additional contributions to the knowledge of predatory mites of the family cunaxidae (Acari:Prostigmata). **Corpuz-Raros, L.A., Naredo, J.C.B., Garcia, R.C.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 158. (Oct 2018).*

Five new species of predatory mites belonging to the subfamilies Coleoscrinae and Cunasinae (family Cunaxidae) are described from the Philippines, namely, Neobonzia l, n. sp., Neoscirula 1,2, and 3, n. spp. and Cunaxa 1n. sp. The male of Dactyloscirus trifidus Corpuz-Raros, 2008 (Cunaxinae) and the female of Lupaeus longisetus (Corpuz-Raros, 1996) (Cunaxoidinae) which were previously unknown are described. A supplementary description is provided for Scutopalus clavatus (Shiba,1976) (Cunaxoidinae) which is recorded for the first time in the Philippines on the coconut leaves infested with the scale insect, Aspidiotus rigidus Reyne. New locality and habitat data are given for some species of the subfamilies, as well as of the subfamilies Bonziiinae and Orangescirulinae. Addition of the new species and the new record brings the Philippine cunaxid fauna to 80.

ACARINA; SPECIES; TAXONOMY; PROSTIGMATA; PREDATORS; FAUNA

Arthopod profile of witches' broom-infected cassava in farmer's fields in Mindoro, Leyte and Bohol [Philippines]. **Caasi-Lit, M.T., Dolores, L.M., del Rosario, E.E., Pinili, M.S., Langres, J.A., Ledesma, E.E., Calilung, B.J., Jr., Laude, R.A.P., Lit, I.L., Jr.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 165-166. (Oct 2018).*

Insect vectors play a very important role in the spread of plant diseases. The reported insect vectors of phytoplasma in cassava in other countries are mostly planthoppers and leafhoppers and other sucking insects from the Order Hemiptera. In the Philippines, only few studies have reposted insect vectors of witches’ broom disease of cassava. Hence, this paper aimed to survey the arthropods associated with cassava infected with phytoplasma disease. Cassava farms in several provinces in the country were visited. Insects were caught using sweep net, with 10 sweeps per replicate and 0 replicates per farmer’s field. Samples were sorted and identified, and then classified according to functional guilds, namely: pest (herbivore), pollinator, parasite, predator, transients, and scavengers. Insect samples from phytoplasma-infected cassava were also collected and placed in 70% ethanol. The detection of phytoplasma in insect DNA was performed using nested PCR with primer specific for phytoplasma. Preliminary results in the field survey showed that the common insects associated with cassava were planthoppers, leafhoppers, mealybugs, and scale insects. It is possible that these collected insect pests maybe vectors of cassava phytoplasma disease. However, only mealybugs were collected form infected cassava plants especially those cassava which were already 6-7 months old. PCR analysis showed that some mealybugs were positive for phytoplasma.

CASSAVA; MANIHOT ESCULENTA; PLANT GALLS; VECTORS; ARTHROPODA; DNA; HEMIPTERA; FULGOROIDEA; PSEUDOCOCCIDAE; PCR; PHYTOPLASMAS; PLANT DISEASES; PHILIPPINES

Aspects of the ecology of the invasive corn planthopper, Stenocranus pacificus Kirkaldy (Hemiptera:Delphacidae): host plant interactions, seasonal occurrence, and confounding damage by sooty molds. **Caasi-Lit, M.T., Lit, I.L.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 163. (Oct 2018).*

Data on the corn planthopper (CPH),Stenocranus pacificus Kirkaldy are updated to further clarify issues regarding its spread from Mindanao to Luzon, based on simple field experiments, casual field observations, and collections, and review of data from our other studies. The continued occurrence of CPH is confirmed and is not anymore limited to the dry cropping season. Apart from CPH, there are other suckling on corn, namely: Peregrinusmaidis (Ashmead), Proutista moesta (Westwood) (Derbidae), Cicadulina bipunctata (Melichar), Cofana spectra Distant, Ricania sp., Rhopalosiphum maidis (Fitch) and Dysicoccus brevipes (Cockerell). These are all phloem-feeders and their collective presence and abundances can cause severe stress to corn plants. Aside from direct damage, great numbers of CPH also effect plant growth and development by the sooty molds that grow on the accumulated honeydew. Sticky black molds also attract different organisms the decrease photosynthesis, and increase leaf surface temperature, that both eventually stunt corn plants. All corn varieties are attacked, whether open-pollinated varieties, classical or genetically engineered hybrids, confirming our earlier conclusions. The observed movement of CPH from non-Bt to Br corn at postharvest in Isabela [Philippines] was were already broken due to borer stalk damage. Aside from corn, CPH also attacks sorghums (common and sweet, Sorghum bicolor (L.) Moench.)and wild (S. halepense (L.) Pers.), itch grass (Rottboellia cochinchinensis (Lour.) Clayton), Job's tears (Coixlacryma-jobi L.) and maramais (Tripsacumlaxum Nash).

ZEA MAYS; MAIZE; FULGOROIDEA; SPECIES; DELPHACIDAE; MOULDS; PEREGRINUS MAIDIS; CICADULINA; RHOPALOSIPHUM MAIDIS

Bioclimate-based maximum entropy modelling for Comperiella calauancica Barrion et al.(Hymenoptera: Encyrtidae) predicted the occurrence of Aspidiotus rigidus Reyne (Hemiptera: Diaspididae) in Zamboanga Peninsula and Romblon [Philippines]. **Almarinez, B.J.** *De La Salle Univ., 2401 Taft Ave., Manila (Philippines). 50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City*

(Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 167-168. (Oct 2018).

The discovery of Comperiella calauanica Barrion et al. has promoted biological control in sustainably managing Aspidiotus rigidus Reyne populations on coconut palms in the Philippines. The maximum entropy (MaxEnt) algorithm was used to construct a bioclimate – based species distribution model (SDM) in early 2016 using presence-only data recorded from field surveys in Batangas, Cavite, Laguna, Bataan and Basilan with confirmed occurrence not only C. calauanica, but also of its hot, primarily for conserving the encyrtid for biological control. The generate SDM had a very high area under receiver operating characteristics curve value of 0.996, suggesting very high predictive power of the model. Since C. calauanica has always occurred together with its host. A. rigidus, the SDM for the former may also be considered for predicting possible suitable areas for new invasion by the latter, especially in the context of climate change. Subsequent field surveys from the late 2016 to early 2018 confirmed the occurrence of A. rigidus in Zamboanga City, and Tablas Island, Romblon and validated the prediction by the SDM of habitat suitability for the destructive coconut pest in parts of Zamboanga City and Tablas Island, Romblon and validated the prediction by the 2016 SDM of habitat suitability for the destructive coconut pest in parts of Zamboanga Peninsula and Romblon. These strongly suggest the utility of bioclimate-based modelling for pest surveillance, monitoring, and implementation of appropriate pest management measures for A. rigidus, including areas with non-zero risk of A. rigidus invasion as predicted through MaxEnt modelling.

COCONUTS; COMPERIELLA; SPECIES; ASPIDIOTUS; BIOLOGICAL CONTROL; MONITORING; PHILIPPINES

Biology of the onion armyworm, Spodoptera exigua (Hubner) (Lepidoptera:Noctuidae). **Navasero, M.V., Candano, R.N., Rigos, J.A., de Panis, W.N.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 153-154. (Oct 2018).*

Life history parameters, development, and post development traits of Spodoptera exigua (Hubner) were studied on different host plants (Allium cepa L., A. fistulosum L., Ricinus communis L., Trianthema portulacastrum L., and Zea mays L.) in laboratory. Significant differences were observed in the life history, larval development, total development time, post developmental period, and fecundity among S. exigua individuals reared on the different host plants, for both sexes. Suitability for feeding and development in decreasing order are as follows; T. portulacastrum, R. communis, A. fislosum, A. cepa, and Z. mays. Based on proximate analysis, levels of crude fiber, and percent moisture rather than crude

protein, crude fat, and local sugars of host plants had influence on feeding suitability and development for S. exigua.

ONIONS; ALLIUM CEPA; ZEA MAYS; RICINUS COMMUNIS; TRIANTHEMA; SPODOPTERA EXIGUA; BIOLOGY

Bipartite network analysis of arthopod community of forest ecosystems in the MODECERA monitoring sites. **Yap, S.A., Amarga, A.K.S.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 168. (Oct 2018).*

Bipartite network projection, a form of complex network bearing non-trivial topological features, is used to present on overview of the arthropod community in different forest ecosystems in MODECERA monitoring stations. Analysis of the network projection showed that across the forest sites, Staphylinidae (rove beetles), Entomobryidae (slender springtails) Formicidae (ants), Phoride (scuttle files), Isotomidae (isotomid springtails), and Aranese (spiders) are the most abundant groups. In terms of forest sites, Mt Makiling Forest Reserve (Laguna), Allah Valley Watershed (South Cotabato), and Jalaur Watershed (Iloilo) have the highest number recorded taxa. In terms of insect families across orders occurring on sites, Coleopptera has the highest recorded count followed by Hemiptera and Diptera. Network projection also showed that in terms of feeding guild assemblage, detritivorus taxa are the most dominant group followed by foliivorous, mucivorous, and omnivorous groups. New distribution records for the genera Cosmolestes(Reduvidae), Brachytarsina (Streblidae), Paranistra (Gryllidae), and Pyrops (Fulgoridae) are presented.

ARTHROPODA; STAPHYLINIDAE; ARANEAE; HEMIPTERA; DIPTERA; NETWORK ANALYSIS; MONITORING; FORESTS; WATERSHEDS

Bounty of ecological service agents in Cacao orchards in the Philippines. **Barrion, A.T., Almarinez, B.J.M., Amalin, D.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. (Oct 2018).*

The natural enemy fauna of two cacao major insect pests – the cacao mired bug, Helopelti sbakeri Poppius (Hmiptera:Miridae) and the cacao pod borer, Conopomorpha cramerella (Snellen) (Lepidoptera:Gracillariidae) in Luzon and Mindanao [Philippines] were fully documented for the first time. These ecological service agents were represented by 122 species, distributed as 97 species of spiders under 15 families, 12 of insects under six families, and 13 of vertebrates under eight families. Among the spiders, the families

Araneidae (32 spp.) and Salticidae (22 spp.) were the most abundant. The gryllids, mantids, reduviids, and ants were the key insect predators. The mymarids – Erythrymelus (2 spp.), and four species of Gonatocerus – egg parasitoids were reported for the first time from the eggs of Helopeltis in the Philippines. Equally valuable natural enemies in the field were the vertebrates like chickens, gekkos, birds, toads and frogs. These bounty of ecological service agents in the cacao orchards need to be conserved and maintained in order to reduce pest populations below damaging levels.

THEOBROMA CACAO; HETEROPTERA; CONOPOMORPHA CRAMERELLA; HELOPELTIS; SPECIES; NATURAL ENEMIES; PREDATORS

Changes in Benzoxazinoid dimboa levels of several native corn genotypes during vegetative-stage infestation of the Asian corn borer. **Caasi-Lit, M.T., Salazar, A.M., Purificacion, M.V., Cuizon, R., Macasaet, J.P.A., Novio, B.A.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 163-164. (Oct 2018).*

Maize synthesizes defence-related metabolites which help lessen insect-feeding damage up to vegetative stage. Changes in 2, 4-dihydroxy, 7-methoxy 1-4 (2H)-benzoxazin-3-one (DIMBOA) were analyzed in six native varieties after artificial infestation of first-brood neonate Asian corn borer (ACB), Ostrinia furnacalis (Guenee), Leaf tissues (-0.05 g) from the seedlings to early vegetative stage were excised at 0, 2, 14 and 16 days after infestation (DAI) and analyzed using High-Performance Liquid Chromatography to determine DIMBOA concentrations. This was done simultaneously with observations of leaf damage ratings differed significantly at all sampling maize stages. All native corn varieties and the positive check, MON810, showed increased production of DIMBOA production. In contrast, negative check, IPB Var 11, showed decreased DIMBOA production. In addition, leaf tissue damage rating showed higher variability from 4-16 DAI (%CV = 16.14 – 17.98). On the other hand, data for DIMBOA levels from Day 0 to Day 16 also showed increasing coefficient of variation (3.78 – 9.10). The possible defensive role of DIMBOA in the native varieties of corn against ACB is discussed.

ZEA MAYS; MAIZE; GENOTYPES; OSTRINIA FURNACALIS; PLANT DEVELOPMENTAL STAGES; LEAVES; DAMAGE; INFESTATION

Comparative life history of coconut scale insect, Aspidiotus rigidus Reyne (Hemiptera:Diaspididae), on coconut and mangosteen. **Cortaga, C.Q., Sison, M.L.J., Lagman, J.P., Fernandez, E.C.J., Galvez, H.F.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 123-134. (Jun 2019).*

The devastation of millions of coconut palms caused by outbreak infestation of the invasive Coconut Scale Insect (CSI) Aspidiotus rigidus Reyne, has posed a serious threat to the industry in the Philippines. The life history of A. rigidus on coconut and mangosteen was comparatively studied to understand the effects of host-plant species on its development, to investigate potential host-suitability factors that contributed to its outbreak infestation, and to gather baseline information on the development and characteristics of this pest. The study was conducted at the Institute of Plant Breeding, College of Agriculture and Food Science, University of the Philippines Los Baños. Insect size (body and scale) was not significantly different on both hosts during egg, crawler, white cap, pre-second and second instar stages, as well as during male pre-pupal, pupal and adult stages. The female third instars and adults, however, were bigger on mangosteen than on coconut. At the end of second instar, sexual differentiation was very visible wherein parthenogenic females further undergone two developmental stages: third instar and adults that feed permanently on the leaves. Males undergone three stages: prepupa, pupa and winged adults. Males normally have shorter life cycle and smaller bodies than the females. Developmental rate of A. rigidus before second instar was not significantly different on both hosts. However, stages approaching to insect maturity of both males and females developed faster on coconut. As a result, A. rigidus life cycle was shorter on coconut than on mangosteen. Moreover, insect fecundity was higher on coconut due to longer female longevity. More females than males were observed on mangosteen while the sex ratio was almost equal on coconut. These results suggest that coconut provides better nourishment and living conditions that support shorter life cycle and augment insect development, longevity and reproduction which are potential host-suitability factors that contributed to the outbreak. Mangosteen is an effective host-plant to rear A. rigidus pure culture as validated also by DNA sequence analysis. Information generated can be used for monitoring and timely management of the pest, in studying host-insect interaction, and in mass rearing for future studies.

COCOS NUCIFERA; GARCINIA MANGOSTANA; ASPIDIOTUS; LIFE CYCLE; ANIMAL DEVELOPMENTAL STAGES; INFESTATION

Detecting Wolbachia sp. in dengue mosquito vector, Aedes aegypti and its potential for biological mass-release vector control program in the Philippines. **Carvajal, T.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 160. (Oct 2018).*

The use of Wolbachia, has been gaining recognition as a biological control approach in mosquito-borne diseases such as Aedes aegypti (L.). This endosymbiont has the ability to generally manipulate the reproduction and immunity of insects (e.g. mosquitos) and thus,

prevent the spread of significant arboviral diseases, namely: dengue, chikungunya and zika. This study is first to report and demonstrate the successful detection of Wolbachia from field-collected A. aegypti. A total of 672 A. aegypti adult mosquito samples were collected in Metropolitan Manila, Philippines and screened using wsp and Wolbachia specific 16S rDNA markers under optimized PCR conditions. Our results yielded positive amplification in wsp and 16S rDNA markers from 113 (16.8%) and 89 (13.2%) mosquito samples, respectively. Phylogenetic analysis revealed that the wsp sequences clustered to supergroups A and B and showed high and identical similarity (99-100%) to five known Wolbachia strains including the virulent wme1POP. The results provide an avenue in utilizing natural Wolbachia strains infecting this mosquito vector for either population replacement or suppression. This step intends to create an efficient and effective streamlines approach for both mass rearing and release programs intended to control the transmission of arboviral diseases by A. aegypti.

AEDES AEGYPTI; PCR; DISEASE TRANSMISSION; BIOLOGICAL CONTROL

Decision-making protocols for the formulation of coconut scale insect (CSI) management strategies. **Yap, S.A., Medina, C.dR., Ceballo, F.A., Pangga, I.B., Yasoña, R.V., Deriquito, R.P., Diño, J.U., Revilloza, M.L.A., Riños, J.M.S., Laude, R.A.P., Alonzo, A.E., Rejuso, P., Hamor, N.H.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 166-167. (Oct 2018).*

The Philippine coconut industry has been threatened by the recent coconut scale insect outbreaks in CALABARZON [Cavite, Laguna, Batangas, Rizal, Quezon] in Luzon and Basillan and Zamboanga in Mindanao [Philippines]. The rapid progression of the outbreak was due to the introduction of a foreign invasive coconut scale species. Aspidiotus rigidus Reyne as confirmed by molecular analysis. In this study, biological and ecological aspects of A. rigidus (AR) and A. destructor Signoret (AD) were studied in order to identify, quantify, and assess the traits present in AR that show its capacity to be an outbreak species. AR has longer developmental period and adult longevity than AD indicating that AR is present on the host for a longer period of time, thus causing more damage. AR has higher survivorship than AD. Life table analysis showed that developmental period, generation time and rate of increase showed a higher chance of survival of AR than AD in field conditions. Although AD produces more offspring, AR without mating. Another study showed differences in the lifespan, sexual maturity and female lifetime productivity characteristics between two species. These information were incorporated in population dynamics models of both species and in an online database for a web-based information management system. The present study represents a significant step forward in integrating information for the formulation of management strategies of CSI outbreak incidents in the future.

COCONUTS; ASPIDIOTUS; SPECIES; POPULATION DYNAMICS; PEST CONTROL; ANIMAL DEVELOPMENTAL STAGES

Diversity of Bemisia tabaci genetic groups and their secondary endosymbionts in the Philippines. **Ogot, A.V., Sandoval, R.F.C., Latina, R.A., Caoili, B.L.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 160-161. (Oct 2018).*

Bemisia tabaci (Gennadius), or silver leaf whitely, is among the most notorious pests worldwide because of its wide host range and its ability to transmit numerous types of plant viruses. B. tabaci exhibits high genetic variability among populations but without obvious phenotypic differences. Several studies suggested the presence of 11-41 genetic groups of this species. Its management has been a challenge. Whiteflies have also been noted to harbour symbiotic prokaryotes, which greatly affect them by providing essential nutrition while others can be non-essential or even deleterious. To date, no such studies have been conducted in the Philippines nationally. Samples from 28 provinces have been identified using cytochrome c oxidase 1 which belong to six different genetic groups, namely: Asia 1 (47.49%), Australia (17.79%), Asia 2 6 (1.02%), Asia 2 10(2.66%), Asia 2 7 (0.08), and the invasive MEAM 1 (30.96%). To date, MEAM 1 has been found on 19 host plants. This particular species has also thrived in mixed populations with another invasive whitefly, Trileurodes vaporariorum Westwood, in plots of lettuce. Angel's trumpet, and Galinsoga parviflora Cav. in high-elevation sites with cooler temperature. PCR amplification using genus-specific 16S and 23S ribosomal DNA genes revealed five secondary endosymbionts, namely: Wolbachia (n=782, 62.66%), Hamiltonelta (332, 26.60%), Rickettsia (379, 30.37%), Arsenophonus (150, 12.02%), and Cadinuim (40, 3.205%). Although individuals from the same populations do not have the same mix of endosymbionts, Hamiltonella is apparently restricted to MEAM 1 while Arsenphorus was only present in the local Asian Aspects.

BEMISIA TABACI; SPECIES; DIPTERA; RICKETTSIA; PESTS OF PLANTS; PLANT VIRUSES

Effects of food diets on the development of superworm (Zophobas morio Fabricius) in Lanao de Sur, ARMM [Autonomous Region in Muslim Mindanao] Philippines. **Sabado, E.M., Villanueva, J.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 154. (Oct 2018).*

The effect of different food diets on the development of superworm (Zophobas morio Fabricius) was studied at the Mindanao State University, Marawi City, Lanao de Sur, ARMM

[Autonomous Region in Muslim Mindanao, Philippines] from August to November 2016. Superworms fed with pollard + chayote + horseradish (0.83 g/l) were the heaviest followed by those fed with pollard + carrots +horseradish (0.79 g/l). Superworms reared on these diets had almost the same body length (45.58 mm; 45.48 mm) 90 days after hatching. Superworms fed with pollard + carrots + horseradish significantly molted more times (12.60) with highest survival rate (76.67%) compared with those fed with pollard + chayote +horseradish (10.30; 66.67%). Superworm fed with rice bran + chayote + horseradish and rice bran + carrot + horseradish were significantly lighter (0.47 g/l; 49 g/l) and shorter (40.38 mm; 40.32 mm) than those fed with pollar with the same sources of moisture. Survival rate of superworms fed with rice bran + chayote + horseradish (73.33%) was comparable to those fed with pollard + carrot + horseradish (76.67%), and pollard + chayote + horseradish (66.67 %) while those fed with rice bran + carrot + horse radish had lower survival rate (56.67%). Superworms fed with pollard and rice bran without moisture sources did not survive. Lack of moisture caused 100% mortality to newly hatched superworms. Pollard is the best food source while carrot is the best source of moisture for breeding superworms.

SECHIUM EDULE; HORSERADISH; CARROTS; RICE; BRAN; PESTS OF PLANTS; LARVAE; FOOD CONSUMPTION; DIET

Family line study: quantifying genetic variability of ACB [Asian corn borer] susceptibility to Bt traits for the prediction of product durability. **Lit, M.C., Alpuerto, V.V., Babu, G., Pescadero, G.R., Panabang, B.B.** *College, Laguna (Philippines). TR-1873. 2018. 27 leaves.*

The family line method measured the frequency of rare resistance alleles of Asian corn borer by examining the survival rate of the offspring of single-pair mating. This was done to predict the genotypic proportions of each family line of ACB populations from Alicaocao, Banga and General Santos City to the new pyramided Bt corn product. The family line study also determined the larval movement of ACB in 100% non-Bt (GT) and seed blend refuge configurations. In turn, this demonstrated the effect of structured and seed blend refuge in the development of resistance and durability of the stacked Bt corn product. Field studies were conducted through artificial infestation in 30-38 DAP corn plants of F1 generation 'family lines' resulting from assortative mating of single-paired feral population of ACB moths. The surviving artificially infested larvae were recovered through destructive sampling, 20 days after infestation. Larval movement was also assessed by taking the coordinates of the plants where the insects were recovered from the whole plant assay. Overall results from the field and leaf disc assays showed that the three population from GenSan, Banga Alicaocao population were observed to survive on Bt plants. This gradual process among some individuals may be a precursor to tolerating the Bt toxin and more exposure in the future may lead to resistance development to Bt corn. Development of resistance is more likely to occur in Alicaocao as indicated by the significant number of

insects recovered and there were also individuals that were collected from 100% Bt plants. The ability to tolerate the toxin during different instar development is likely an initial episode to gradually complete their growth and development until they can fully develop on the Bt corn, Larval movement showed that most of the insects surviving in Bt corn were adjacent to refuge corn thus plant movement from a non-Bt corn to a Bt corn may present a higher chance of tolerance to the Bt toxin in later stages of the ACB development. Results also showed that there were fewer larvae recovered in a seed blend and may not yield as many susceptible individuals as the structured refuge. Thus, seed-blend refuge strategies may exacerbate the development of resistance to Bt corn of the ACB through the introduction of low-dose Bt toxin. For the durability of the Bt product, results showed that if the occurrence of resistant alleles in the field was intermediate between rare and common. resistance could develop from as few as 5 generations of 67 generations. While most simulation models start with q=.0001 (1 resistant allele in 1000 individuals), a higher initial resistant frequency was suspected. From the calculations made, it appeared the resistance frequency was suspected. From the calculations made, it appeared the resistance could develop rapidly once the initial frequency reaches 5% resistant alleles at 10% refuge size.

ZEA MAYS; MAIZE; VARIETIES; GENES; PESTS OF PLANTS; LARVAE; PEST RESISTANCE; OSTRINIA FURNACALIS; BACILLUS THURINGIENSIS

First attempt toward an updated inventory of genera and species of selected Philippine arthropods. **Lit, I.L., Letana, S.D., Villancio, G.G.S., Barrion-Dupo, A.L.A., Lucañas, C.C., Abenis, K.O., Sotto-Alviola, M.P., Eusebio, O.L., Baroga-Barbecho, J., Alvarez, J.DV., Naredo, J.C.B., Corpuz-Raros, L.A., Rasalan, J.B., Barbecho, N.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists. 0048-3753. v. 32 (2) p. 159. (Oct 2018).*

Terrestrial arthropods (i.e., insects, entognaths, spiders, mites, and others) are the most diverse group of organisms, comprising more than half of the earth's known species. In the Philippines, approximately 20,892 hexapod species were included in the previous list by Gapud in 2000. However, changes in taxonomic position synonymies and new discoveries added to the records of the above mentioned list. Unfortunately, no succeeding attempts have been done to update the previous counts. Currently, there is an initiative to update and database the known terrestrial arthropods. Although still incomplete, the current listing shows a notable increase in some groups (e.g. Plecoptera and Embioptera) and decrease in others (e.g. Phasmatodea and Stresiptera) for some orders. An updated summarized frequency of species under each family of selected orders is presented. A continuous effort is needed to update this list for taxonomic changes and new discoveries.

ARANEAE; SPECIES; ACARINA; ARTHROPODA; GENERA; BIODIVERSITY; TAXONOMY; PHILIPPINES

Houdini: Asian corn borer larval movement calculator. **Benigno, E.A., Caasi-Lit, M.T.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 165. (Oct 2018).*

Larval movement is one basic information needed for designing refuge systems for an efficient insect resistance management program. Larvae are observed to move around mixtures of Bt and non-Bt corn plants in the field in what appears as 'escape routes' in avoiding Bt plants. These movements may be active (deliverate, if larvae can detect Bt plants) or passive (carried by wind or other physical factors). A program to track the direction and magnitude of larval movement was developed in Excel. This program was named after a famous escape artist, 'Houdini'. The program computes the shortest distance travelled by the larvae from release point applying the Pyrgagorean theorem based on distances defined by the x and y coordinates of the plants of interest. The hypotenuse in the distance travelled. The release point is at the center of the plot (origin of point (0,)). This program was used to simulate larval movements based on observed larval distribution in 20 configurations of mixed stands of Bt and non-Bt plants. The number of recovered larvae decreased exponentially at distances from the release point. Most larvae tended to stay in the career or travel shorter distances as the proportion of Bt plants increased around the center. This program can also be used to track larval dispersion in connection with family line studies.

ZEA MAYS; MAIZE; OSTRINIA FURNACALIS; LARVAE; MOVEMENT; COMPUTERS; INSECT CONTROL; PEST RESISTANCE

Insecticide use against onion armyworm, Spodoptera exigua (Hubner) (Lepidoptera: Noctuidae), among onion farmers in Nueva Ecija [Philippines]. **Navasero, M.V., Ardez, K.P., Bato, M.B.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 153. (Oct 2018).*

A survey on insecticide use against the onion armyworm (OAW), Spodoptera exigua (Hubner), in Nueva Ecija [Philippines] was conducted in August-September 2017. On hundred sixty-five farmer respondents from 16 municipalities with history of high OAW infestation were interviewed. Seventy-three insecticide brands, averaging 13 percent farmer, were used during the outbreak of OAW. The most number of brands, and also, the most commonly used by farmers, except for one diamide brand, belong to carbamates,

pyrethroids, and organophosphates because those are cheaper. However, they did not find any of those effective. Many resorted to banned or restricted insecticides including several smuggled brands. Some of them also tried using non-insecticide materials, reflecting their desperation in controlling OAW. Spraying was done 1-3 times daily. Majority of those who practised cocktailing, mixed a 'weak' insecticide to 'dilure' with a 'strong' one. They associated efficacy with price, the cheap ones as weak, and the expensive ones, strong. They also mixed liquid with powder formulations believing that powder formulations act as stickers. Nonetheless, they did not find any of those insecticides, as well as cocktailing, effective. They suspected that OAW is already resistant to all of those insecticides. Majority requested the government/researchers to discover or find an effective insecticide against the pest. In addition to using banned and smuggled insecticides, cocktailing, very frequent application and improper disposal of empty containers of insecticides are common practice among most farmers.

ONIONS; SPODOPTERA EXIGUA; FARMERS; INSECTICIDES; INFESTATION; PESTICIDE RESISTANCE; PHILIPPINES

Isolation and characterization of Rhizobacteria for biological control of root-knot nematodes in Indonesia. **Safri, I., Lisnawita., Lubis, K., Tantawi, A.R., Murthi, S.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 67-81. (Jun 2018).*

Four rhizobacteria isolated from a potato field were assesed for their antagonistic potential against root-knot nematode (Meloidogyne spp.) affecting potato crops in vitro. Pure cultures of rhizobacteria were characterized based on their morphology, physiology, and biochemistry, as well as biofertilizer and biopesticide activities. An in vitro screening of bacterial strains against root-knot nematodes was conducted in a 25-microwell plate for 4 hours after nematode application. Four potential antagonistic bacteria were able to kill Meloidogyne spp. and were selected from the in vitro assay. These four bacteria were identified as Serratia marcescens, Serratia sp., Vibrio sp., and Aeromonas sp. Percentage nematode mortality after placing second stage nematode juveniles 2 (J2) in sterile distilled water for 12 hours ranged from 98.20 to 99.87%, with Aeromonas sp. showing the highest percentage nematode mortality (99.87%). Additionally, all rhizobacterial strains were positive for the production of gelatinase, protease, and chitinase enzymes, and were considered as biopesticides. This experiment indicated that all selected bacterial strains associated with potato have potential as environmental-friendly biocontrol agents against root-knot nematode in potato. For any future studies, bacterial efficacy in pots and field trials should also be tested.

RHIZOBACTERIA; SERRATIA; VIBRIO; AEROMONAS; BACTERIAL PESTICIDES; MELOIDOGYNE; BIOLOGICAL CONTROL AGENTS; INDONESIA

Laboratory efficacy of selected insecticides against onion armyworm, Spodoptera exigua (Hubner) (Lepidoptera: Noctuidae). **Navasero, M.V., Ardez, K.P., Bato, M.B.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 152-153. (Oct 2018).*

Nineteen formulated insecticide products were evaluated for their efficacy against third instar larvae of onion armyworm (OAW), Spodoptera exigua (Hubner), using the leaf-dip bioassay method. Dose-mortality response curves were generated using Polo Plus and Logit Analysis version 2.0. Lethal dose estimates were calculated using PriProbit ver. 1.63. Effective dose-recommended rateration (ED-RR ratio) was used for comparison of their relative efficacy. Complete dose-related mortality data were generated for 10 of these products, namely: Bacillus thuringiensis Berliner, beta-cypermethrin chorantraniliprole, chlorfenapyr, indoxacard, spinetoram, spinosad, methomyl, pyridalyl, and a mineral oil. There of these products (spinetoram chlorfenapyr . spinosad) were found efficacious to 3rd instar larvae based on their ED-RR ratios while the mineral oil had high ovicidal activity. Dose-mortality response curves at different periods of exposure were not significant for chlorfenapyr indicating that it is fast acting. In contrast, dose-mortality response corves for the other compounds were significant, indicating these are relatively slow acting with the exceptions of beta-cypermethrin and methomyl. The last two are known to have quick knockdown effects but significant differences in dose-mortality curves suggest rather high level of resistance in OAW. Results of laboratory assay for the rest of the compounds showed very low, if not total lack of, efficacy against OAW. Considering the highest doses already tested for these compounds, except for pyrdalyl, their ED-RR ratios were very high but the recorded mortalities did not go beyond 70%.

ONIONS; SPODOPTERA EXIGUA; CHEMICAL CONTROL; INSECTICIDES; EVALUATION; LABORATORY EXPERIMENTATION; LARVAE; BACILLUS THURINGIENSIS

Mealybugs (Hemiptera:Pseudococcidae)of cassava (Manihot exculaenta Crantz) in the Philippines. **Lit, I.L. Jr., Caasi-Lit, M.T., Laude, R.A.P., Lucañas, C.C.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 158-159. (Oct 2018).*

Mealybugs (Hemiptera:Pseudoccidae) infesting cassava plants in the field and in the greenhouse/screenhouse were collected and identified in connection with an on-going

survey of potential vectors of phytoplasmas. Existing museum collection records were also reviewed. Five species are now known to attack cassava in the Philippines. They are the pineapple mealybug Dysmicoccus brevipes (Cockerell), grey or striped mealybug Ferrisia virgate (Cockerell), buff coconut mealybug Paracoccus marginatus Williams and Granara de Willink, Jack Beardsley's mealybug, Psuedococcus jackbreadsleyi Gimpel and Miller, and two other still undetermined species of Pseudococcus, one of which is near Ps. Baliteus Lit. The most commonly encountered species during the survey were Ps. Jackbeardsleyi and P. marginatus. The cassava mealybug Phenacococcus manihoti Matie-Ferrero, earlier included in a list of cassava pests in the Philippines, was not observed nor collected in any of several trips to cassava-growing areas.

MANIHOT ESCULENTA; CASSAVA; PSEUDOCOCCIDAE; PEST INSECTS; INFESTATION; VECTORS; PHILIPPINES

Midgut characters for delineation of some Philippine Pynoscelus spp. (Blattodea:Blaberidae:Pycnoscelinae). **Lucañas, C.C., Anino, K.C.F., Antonio, A., Hosana, A.T.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 157. (Oct 2018).*

The midguts and proventriculi of three Pyncoscelus spp. from the Philippines are described. Each group of gastric caeca and proventriculus was dissected and analyzed. The number of gastric caeca varies per species, but all have two long gastric caeca. Results showed that P. sp. Nr. Surinanmensis (L.) was distinct from the P. indicus (Fabricius) and P. striatus (Kirby). Similarities and differences of P. indicus and P. striatus were also noted. Differences between sexes of P. indicus and P. striatus are observed. The selected mitgut characters can be useful in identification but may not be phylogenically meaningful.

BLABERIDAE; PROVENTRICULUS; BLATTARIA; PHYLOGENY; PHILIPPINES

Morphology of the scent gland system of the Malayan rice black bug, Scotinophara coarctata (Fabricius) (Hemiptera:Pentatomidae) and a preliminary investigation of its function. **Enabore, R.J.DJ.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 162-163. (Oct 2018).*

The morphology of the external Scent Efferent System (SES) and the internal glands as well as the anti-predatory function of the scent gland system (SGS) of the Malayan Rice Black Bug, Scotinophara coarctata (Fabricius), was studied. The SGS of S. coartata had two types of glands, namely: the Dorsal Abdominal Glands (DAGs) in the nymphs, only DAG 2 and 3

are functional. These glands were found to disappear when the nymphs metamorphosed into adults. A sexual dimorphism was observed in the bilobed adult MTG, with female's MTG larger than the male's. Scanning electron micrograph of the external SES revealed circular microsculptures associated with these glands which help in the effective discharge and volatilization of the scent gland secretion. Anti-predatory test showed that discharge of scent gland secretion from fifth instar nymphs (p=0.000) and adults (p=0.003) was not independent from predator deterrence. Pairwise comparison of ant mortality inflicted among the four treatments showed that adult (z=5.119, P=0.000) and fifth instar nymphs (z=-4.381, p=0.0000) of S. coartata 1 (mango leafhopper) and control 2 (Oecophyllasmaragdina(Fabricius) only). There findings indicate the possible antipredatory function of the scent gland system of S. coarctata.

SCOTINOPHARA; SPECIES; RICE; SKIN GLANDS; ANIMAL DEVELOPMENTAL STAGES

Morphometric and molecular analysis of eggplant fruit and shoot borer, Leucinodes orbonalis Guenee in the Philippines for population differentiation. **Taylo, L.D., Hautea, D.M., Marasigan, J.C.M., Sagarbarria, M.G.S., Marin, M.M., Latiza, I.L., Parducho, F.E., Austral, A.D., Maligalig, E.R., Raymundo, I,V., de Vera, M.L.** *Philippines Univ. Diliman, Diliman, Quezon City (Philippines). Office of the Vice President for Academic Affairs. College, Laguna (Philippines). TR-1882. 2018. 49 leaves.*

The eggplant fruit shoot borer (EFSB) has been considered to be most serious chronic insect pest eggplant, with yield losses ranging from 51-73% per cropping season. It is important to correctly identify EFSB species in the Philippines, and to describe the genetic relationship among and within its populations to develop the most cost-effective Insect Pest Management (IPM) against this pest. The morphology of insect male external genetilia has been extensively used in distinguishing species as it is highly specialized and modified for mating. The mitochondrial DNA (mtDNA) cytochrome oxidase I (COI) gene is commonly used for species as it is high conserved elements. It encodes for the largest of the cytochrome subunits and available established universal primers. Another common molecular marker, the mtDNA COII gene, has been used to estimate the molecular variation among populations. This project aims to characterize the Philippine EFSB populations based on morphometric measurements of male genitalia and DNA sequence analysis of molecualar markers, COI and COII genes for species identification and population differentiation. In this study, the researchers confirmed the identity of EFSB populations sampled throughout the Philippines to be L. orbonais, both morphologically and genetically. In terms of appearance, there was no observed difference between the adult male genital morphology of Philippine EFSB and previously identified L. orbonalis by Mally et al. (2015). Analysis of principal components shows that the sacculus length has the most variation in the characters were examined, although, it is not statistically significant. BAsed on COI

sequence data, Philippine EFSB populations are predominated by a single, widespread haplotype and most likely constitutes a single phyletic unit with no sign of cryptic species. Low nucleotide and haplotype diversity suggests a recent colonization of founder effect and support similar results regarding EFSB population structure in the Philippines (Chang et al., 2014). This support the hypothesis that L. orbonalis was introduced to the Philippines. Only eggplant seeds are imported to the Philippines through private seed companies (Chupungco et al., 2014a). Since adult molts lay eggs on the undersurfaces of leaves, tender shoots, or flower buds (Srinivasan, 2009), it is more likely the EFSB was introduced to the Philippines by direct disperal via market trade. Eggplant fruit or plant parts infested with EFSB could have been brought to the country in the 1970s, when the pest was first discovered (Navasero, 1983). This scenario is likely because L. orbonalis has been intercepted multiple times before at U.S. ports of entry (Blackburn and Miller, 1984). This could explain the predominance of a single widespread haplotype that resulted from a founder effect.

AUBERGINES; LEUCINODES ORBONALIS; SPECIES; GENETIC VARIATION; LARVAE; GENITALIA; PEST CONTROL; POPULATION DYNAMICS; CROP YIELD; LOSSES

Movement of the different larval instars of Asian corn borer, Ostrinia furnacalis (Guenee),on non-Bt corn hybrid. **Caasi-Lit, M.T., Lontoc, M.B.A., Pescadero, G.R., Bigcas, J.P., Elladora, E.V., Dacuba, R.H.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 164-165. (Oct 2018).*

There are only very limited studies on larval movement of the Asian corn borer (ACB) in non-Bt and Bt corn in the Philippines. Little is known about ACB larval behavior especially on how they move from one plant to another. We determined the movement of ACB in a non-Bt corn hybrid as influenced by larval stages and density at four, eight, 12 and 16 days after infestation (DAI) in corn plots of three rows x nine hills with 21 plants per plot. The center plant was infested using three ACB stages in two densities: blackhead- stage egg masses with densities of two and four egg masses; day-old neonates and 4-day old second instar larvae both with 30 and 80 larval densities. In all larval stages, most of those recovered stayed on the central plant even until 16 DAI. Neonates tend to move from plant to plant and disperse more, compared to second instar larvae. Larval movement is also influenced by infestation rate. Only few larvae were recovered when infested with blackhead-stage egg masses. When 80 second instar larvae were infested, more ACB were recovered compared to only 30 larvae. Neonates dispersed uniformly for the first four DAI while second instar larvae stayed mostly on the central plant. Larval movement was greatly influenced by larval age and density. This has great implication in formulating recommendations for refuge (seed mixes or planting in separate blocks, appropriate and effective under local conditions.

ZEA MAYS; MAIZE; HYBRIDS; OSTRINIA FURNACALIS; LARVAE; BEHAVIOUR; MOVEMENT; PEST CONTROL; PEST RESISTANCE

Multi-location field trials of Radiation-Modified Kappa Carrageenan as inducer of resistance against major pests and diseases in rice. **Magsino, G.L.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1839. Oct 2017. 101 leaves.*

Efficacy of Radiation-Modified Kappa Carrageenan PGP as plant growth promoter and inducer of resistance against major pests and diseases in rice was evaluated under farmer fields in UPLB-CES [University of the Philippines Los Baños-Central Experiment Station] and Victoria, Laguna, Nueva Ecija, Bulacan, Iloilo and Zamboanga del Sur [Philippines]. Results have shown that supplementing farmer's practice on fertilizer application with 1.6li/ha, 3.0 li/ha and 4.8li/ha Carrageenan PGP sprayed three times per cropping season at 14, 30 and 45 DAT increased plant height, number of filled grains and grain yield while reducing number unproductive panicle length, number of filled grains and grain yield while reducing number of unproductive tillers and unfilled grains. Supplementing Carrageenan PGP, especially the 3.0 li/ha/application dosage, to farmer's practice produced 4.12% to34.78% greater yield during the Wet Season and 8.30% to 66% yield increase during Dry Season. Incidences of Tungro, bacterial leaf blight and other diseases were found to be less than 5% across all trial sites. Consistent high counts of beneficial arthropods such as spiders, ladybeetles, dragonflies and damselflies were observed in fields sprayed with Carrageenan PGP. The consistent presence of the natural enemies in the field were able to manage the population of pests including green leafhopper, brown planthopper and stemborers, The outstanding performance of Carrageenan PGP as plant growth promoter and inducer of resistance to insect pests and diseases was highlighted in the Farmer's Field Days conducted at each trial site. Farmers from different communities and organizations around the area were invited in the field days that serve as the initial step in the technology transfer. Research results of UPLB and Iloilo trials per Experimental Use Permit (EUP) Guidelines were submitted to FPA and provisional registration was issued last August 2017 and full product registration by the first quarter of 2018.

ORYZA SATIVA; RICE; CARRAGEENANS; PESTS OF PLANTS; RADIATION; PEST RESISTANCE; DISEASE RESISTANCE; FIELD EXPERIMENTATION; TUNGRO DISEASE; BLIGHT; APPLICATION RATES; FERTILIZER APPLICATION

Not all sequences found in the internet are based on correctly identified specimens: examples from data analyses for stick insects (Phasmatodea) and other examples. **Abenis,**

K.O., Lit, I.L., Jr., Doo-Sang Park., Eusebio, O.L. *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 161-162. (Oct 2018).*

The advancement in technologies, especially tools for molecular techniques, continually evolves, thus reducing costs for basic analysis like DNA barcoding. This taxonomic method that uses a short genetic marker in an organisms' DNA is a widely used tool for identifying organisms by many researchers at present. This method has confirmed morphological phylogenies of many groups, and even resolved species-complex problems. A few cases in the Philippines were even published as new species based solely on molecular data. However, the research on stick insects (Phasmatodea) shows that despite having stick insect sequences deposited in databases like GenBank and BOLD Systems, matches to query cover may hit to a hundred percent but identifies our specimen to a different genus. For instance, Pharnacia ponderosa Stal (Phasmatidae: Clitumaninae) is identified as Neohirasea japonica (Haan) (Lonchodidae: Necrosiinae) in GenBank but barcodes for P. ponderosa are likewise available in the gene banks. Researchers' case for the wasp (Hymenoptera, Ammophila coronate A. Costa also had 100% query cover to family Tarsonemidae (Acari) and Oenochroma vinaria Guenee (Lepidoptera).

PHASMIDA; HYMENOPTERA; DNA; TARSONEMIDAE; ACARINA; GENETIC MARKERS; PHYLOGENY; GENE BANKS; DATABASES

Potential chemical cues relevant to the feeding behaviour of the cacao mired bug, Helopeltis bakeri Poppius. **Tavera, M.A., Ormenita, L.A., Amalin, D.M., D.M. Janairo, J.I.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 166. (Oct 2018).*

The growing demand for cacao worldwide has tripled since 1970s, owing partly to wider awareness of its health benefits and variety of uses. In the Philippines, 90% of cacao production comes from Mindanao. However, due to insect infestations, local production has been hampered leading to declining yields. The cacao mired bug (CMB), Helopeltis bakeri Poppius, is a major pest in the Philippines. CMB feeds on and damages cacao pods, rendering them unusable. Integrated Pest Management is a promising and effective approach of managing infestations, wherein use of semichemicals is an important aspect. By identifying the chemical cues that CMBs detect during feeding, these could be used to confuse and disorient them. Volatile chemical profiles of feeding hosts of CMB were obtained using solid phase microextraction coupled with gas chromatography-mass spectrometry. A bicyclic sesquiterpene compound was common in all alternative feeding

hosts of the CMB. Further testing using olfactometry confirmed attraction of the CMB to the sesquiterpene compound. This chemical is a possible kairomone that has potential for CMB management.

THEOBROMA CACAO; MIRIDAE; HETEROPTERA; KAIROMONES; SEMIOCHEMICALS; FEEDING HABITS; PEST CONTROL; HOSTS; INFESTATION; INTEGRATED PEST MANAGEMENT

Preliminary study on the bioecology of two oothecal parasitoids for potential biological control of Periplaneta Americana (Linnaeus) (Blattodea: Blattidae) in the Philippines. **Almarinez, B.J.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 154-155. (Oct 2018).*

The American cockroach Periplaneta Americana (L.), is a cosmopolitan pest. Management for the pest cockroaches usually includes swatting, chemical habitations, and sanitation. Biological control is rare, especially in urban habitations. While non-biological methods are effective against adults and nymphs, oothecae containing up to 20 eggs may remain unaffected. Among natural enemies of P. americana are parasitic wasps, two of which parasite oothecae, namely: the ensign wasp, Evania appendigaster (L.), and the eulophid Aprostocetus hagenowii (Ratzeburg). Controlled rearing and breeding experiments on wild-captured and laboratory-reared adult E. appendigaster and emergent A. hagenowii from wild-collected and laboratory-kept parasitized oothecae were conducted. Parasitic behaviour, development (oviposition to emergence), number of offspring, and percent emergence in a parasitized ootheca, and adult longevity were observed. E. appendeigaster is solidarity, with a single wasp emerging from one parasitized ootheca after 46.33 days. Adults survived for 12.33 days in captivity. In contrast, A. hagenowii is gregarious, with 25-176 wasps emerging from a single oothecaafter 33.92 days post-oviposition. Adults lived for 21.25 days in captivity. While percent emergence for both species were so far below 50%, all oothecae parasitized by either parasitiod within 1-2weeks after oothecal deposition did not hatch. Both species can reared in the laboratory at a range of 25-28 deg C, 60-80% relative humidity, and 12-12 photoperiod. These preliminary findings not only provided insights into the potential of these two endoparasitoids for biocontrol of P. americana in the Philippines, but also suggest their mass-rearability.

PERIPLANETA AMERICANA; BLATTARIA; CHEMICAL CONTROL; HYGIENE; BIOLOGICAL CONTROL; EULOPHIDAE; EVANIIDAE; PARASITOIDS; PEST CONTROL; NATURAL ENEMIES

Pyraxal sup TM (Triflumenzopyrim): a novel insecticide for rice hopper control in Asia Pacific. **Dupo, H.B., Jr., Gurulingappa, P., Irfan, B., Nguyen, Q.H., Poonak, D., Rattan, R., Zulkarnain, I., Wen, W., Ogawa, H.** *50th Anniversary and Annual Scientific Conference of the*

Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 152. (Oct 2018).

Rice plant- and leafhoppers are the most important sucking pests of rice to Asia. As rice a staple food crop that feeds billions, the rice hopper insecticide resistance that has developed in the past years has caused hopper outbreaks that have become common place in rice paddies across Asia. Pyraxalt sup TM (DPX-RAB55, Trifluromezopyrim), being commercialized by DowDupont provides excellent control of rice hoppers [Nilaparvata lugens (Stal), Sogatella furcifera (Horvath), and Nephotettix virescens (Distant)], including populations that have developed resistance to other insecticides which belong to different chemical classes. Pyraxalt sup TM is a potent nAChR inhibitor. It interacts in a unique way to a2-nAChR that blocks nerve transmission causing lethargic reaction in rice hoppers . Pyraxalt sup TM exhibits a long residual efficacy to any stage of the hopper, precents hopper-vectored long residual efficacy to any stage of the hopper, prevents hopper-vectored virus infection, and is relatively safe to natural enemies in the rice ecosystem.

CICADELLIDAE; SPECIES; RICE; INSECTICIDES; PESTS OF PLANTS; PEST CONTROL; CHEMICAL CONTROL

Rodent damage in the Philippines results of a 3-year PRISM [Philippines Rice Information Systems] National survey. **Marques, L.V., Duque, U.G., Bumagat, D.K.R., Martin, E.C.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 151. (Oct 2018).*

Rodents are chronic pests of rice in the Philippines. To quantify the injury caused by this important group of pests to rice crop, the Philippines Rice Information Systems (PRISM) conducted a nationwide survey from 2015 to 2017. Within the 3 year span, 3761 monitoring visits were done in 16 regions. Those visits were done twice a year every ripening stage of the rice crop. PRISM nationwide survey detected an incidence of 1.49-2.71 % rat injury. At the regional level, Region 2 [Cagayan Valley] recorded the highest incidence of rat injury to crops, i.e., during the first semester of 2016, with an average of 11.46% as well as the lowest, i.e. during the first semester of 2017 with an average of 0.12%.

ORYZA SATIVA; RODENTS; RATS; CROP LOSSES; PEST CONTROL; SURVEYS; MONITORING; PHILIPPINES

Species richness and abundance of spiders inhabiting rice in fresh swamps and tidal lowlands in South Sumatra, Indonesia. **Herlinda, S., Yudha, S., Thalib, R., Khodijah.,**

Suwandi., Lakitan, B., Verawaty, M. *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 82-93. (Jun 2018).*

Species richness and abundance of arthropods can be affected by the growth stage of a plant and by specific planting methods in agroecosystems. Thus, there is a need to quantify arthropod assemblages, in order to analyze the species richness and abundance of spiders inhabiting rice. This study aimed to analyze the species richness and abundance of spiders inhabiting rice during both their vegetative and generative stages in fresh swamps and tidal lowlands of South Sumatra, Indonesia. The survey was carried out from February up to August 2012. Arboreal spiders were sampled using sweep nets, while soil-dwelling spiders were collected through pitfall traps. Families belonging to arboreal spiders present were: Araneidae, Tetragnathidae, Linyphiidae, Oxyopidae, Thomisidae, Theridiidae, and Salticidae. Soil-dwelling spiders present belonged to the family Lycosidae. Spider abundance was significantly greater in fresh swamps than in the tidal lowlands for both spiders (Tetragnatha vermiformis and Oxyopes bikakaeus) during the vegetative stage. On the other hand, the soil-dwelling spider Arctosa tanakai under family Lycosidae had a significantly greater abundance in fresh swamps than in tidal lowland ecosystems during the generative stage. Meanwhile, during the generative stage the average abundance of arboreal spiders was significantly greater in the fresh swamps than in the tidal lowlands, while there was no significant difference in species richness. For soil-dwelling spiders, there was no significant difference in abundance and species richness during the vegetative stage of rice. From the two groups of spiders for both ecosystems, the soil-dwelling family Lycosidae would make a better predator of rice pests.

ORYZA SATIVA; RICE FIELDS; SWAMPS; LOWLAND; ARANEAE; ARTHROPODA; PREDATORS; PEST INSECTS; INDONESIA

Taxonomy and diversity of Philippine insects: status and challenges based on a review of studies from 2002-2015. **Letana, S.D., Lit, I.L., Jr., Villancio, G.G.S.** *2015 Philippine Interational Biomass Conference: Exploring the market potentials of biomass for bio-based fuel and energy, , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 157-158. (Oct 2018).*

Numerous new records and described species have been added to Philippine insect fauna from 2002 to October 2015, with a total of 825 new additions generated from 225 publications; with several more undescribed specimens. Out of the 895 new faunal records, 80 (10.18%) were published through local efforts, 40 (4.96%) species added from 25 publications that were primarily authored by Filipinos (or Filipinos as first authors) and 40 (5.22%) additional insect species from 13 publications that were published with Filipinos as co-authors with foreign contingents as first authors. Throughout the centuries taxonomic

studies as well as catalogues and checklists have mostly been predominated by foreign authors. In fact, of the 251 publications from 2002-2015, 25 (9.96%) papers were contributed by Filipino authors, other major contributions were Autria, with 35 (13.94%) and Germany with 26 (10.36%), placing the Philippines at third. Prominent local authors from 2002-2015 include Barrion-Dupo, Gapud, Lit, and others. Although local capability for entomological research has increased and shown potential, publications in the past decade or so are still dominated by foreign names. Similarly, majority of the type specimens from the country are still deposited in foreign institutions. This fact does not mean lack of specialists and institutions to do the same work, but that there are still hindrances toward a larger research body for Philippine insect taxonomy research. There are still gaps and areas to be explored as well as specimens and collections to be examined, and an abundance of material to work on.

INSECTA; SPECIES; TAXONOMY; FAUNA; BIODIVERSITY; PHILIPPINES

Update on high throughput evaluation for host plant resistance to biotic stresses in rice. **Pacia, J.B., Mendoza, R.D., Quilty, J.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 162. (Oct 2018).*

The Biotic Stress Resistance Evaluation Center (BSREC) of the International Rice Research Institute (IRRI) provides support for the high throughput evaluation of valuable breeding materials for host plant resistance to rice blast, bacterial leaf blight (BB), rice tungro disease, brown planthopper (BPH), and green leafhopper (GLH). BSREC delivers high-quality evaluation results to breeders for the identification of resistant varieties and breeding lines in order to support research and national programs. The Center operates by strictly following the standard protocols for resistance evaluation which have been a product of IRRI plant pathologists', virologists', and entomologists' long-term research. BSREC accepts biotic stress resistance evaluation requests from internal and external customers. Full cost recovery (FCR) is implemented to maintain the Center's insect and disease cultures/sources, facilities and manpower. Since 2015, BSREC, along with other IRRI systems, had undergone stages of transformation to further improve the quality of their services. It is now composed of three core team members and is getting manpower support from IRRI's internal poll of research technician and from outsourced services. BSREC is now one of the centralized units of the Rice Breeding Operations under the newly formed Integrative Research Support (IRS) platform of IRRI.

ORYZA SATIVA; RICE; FULGOROIDEA; SPECIES; STRESS; TOLERANCE; TUNGRO DISEASE; DISEASE CONTROL; PEST INSECTS

H20 - Plants diseases

Antifungal activity of soil yeast (Lachancea kluyveri SP132) against rice pathogenic fungi and its plant growth promoting activity. **Sripodok, C., Thammasittirong, A., Thammasittirong, S.N-R.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 55-65. (Jun 2019).*

A soil yeast, Lachancea kluyveri SP132, was isolated from rice paddy field soil in Nakhon Pathom province, Thailand, and was evaluated for its antifungal activity and plant growth promoting activity at Kasetsart University, Kamphaeng Saen Campus, Thailand, from 2016-2017. SP132 displayed potent in vitro inhibitory activity on mycelial growth against Rhizoctonia solani, a rice sheath blight fungal pathogen, using the dual culture method. The potent yeast also exhibited antifungal activity against Curvularia lunata, a rice dirty panicle fungal pathogen. Cell-free culture of SP132 displayed an effect on hyphal morphology and mycelial growth of pathogenic fungi. Based on the inhibition activity values, cell-free culture of SP132 showed the best effect on R. solani growth. The highest inhibition activity against R. solani (87.67%, compared with the control) was achieved using 30% cell-free culture. The ability of SP132 to produce extracellular antifungal enzymes (chitinase, cellulase and amylase) suggested that these enzymes may be partly correlated with the antagonistic activity against rice pathogenic fungi. Study on plant growth promoting activities revealed that this effective yeast antagonist produces indole-3-acetic acid (IAA) and ammonia and can generate phosphate solubilization. The treated rice seed with SP132 had improved seed germination and seedling growth. These results suggested that the L. kluyveri SP132 isolated in this work may be further used as a biocontrol agent and plant growth promoting agent.

ORYZA SATIVA; RICE; BLIGHT; INFLORESCENCES; PATHOGENS; PLANT GROWTH SUBSTANCES; BIOLOGICAL CONTROL; GERMINATION; SEED; SEEDLINGS; GROWTH

Comparative transcriptome analysis of papain-lite cystine protease-mediated resistance against Xanthomonas oryzae pv. oryzae in rice. **Nino, M.C., Cho, Y.G.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 120. (Sep 2019).*

High throughput transcriptome investigations of plant immunity highlight the complexity of gene networks leading to incompatible interaction with the pathogen. Accumulating findings implicate papain-like cysteine proteases (PLCPs) as central hub in plant defence.

While diverse roles of PLCPs in different pathosystems have become more evident, information on gene networks and signaling pathways necessary to orchestrate downstream responses in unavailable. To understand the biological significance of cysteine protease against Xanthomonas oryzae pv. oryzae (Xoo), PLCP-overexpression and knockdown transgenic rice were generated. Pathogenicity test revealed the attenuation of Xoo K3a virulence in transgenic lines which is ascribed to high hydrogen peroxide and free salicylic acid accumulation. Next-generation sequencing of RNA from transgenic and wild type plants identified 1,597 combined differentially expressed genes, 1,269 of which were exclusively regulated in the transgenic libraries. It was found that PLCP aids rice to circumvent infection through extensive activation of transduction signal and transcription factors that orchestrate downstream responses including up-regulation of multiply pathogenesis-related proteins and biosynthesis of secondary metabolites.

ORYZA SATIVA; TRANSGENIC PLANTS; NUCLEOTIDE SEQUENCE; RNA; PATHOGENICITY; BLIGHT; XANTHOMONAS

Development of BioMAGIC population in rice: applications and use in breeding for disease resistance. **Jubay-Baer, M.L., Singh, R.K., Bonifacio, J.R., Borja, F.N.N., Swamy, B.P.M., Leung, H.T.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 121. (Sep 2019).*

Rice is prone to different types of biotic stresses resulting to significant yield losses. Breeding for disease resistance is traditionally done through biparental crosses. However, native trait stacking is difficult to achieve whenever breeders are working for multiple traits. In this study, a Multi-parent Advanced Generation Inter-Cross (BioMAGIC) population with biotic stress resistance was developed using 8 founders that have multiple resistance to insect pests and diseases. The population was subjected for initial screening to blast, rice tungro virus (RTV), brown plant hopper (BPH), green leaf hopper (GLH) and two races of bacterial blight (PXO 61 and PXO 86). Results showed that out of 684 lines, 50% of the lines scored resistant to blast, 76% to different races of BLB such as PXO61, 29% to PXO 86, 28% to GLH, 14% to BPH and 2% to RTV. Fifty two lines with multiple disease resistance were sequenced at 10X depth using Illumina (HiSeq X-Ten). These lines were found to have known genes/QTL for BPH3, BPH17, Xa4, Xa7, xa13, Xa21, Pita and Pi54. For a better understanding of the extent of adaptation of this highly recombined population, 19 genotypes were tested in 3 locations (IRRI, Iloilo and Bukidnon) during 2018WS in the Philippines. Individual and combined analysis of variance revealed significant genotypic effects and genotype and environmental (GxE) interactions for grain yield. Among the lines, IR116262:26-B24-9-10-1 was most stable for grain yield across locations. This line

outperformed inbred checks and all the founders and showed resistant reaction of GLH, PXO61, PXO86, blast and has genes/QTLs for Xa4, Xa7 and Pita. In addition to offering disease resistance, BioMAGIC lines will serve as useful donors for varietal development of economically important biotic traits and precisely identifying QTLs for multiple traits.

ORYZA SATIVA; BREEDING METHODS; DISEASE RESISTANCE; GENOTYPE ENVIRONMENT INTERACTION; STRESS

Evaluation of antifungal activity of plant extracts obtained from 'Paho' (Mangifera altissima Blanco) aggainst Collectotrichum gloeasporoides (Penz.) Penz and Sacc. causing anthracnose on 'Carabao Mango' (Mangifera indica L.) fruits. **Rolloque, J.B.C., San Gabriel, E.V., Sabularse, V.C., Dalisay, T.U., Hernandez, H.P.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 115-116. (Sep 2019).*

Carabao mango (Mangifera indica L.) is a seasonal and climacteric fruit which is widely grown in tropical regions. Several countries, including the Philippines, export carabao mangoes to nearby countries. However, its short shelf life and susceptibility to pathogen infestation limits the capability of mango fruits to be transported to distant places and to be stored for a long time. Colletotrichum gloeosporioides, a fungal pathogen causing the anthracnose disease of mango is the most popular and difficult to manage. The study aimed to evaluate the antifungal activity of plant extracts obtained from ‘paho’ (Mangifera altissima Bianco) against. C. Gloeosporioides. To do so, sequential extraction using hexane, dichloromethane, ethyl acetate and ethanol as solvent was employed to extract constituent compounds from ‘paho’ peels. Hexane, dichloromethane and ethanol extracts exhibited no antifungal activity against C. Gloeosporioides. Ethyl acetate extract on the other hand, was determined to be active towards C. Gloeosporioides using spore germination inhibition assay. After determination of the active extract, the same assay was used to determine the spore minimum inhibitory concentration (sMIC). Results show that at 5% (w/v) ethyl acetate extract, percentage spore germination is at zero percent. Phytochemical analysis of ethyl acetate extract suggests probable presence of phenolic and polyphenolic compounds. In vivo experiments verify the effectivity of ethyl acetate extract as a natural control agent against C. gloeosporioides.

MANGIFERA; SPECIES; PLANT EXTRACTS; ANTIFUNGAL PROPERTIES; PATHOGENS; INFESTATION; BIOCHEMISTRY

Evaluation of inoculation methods for characterizing the resistance of rice genotypes to panicle blast. **Irang, A.M.S., Alberto, R.T., Niones, J.T.** 25. *Federation of Crop Science*

Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 90. (Sep 2019).

Rice blast disease caused by fungal pathogen, Pyricularia oryzae, imposes a constant constraint to the stable rice production worldwide. Panicle blast causes incomplete grain filling and poor milling quality leading to direct yield loss. Thus, panicle blast in considered the most destructive phase of the disease and can occur without being preceded by severe leaf blast. Host resistance is considered the most effective, economical and environmentally friendly way of rice blast diseases management. Although rice varieties with leaf blast resistance have been developed, they do not necessarily show the same level of resistance against panicle blast. The limited sources of resistance for panicle blast is partly because of the lack of effective and efficient screening techniques for panicle blast resistance. The resistance evaluation methods for leaf blast are much simpler than that for panicle blast. In this study, were evaluated three inoculation methods, namely, injection, cotton balls saturated with blast conidial suspension and spraying, for their effectiveness in screening plant materials for panicle blast resistance. Blast susceptible variety (LTH) and two differential rice varieties with known resistance gene (IRBLkH-k3 for Pik-h and IRBLta-K1 for Pita gene) were inoculated with two blast differential isolates. The three inoculation methods were compared in terms of panicle blast severity and incidence, consistency of symptoms expression in each inoculation set-up and ease of application. Results showed that spraying was the most effective as this method provided a consistent expected reaction in all test varieties and produced sufficiently high levels of disease to discriminate between susceptible and resistant rice genotypes. Also, it was found to be more practical, rapid and reliable that made it feasible for mass screening of rice germplasm for panicle blast resistance.

ORYZA SATIVA; GENOTYPES; BLIGHT; DISEASE RESISTANCE; PYRICULARIA ORYZAE; INOCULATION; EVALUATION

Multi-location field trials of Radiation-Modified Kappa Carrageenan as inducer of resistance against major pests and diseases in rice. **Magsino, G.L.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1839. Oct 2017. 101 leaves.*

Efficacy of Radiation-Modified Kappa Carrageenan PGP as plant growth promoter and inducer of resistance against major pests and diseases in rice was evaluated under farmer fields in UPLB-CES [University of the Philippines Los Baños-Central Experiment Station] and Victoria, Laguna, Nueva Ecija, Bulacan, Iloilo and Zamboanga del Sur [Philippines]. Results

have shown that supplementing farmer's practice on fertilizer application with 1.6li/ha, 3.0 li/ha and 4.8li/ha Carrageenan PGP sprayed three times per cropping season at 14, 30 and 45 DAT increased plant height, number of filled grains and grain yield while reducing number unproductive panicle length, number of filled grains and grain yield while reducing number of unproductive tillers and unfilled grains. Supplementing Carrageenan PGP, especially the 3.0 li/ha/application dosage, to farmer's practice produced 4.12% to34.78% greater yield during the Wet Season and 8.30% to 66% yield increase during Dry Season. Incidences of Tungro, bacterial leaf blight and other diseases were found to be less than 5% across all trial sites. Consistent high counts of beneficial arthropods such as spiders, ladybeetles, dragonflies and damselflies were observed in fields sprayed with Carrageenan PGP. The consistent presence of the natural enemies in the field were able to manage the population of pests including green leafhopper, brown planthopper and stemborers, The outstanding performance of Carrageenan PGP as plant growth promoter and inducer of resistance to insect pests and diseases was highlighted in the Farmer's Field Days conducted at each trial site. Farmers from different communities and organizations around the area were invited in the field days that serve as the initial step in the technology transfer. Research results of UPLB and Iloilo trials per Experimental Use Permit (EUP) Guidelines were submitted to FPA and provisional registration was issued last August 2017 and full product registration by the first quarter of 2018.

ORYZA SATIVA; RICE; CARRAGEENANS; PESTS OF PLANTS; RADIATION; PEST RESISTANCE; DISEASE RESISTANCE; FIELD EXPERIMENTATION; TUNGRO DISEASE; BLIGHT; APPLICATION RATES; FERTILIZER APPLICATION

Reactions of rice varieties to major diseases under Bicol [Philippines] condition. **Guarin, K.M.B., Rillon, J.P., Broceros, R.C., Mananghil, O.E., Padolina, T.F., Orbon, C.A.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 106-107. (Sep 2019).*

Planting of resistant variety is one of the primary strategies when dealing with diseases of rice. Every year, new breed of rice undergo several controlled trials throughout the country to ensure their resistances and adaptabilities. However, results from such trials alone may not directly reflect the performances of the varieties once released to local farmers' field since environmental conditions and farming techniques vary from one place to another. Thus, a varietal evaluation was conducted to determine the reactions of existing and newly released varieties to prevailing disease pressures under Bicol [Philippines] conditions. During 2018 wet season, 24 rice varieties were established in 8 trial sites of Bicol Region. Results revealed that four varieties (NSIC Rc 430, Rc 480, Rc 472 and Rc 474) were resistant

to bacterial leaf blight, 11 varieties (NSIC Rc 440, Rc 354, Rc 216, Rc 238, Rc 438, Rc 226, Rc 442, Rc 476, Rc 472, Rc 434, Rc 474) resistant to sheath blight, and 13 varieties (NSIC Rc 440, Rc 226, Rc 436, Rc 238, Rc 216, Rc 442, Rc 354, Rc 408, Rc 368, Rc 250, Rc 380, Rc 480 and Rc 478) resistant to tungro. These varieties showed resistances towards major disease pressures indicating suitability for cultivation under Bicol conditions.

ORYZA SATIVA; VARIETIES; SELECTION; EXPERIMENTATION; BLIGHT; TUNGRO DISEASE; PHILIPPINES

Response of selected hybrids of abaca (Musa textilis Nee) to bunchy top and mosaic diseases in the field. **Parac, E.P., Lalusin, A.G., Pangga, I.B., Sta. Cruz, F.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 109. (Sep 2019).*

The abaca hybrids namely, Hybrid 2 and Hybrid 7 which were derived from a cross between the resistant wild banana (Musa balbisiana) var. 'Pacol' and the susceptible abaca var. 'Abuab' possessing the high fiber quality trait, have been previously selected with promising resistance to bunchy top disease. In this study, the response of there hybrids to natural infection was evaluated in the field. Results show that both hybrids did not show the disease symptoms of dark green streaks on veins and midribs, marginal leaf chlorosis, narrow and stiff leaves or upright and crowding of leaves at the apex of the plant over the five years observation period. The virus was not detectable by ELISA in all asymptomatic Hybrid 2 and Hybrid 7 using polyclonal antibody against BBTV. Samples were confirmed negative for the presence of BBTV when tested by PCR using the primer pair BBT1 and BBT2 that amplifies the 349-bp fragment or viral DNA-R component. The response was observed under condition of high disease pressure wherein the susceptible 'Tinawagan Pula' and 'Abuab' developed severe disease characterized by high disease incidence, and severe symptoms. Based on disease index, Hybrid 2 and Hybrid 7 were considered resistant to bunchy top. In addition, Hybrid 2 and Hybrid 7 had shown some degree of resistance to bract and abaca mosaic characterized by low incidence of infection. Knowledge on the resistance response of abaca hybrids would be useful in designing appropriate methods for virus resistance screening and selection of promising lines towards breeding varieties with resistance to bunchy top.

MUSA TEXTILIS; ABACA; HYBRIDS; PLANT VIRUSES; INFECTION; DISEASE RESISTANCE; FIELDS; SYMPTOMS

Results of virus indexing of Garlic bulbs from Regions 1 (Ilocos Region), 2 (Batanes), 4-B (Mindoro) and 6 (Iloilo) [Philippines] and from the IPB [Institute of Plant Breeding, University of the Philippines Los Baños, College, Laguna] collection. **Dolores, L.M., Pateña, L.F.** *College, Laguna (Philippines). 2018. Utilization of the technology of producing true-to-type and certified virus-free garlic (Allium sativum L.) for economic production of planting materials for the farmers, Pateña, L.F.Barba, R.C.Dolores, L.M.Garcia, R.N.Madamba, J.A.B..- College, Laguna (Philippines), TR-1905. 2018. p. 75-78.*

Using Reverse Transcriptase Polymerase Chain Reaction (PT-PCR) test, a total of 67 garlic varieties/cultivars from Region 1 (Ilocos Region), 2 (Batanes), 4B (Mindoro) and 6 (Iloilo) in the IPB collection were assayed to the presence of garlic viruses. Results showed that all the garlic cloves were infected with one or mixtures of 2, 3 or more than 4 garlic viruses. None of the varieties/cultivars tested was found virus-free. Among the regions, the lowest virus-infection was found in the region 4B (Magsaysay, Occidental Mindoro) (11.1%), followed by the Region 6 (Miagao, Iloilo) (33.3%), and Region 2 9Itbayat, Batanes) (58.3%). The greatest infection among the garlic cloves tested from Region 1, with Ilocos Sur having mixed infection from 2 to 8 viruses while Ilocos Norte, from 2 to 4 viruses. Comparing the samples which had undergone tissue culture (sample no 66, G sub 2-TC) and those not tissue-cultured (sample no 67, Non-TC), of Ronlad Geralde from Burgos, Ilocos Norte, two viruses were eliminated by tissue culture, OYDV and GarVX. All of the samples will also be assayed using ELISA [Enzyme-Linked Immunosorbent Assy] as soon as the required antesera/antibodies are produced.

ALLIUM SATIVUM; GARLIC; VARIETIES; BULBS; PLANT VIRUSES; PCR; REVERSE TRANSCRIPTASE; VIRUSFREE PLANTS; PHILIPPINES

H50 - Miscellaneous plants disorders

Effects of downy brome (Bromus tectorum L.) and Italian nyegrass (Lolium multiflorum Lam.) on growth inhibition of wheat and weeds. **Jang, S.J., Yun, Y.B., Kim, Y.J., Kuk, Y.T.** *Philippine Agricultural Scientist (Philippines). Formerly The Philippine Agriculturist. 0031-4454. v. 101(1) p. 20-27. (Mar 2018).*

The objectives of this research were to determine the inhibitory effects of wheat and weeds by soil application and different extractions of downy brome (Bromus tectorum, DB) and Italian ryegrass (Lolium multiflorum Lam., IRG) shoot and roots, and to identify inhibition substances by fermentation extraction of IRG shoot and roots. Shoot fresh weight (SFW) of two wheat cultivars, Stephens and Tubbs 06, was reduced 28-53% and 53-55% by DB residues grown at 25, 35, and 45 d after seeding (DAS) in sandy loam soil under greenhouse conditions, respectively, compared with the control treatment. SFW of wheat cultivars

Stephens and Tubbs 06 was reduced 30-48% and 34-45% by IRG residues grown at 25, 35, and 45 DAS in sandy loam soil under greenhouse conditions, respectively, compared with those of the control. In soil application (150 g m-2 or 300 g m-2) of DB and IRG roots grown at 35 DAS, SFW of both wheat cultivars was reduced 33-52% compared with the control. However, the SFW of both wheat cultivars upon soil application of IRG and DB shoots was increased by increasing amounts of application. Common lambsquarters (Chenopodium album L.), pigweed (Amaranthus alus L.), spiny sowthistle (Sonchus oleraceus L.), white clover (Trifolium repens), barnyardgrass (Echinochloa crus-galli (L.) P. Beauv.), and large crabgrass (Digitaria ciliaris) were inhibited 23-95% and 25-80% by soil application of IRG and DB roots, respectively, compared with the control. However, weed growth inhibition was less affected by these treatments. The shoot and root fresh weights of both wheat cultivars were inhibited by water extracts of IRG and DB shoots at 0.5%, 1%, 2.5%, 5%, and 10% concentrations, but not by water extracts of IRG and DB roots. Reduction of shoot and root fresh weight in both wheat cultivars was observed more in fermentation extracts of IRG shoots and roots than in water extracts of IRG roots. Phenol compounds hydrocinnamic acid, caffeic acid, p-coumaric acid, and ferulic acid were confirmed in fermentation extraction of DB and IRG shoot and roots by high performance liquid chromatography (HPLC); the contents of phenol compounds were greater in DB and IRG shoots than in roots. Shoot and root weight of both wheat cultivars was inhibited 42-69% by 0.5, 1, and 3 mM treatments of phenol compounds p-coumaric acid, ferulic acid, and caffeic acid. Therefore, retarded growth of wheat and weed may have been caused by the phenol compounds of DB and IRG.

TRITICUM AESTIVUM; WEEDS; GROWTH; ANTAGONISM; BROMUS TECTORUM; LOLIUM MULTIFLORUM; ALLELOPATHY; BIOLOGICAL COMPETITION

Thermal mapping of high-yielding varieties of sugarcane subjected to drought stress. **Quilloy, E.P. Renovalles, E.M. Delfin, E.F., Maravilla, A.M.B., Carpentero, A.S.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 117. (Sep 2019).*

This study is aimed to establish the thermal map of ten high-yielding varieties of sugarcane subjected to drought stress. The ten varieties were planted in a sugarcane field trial established in Brgy. [village] Tranca, Bay, Laguna [Philippines]. The area was divided into subplots subjected to two treatments: drought stress and control. Drought was imposed to the plot by withhoulding irrigation during tillering stage (3 months old) while the control plot was regularly irrigated every week. Thermal response of the varieties was determined using the Flir Vue Pro R thermal camera. The camera was attached to the quadcopter which

follows a pre-loaded mission at auto flight. Captured images were stitched and recolored with inferno color scheme using QGIS. The average temperature of each variety was determined and graphed. Preliminary results showed that during drought imposition, varieties under drought stress generally have higher temperature than in the control plot; however, after recovery stage, the control plot exhibited higher temperature values.

SACCHARUM OFFICINARUM; HIGH YIELDING VARIETIES; DROUGHT; DROUGHT STRESS; THERMAL ANALYSIS; TEMPERATURE; IMAGERY; PHOTOGRAPHY; IMAGE ANALYSIS

H60 - Weeds and weed control

Efficacy of tank-mixed bispyribac-sodium and surfactants against selected lowland and upland weeds and their safety to rice (Oryza sativa L.). **Arcillas, L.S.N., Bariwan, J.V., Valencia, K.P., Kumar, V.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 88. (Sep 2019).*

A potential systematic post-emergence herbicide bispyribac-sodium (Bis-Na) was studied to determine its ability to control wide range of weeds and effect on rice. Addition of surfactants such as polyoxyethylene sorbitan fatty acids (PSFA) and terpene polymers (TP) was done to study their ability to increase the efficacy of the herbicide. During the 2017 wet season two sequential screenhouse trials were conducted at the International Rice Research Institute, Los Baños, Laguna, Philippines. The herbicide was admixed to the surfactants with 15, 20, 25 and 30 g ai/ha herbicide rate applied at 2-3 and 4-6 leaf stages. Weed control efficiency (WCE) and percent suppression were observed to determine differences in efficacy of control at the species level. Application of Bis-Na with PSFA at 2-3 leaf stage has the highest WCE of 75-100% in controlling grasses Echinochoa crus-galli (L.) Beauv. and Ischaemym rugosum Salisb. even at 15 g ai/ha. Meanwhile, application of Bis-Na alone was observed to be effective to sedges and broadleaf Ludwigia hyssopifolia (G. Don) Exell. The sedges Cyperus iria L. and Fimbristylis miliacea (L.) Vahl were effectively controlled by 20-30 g ai ha-1 and 15 g ai ha-1 herbicide rate, respectively. L. hyssopifolia was effective controlled by 15 g ai ha-1 upon application of herbicide at 2-3 leaf stage. On the other hand, application of Bis-Na with PSFA at 4-6 leaf stage of Eclipta prostrate (L.) L. has 100% WCE even at 15 g ai/ha. Based on the percent survival and percent tolerance, Bis-Na and surfactants have no significant effect on rice.

ORYZA SATIVA; WEEDS; WEED CONTROL; HERBICIDES; APPLICATION RATES; WET SEASON

Lactic acid as a potential herbicide of mungbean (Vigna radiata (L.) R. Wilczek): effect or growth and yield performance. **Rapadas, R.R.Jr., Sumalapao, D.E.P., Ledesma, N.A.A.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 116. (Sep 2019).*

Lactic acid is a naturally produced compound that has been used as a safe environmental herbicide against a variety of grass and broadleaf weed species. However, it was found to be toxic to certain leguminous plants. It might also be toxic to important legume crops such as the mung bean (Vigna radiate (L.) R. Wilczek). This study aimed to (1) determine the percentage composition of lactic acid that can constrain the most number of weeds without affecting mung bean survivability and (2) assess the effect of lactic acid on the growth and yield performance of the crop. A two factorial experiment arranged in Completely Randomized Design (CRD) with four treatments and three replications was employed in this study. The different treatments evaluated were control (no herbicides solution), 2% lactic acid, 4% lactic acid and Roundup (positive control). The results revealed that the plants administered with 4% lactic acid obtained the tallest plant height at maturity, most number of leaves produced per plant, the highest yield per plot, and the most number of weeds being constrained compared to Roundup. However, when the mung bean variety was included as a variable, slightly different response was observed between 'Ginituan' (yellow) and 'Kulabo' (green). 'Ginintuan' had a higher tolerance for lactic acid with no significant differences found at the 4% level of concentration when compared with the control and had the highest value obtained in every parameter compared to 'Kulabo'. Minimum effect was observed at 2% of lactic acid as with the Control groups. The results suggest that as an herbicide, up to 4% of lactic acid could be safe to use on both varieties of mung bean as it did not affect the growth and yield performance of the crop, whereas it was effective in constraining weeds.

VIGNA RADIATA RADIATA; MUNG BEANS; LACTIC ACID; HERBICIDES; GROWTH; GROWTH RETARDANTS; CROP PERFORMANCE; CROP YIELD

Survey of dominant weed species in the Philippine irrigated lowland rice fields. **Garcillano, M.C., Marquez, L.V., Martin, E.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 107. (Sep 2019).*

Weeds are one of the constraints when growing and achieving higher yields of cultivated plants. This group of pest could reduce yields of rice up to 96% when uncontrolled. Knowing

the kind of weeds infesting the rice fields is one of the prerequisites of effective weed management. This information, however is limited in the Philippines. A survey was conducted in 1,679 rice fields (monitoring fields) across all regions of the Philippines from July to December 2018, to determine the most common weeds of rice in the country. Monitoring fields with at least 200 m2 were sampled monthly by randomly placing three 1 x 1 m quadrat. Data on dominant weeds based on weed cover and weed species were collected and analyzed. Results of the survey showed that Echinochloa glabrescens (14.58%), Echinochloa crusgalli (11.71%) and Cyperus difformis (10.14%) were the top three most dominating weed species in the Philippine rice fields. Strategies for controlling these weeds must be properly identified, designed, and implemented when considering weed management at a national scale.

RICE FIELDS; LOWLAND; ECHINOCHLOA CRUS GALLI; CYPERUS; SPECIES; WEED CONTROL

J - POSTHARVEST TECHNOLOGY

J11 - Handling, transport, storage and protection of plant products

Fruit quality assessment of Cardaba banana (Musa acuminata x balbisiana) (ABB) at different harvest month using color index. **Fabro, D.M., Aguilar, E.A., Paelmo, R.F., Diving, F.A.M., Elleva, L.I.F., Garcia, G.R.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 91-92. (Sep 2019).*

The Cardaba/Saba (Musa acuminate x balbisiana) (ABB) is a traditional Filipino staple cooking banana used as an ingredient to food or as dessert. Ironic to its ubiquity, there is a lack of studies on good production system. There is an expanded, market- driven demand for these cultivars for banana chips, and farm gate price has been on the rise since 1990. The high nutritional value of banana, low glycemic index (GI) rating makes it a health food gaining world acceptance in a rapidly expanding snack food market. Producing high quality mature fingers that conform to the grade and size standards required of particular market will increase the value of produce, benefiting even smallhold growers. This study monitor the changes in quality of Cardaba/Saba banana across different harvest dates in Lucena, Quezon [Philippines] from March 2019. Mature bananas harvested are tagged and fruit size calibrated to satisfy the criteria of good quality bananas contained in PNS/BAFPS 08:2004 (for fresh fruit- Saba and Cardaba Banana- standard establishes a system of grading and classifying 'Saba' and 'Cardaba' type bananas produced in the Philippines) i.e., length of the middle finger of the second hand from the peduncle must have 12-15 cm and the diameter must be 4.0-4.5 cm. Ripening of harvested fruits were monitored and analyzed in the

PHTRC, UPLB [Postharvest Training and Resource Center, University of the Philippines Los Baños]. Four hands from four bunches were assessed guided by the Banana Color Index of USDA. The fruit quality parameters assessed are pulp-peel ratio, total soluble solids, pulp pH, titratable acidity and firmness. Preliminary results showed that as ripening progresses pulp-peel ratio increases, while fruit firmness decreases. Titratable acidity and total soluble solids were also observed to have an increasing trend. Pulp pH ranged from 5.80 to 6.60. significant changes during fruit ripening was observed on the shifting of color index (CI) from CI 2 to CI 3.

MUSA (BANANAS); VARIETIES; FRUITS; RIPENING; CHEMICOPHYSICAL PROPERTIES; QUALITY; HARVESTING

Storage decisions of jasmine rice farmers in Thailand. **Srisompun, O., Simla, S., Boontang, S.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 80-91. (Jun 2019).*

The effects of economic and other factors on the jasmine rice storage decisions of farmers were analyzed using a binomial logistic regression model. The farm survey data from nine major productive provinces in the Northeastern region, and 330 rice farmers sampled during the 2017/18 crop year were examined. The data collection was done in January to April, 2018. The probability of storing jasmine rice was 43.6%, and the physical factors of the farms exhibited the highest effect on the storage decisions of the farmers. Factors such as having a barn, the jasmine rice yield, the region, the cultivation pattern, the female labor proportion, and participation in the rice-pledging scheme positively affected the storage decisions of the farmers. In contrast, household income negatively affected the storage decision. The study results suggest that the implementation of a policy for reducing the paddy supply during the harvest season requires economic and other incentives. Rice barn development is crucial for and correlated with the storage decision. Therefore, providing support for constructing or repairing barns increased the storage decision probability. Primarily, the large scale farmers benefited from the rice-pledging scheme. Public schemes should be thoroughly implemented. The need for sophisticated equipment, regulation procedures, and the high cost associated with rice storage reduced farmer participation, but the scheme did not affect the rice farm gate price.

RICE; STORAGE; SUPPLY; COSTS; MARKETS; PROFIT; PRICES; FARMERS; DECISION MAKING; THAILAND

K - FORESTRY

K01 - Forestry - general aspects

Above ground biomass and carbon sequestration of 4 bamboo species in the Philippines. **Lantican, N.L.M., Ociones, F.T., Tandug, L.M.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 27(1) p. 27-38. (Jan-Dec 2017).*

This study on the biomass and carbon sequestration of 4 selected economically important bamboo species in the Philippines, namely, giant bamboo (Dendrocalamus asper Schultes f.), kawayan tinik (Bambusa blumeana J.A and J.H. Schultes), bolo (Gigantochloa levis (Blanco) Merr.), and buho (Schizostachyum lumampao (Blanco) Merr.) was conducted by the Ecosystems Research and Development Bureau (ERDB) from 2013 to 2014. Aboveground biomass was determined on 243 sample bamboo culms of the 4 species covering a wide range of diameter classes from 9 provinces in Cordillera Autonomous Region (CAR) and regions 1, 2, 3, 6, 7, 10, 11, and 13. The average dry biomass of the 4 species was 51.1 kg for D. asper, 23.6 kg for B. blumeana, 19.1 kg for G. levis, and 3.8 kg for S. lumampao. Prediction equations using allometric models were developed for estimating the ovendry weights of the whole culm using variables such as diameter and total height. Results on the carbon analysis showed that the aboveground biomass of the 4 bamboo species can store an average of 44.3, 43.6, 43.2, and 39.8 percent carbon for D. asper, B. blumeana, G. levis, and S. lumampao, respectively. Furthermore, carbon content taken from the samples of the 4 bamboo species revealed that the pole (45.4%) showed significantly higher carbon content in its biomass than the branches (43.5%) and the leaves (39.4%).

BAMBOOS; DENDROCALAMUS; BAMBUSA; GIGANTOCHLOA; SPECIES; BIOMASS; CARBON; PHILIPPINES

Advancement of science for the sustainable utilization and conservation of forest genetic resources of falcata (Falcataria moluccana (Miq.) Barneby and J.W. Grimes) and Yemane (Gmelina arborea Roxb). **Tolentino, E.L., Jr., Casas, J.V., Gumpal, E.C., Maldia, L.SJ., Quimado, M.O., Ata, J.P., Tinio, C.E.** *Department of Environment and Natural Resources Ecosystem Research and Development Service Region 13 (Philippines). Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1874. 2018. 157 leaves.*

The three-year project was conducted primarily to build the level of understanding and techniques on the best use of available genetic base of key plantations species, Falcataria

moluccana (Miq.) Barneby and J.W. Grimes, and Gmelina arborea Roxb., in order to achieve a 30% increase in yield from plantations from the current 2013 yield which is approximately 60 cu m/ha. FGR materials of the two species were collected all over the country. Seeds from total of 133 mother trees (MTs) of falcata and 166 mother trees of gmelina were collected during the first year of the project and placed in the field trials. The two partner institutions-the Cedntral Mindanao University and the Isabela State University raised the seedlings in the nursery in the second year ane eventually established the field trials (FT) prior to the third-year operation of the project. The gmelina FTs were established in Cabagan and Echague, Isabela, Falcata FTs were established in CMU, Maramag, Bukidnon, Baliangao, Misamis Oriental [Philippines]. An incomplete block design was used to lay-out the seedling of the various mother trees (MTs) in the FTs. Survival, height and diameter were assessed in the FTs. Additinal information of the pest and disease resistance were noted. Leaf samples from a total of 330 trees of G. arborea and 363 trees of F. moluccana from various stands/plantations in the country were collected for molecular genetic characterization. Selected mother tree in each species used in the establishment of field trials were included in the genetic analysis. DNA extraction and marker amplifications were conducted. Based on the Bayesian and model-based clustering analysis implemented in STRUCTURE analysis the genetic structure was evaluated using the multilocus genotypes of each individual. The model assumes the presence of ancestral genetic cluster (K), which the number may ne unknown, and by Markov Chain Monte Carlo (MCMC) simulations individual multi-locus genotypes are assigned probabilistically to pre-determined values of K. Various trainings on tree improvement, forest genetics, seed and nursery technologies and field trials establishment and management wre carried out with the partner institutions (CMU and ISU). A total of 12 ha of FTs were established by the project 2, hectares more of the 10 ha initially targeted by the project 4 ha for gmelina by ISU and 6 ha for falcata by CMU. The gmelina FTs were established in Cabagan and Echague, Isabela while the falcata FTs were established in Cabagan and Echague, Isabela whiule the falcata FTs were established in Central Mindanao University in Maramag, Bukidnon, Baliangao, Misamis Occidental, Buda, Marilog District, Davao City, and Talisayan, Misamis Oriental. The two gmelina FTs were both hit by the two consecutive typhoons in 2016, which has adversely affected survival and growth forms. The Echegue FT has the following results: survival is still quite high for many seedlings but was not as high for many MTs cpmpared to the MTs in Cabangan. The falcata seedlings from the various MTs planted at the CMU FT have exhibited excellent survival rates after one year. For the Baliangao Misamis Occidental, survival percent at 65%. Survival and growth forms gmelina seedlings have been significantly affected by the two typhoons that directly crossed Northern Luzon, i.e. Typhoon Karen and Typhoon Lawin. The falcata FTs at this stage has has not provided very consistent information on the top performing MTs, but has been shown that better growth performance (e.g. height and diameter) could be obtained when the FGR is marched to particular sites. No consistent mother three for either species scored high in the parameters

so far evaluated. This would indicate the need for further observations to elicit the true difference between the mother trees and allow at the best performing mother trees to exhibit their genetic potentials. In terms of genetic diversity, there was notable decrease of 20 to 30 percent in G. arborea in the sampled stands compared to the natural populations of the species as assessed by a previous study, although modest divergence was found among genetic clusters. Genetic diversity is the backbone of plantation forestry and forest restoration tree improvement programs. Without the diverse FGRs, it is impossible to proceed with any tree improvement program. For three years, the project was able to hold nine trainings sessions on various aspects of silviculture, tree improvement and genetics. A total of 302 trainees have undergone these various trainings which is general aimed to capacitate would-be researchers in tree improvement.

GMELINA ARBOREA; FORESTS; GENETIC RESOURCES; PLANTATIONS; GENETIC VARIATION; SEEDLINGS; SURVIVAL; RESOURCE CONSERVATION

Impact assessment of CY 2009 CBFM-CARP [Community-based Forest Management-Comprehensive Agrarian Reform Program] Project in Region IV-A [Cavite, Laguna, Batangas, Rizal, Quezon, Philippines. **Capinpin, H.L.L., Dolom, P.C., Casin, Ma.C.S., Nicmic, J.C., Punzalan, B.A.** *Department of Environment and Natural Resources, Visayas Avenue, Diliman, Quezon City (Philippines). College, Laguna (Philippines). TR-1906. 2017. 30 leaves.*

The respondents of the project ranges from 30 to 50 percent of the target 50% of the SES respondents last 2009. The beneficiaries of the project were at the middle to old age (40 years old and above). The oldest respondents was 86 years old as beneficiary of the projects. Eighty-six percent of the respondents attained elementary and high school level of education. Thus, this implies that the beneficiaries were familiar to the area since living there for a period of time. Roman Catholic was the major religious affiliation of the respondents. The average number of household size was 4. The ownership of the respondents in terms of vehicle, furniture, appliances and electronic gadgets increased over the period of time. The income derived from CBFM-CARP [Community-based Forest Management-Comprehensive Agrarian Reform Program] project contributed in attained this items. No much improvement or changed on the availability of facilities on health, infrastructure, transportation, and credit facilities in each respective area. However, there was a significant increased on communication facility particularly on the use of mobile phone of the respondents. Waste disposal of the respondents improved over the period of the time from burning and throwing waste everywhere to practicing segregation, composting and collection from LGUs in their respective area. The average number of involvement of the respondents in an organization was to except from their membership in people's organization. Majority of the respondents mentioned that farming was the source of income from 2009 to 2015. The average primary annual income of the respondents

increased from PhP41,976.86 to PhP 56,228.81 while the secondary annual income also increased from PhP33,752.90 to PhP46,035.23 over the period of time. The grand annual income of the respondents was PhP74,880.63 to 105,168.81. The annual income from the CBFM-CARP project was PhP2,030,903.00 which was only 12% of the grand total income of the respondents. The average percentage of the farm produced domestically ranges from 10-20% while the percentage sold was 80-90%. Expenditures and saving of the respondents increased from 2009 to 2015. The CBFM-CARP project is selected areas in Region 4-A [[Cavite, Laguna, Batangas, Rizal, Quezon, Philippines] contributed to the increased income and ownership of vehicle, furniture, appliances and electronic gadgets of the respondents.

FOREST MANAGEMENT; AGRARIAN REFORM; WASTE DISPOSAL; INCOME; PHILIPPINES

K50 - Processing of forest products

Catching up with nanotechnology to support the Philippine forest products industry: [Nanotechnology for the Philippine Forest Product Industry: development of protocols for preparing nanocellulose from Philippine Bamboo and Exploring their potential applications. **Razal, R.A.** *2018-19 UPLB Centennial Professorial Chair Lecture, College, Laguna (Philippines), 10 Jun 2019. College, Laguna (Philippines). 2019.*

The Philippine forest products industry has been saddled with problems stemming from scarcity of timber in view of the deforested state of the country's production forests. This has hampered the industry's ability to supply panels and other modern materials needed for the burgeoning construction of buildings for commerce and services, residences, and other infrastructure. Meanwhile, the forests abound with renewable non-timber resources like bamboo, while large areas had been planted with fast-growing industrial tree species which are harvested at relatively younger age and smaller diameter than trees that once thrived in the primary forests. When utilized, the smaller timber affords significant wastes that are too valuable to squander, while bamboo poles re relatively abundant, renewable wood-like resources that are still awaiting opportunities for expanded utilization. Nanotechnology affords the opportunity to support the Philippine forest products industry by enabling the conversion of otherwise less valuable forest-based materials to nanosized particles that can be integrated in composites in minute amount, but with resultant improvement in their properties. This lecture presents results of experiments undertaken to prepare nanocellulose from two Philippine species of bamboo, namely Bambusa bluemeana and Bambusa vulgaris, and from the wastes of three industrial tree plantation species, Gmelina arborea, Paraserianthes falcataria, and Acacia mangium. The bamboo species were selected following chemical analyses that showed favorable cellulose and minimal lignin content. Protocols involving a series of preparative treatments such as pulping, bleaching, chlorite and alkali treatment to afford cellulose were developed, while two types of

nanocellulose products were isolated. Cellulosic nanocrystals were obtained from the sulfuric acid hydrolysis of alkali-insoluble cellulose, while cellulosic nanofibrils were prepared from variously treated precursors using Masuko sup R friction grinder super mascolloider. Yield was determined at various stages of preparation, while the nanocellulose products were characterized by microscopy (optical, atomic force, and electron), Fourier transform infrared spectroscopy, dynamic light scattering, and X-ray diffraction analysis. Application trials of the nanocelluloses involved preparation ofxylan and thermoplastic starch enriched with nanocellulose, nanopaper made from nanocellulose with and without termiticide, and handsheets made from bamboo pulp with various amounts of bamboo nanofibrils to replace inorganic fillers. Results showed the feasibility of producing composites whose physicO-mechanical properties and water-vapor transmission rate improved with small addition of nanocellulose. Likewise, favorable enhancement of paper properties was obtained in bamboo handsheets with small percentages of nanocellulose, while nanopaper with termiticide showed efficacy for use as a barrier against termites. There are promising outcomes that indicate the potential of nanotechnology to uplift the Philippine forest industry.

BAMBOOS; BAMBUSA VULGARIS; GMELINA ARBOREA; PARASERIANTHES; ACACIA MANGIUM; CELLULOSE; FORESTS; TECHNOLOGY; TECHNOLOGY TRANSFER; PULP; PULP AND PAPER INDUSTRY; FOREST PRODUCTS; PROCESSING; CHEMICOPHYSICAL PROPERTIES; PHILIPPINES

L - ANIMAL SCIENCE, PRODUCTION AND PROTECTION

L01 - Animal husbandry

Bees and other insect pollinators in Lanao del Norte [Philippines]: an inventory toward conservation of crop pollinator species. **Baroga-Barbecho, J., Locsin, A.M.E., Polintan, E.A., Cervancia, C.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 156. (Oct 2018).*

A survey of pollinator species was conducted in three sites in Lanao del Norte [Philippines] specially in the municipalities of Kapatagan, Tubod, and Sultan Naga Dimapora. These are also the sites selected for the establishments of meliponaries. The researchers performed random sampling using sweep nets, usually from 0700 to 1400h. The foraging behavior patterns of floral visitors were closely observed if the are gathering nectar, pollen, or both. Visual observations were complemented with video cameras. The initial results showed that there are more pollinators in areas where there are more diverse flowering plants than in areas with a lower diversity of angiosperms. Most of the species of pollinators the

researchers have identified belonged to the insect orders Hymenoptera, Diptera, and Lepidoptera. The presence of these species may contribute to the diversity of the ecosystem. The rich vegetation in Lanao provides sustainable nectar and pollen sources and habitat for the pollinators.

APIDAE; HYMENOPTERA; DIPTERA; LEPIDOPTERA; NECTAR; POLLEN; POLLINATORS; RESOURCE CONSERVATION; PHILIPPINES

Intensive beekeeping training course report. **Barroga-Barbecho, J.B.** *College, Laguna (Philippines). TR-1889. 2018. 84 leaves.*

The UPLB [University of the Philippines Los Baños, College, Laguna] is committed to its vision as the National center for Bee Research and Development in the Philippines to support sustainable management of agriculture, forestry, and beekeeping industry. The Program offers quarterly beekeeping training to continuously develop appropriate apicultural and meliponiculture technologies for farmers, women, entrepreneurs, and hobbyist to generate income. A total of 29 participants from Luzon, Visayas, and Mindanao enrolled in the November 05-10, 2018 intensive beekeeping short course. Participants of the training were composed of beekeeper, government employees, farmers, businessmen, office secretary, teachers, managers, driver, LGUs, therapist, analyst, engineer, nurse, IT, filmaker, OFW. Almost 90% of the participants have no experience and knowledge on handling and keeping bees. The 5.5-day training activities includes lectures supplemented by practicum, field workk, apiary (Apis millifera and A. cerna) and meliponary (Tetragonula biroi) visits. Lectures and practicums given by UPLB Bee Program trainers and demonstrators were conducted informally to allow the participants to bring in their questions immediately.

APIDAE; APIS CERANA; APIS MELLIFERA; TRAINING COURSES; EXTENSION ACTIVITIES; DIFFUSION OF INFORMATION; APICULTURE

Physico-chemical properties, heavy metal content, and microbiological quality of stingless bee, Tetraganula birot (Friese) honey from Laguna and Sorsogon, Philippines. **Polintan, E.A., Sabino, N.G., Locsin, A.M.E.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 155-156. (Oct 2018).*

The physico-chemical properties of honey gathered from Tetragonula biroi (Friese) meliponaries intended for the production of medical grade honey were determined using standard protocol. The samples were also tested for the presence of heavy metals (mercury, lead, chromium) and common microbial species (Salmonella sp., Vibrio sp.,

Staphylococcus aureus, E. coli, and mold count). Manuka honey, which is known for its medicinal value was used as control. The average moisture content, glucose, fructose, and sucrose of stingless bee honey were 23, 3.78, 8.36 and 0.65% respectively. The pH level was 3.23. The microbial pathogens and heavy metals detected in all samples were below the allowable limit. The physio-chemical properties of the samples were comparable with Manuka honey.

APIDAE; SPECIES; HONEY BEES; CHEMICOPHYSICAL PROPERTIES; HEAVY METALS; MICROBIOLOGICAL ANALYSIS; BIODIVERSITY; SALMONELLA; VIBRIO; STAPHYLOCOCCUS AUREUS; PHILIPPINES

L10 - Animal genetics and breeding

Distribution pattern and economics analysis of meliponaries in the Philippines. **Locsin, A.M.E., Cuevas, A.C., Polintan, E.A., Cervancia, C.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 155. (Oct 2018).*

The stingless bee, Tetragonulabiroi (Friese), is currently used in the Philippines for pollination of high-value crops like mango, avocado and some vegetables. It is also used for ecosystem restoration in disaster-hit areas. Apart from the impact of stingless bees on pollination, their products are popular and command high market value. The distribution pattern of meliponaries (stingless bee yard) in the Philippines was mapped and its economics feasibility analyzed. There are 85 meliponaries spread in Luzon (58), Visayas (20), and Mindanao (7). Among the beekeepers, only eight are keeping more than 1,000 T. biroi colonies where our economic analysis was based. All the colonies are located in Luzon, which could be explained by the abundance of feral colonies and nesting sites. In the Visayas and Mindanao, the predominant species is T. laeviceps, a species which does not produce surplus honey. The propagation of stingless bees on the commercial scale is feasible in the Philippines as shown in the Benefit-Cost Ratio value analysis. If the present value of benefits exceeds that of the cost, the BCR is greater than one, indicating that the project is feasible. In this study, the BCR is 1.31. Being native to the country, the stingless bee has a wide genetic pool and is resistant to pest and diseases, thus, the cost of rearing is lower, compared with introduced bee species. Moreover, it can exploit diverse floral resources, making their production sustainable.

APIDAE; SPECIES; POLLINATION; MANGIFERA INDICA; PERSEA AMERICANA; ECONOMIC DISTRIBUTION; COST BENEFIT ANALYSIS; PHILIPPINES

Livestock reproductive biotechnologies: role in land preservation and green agriculture. **Hufana-Duran, D.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 162-170. (Jun 2018).*

Green agriculture is a product of development, of adopting innovations from the results of scientific research activities and careful planning. It is associated with building a concept of ecological civilization, of making an overall plan for urban, including rural socio-economic development, and establishment of new ecological socialist countryside. It is a manifestation of increased productivity, promotion of the reasonable distribution of rural productivity, optimization of the allocation of factors and maximization of economic benefits. With the increasing human population, urbanization and expansion of land utilization, integrated crop-livestock husbandry is important to promote green agriculture as livestock provide manure aside from catering to the increasing requirements for milk and meat for human consumption. As land scarcity increases, poorer land is used, causing the marginal productivity of labour and of land to decline. So high priority should be given to maintaining soil productivity by increasing agricultural production through yield increases with little or no additional land. Livestock genetic improvement is therefore needed to produce the animals with superior genetics that could produce the needed milk and meat without necessarily raising the high number of livestock and occupying much space to meet the human requirement. In the implementation of livestock genetic improvement programs, reproductive biotechnologies play an important role to maximize and facilitate the multiplication of genetically superior bulls through artificial insemination, while ovum pick up and in vitro embryo production and transfer maximize the female contribution to genetic progress. The theories and practices on the role of reproductive biotechnologies on green agriculture is presented.

LIVESTOCK; REPRODUCTION; SILVOPASTORAL SYSTEMS; ANIMAL BIOTECHNOLOGY; BREEDING METHODS; ARTIFICIAL INSEMINATION; EMBRYO TRANSFER

L20 - Animal ecology

Asian pollinator diversity and density measures: survey and indexing standard to detect and assess pollinators deficits. **Rabajante, J.F., Tubay, J.M., Jose, E.C., Cervancia, C.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 156-157. (Oct 2018).*

In response to the need to derive empirical data on the status of pollinators in Asia, a protocol was developed to assess the pollinator population in managed, natural, and disaster-hit ecosystems. The three important steps are planning implementation of the

survey, and computation of indices. In the planning step, experts rank and classify the pollinator hotspots in various ecosystem types (orchard or agroecosystem and natural vegetation) based on the seasonally and likelihood of having high number of flowers and pollination. Two-stage sampling and mapping of each hotspots are designed. The number of sample hotspots is computed according to sampling precision and confidence levels assigned per class per ecosystem type. In each sample hotspot, sample survey sites are randomly selected according to the agreed agroecosystem, a grid map with 100-sq m divisions is surveyed. For natural vegetation, survey sites are randomly selected according to the location of pollinator nesting sites. All sampling surveys are conducted during the blooming period of the plants, with consideration of the peak of anthesis, because of this is the period when the pollinators are actively foraging, pollen viability is high and nectar secretion is at its peak. Moreover, a Microsoft Excel template is created to compute for diversity measures (Modified Shannon index for pollinators and Modified Shannon index for flowers) and the authors proposed pollination matching measures (P-to-P ration and index).

POLLINATORS; DENSITY; ORCHARDS; AGROECOSYSTEMS; VEGETATION; MATHEMATICAL MODELS

Bees and other insect pollinators in Lanao del Norte [Philippines]: an inventory toward conservation of crop pollinator species. **Baroga-Barbecho, J., Locsin, A.M.E., Polintan, E.A., Cervancia, C.R.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 156. (Oct 2018).*

A survey of pollinator species was conducted in three sites in Lanao del Norte [Philippines] specially in the municipalities of Kapatagan, Tubod, and Sultan Naga Dimapora. These are also the sites selected for the establishments of meliponaries. The researchers performed random sampling using sweep nets, usually from 0700 to 1400h. The foraging behavior patterns of floral visitors were closely observed if the are gathering nectar, pollen, or both. Visual observations were complemented with video cameras. The initial results showed that there are more pollinators in areas where there are more diverse flowering plants than in areas with a lower diversity of angiosperms. Most of the species of pollinators the researchers have identified belonged to the insect orders Hymenoptera, Diptera, and Lepidoptera. The presence of these species may contribute to the diversity of the ecosystem. The rich vegetation in Lanao provides sustainable nectar and pollen sources and habitat for the pollinators.

APIDAE; HYMENOPTERA; DIPTERA; LEPIDOPTERA; NECTAR; POLLEN; POLLINATORS; RESOURCE CONSERVATION; PHILIPPINES

Diversity and distribution of herpetofauna in Balesin Island, Polillo, Quezon, Philippines. **Gojo Cruz, P.H.P., Afuang, L.E., Gonzales, J.C.T., Tabaranza, D.G.E., Alejando, M.D., Cajano, M.A.D., Afuang, D.L.E.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 37-56. (Jan-Dec 2016).*

A survey of the ecosystems and herpetofauna of Balesin Island in the Polillo group of islands was conducted on 19-22 July 2015. The survey was part of a bigger biodiversity study of the whole island for a conservation management program planning for Balesin Island Resort. Several standard survey techniques were used to assess the island's herpetofauna. GIS-based mapping was done to identify the boundaries of the island's habitat types and the herpetofaunal distribution. A vegetation survey was likewise conducted. Seven major habitat types were identified. A total of 16 species of herpetofauna were documented including 2 amphibians, 1 agamid, 3 geckos, 6 kinks, 3 snakes, and 1 monitor lizard. Malayopython reticulatus was reported present by the locals on the island but was not observed during the study. With the exception of Laticauda laticauda, all herpetofauna documented in Balesin Island have been recorded elsewhere in the Polillo group of islands.

ISLANDS; BIODIVERSITY; ECOSYSTEMS; ANIMAL RESOURCES; FAUNA; HABITATS; GEOGRAPHICAL DISTRIBUTION; PHILIPPINES

Ecological influence of sediment bypass tunnels on microinvertebrates in dam-fragmented rivers using DNA metabarcoding. **Serrana, J., Watanabe, K.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 159-160. (Oct 2018).*

Sediment bypass tunnels (SBTs) are guiding structures in reservoirs used to reduce sediment accumulation during high flows. Sediments in transport are diverted to downstream reaches during operation. Previous studies monitoring the ecological of SBT operations on downstream reaches suggest a positive influence of SBTs on riverbed sediment conditions and macroinvertebrate communities based on traditional morphology-based surveys. Morphology-based macroinvertebrate assessments are costly and time-consuming, and the large number of morphologically cryptic, small-sized, and undescribed species usually results in coarse taxonomic identification. In this study, we used metabarcoding analysis to assess the influence of SBT operations on macroinvertibrates downstream of SBT outlets by estimating species diversity and pair-wide community dissimilarity between upstream and downstream locations in dam-fragmented rivers with operational SBTs in comparison to dam-fragmented (i.e. no SBTs) and free-flowing rivers (i.e. no dam). Dissimilarities between upstream and downstream communities in SBT sites at the Reuss (Pfaffensprung dam) and Rabiusa (Egschi dam) rivers were relatively low and

similar to free-flowing rivers, while values for the Albula (Solis dam) were relatively high and similar or higher than dam-fragmented river. Macroinvertebrate abundance using morphologically-identified specimens was positively correlated to abundance using metebarcoding. This supports and reinforces the use quantitative estimates for diversity analysis with metabarcoding data. Macroinverterate community dissimilarity analysis with increasing operation time and frequency of SBTs. These factors influence changes in riverbed features, e.g. sediment relations, that subsequently affect the recovery of downstream macroinvertibrate communities to those of respective upstream of downstairs.

AQUATIC ORGANISMS; SEDIMENT; RIVERS; DNA; WATER RESERVOIRS; DNA; DAMS

Foraging behavior association between Irrawaddy dolphins (Orcaella brevirostris) and tidal not fisheries in the coastal waters of Pulupandan, Negros Occidental, Philippines. **Casipe, K.P., Espinosa, K.E.S., Jarabelo, C.J.M., dela Paz, M.E.L.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 67-92. (Jan-Dec 2016).*

The coastal waters of Pulupandan, Negros Occidental [Philippines] has been known to be a core feeding area for a small population of endangered Irrawaddy dolphins, which have been observed foraging within close proximity to permanent tidal nets used by locals. Foraging behavior and interactions with tidal nets were observed during a series of boat-based surveys from April to September 2015. Foraging behavior was classified based on proximity to the tidal nets: net (0 50 m) and open water (50 m) foraging. Specific preference for any of the tidal nets was measured using Coefficient for Area Use. Catch per Unit Effort (CPUE) was obtained to determine the productivity of each tidal net. The total time spent foraging in open water did not prove to be significantly different from the time spent foraging in tidal nets (alpha = 0.05), suggesting minimal differences between these areas. There was no significant difference in the CPUE in all 6 tidal nets. However, dolphins appeared to prefer one specific tidal net, having significantly (alpha = 0.05) spent more time engaging in net foraging than in other nets. Pearson Correlation Coefficient showed significant relationship between net foraging and CPUE.

DOLPHINS; FORAGING; BEHAVIOUR; COASTAL WATERS; FISHING NETS; PHILIPPINES

Forest bat diversity and abundance in different habitats in Mt. Kanlaon Natural Park, Negros Island [Philippines]. **Deligero, J.A., Warquez, D.A., Doble, K.J.S., Paguntalan, L.M.J., Jakosalem, P.G.C.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 19-36. (Jan-Dec 2016).*

Bat diversity and abundance in different habitats along an elevational gradient was assessed on Mt. Kanlaon Natural Park (MKNP) from 19 May – 2 June 2015 using mist netting and harp trapping methods. A total of 72 net nights and 68 trap nights as well as 65 20m x 20m circular vegetation plots were conducted. There were 608 bats captured representing 23 species, of which 8 are endemic to the Philippines. Ten bat species were added to the list of bats previously recorded in Mt. Kanlaon : Pteropus pumilus, Hipposideros ater, Hipposideros diadema, Kerivoula cf. hardwickii, Kerivoula pellucida, Murina cyclotis, Myotis cf. rufopictus, Pipistrellus sp., Rhinolophus inops, and Rhinolophus subrufus. Secondary montane forest had the highest bat diversity (H1 = 1.88). Logistic Regression Analysis and Poisson Distribution showed several variables (number of trees of specific height, canopy and subcanopy cover, elevation, number of dead trees and fruiting trees, distance from water, and mean DBH) with significant association to bat occurrence and abundance.

CHIROPTERA; SPECIES; BIODIVERSITY; NATIONAL PARKS; HABITATS; SPATIAL DISTRIBUTION; PHILIPPINES

Introduced frogs in buffer zone and adjacent areas of Mt. Banahaw de Lucban, Quezon Province, Luzon Island, Philippines. **Samaniego, E.V.G.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 57-66. (Jan-Dec 2016).*

Mt. Banahaw de Lucban [Quezon Province, Philippines], a part of the Mt. Banahaw San Cristobal Protected Landscape, is home to diverse endemic frogs including Platymantis banahao, P. montanus, P. naomii, P. luzonensis, P. pseudodorsalis, and P. indeprensa. This study was conducted to determine the occurrence of the 5 introduced frog species in the Philippines, namely: Rhinela marina (Linnaeus), Lithobates catesbeianus (Rana catesbeiana) (Shaw), Hoplobatrachus rugulosus (Wiegmann), Hylarana erythraea (Schlegel), and Kaloula pulchra Gray. Using quadrat methods and direct count of introduced frog populations in 5 barangays [villages] located at the foot of Mt. Banahaw de Lucban, a total of 373 frogs belonging to 4 species were counted. Rhinella marina has the highest occurrence (210 individuals) followed by K. pulchra (118), H. rugulosus (23), and H. erythraea (22). Lithobates catesbeianus was not observed during the survey. Interviews conducted with farmers and locals highlighted the sudden increase of K. pulchra population in the recent years. The species occurring nearest to the protected area was Hylarana erythraea.

HIGHLANDS; LANDSCAPE CONSERVATION; FROGS; SPECIES; INDIGENOUS ORGANISMS; PHILIPPINES

Not all sequences found in the internet are based on correctly identified specimens: examples from data analyses for stick insects (Phasmatodea) and other examples. **Abenis,**

K.O., Lit, I.L., Jr., Doo-Sang Park., Eusebio, O.L. *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 161-162. (Oct 2018).*

The advancement in technologies, especially tools for molecular techniques, continually evolves, thus reducing costs for basic analysis like DNA barcoding. This taxonomic method that uses a short genetic marker in an organisms' DNA is a widely used tool for identifying organisms by many researchers at present. This method has confirmed morphological phylogenies of many groups, and even resolved species-complex problems. A few cases in the Philippines were even published as new species based solely on molecular data. However, the research on stick insects (Phasmatodea) shows that despite having stick insect sequences deposited in databases like GenBank and BOLD Systems, matches to query cover may hit to a hundred percent but identifies our specimen to a different genus. For instance, Pharnacia ponderosa Stal (Phasmatidae: Clitumaninae) is identified as Neohirasea japonica (Haan) (Lonchodidae: Necrosiinae) in GenBank but barcodes for P. ponderosa are likewise available in the gene banks. Researchers' case for the wasp (Hymenoptera, Ammophila coronate A. Costa also had 100% query cover to family Tarsonemidae (Acari) and Oenochroma vinaria Guenee (Lepidoptera).

PHASMIDA; HYMENOPTERA; DNA; TARSONEMIDAE; ACARINA; GENETIC MARKERS; PHYLOGENY; GENE BANKS; DATABASES

L50 - Animal physiology and biochemistry

Not all sequences found in the internet are based on correctly identified specimens: examples from data analyses for stick insects (Phasmatodea) and other examples. **Abenis, K.O., Lit, I.L., Jr., Doo-Sang Park., Eusebio, O.L.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 161-162. (Oct 2018).*

The advancement in technologies, especially tools for molecular techniques, continually evolves, thus reducing costs for basic analysis like DNA barcoding. This taxonomic method that uses a short genetic marker in an organisms' DNA is a widely used tool for identifying organisms by many researchers at present. This method has confirmed morphological phylogenies of many groups, and even resolved species-complex problems. A few cases in the Philippines were even published as new species based solely on molecular data. However, the research on stick insects (Phasmatodea) shows that despite having stick insect sequences deposited in databases like GenBank and BOLD Systems, matches to query

cover may hit to a hundred percent but identifies our specimen to a different genus. For instance, Pharnacia ponderosa Stal (Phasmatidae: Clitumaninae) is identified as Neohirasea japonica (Haan) (Lonchodidae: Necrosiinae) in GenBank but barcodes for P. ponderosa are likewise available in the gene banks. Researchers' case for the wasp (Hymenoptera, Ammophila coronate A. Costa also had 100% query cover to family Tarsonemidae (Acari) and Oenochroma vinaria Guenee (Lepidoptera).

PHASMIDA; HYMENOPTERA; DNA; TARSONEMIDAE; ACARINA; GENETIC MARKERS; PHYLOGENY; GENE BANKS; DATABASES

L53 - Animal physiology - reproduction

Effects of sugar types in semen extender on sperm quality and longevity of frozen goat semen. **Rattanatabtimtong, S., Satsook, P., Chomchai, S., Tongthaeng, V.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 152-161. (Jun 2018).*

Supplementation of beneficial substances in semen extender is one of crucial ways to maintain the optimal sperm quality of frozen semen. The addition of sugar to semen extender has an advantageous effect and can be used as an energy source. The aim of this study was to evaluate the effects of different sugar types in semen extenders on sperm quality and longevity after cryopreservation. Semen samples were obtained from healthy Boer goats (Capra aegagrus hircus) twice a week for four weeks. Individual sample was initially evaluated for quality. For each day of semen collection, good quality semen samples were pooled, divided into three groups, and cryopreserved in Tris-base extenders supplemented with different three sugar types: glucose, fructose, and trehalose. All samples were promptly frozen for further study. The samples were analyzed for motility, viability, membrane integrity, and sperm morphology after thawing and incubated at 1, 2, and 3 h. The results showed that total motility, progressive motility, viability, and membrane integrity of sperms in extender supplemented with trehalose were significantly higher than those in extenders supplemented with glucose and fructose(p0.05). This suggested that trehalose can be potentially used as a cryoprotectant in a semen extender to preserve the optimal quality of motility, viability, and membrane integrity of goat sperms.

GOATS; SEMEN; QUALITY; ARTIFICIAL INSEMINATION; SUGAR; EVALUATION; FREEZING

Livestock reproductive biotechnologies: role in land preservation and green agriculture. **Hufana-Duran, D.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 162-170. (Jun 2018).*

Green agriculture is a product of development, of adopting innovations from the results of scientific research activities and careful planning. It is associated with building a concept of ecological civilization, of making an overall plan for urban, including rural socio-economic development, and establishment of new ecological socialist countryside. It is a manifestation of increased productivity, promotion of the reasonable distribution of rural productivity, optimization of the allocation of factors and maximization of economic benefits. With the increasing human population, urbanization and expansion of land utilization, integrated crop-livestock husbandry is important to promote green agriculture as livestock provide manure aside from catering to the increasing requirements for milk and meat for human consumption. As land scarcity increases, poorer land is used, causing the marginal productivity of labour and of land to decline. So high priority should be given to maintaining soil productivity by increasing agricultural production through yield increases with little or no additional land. Livestock genetic improvement is therefore needed to produce the animals with superior genetics that could produce the needed milk and meat without necessarily raising the high number of livestock and occupying much space to meet the human requirement. In the implementation of livestock genetic improvement programs, reproductive biotechnologies play an important role to maximize and facilitate the multiplication of genetically superior bulls through artificial insemination, while ovum pick up and in vitro embryo production and transfer maximize the female contribution to genetic progress. The theories and practices on the role of reproductive biotechnologies on green agriculture is presented.

LIVESTOCK; REPRODUCTION; SILVOPASTORAL SYSTEMS; ANIMAL BIOTECHNOLOGY; BREEDING METHODS; ARTIFICIAL INSEMINATION; EMBRYO TRANSFER

L60 - Animal taxonomy and geography

Distribution, abundance, and habitat requirements of endangered babblers in Mt. Kanlaon Natural Park, Negros Island, Philippines. **Pios, S.G.B., Warquez, D.A., Reintar, A.T., Paguntalan, L.M.J., Jakosalem, P.G.C.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 1-18. (Jan-Dec 2016).*

A study on the distribution, abundance, and habitat requirements of flame-templed babbler (Dasycrotapha speciosa) and Negros-striped babbler (Stachyris nigrorum) in Mt. Kanlaon Natural Park was conducted from 18 May to 2 June 2015. A total of 44.5 km of transects were surveyed using a combination of line transect and point count methods while 567 circular plots measuring 30 m x 30 m were established for habitat assessment. A total of 27 individuals of the flame-tempered babbler were recorded in habitat types occurring from 604–1,078 masl while 14 individuals of the Negros striped-babbler was encountered in

primary forest and secondary montane forest from 1,105–1,927 masl. D. speciosa was abundant in secondary lowland forest (n = 16) while S. nigrorum was abundant in secondary montane forest (n = 8). The presence of D. speciosa in plantation denotes that this forest serves as temporary habitat for this babbler. Both logistic regression analysis and Poisson distributions showed that increased percentage of climbing bamboos and trees with 16–20 m height and decreased elevation implied increased likelihood of the occurrence and abundance of D. speciosa. Subsequently, decreased tree density was associated with increased occurrence and abundance of S. nigrorum. Existing local threats include bird hunting, illegal tree cutting for timber, and firewood and charcoal production. This study recommends regular forest monitoring and strengthening of forest protection and enforcement.

BIRDS; SPECIES; ENDANGERED SPECIES; SPATIAL DISTRIBUTION; HIGHLANDS; HABITATS; ALTITUDE; PHILIPPINES

L72 - Pests of animals

Additional contributions to the knowledge of predatory mites of the family cunaxidae (Acari:Prostigmata). **Corpuz-Raros, L.A., Naredo, J.C.B., Garcia, R.C.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologist (Philippines). 0048-3753. v. 32 (2) p. 158. (Oct 2018).*

Five new species of predatory mites belonging to the subfamilies Coleoscrinae and Cunasinae (family Cunaxidae) are described from the Philippines, namely, Neobonzia l, n. sp., Neoscirula 1,2, and 3, n. spp. and Cunaxa 1n. sp. The male of Dactyloscirus trifidus Corpuz-Raros, 2008 (Cunaxinae) and the female of Lupaeus longisetus (Corpuz-Raros, 1996) (Cunaxoidinae) which were previously unknown are described. A supplementary description is provided for Scutopalus clavatus (Shiba,1976) (Cunaxoidinae) which is recorded for the first time in the Philippines on the coconut leaves infested with the scale insect, Aspidiotus rigidus Reyne. New locality and habitat data are given for some species of the subfamilies, as well as of the subfamilies Bonziiinae and Orangescirulinae. Addition of the new species and the new record brings the Philippine cunaxid fauna to 80.

ACARINA; SPECIES; TAXONOMY; PROSTIGMATA; PREDATORS; FAUNA

Endoparasites of selected captive endemic threatened wildlife species in Negros Island, Philippines. **Alejano, F.A.L., Pabon, J.T., Gorre, R.N., Villagracia, S.S.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 93-98. (Jan-Dec 2016).*

This study aimed to detect, identify and determine the prevalence of endoparasites in selected endemic threatened wildlife species of Negros Island at the Negros Forests Ecological Foundation Inc. Biodiversity Conservation Center in Bacolod City [Philippines]. From 23 July to 14 August 2015, three fecal samples were each collected from three individuals of captive species: Sus cebifrons negrinus, Rusa alfredi, Penelopides panini panini, and Gallicolumba keayi. Analysis of 36 samples using Direct Fecal Smear, Simple Flotation and Sedimentation Techniques, showed that only S.c. negrinus were infected with endoparasites. Ascaris vitulorum was the most prevalent endoparasite (92%), followed by Giardia duodenalis (14%) and Balantidium coli (6%). Degree of infection was found to be mild or below 500 based on the number of eggs per gram of fecal sample. It is recommended that administration of antihelminthics to captive S.c. negrinus individuals should be done periodically coupled with better sanitary measures so that parasitic infection in the enclosures will be reduced.

WILDLIFE; SPECIES; ENDANGERED SPECIES; INDIGENOUS ORGANISMS; PARASITES; ANTHELMINTICS; PHILIPPINES

First attempt toward an updated inventory of genera and species of selected Philippine arthropods. **Lit, I.L., Letana, S.D., Villancio, G.G.S., Barrion-Dupo, A.L.A., Lucañas, C.C., Abenis, K.O., Sotto-Alviola, M.P., Eusebio, O.L., Baroga-Barbecho, J., Alvarez, J.DV., Naredo, J.C.B., Corpuz-Raros, L.A., Rasalan, J.B., Barbecho, N.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists. 0048-3753. v. 32 (2) p. 159. (Oct 2018).*

Terrestrial arthropods (i.e., insects, entognaths, spiders, mites, and others) are the most diverse group of organisms, comprising more than half of the earth's known species. In the Philippines, approximately 20,892 hexapod species were included in the previous list by Gapud in 2000. However, changes in taxonomic position synonymies and new discoveries added to the records of the above mentioned list. Unfortunately, no succeeding attempts have been done to update the previous counts. Currently, there is an initiative to update and database the known terrestrial arthropods. Although still incomplete, the current listing shows a notable increase in some groups (e.g. Plecoptera and Embioptera) and decrease in others (e.g. Phasmatodea and Stresiptera) for some orders. An updated summarized frequency of species under each family of selected orders is presented. A continuous effort is needed to update this list for taxonomic changes and new discoveries.

ARANEAE; SPECIES; ACARINA; ARTHROPODA; GENERA; BIODIVERSITY; TAXONOMY; PHILIPPINES

Taxonomy and diversity of Philippine insects: status and challenges based on a review of studies from 2002-2015. **Letana, S.D., Lit, I.L., Jr., Villancio, G.G.S.** *2015 Philippine Interational Biomass Conference: Exploring the market potentials of biomass for bio-based fuel and energy, , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 157-158. (Oct 2018).*

Numerous new records and described species have been added to Philippine insect fauna from 2002 to October 2015, with a total of 825 new additions generated from 225 publications; with several more undescribed specimens. Out of the 895 new faunal records, 80 (10.18%) were published through local efforts, 40 (4.96%) species added from 25 publications that were primarily authored by Filipinos (or Filipinos as first authors) and 40 (5.22%) additional insect species from 13 publications that were published with Filipinos as co-authors with foreign contingents as first authors. Throughout the centuries taxonomic studies as well as catalogues and checklists have mostly been predominated by foreign authors. In fact, of the 251 publications from 2002-2015, 25 (9.96%) papers were contributed by Filipino authors, other major contributions were Autria, with 35 (13.94%) and Germany with 26 (10.36%), placing the Philippines at third. Prominent local authors from 2002-2015 include Barrion-Dupo, Gapud, Lit, and others. Although local capability for entomological research has increased and shown potential, publications in the past decade or so are still dominated by foreign names. Similarly, majority of the type specimens from the country are still deposited in foreign institutions. This fact does not mean lack of specialists and institutions to do the same work, but that there are still hindrances toward a larger research body for Philippine insect taxonomy research. There are still gaps and areas to be explored as well as specimens and collections to be examined, and an abundance of material to work on.

INSECTA; SPECIES; TAXONOMY; FAUNA; BIODIVERSITY; PHILIPPINES

L73 - Animal diseases

Detecting Wolbachia sp. in dengue mosquito vector, Aedes aegypti and its potential for biological mass-release vector control program in the Philippines. **Carvajal, T.M.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 160. (Oct 2018).*

The use of Wolbachia, has been gaining recognition as a biological control approach in mosquito-borne diseases such as Aedes aegypti (L.). This endosymbiont has the ability to generally manipulate the reproduction and immunity of insects (e.g. mosquitos) and thus,

prevent the spread of significant arboviral diseases, namely: dengue, chikungunya and zika. This study is first to report and demonstrate the successful detection of Wolbachia from field-collected A. aegypti. A total of 672 A. aegypti adult mosquito samples were collected in Metropolitan Manila, Philippines and screened using wsp and Wolbachia specific 16S rDNA markers under optimized PCR conditions. Our results yielded positive amplification in wsp and 16S rDNA markers from 113 (16.8%) and 89 (13.2%) mosquito samples, respectively. Phylogenetic analysis revealed that the wsp sequences clustered to supergroups A and B and showed high and identical similarity (99-100%) to five known Wolbachia strains including the virulent wme1POP. The results provide an avenue in utilizing natural Wolbachia strains infecting this mosquito vector for either population replacement or suppression. This step intends to create an efficient and effective streamlines approach for both mass rearing and release programs intended to control the transmission of arboviral diseases by A. aegypti.

AEDES AEGYPTI; PCR; DISEASE TRANSMISSION; BIOLOGICAL CONTROL

M - FISHERIES AND AQUACULTURE

M01 - Fisheries and aquaculture - general aspects

Ex-ante analysis of industry strategic S and T [Science and Technology] plans for marine resources sector: Ex-ante analysis of industry strategic S and T [Science and Technology] plans for sea cucumber. **Garcia, Y.T., Valientes, R.M., Abante, J.C.I.** *College, Laguna (Philippines). TR-1755. 2016. 103 leaves.*

SEA CUCUMBERS; INDUSTRY; MARINE RESOURCES; EX-ANTE IMPACT ASSESSMENT; HATCHING; NURSERY GROUNDS; PONDS; AQUACULTURE

Ex-ante evaluation of PCARRD [Philippine Council for Agriculture, Forestry and Natural Resources Research and Development] Industry Strategic S and T [Science and Technology] (ISP) plans for marine resources (seaweed). **Garcia, Y.T., Padua, D.K.B., Tan, I.M.A.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. College, Laguna (Philippines). TR-1734. 2016. 105 leaves.*

SEAWEEDS; MARINE RESOURCES; EX-ANTE IMPACT ASSESSMENT; AQUACULTURE; FOOD SECURITY

M11 - FISHERIES PRODUCTION

Estrogenic pollutants: impacts on reproductive health of fish in Laguna de Bay [Philippines]. **Paraso, M.G.V.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 33.*

Laguna de Bay receives a complex mixture of industrial effluents, agricultural runoff, and municipal wastewaters from its extensive watershed. Recent studies detected significant levels of the hormone 17 betha-estrodoil (E2) in lake water samples that confirm its contamination with human and/or animal excreta. Moreover, increased estrogen biomarker responses in collected fish were observed. Both caged and feral male common carp (Cyprinus carpio) demonstrated testicular abnormalities and vitellogenin synthesis that are indicative of exposure not only to E2 but also to potential estrogen-mimicking compounds. Although no obvious signs of illness were seen in fish, exposure to estrogenic pollutants could decrease fish fecundity, which might have negative implications on the sustainability of fish populations.

CYPRINUS CARPIO; CARP; REPRODUCTIVE HEALTH; OESTROGENS; WILD ANIMALS; FERTILITY; LAKES; POLLUTION; PHILIPPINES

M12 - Aquaculture production and management

Ex-ante analysis of industry strategic S and T [Science and Technology] plans for marine resources sector: Project title: Ex-ante of industry strategic S and T [Science and Technology] plans for abalone. **Garcia, Y.T., Alcalde, J.V., Foliente, J.A.P.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. Southeast Asian Fisheries Development Center, National Highway, Tigbauan, 5021 Iloilo (Philippines). Aquaculture Dept. College, Laguna (Philippines). TR-1756. Nov 2016. 136 leaves.*

ABALONES; MOLLUSCA; MARINE RESOURCES; EX-ANTE IMPACT ASSESSMENT; SUPPLY; DEMAND; PRODUCTION

Influence of HUFA [Highly Unsaturated Fatty Acids] enriched zooplankton on growth, survival and stress tolerance of Glossogobius giuris (Hamilton, 1822) 'biyang puti' larvae. **Lontoc, B.M., Fajardo, R.D.** *College, Laguna (Philippines). TR-1885. 2018. 32 leaves.*

Effects of enriched Moina macrocopa at varying HUFA [Highly Unsaturated Fatty Acids] concentrations were evaluated on the growth, survival and stress tolerance of 30 dph Glossogobius giuris 'biyang puti' larvae. Three treatment groups and one control were replicated three times with ten individual fish per replicate. T1 received 0.5ml of the enrichment medium, T2 1.5 ml, T3 2.5 ml and T4 received the unenriched diet. Growth factors such as specific growth rate (SGR), weight gain (WG), relative growth rate (RGR), absolute growth rate (AGR), and daily growth index (DGI) were among the parameters evaluated at the end of the experiment. Survival was likewise noted at the end of the experiment. Thermal (36.5 deg C for 30 minutes) and pH (pH for 5 minutes) shocks were among the parameters considered for stress tolerance test. Surviving individuals were noted after subjecting the larvae into each test. Current study shows that T1 exhibited significantly higher SGR compared to the control while for the rest of the growth parameters, T1 showed significantly higher values among the treatment groups. T1 has the lowest mean survival rate when numerically compared to the rest of the treatments, however, statistical analysis revealed no significant difference. Based from the results, it could be inferred: (1) that HUFA-enrichment of Moina macrocopa has resulted in improvement of growth parameters, (2) that there were some indications of increased survival of biyangputi larvae with increased HUFA-enrichment of live feeds.

GLOSSOGOBIUS GIURIS; SPECIES; LARVAE; ZOOPLANKTON; GROWTH; STRESS; TOLERANCE; UNSATURATED FATTY ACIDS; FEEDS; ANIMAL FEEDING

N - AGRICULTURAL MACHINERY AND ENGINEERING

N10 - Agricultural structures

Rehabilitation of seed conservation facility for the National Corn Germplasm Collection at NPGRL [National Plant Genetic Resources Laboratory, University of the Philippines, Los Baños]. **Bon, S.G. Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research.** *College, Laguna (Philippines). TR-1918. 2019. 39 leaves.*

MAIZE; SEEDS; GERMPLASM CONSERVATION; STORAGE; STOREHOUSES; BUILDING CONSTRUCTION

N20 - Agricultural machinery and equipment

Operational policy for the development of the Philippine agricultural and fisheries mechanization index. **Amongo, R.M.C., Larona, M.V.L., Onal, M.K.S., Ilao, C.I.L., Lalap, G.N.L., Ogius, L.E., Melendez, P.B.** *Department of Agriculture, 2nd Floor BSWM Bldg., Elliptical Rd., Diliman, Quezon City (Philippines). Philippine Council for Agriculture and Fisheries. College, Laguna (Philippines). TR-1785. 2017. 166 leaves.*

It has been widely accepted the agricultural mechanization had been the precursor of industrialization of many developing countries in Asia, such as Korea, Japan, Taiwan, among others. The path from mechanization towards industrialization had not been easy. Political will, social preparation, and enactment of relevant laws are some of the factors that contribute to the success in implementing agricultural mechanization. Agricultural mechanization through large-scale system implemented by developed and developing countries in Asia was elevated at a higher level in the past decades for improved land, labor and crop productivity. With the importance of agricultural technology as highlighted in the UN Sustainable Agricultural Development Plan of 2015, an off-shoot of the Millennium Development Plan (2000-2015), an operational policy towards standardizing the agricultural mechanization index (AMI) is imperative towards updating and assessing the level of mechanization for policy directions. Moreover, the enactment of Republic Act 10601 otherwise known as the Agricultural and Fisheries Mechanization (AFMech) Law of 2013 stipulates the important role of mechanization in the country's agricultural development. The law mandated the government to support the investment for the distribution of agricultural mechanization technologies throughout the country in support of the food security ad sufficiency programs. However, different methodologies and descriptions on the level of mechanization by institutions involve in agricultural mechanization development were formulated which could serve as bases for decision making. Hence, there is a need to harmonize such methodologies and come up with a standard operational procedure in indicating our level of mechanization. Such information shall provide basis for policy and decision makers to make ell- informed decisions for the acquisition, distribution and utilization/adoption of agricultural mechanization technologies. Moreover the information will provide the operational procedure for regular updating of mechanization index for research development and extension activities and policy decisions related to agriculture and fisheries mechanization. This project is composed of four studies. The first study involves the benchmarking off the agricultural mechanization index in the Philippines vis-a-vis selected ASEAN countries. Two ASEAN countries namely Vietnam and Thailand were visited to gather the recent developments and to document the technologies utilized in determining their level of agricultural mechanization. Other countries namely: Myanmar, Lao PDR, Cambodia and South Korea were also benchmarked through a survey

questionnaire. The second study comprised of the development of a standardized procedure for the Philippine agricultural mechanization index (AMI) where significant components were identified. The third study is the formulation of the standard operating policy for the AMI where a modified agricultural mechanization. The fourth study is the validation activities to verify the MAMI procedure in a rice growing area in Oriental Mindoro. Policy statements and related policies were formulated and submitted for adoption of the government through the Department of Agriculture.

AGRICULTURAL DEVELOPMENT; FISHERY POLICIES; PROCESSING; MECHANIZATION; STANDARDIZING; TECHNOLOGY; PHILIPPINES

P - NATURAL RESOURCES AND ENVIRONMENT

P01 - Nature conservation and land resources

Campus social media page promotes biodiversity through documented encounters with wildlife. **Hubilla, E.K.** *Agriculture (Philippines). 0118-857-7. v. 24 (3) p. 58-59. (Mar 2020).*

FLORA; FAUNA; WILDLIFE; NATURE CONSERVATION; BIODIVERSITY; SOCIAL PARTICIPATION; COMMUNICATION TECHNOLOGY

Diversity and distribution of herpetofauna in Balesin Island, Polillo, Quezon, Philippines. **Gojo Cruz, P.H.P., Afuang, L.E., Gonzales, J.C.T., Tabaranza, D.G.E., Alejando, M.D., Cajano, M.A.D., Afuang, D.L.E.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 37-56. (Jan-Dec 2016).*

A survey of the ecosystems and herpetofauna of Balesin Island in the Polillo group of islands was conducted on 19-22 July 2015. The survey was part of a bigger biodiversity study of the whole island for a conservation management program planning for Balesin Island Resort. Several standard survey techniques were used to assess the island's herpetofauna. GIS-based mapping was done to identify the boundaries of the island's habitat types and the herpetofaunal distribution. A vegetation survey was likewise conducted. Seven major habitat types were identified. A total of 16 species of herpetofauna were documented including 2 amphibians, 1 agamid, 3 geckos, 6 kinks, 3 snakes, and 1 monitor lizard. Malayopython reticulatus was reported present by the locals on the island but was not observed during the study. With the exception of Laticauda laticauda, all herpetofauna documented in Balesin Island have been recorded elsewhere in the Polillo group of islands.

ISLANDS; BIODIVERSITY; ECOSYSTEMS; ANIMAL RESOURCES; FAUNA; HABITATS; GEOGRAPHICAL DISTRIBUTION; PHILIPPINES

Environment code of Tanauan City [Batangas, Philippines]. **Philippines Univ. Los Baños, College, Laguna (Philippines). School of Environmental Science and Management.** *College, Laguna (Philippines). TR-1801. 12 leaves.*

ENVIRONMENTAL POLICIES; REGULATIONS; TOURISM; ENVIRONMENTAL MANAGEMENT; PHILIPPINES

Introduced frogs in buffer zone and adjacent areas of Mt. Banahaw de Lucban, Quezon Province, Luzon Island, Philippines. **Samaniego, E.V.G.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 26(1 and 2) p. 57-66. (Jan-Dec 2016).*

Mt. Banahaw de Lucban [Quezon Province, Philippines], a part of the Mt. Banahaw San Cristobal Protected Landscape, is home to diverse endemic frogs including Platymantis banahao, P. montanus, P. naomii, P. luzonensis, P. pseudodorsalis, and P. indeprensa. This study was conducted to determine the occurrence of the 5 introduced frog species in the Philippines, namely: Rhinela marina (Linnaeus), Lithobates catesbeianus (Rana catesbeiana) (Shaw), Hoplobatrachus rugulosus (Wiegmann), Hylarana erythraea (Schlegel), and Kaloula pulchra Gray. Using quadrat methods and direct count of introduced frog populations in 5 barangays [villages] located at the foot of Mt. Banahaw de Lucban, a total of 373 frogs belonging to 4 species were counted. Rhinella marina has the highest occurrence (210 individuals) followed by K. pulchra (118), H. rugulosus (23), and H. erythraea (22). Lithobates catesbeianus was not observed during the survey. Interviews conducted with farmers and locals highlighted the sudden increase of K. pulchra population in the recent years. The species occurring nearest to the protected area was Hylarana erythraea.

HIGHLANDS; LANDSCAPE CONSERVATION; FROGS; SPECIES; INDIGENOUS ORGANISMS; PHILIPPINES

Policy review of PCSD [Palawan Council of Sustainable Development] resolution 04-233 thru comparative social impact analysis: the case if indigenous Batak and Pelawan Almaciga tappers from Tagnipa, Roxas and Amas Brookes point. College, Laguna (Philippines). *TR-1851. Dec 2014. 45 leaves.*

Historically, almaciga (bagtik) concessions though tapped by indigenous peoples locally known as magbabagtik and found with ancestral domain were owned by private concessionaires who also control the market. These resulted to inequitable access and benefits from the gains of almaciga trade where IPs are the losing end. For decades IPs unrequited toil in Almaciga tapping have supplied a primary local economic industry that

have fed economic clout and political power to traders turned ruling elites while pumping local forest revenues. It was only within the dacade that exclusive Almaciga concession rights were recognized and granted for indigenous peoples, PCSD [Palawan Council of Sustainable Development] resoluton 2004-233. This research study entitled 'POLICY REVIEW OF PCSD RESOLUTION 04-233 THRU COMPARATIVE SOCIAL IMAPACT ANALYSIS BETWEEN PELAWAN AND BATAK INDIGENOUS TAPPERS' COMMUNITIES WITHIN AMAS, BROOKES POINT AND TAGNIPA, ROXAS' attempts to answer if indeed PCSD Resolution No. 04-233 contributed to advance the social wellbeing of the indigenous peoples sector as crucial stakeholders of the local Almaciga industry and key agents of forest conservation. This is qualitative comparative case analysis study that explores policy dynamics between two contrasting socio-cultural context of Pelawan and Batak indigenous almaciga tappers in the course of PCSD Resolution No. 04-233 ratification and implementation. The CORE indicators namely C- Cultural Context; O- Organizational Response; and RE-Resource Rights and Equity were used to identify and analyze the factors that in Auence the in the the realization of the resolutions policy rationale base on the local perspectives and experiences. Findings reveal that almaciga forest and derived resins of the indigenous peoples is more than just an economic resource but a medium of forest-cultural interaction. The Almaciga resources served as an important adaptive mechanism to cope with the encroachment of cash economy in the Palawan Ips of Amas while bagtik is a means of livelihood survival in the case of the dwindling and improverished Bataks of Tagnipa. Despire the enactment of PCSD 2004-233, grave social inequities persists reflected in the exploitative middlemen or kapatas among the Btaks and the debt-ridden and credit-dependent market relations of Pelawan of Amas. Evidently, indigenous almaciga tappers' are crucial forest conservation actors whose customary status of recognition of land rights and tenure security, status of livelihood diversification and pressures of rural poverty; demographic and socio-cultural context along with local IP's organizational capabilities in Auence the sustainability of Almaciga livelihoods and their access to Almaciga concession rights. POlicy gaps in establishing institutional clear strategies; weak policy education and communication to pertinent sectors, primarily IP communities undermined the implementation of PCSD 2004-233. Much is yet to be realized to achieve the policy rationale due to various interlinked socio-environmental and economic issues revolving the local Almaciga sectors. These are (a)acquisition of exclusive almaciga concession rights remains to be costly, tedious and problematic-compounded vy bureaucratic failures of corruption and ambuguity; (b)the tedious, snail-paced delineation and processing of their Certificate of Ancestral Domain Titles (CADTs), makes their aspiration and local assertion of rights to land and resources elusive; (c)lack of enabling mechanisms including institutional support and initial financial capital for IP-POs self reliant management of community-based almaciga trade and (d)lack of advocacy and policy lobbying to pursue reforms in Almaciga trade market relations towards equity. Based on the research insights, the following recommendations are proposed to contribute to the PCSD 2004-233 policy rationale of advancing institutional

collaboration, genuine IP rights to land resources, forest conservation and social equity. These are (1)Pursue policy lobbying and program assistance to advance the genuine achievement of indigenous peoples rights to culture, land, resources and self-determination; (2)Formulation of accountability and transparency mechanism thru a Standard-Operating-Procedure (SOP) process Aow-chart and guidelines in O.M.L. Almaciga.License processing and renewal in all levels to counter corruption, promote public information, services of efficiency and good governance; (3)Conduct of Almaciga Policy and Multisectoral Conference to pursue multisectoral policy dialogue and institutional participation towards policy and market reforms not just on PCSD 2004-233 but on the local almaciga sector perse; (4)Advance financial support IP-PO concession holder, market and policy reforms for equitable benefit sharing (5)Institutional partnerships to support community based development programs, participatory organizational capacity development and governance involvement among indigenous almaciga tappers' communities; (6)initiative development of community-based forest biodiversity assessment and resource system monitoring and information system (CBMIS) centered on Almaciga IP-PO concession holders.

AGATHIS; SPECIES; ETHNIC GROUPS; FORESTRY POLICIES; LAND RESOURCES; ENVIRONMENTAL IMPACT ASSESSMENT; SUSTAINABLE DEVELOPMENT; FOREST PRODUCTS

P05 - Energy resources management

Stakeholders' satisfaction study C.Y. 2018 main report: Stakeholders' satisfaction survey for PNOC [Philippine National Oil Company Exploration Company] Exploration Corporation. **Visco, E.S.** *College, Laguna (Philippines). TR-1884. 2019. 129 leaves.*

The conduct of stakeholders' satisfaction survey (SSS) to measure PNOC ECs [Philippine National Oil Company Exploration Company Exploration Corporation] performance for 2018 is one of the requirements of the Governance Commission for Government-Owned or-Controlled Corporations(GCG).The result of this annual conduct of SSS is very important to determine how PNOC EC fared in terms of their mandated functions and also serve as a crucial feedback mechanism to regularly improve their project operations. This year, the study was conducted to determine the level of satisfaction of all PNOC EC's customers/stakeholders on the conduct of projects being developed and implemented by PNOC EC. Specifically, it aimed to: 1.quantify the stakeholder's specific and overall satisfaction level for business activity and determine the average of the overall satisfaction rating; 2.determine the top reasons for satisfaction and dissatisfaction of the stakeholders; 3. determine the derived importance by correlating the satisfaction levels of each attribute with the overall satisfaction rating and a plant a derived importance score per attribute against satisfaction score per attribute in the prescribed scatter diagram; and, 4.identify

opportunities for improvement to enhance the stakeholder's satisfaction. Result showed that PNOC EC got 5.0 ('Very satisfied') rating both in their overall performance based on their stakeholder's perception and on the six attributes of SS. Almost all (96.1%) of the respondents gave PNOC EC positive ratings on the statements measuring the SS. Of the 96.1% positive rating, 59.11% of them rated PNOC EC's performance 5 ('Very satisfied') and 36.99% of them rated PNOC EC 4 ('Satisfied'). Their positive ratings per attribute are the following: 98.1% for Staff and organization; 93.66% for Partner organization; 80% for Complaints handling; 93.15% for Information and communication; 100% for Information and communication (Website); and 96.4% for Facilities. These very high positive rating means that the PNOC EC stakeholders are very contented and satisfied with PNOC EC operations this 2018. This result was consistent with the ratings they received from their stakeholders in the past years since the conduct of SSS was required to all GOCCs in the country. As for the reasons for rating,stakeholders who rated PNOC EC positively mentioned these top three reasons: 1. PNOC EC generally provides good service; 2. programs and services are useful and helpful; and, 3. we are generally satisfied with the services they provided. Aside from determining their overall satisfaction based on their perception and on the six attributes, the study also determined the most influential attribute to stakeholders’ satisfaction. This is done to analyze what really drives the satisfaction of the PNOC EC stakeholders. With these findings, it is important that PNOC EC should maintain 'Very satisfactory' performance by continuing to excel in the attributes that are found to be significantly influential to their SS. PNOC EC should look into the recommendations provided by their stakeholders and the research team and focus on the identified areas for improvement. This way, PNOC EC will continue to provide excellent services with the highest integrity and commitment to public service in the years to come.

OILS INDUSTRY; COAL; ENERGY MANAGEMENT; SURVEYS; SERVICES; PHILIPPINES

P06 - Renewable energy resources

Saccharine feedstocks for the production of high value products. **Demafelis, R.B., Gatdula, K.M., Dizon, L.S.H., Pector, A.A., Movillion, J.L., Elegado, F.B., Gomez, C.C., Almazan, R.A.R., Asuncion, R.V.** *Department of Agriculture, BPI Cmpd. Visayas Ave. Diliman, Quezon City (Philippines). Bureau of Agricultural Research. University of the Philippines Los Baños Foundation, Inc., College, Laguna (Philippines). College, Laguna (Philippines). TR-1822. 2017. 99 leaves.*

Energy supply has been one of the concerning issues forced worldwide. Fossil fuel, the main source of depleting. Price of oil in the world market constantly changes. Environmental damages and issues like global warming and climate change, which is said to be caused by burning fuel sources, are threatening. For these concerns, fuel must be environmental-

friendly and must be obtained from renewable sources. This study assessed saccharine feedstocks such as mollasses, sugarcane syrup and sweet sorghum syrups for the biofuel production. Bacterial strains of Clostridium acetobutylicum 1200 and 1532, which were obtained from the Philippine National Collection of Microorganism (PNCM), National Institute of Molecular Biology and Biotechnology (BIOTECH), UPLB [University of the Philippines Los Baños] were utilized for the products of acetone, butanol and ethanol solvents. Conditions such as substrate concentration (10 deg Bx and 30 deg Bx), temperature (30 deg C and 50 deg C), acidity (pH 4 and pH 6), agitation (with and without), nutrient supplementation (with and without ammonium acetate), bacterial strain and inoculum loading (10% v/v and 30% v/v) were varied. Quantification of the solvents formed in the mediums were analyzed using Shimadzu 2010 Plus Gas chromatography unit, InertCAP Wax column. Headspace method coupled with Full Evaporation Technique (FET) was used as sample preparation for the said analysis. During the parametric studies, the highest fermentation efficiency of 64.43% and highest butanol production of 0.216% v/v was observed in the fermentation of sweet sorghum syrup using Clostridium acetobutylicum 1200. Significant parameters are substrate concentration (+), inoculum loading (+), pH (-) and interactions of temperatures-substrate concentration (+), temperature-inocolum loading (-) substrate concentration-inocolum loading (+) substrate and concentration-pH (-). Optimum conditions for ABE fermentation was obtained using 30.4% v/v inocolum loading, 40.4 deg Brix syrup, 50 deg C reaction temperature and medium pH of 4, resulting to a highest butanol yield of 1.52% v/v with a corresponding process efficiency of around 54.8% to 58.7%. For the omega-3 fatty acid production, Trichoderma harzianum was obtained from Institute of Bilogucal Sciences (IBS), UPLB. Among the three tested substrates, DHA yield from molasses is highest at 6.902 +- o.040 mg/L using the following conditions: 10% v/v inoculum loading, 20 Deg Brix concentration of the syrup and within a reaction time of 17 days.

MOLASSES; SUGARCANE; SORGHUM BICOLOR; BIOFUELS; CLOSTRIDIUM ACETOBUTYLICUM; ACETONE; ETHANOL; FERMENTATION; PRODUCTION; TEMPERATURE

Sugar crop-based biorefinery for an integrated production of sugar, ethanol and other high-value products. **Borines, M.G.** *Capunitan, J.A. UPLB Centennial Professorial Chair Lecture, College, Laguna (Philippines), 27 Jun 2019. College, Laguna (Philippines). 2019.*

Although the Philippines' sugar industry contributes greatly to the country's economy. It still faces major challenges in terms of competitiveness and inadequacy as brought by the full implementation of the ASEAN Free Trade (AFTA) and inability to meet the current demand for bioethanol as fuel blend (Ang, 2018). Thus, there is a need to create an alternative revenue stream for the industry and to eliminate ethanol imports, which can be achieved by developing high-value products from sugarcane, sugar and its by-products, as well as sweet

sorghum, another potential sugar crop. This can be realized through the establishment of a sugar crop-based biorefinary, which is an integrated facility for sustainable processing of biomass into a spectrum of bio-based products (food, feed, chemicals and materials) and bioenergy (biofuels, power and/or heat. Thus, the lecture was done to develop a framework for the sugar crop-based biorefinery to produce high-value products suitable for Philippine sugar factories and distilleries. In this lecture, the biorefinery concept was first discussed, including its definition and elements such as feedstock, conversion processes, platforms and products. From the available literature, as well as studies that have been made at the Department of Chemical Engineering, the various products that cabe be derived from sugar crops by fermentation and conversion or recovery were described. For sugar cane, the following products can be developed from cane trash, cane juice or syrup, sucrose and mascovado: biofuels (ethanol, methane, hydrogen), bioplastics, platform chemicals, food products, compost or soil ameliorant and other important chemicals, food products, compost or soil ameliorant and other important chemicals and products (Anh, et al., 2000; Lukatijis, et al., 2018; Bonadio et al., 2018; Palisoc, 2017; Xiao et al., 2018; Vohra, et al., 2014; Vijayendra et al., 2001; Garcia et al., 2017; Khan, 1995). For sweet sorghum juice and syrup, fermentation products include biofuels (ethanol, butanol, hydrogen) as well as important chemicals such as butadiene and lactic acid, among others. For sugar manufacture by-products such as bagasse, molasses and filter cake, products like fuel, policosanol, bioplastics, bipolymer, baker's yeast, monosodium glutamate, itaconic acid, acetone, among others, can also be obtained. After describing the high value-products that can be developed from sugar crops and their byproducts, a sugarcane-based biorefinery was proposed, supplemented with a sorghum-based biorefinery. For sweet sorhum, a possible biorefinery scenario would be integrate it with an existing sugarcane-based biorefinery, and utilize the sorghum juice or syrup for bioethanol production. Biofuels Act 2006 has created a market for bioethanol characterized by demands-supply gap and big volume imports. A consisted and reliable year round supply of feedstock is a significant cost component for biorefinery. With the seasonality of sugarcane, the use of sweet sorghum as an alternate feedstock for distillery could fill the demand for feedstock since sweet sorghum is a persistent crop. Moreover, they could be handled by a traditional sugar cane harvest and processing system. Market study and life cycle analysis of the biorefinery models presented most be done to look at all the logistic problems and issues such as cultivation, harvesting, transport, pretreatment, etc. These studies might identify the more promising biorefinery platform that will maximize the production of sugar, electricity and ethanol. Results of these studies might also help the policymakers to come up with a specific policy development in the country for the integration of sugar, ethanol and electricity in a sugar based biorefinery.

SUGARCANE; SORGHUM; SUGAR; ETHANOL; SUGAR INDUSTRY; LIFE CYCLE; CULTIVATION; HARVESTING; TRANSPORT; PURIFICATION

Application of analytic hierarchy process and GIS in landslide vulnerability assessment of Matulinao Watershed, Cebu, Philippines: a case study anchored on the climate change framework. **Lanuza, R.L., Carreon, B.O., Camello, D.L.S., Daño, A.M.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 25(1 and 2) p. 79-120. (Jan-Dec 2015).*

The study was conducted in the ecologically and economically significant Matutinao Watershed in Cebu [Philippines]. Ongoing developmental activities in the area necessitate a landslide vulnerability assessment to avoid possible losses of lives and properties. A GIS-assisted approach was developed to: a) evaluate the utility of GIS with regard to landslide vulnerability assessment anchored on the climate change framework; b) identify and map out the areas vulnerable to landslide; c) recommend appropriate measures to avoid loss of lives and properties; and d) formulate policy recommendations. Using the Analytical Hierarchy Process (AHP) in determining the relative importance of factors identified and GIS, the landslide vulnerability anchored in a climate change perspective was determined. Exposure to landslide was based on 2020 climate projections. The sensitivity was computed based on the model derived from AHP, expressed as L= 0.8297 [0.3160SI + 0.0973R + 0.0973T + 0.0912Ga + 0.0912Gf + 0.1729Gfl+ 0.0698So + 0.0633Lu] + 0.1703 [0.2532FS + 0.3175H + 0.4349GD].

WATERSHED MANAGEMENT; WATERSHEDS; LANDSLIDES; ENVIRONMENTAL IMPACT ASSESSMENT; GEOGRAPHICAL INFORMATION SYSTEMS; CLIMATE; CLIMATIC CHANGE; PHILIPPINES

Assessment of geophysical hazards in Southwest Laguna De Bay [Philippines]: insights from geological, geomorphological and ground penetrating radar data. **Ramos, N.T., Israel, V.A.I., Tubog, M.V.A., Marquez, E.J., Payot, B.D., Queaño, K.L., Faustino-Eslava, D.V., Dimalanta, C.B., Armada, L.T., Labis, F.A.C., Alvanza, G.A., Espaldon, M.V.O.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 29.*

The municipalities of Los Baños, Calamba and Bay, Laguna [Philippines] are underlain by lava flow units (e.g., basalt, andesite, dacite) and capped by pyroclasic deposits (e.g. tuff) of by the Macolod Volcanic Complex. Rock samples were collected and stratigraphic sections were described to further characterize the volcanic processes along the southwester portion of Laguna de Bay. Landslide hazard assessment were also carried out along the foot slopes where communities are exposed to potentially unstable hillslopes. Initial assessment of factors that contribute to slope failures reveals the strong influence of steep slopes/gradients on landslide occurrences. Geological and ground penetrating radar (GPR) data were then integrated to characterize the varied materials (e.g. soils, sediments, rocks) that underlie certain areas of Los Baños, Laguna. In addition to recognize the variable geophysical signatures of rock units at depth, deformed or fractured zones were also inferred from the GPR radargrams. Information derived from the geological and geophysical surveys are important in assessing the effects of ground shaking related to the potential rapture of nearby active faults. Outputs from this project will be useful in mitigating the impacts of geophysical hazards that pose risks to lake-watershed communities, particularly those underlain by deformed and poorly consolidated materials or those that are situated along the low-lying coastal zones of Laguna de Bay.

LAKES; RISK ASSESSMENT; RISK MANAGEMENT; RADAR; COASTAL AREA; LANDSLIDES; PHILIPPINES

Assessment of geophysical hazards in Urban Lacustrine Systems: under the program Ten Years after Millenium Ecosystem Assessment of Laguna de Bay: towards a sustainable future. **Ramos, N.T., Marquez, E.J., Padrones, J.T., Claro, S.M.D., Pabroquez, R.B.** *College, Laguna (Philippines). 30 Apr 2018.*

Landslide and flood hazards constantly pose damaging impacts to upland and lakefront communities in southern Laguna de Bay [Philippines]. Major slope failures have occurred along the flanks of Mt. Makiling due to heavy rains brought about by typhoons such as Milenyo (2006) and Paolo (2017). Prolonged and intermittent rains would also cause persistent flooding in the low-lying urban areas and coastal communities bordering the lake. In this study, the authors estimate the impacts of landslide, flood, and liquefaction hazards in the municipalities of Calamba, Los Baños, and Bay through field surveys and semi-quantitative analysis. The municipalities of Los Baños, Calamba and Bay in Laguna are underlain by lava flow units (e.g. basalt, andesite, dacite) and capped by pyroclastic deposits (e.g., tuff) of the Macolod Volcanic Complex. Rock samples were collected and stratigraphic sections were described to further characterize the volcanic processes along the southwestern portion of Laguna de Bay. Geological and ground penetrating radar (GPR) data when integrated to characterize the varied materials (e.g., solis, sediments, rocks) that

underlie certain areas of Los Baños, Laguna. In addition to recognizing the variable geophysical signatures of rock units at depth, deformed or fractured zones were also inferred from the GPR radargrams. Landslide hazard assessments were also carried out along the foot slopes where communities are exposed to potentially unstable hillslopes. We used analytic hierarchy process (AHP) and GIS techniques to evaluate the relationship of geological, geomorpholohical, and anthropogenic factor to hazard susceptibility. Our assessment reveals that slope failures in the area are strongly influenced by slope gradient, rock type, and degree of weathering. Floods generally affect lakefront and low-lying communities which have become more vulnerable due to urban development. Following the guidelines of the National Economic and Development Authority (NEDA) in disaster risk assessment, the risk of fatality and property damage to different hazards were estimated by multiplying the probability of occurrence of the hazard and its consequences (e.g., cost, extent of affected area). Building damage due to a Mw7.2 earthquake along the West Valley Fault was also assessed for highly urbanized barangay [villages] in Los Baños, where residential, commercial, industrial, and academic structures thrive. Assuming a felt intensity of PEIS 8, almost 40 percent of buildings in the barangay will have a high probability of complete damage – these are structures built from concrete hollow blocks (CHB-type) and those built from concrete hollow blocks with wood or light material (MWS-type). Information derived from the geological and geophysical surveys are important in assessing the effects of ground shaking related to the potential rupture of nearby active faults. Outputs from this project will be useful in mitigating the impacts of geophysical hazards that pose risks to lake-watershed communities, particularly those underlain by deformed and poorly consolidated materials or those that are situated along the low-lying coastal zones of Laguna de Bay. The assessment hazards and risks is also useful for local governments in prioritizing areas for further evaluation and in strengthening their disaster risk reduction and management plans.

URBAN AREAS; HIGHLANDS; LANDSLIDES; FLOODING; DISASTER PREPAREDNESS; DISASTER PREVENTION; SUSTAINABLE DEVELOPMENT; MARINE AREAS; ECOSYSTEMS; EVALUATION; ENVIRONMENTAL IMPACT ASSESSMENT; PHILIPPINES

Ecological influence of sediment bypass tunnels on microinvertebrates in dam-fragmented rivers using DNA metabarcoding. **Serrana, J., Watanabe, K.** *50th Anniversary and Annual Scientific Conference of the Pest Management Council of the Philippines., Inc., , Iloilo City (Philippines), 8-11 May 2018. Philippine Entomologists (Philippines). 0048-3753. v. 32 (2) p. 159-160. (Oct 2018).*

Sediment bypass tunnels (SBTs) are guiding structures in reservoirs used to reduce sediment accumulation during high flows. Sediments in transport are diverted to downstream reaches during operation. Previous studies monitoring the ecological of SBT

operations on downstream reaches suggest a positive influence of SBTs on riverbed sediment conditions and macroinvertebrate communities based on traditional morphology-based surveys. Morphology-based macroinvertebrate assessments are costly and time-consuming, and the large number of morphologically cryptic, small-sized, and undescribed species usually results in coarse taxonomic identification. In this study, we used metabarcoding analysis to assess the influence of SBT operations on macroinvertibrates downstream of SBT outlets by estimating species diversity and pair-wide community dissimilarity between upstream and downstream locations in dam-fragmented rivers with operational SBTs in comparison to dam-fragmented (i.e. no SBTs) and free-flowing rivers (i.e. no dam). Dissimilarities between upstream and downstream communities in SBT sites at the Reuss (Pfaffensprung dam) and Rabiusa (Egschi dam) rivers were relatively low and similar to free-flowing rivers, while values for the Albula (Solis dam) were relatively high and similar or higher than dam-fragmented river. Macroinvertebrate abundance using morphologically-identified specimens was positively correlated to abundance using metebarcoding. This supports and reinforces the use quantitative estimates for diversity analysis with metabarcoding data. Macroinverterate community dissimilarity analysis with increasing operation time and frequency of SBTs. These factors influence changes in riverbed features, e.g. sediment relations, that subsequently affect the recovery of downstream macroinvertibrate communities to those of respective upstream of downstairs.

AQUATIC ORGANISMS; SEDIMENT; RIVERS; DNA; WATER RESERVOIRS; DNA; DAMS

Impact of climate change and economic factors on Malaysia food price. **Wong, K.K.S., Lee, C., Wong, W.L.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 32-42. (Jun 2019).*

This paper is motivated by the increasing food price over the recent years (2010 – 2017) in Malaysia. Food is a necessity for mankind and everyone has equal rights to enjoy adequate food protecting from hunger and malnutrition. In general, we understand that food and agriculture production are highly related. Crop production is affected biophysically by climatic variables, i.e. suitable rainfall and temperature for photosynthesis process to take place. If these climatic variables alter extremely in a long-term period, crop production will be affected and crop damage can occur due to the climate change effect such as extreme flood and drought. Hence, if climate change effect is defined as a linear relationship, it will result in a misleading explanation whereby as long as rainfall and temperature increase (or decrease) it will cause the crop production to decrease (or increase). Given the problem associated with food price, this paper investigated the food price determinants by looking at both economic factors and climate change. Non-linear time series analysis namely Engle-Granger (EG) cointegration test and Error Correction Mechanism (ECM) were performed by including the determinants such as Carbon Dioxide (CO2), crude oil price, exchange rate and

real gross domestic product (RGDP). The results showed that both economic Real Gross Domestic Product and climate factors jointly affect food price significantly and climate factor (CO2) exhibits a strong non-linear Ushaped impact on food price in the long run. In addition, the Error Correction Term (ECT) showed that food market will have a slower self-recovery mechanism to adjust and return the temporary food market demand-supply shock to the equilibrium.

FOODS; PRICES; MARKETS; ECONOMIC ANALYSIS; ECONOMIC GROWTH; EXCHANGE RATE; CLIMATIC CHANGE; MALAYSIA

Laguna de Bay [Philippines] watersheds and water availability. **Tabios, G.Q., III.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 30.*

This paper presents the Laguna de Bay (Laguna Lake) [Philippines] watersheds, their hydrological characteristics and water availability. Based on hydrologic characteristic, watershed modeling and simulation in conducted to determine the water availability and reliability. A simplified water balance of lake inflows and outflows is also presented to assess the lake hydrology. Some results of modeling in the lake hydraulics are also presented.

LAKES; WATERSHEDS; WATERSHED MANAGEMENT; WATER AVAILABILITY; HYDROLOGY; WATER; PHILIPPINES

Landslide vulnerability assessment of Kisloyan sub watershed in Mindoro Island, Philippines. **Vendiola, E.E., Limpioda, M.R.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 25(1 and 2) p. 51-78. (Jan-Dec 2015).*

Kisloyan subwatershed is one of the crucial sources of water to the Magasawang Tubig River. Mag-asawang Tubig River is one of the major rivers in Oriental Mindoro [Phillippines] that provides irrigation and domestic water to at least three of the big towns in the province and serves as a natural habitat to endemic and endangered flora and fauna.

However, it is threatened because of nickel and cobalt extraction, with deposits considered as one of the largest in the Far East. A total mining area of 1,435.90 ha is administratively shared by the municipalities of Victoria, Oriental Mindoro and Sablayan, Occidental Mindoro. This study determined the landslide vulnerability of the Kisloyan subwatershed to come up with recommendations on how to mitigate the impacts of this hazard. Vulnerability assessment was conducted based on the natural characteristics and the man-induced attributes of the site. Results of the study indicated that the Sablayan, Occidental Mindoro portion has the highest vulnerability to landslide, particularly to geological risks.

WATERSHED MANAGEMENT; WATERSHEDS; ENVIRONMENTAL IMPACT ASSESSMENT; LANDSLIDES; PHILIPPINES

Local community perception: a key to a healthy socioecological system of the Laguna de Bay. *Project 4: Assessing Socio-Ecological System (SES): visioning a sustainable future of Laguna de Bay [Laguna, Philippines]: under the program Ten Years after the Millennium Ecosystem Assessment of Laguna de Bay: towards a sustainable future, Espaldon, M.V.O.Rebancos, C.M.Alaira, S.A.Tatlonghari, C.M.Dimasuay, G.L.B.Lacson, J.A.M.Macale, L.S.Gapaz, R.B.Tapia, J.M.L.Tapay, S.D.Fermalan, G.B..- College, Laguna (Philippines). TR-1862. May 2018. p. 135-155.*

LAKES; LOCAL GOVERNMENT; WATER POLLUTION; NATURE CONSERVATION; WATER CONSERVATION; RESOURCE MANAGEMENT; PHILIPPINES

Molecular and culture-based characterization of bacterial community from Manleluag Alkaline Spring in Pangasinan [Philippines]: project title: isolation and screening of alkalne bacteria from Manleluag Alkaline Spring producing and industrially important enzyme. **Lantican, N.B., Montecillo, A.D., Franco, R.A.G., Sabino, N.G., Bertuso, A.L.G., Babasan, M.D.D., Tambalo, F.M.Z.** *College, Laguna (Philippines). TR-1904. 2018. 144 leaves.*

A total of 826 bacterial isolates were cultured and characterized from three sample collection locations in Manleluag hyperalkaline spring in Mangatarem, Pangasinan [Philippines]. Sampling was also done in 4 different quarters to obtain a thorough presentation of the bacterial population of the area. Variation in the cultural morphology of the isolates were observed, with majority displaying Gram-positive reaction (90%) typical in environments with elevated pH conditions. Bacterial isolates were screened for the presence of different enzymes of industrial importance. A total of 428 bacterial isolates showed protease activity when tested using Skim Milk Assay. Majority of these isolates was obtained during the Q2 sampling Protease activity was evaluated at two pH conditions (pH 7 and pH 10). Isolate SNE-IV-1.2-137 had the highest protease activity (Cz ratio = 0.2056). Cyclodextrin glycosyltransferase (CGTase) activity was evaluated using Phenolphthalein

Assay, with 54 bacterial isolates exhibiting significant activity. Isolate WNE-I-1.1-036 displayed highest CGTase activity (46.0094 U/ml). Asparaginase activity of the bacterial isolates were initially screened using qualitative assay using colorimetric method. Ninety seven isolates initially screened using a qualitative assay using colorimetric method. Ninety seven isolates initially displayed enzyme activity which was consequently verified using quantitative Nesslerization method. Isolate WNE-II-1.3-121 had the highest enzyme activity of 26 mM NH sub 3 per ml enzyme sample at 24 hours. Presence of antimicrobial activities were done using 16S rDNA sequencing. Lastly, preliminary optimization of protease extraction was also done using isolate SNE-IV-1.2-137. Protease extraction and was observed at its highest using 70% ammonium sulfate saturation.

WATER SPRINGS; ALKALINITY; PROTEASES; DEXTRINS; ESCHERICHIA COLI; PSEUDOMONAS; AERUGINOSA; STAPHYLOCOCCUS AUREUS; ENZYMES; PHILIPPINES

Molecular and culture-based characterization of bacterial community from Manleluag alkaline spring in Pangasinan [Philippines]: Project title: Molecular characterization of bacterial community from Manleluag alkaline spring in Pangasinan. **Diaz, M.G.Q., Manalang, A.P., Berdos, M.L.G., Anacleto, M.R.U.** *Emerging Interdisciplinary Research Program, University of the Philippines System (Philippines). College, Laguna (Philippines). TR-1903. 2018. 65 leaves.*

Next generation sequencing technology specifically Illumina HiSeq 2500 platform was employed to obtain the microbial community profile of the Manleluag Hyperalkaline Spring in Pangasinan [Philippines]. Sediment samples was collected from location NO [15 deg 42'11002'N (latitude)/120 deg 16'57.41'E (longitude)]. N1 [15 deg 42'17.30'N (latitude)/120 deg 17'0.70'E (longitude)], and N2 [15 deg 42'17.31'N (latitude)/120 deg 17'0.71'E (longitude). For each location three replicates were collected. DNAs were directly isolated from the sediments. Based on DNA quality and amount, five samples were sequenced, three replicates from NO and two DNA quality and amount, five samples were sequenced, three replicates from NO and two replicates for N2. DNA isolated from N1 is very small in amount and is not of good quality. Correlation analysis and Principal Coordinate Analysis (PCoA) of the obtained data showed that the two replicates of N2 were highly similar. For NO, replicates NO-1 and NO-2 were highly similar but their correlation with NO-3 was a lot lower. Because of this observed difference, the succeeding analyses used NO-1 and NO-2 for location O. Two bioinformatics pipelines include quality assessment of reads, assembly by MEGAHIT and taxonomic annotation using DIAMOND and MEGAN. In one of the pipelines, gene prediction using MetaGeneMark and generation of unigenes using CD-HIT and SoapAligner were employed after the metagenome assembly was generated. The second pipeline directly proceeded to taxonomic annotation after the metagenome assembly. Based on both piplelines, the most abundant phylum is Proteobacteria which

includes classes Betaproteobacteria, Alphaproteobacteria, Gammaproteobacteria and Deltaproteobacteria, Acidobacteria, Delinococcus-Thermus, Planctomycetes, Actinobacteria, Armatimonadetes, and Verrumicrobia. Other abundant clases such as Clostridia, Anaerolineae, Bacteroidia, Solibacteres, and Deinococci also belong to the abundant phyla. The most abundant archaea is phylum Euryarcheota with Methanobacterium. The observed predominating taxa reflect the prevalent metabolic pathways that persist in environments characterized by high pH and exhibit serpentinization. The Manleluag Hyperalkaline Spring is a rich source of microorganisms. The data obtained in this study is very good genomic resource that can be used by the future researches.

SPRING; BACTERIA; PH; ALKALINITY; DNA; GENES; SEDIMENT; PIPES; MICROORGANISMS; PHILIPPINES

National Research and Development Project for watershed management: Pagsanjan-Lumban Watershed, Laguna [Philippines]. **Cruz, R.V.O.** *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. Mariano Marcos State Univ., Roosevelt Avenue Brgy. 12 San Blas, Paoay, 2902 Ilocos Norte (Philippines). Isabela State Univ., Pan-Philippine Hwy, Echague, Isabela (Philippines). Bicol Univ., Guinobatan, Albay (Philippines). College, Laguna (Philippines). TR-1853. 2017. 298 leaves.*

The watershed plays a critical role in the sustenance of its surrounding environs. Its vast natural resources provide an array of protective services and amenities, educational and scientific opportunities, as well as psycho-physiological influences. Watershed also provide water for domestic, agricultural and ecological maintenance services. It also a have of several communities that depend greatly on the watershed for its livelihood. This project generated data and information through a network of Learning Watersheds that would be useful in guiding policy decisions on the kind and the extent to which various land uses and land use practices could be allowed in the watershed without impairing the sustainability of surface and ground water resources. This could also provide fresh information for a better understanding on the responsiveness of policies such as on the withdrawal of critical watersheds and watershed reservations from agriculture and other uses. Hence, founded in the vision of enhancing science and technology-based watershed and ecosystem management, the general objective of this project was to develop a network of learning watersheds and watershed management decision support system. Biophysical and geomorphic features of a watershed are helpful vulnerability indicators. Characterizing these features could provide information on the potential threats to a watershed, which the managers, planners, decision makers and researchers can use. The Pagsanjan-Lumban Watershed [Laguna, Philippines] has a relatively flat to moderately sloping to rolling

topography starting from the lakeshore going towards the mountains. Its drainage density value is relatively high, which may be due to the presence of impermeable sub-surface material, sparse vegetation and high relief. The texture ratio of the watershed is also quite low and has a hydrologically long basin lag time.

WATERSHEDS; WATERSHED MANAGEMENT; LANSIUM DOMESTICUM; COCOS NUCIFERA; COLEOPTERA; BIODIVERSITY; ECOSYSTEMS; WATER SUPPLY; LAND USE; DECISION SUPPORT; PHILIPPINES

Optimization and validation of a differential pulse anodic stripping voltam-metric (DPASV) method for trace analysis of inorganic arsenic in contaminated water. **Magalona, M.L., Peralta, M.M., Lacsamana, M.S., Sabularse, V.C., de Guzaman, C.C.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 137-151. (Jun 2018).*

The maximum contamination limit set by the U.S. Environmental Protection Agency (EPA) for arsenic in drinking water is 10 ppb in view of the adverse effects of chronic arsenic exposure on human health. Hence, there is a need to develop an inexpensive, field-operable method that can quantify arsenic at or below this concentration to ensure compliance with EPA regulations without exposure of the analyst to toxic arsine gas. An electroanalytical method was optimized and validated to analyze trace inorganic arsenic as As(III) and total As (As(III) + As(V)) using differential pulse anodic stripping voltammetry with a gold disk as the working electrode, Pt/Ti rod as the auxiliary electrode, and Ag/AgCl as the reference electrode. The study was conducted at the Institute of Chemistry, University of the Philippines Los Baños [Philippines] from June 2015 to October 2016. The electroanalytical method was found to be precise and sensitive based on the resulting RSD values (13%). It also had a satisfactory percent recovery of 91% for As(III) and 81% for As(V). The limit of detection of As(III) and As(V) were 2.24 and 6.96 ppb, respectively while the limit of quantification of As(3) and As(5) were 7.49 and 23.19 ppb, respectively. The total arsenic content of groundwater samples obtained by this method was validated with inductively coupled plasma – optical emission spectrophotometry, and statistical analysis using the t-test showed that the two methods were not significantly different. This in expensive and rapid method allows for speciation species found in field water samples and will be a great boon for monitoring water quality for farming communities that rely on raw groundwater for cooking and drinking.

WATER QUALITY; WATER SUPPLY; WATER; POLLUTION; GROUNDWATER; ARSENIC COMPOUNDS; ANALYTICAL METHODS

Perception and scenario building for South Bay communities of Laguna de Bay, Laguna, Philippines. **Rebancos, C.M., Espaldon, M.V.O., Alaira, S.A., Macale, L.S.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 35.*

The study was conducted through a scenario building exercise using Focused Group Discussions and Key Informant Interviews as tools to capture perception of communities from South Bay. Municipalities of Calamba, Los Baños and Bay, Laguna. The output were perceived future lake conditions that details direction towards which the lake would develop 20-50 years with current year as point of reference while at the same time, establishing past condition and present use of the lake to establish motivation and drivers of change as the community sees them. The outputs of the activity are scenarios categorized into four. The first scenario is Business as usual. The community envisions lake characterized by declining fish populations, more garbage, more chemical and toxic wastes coming from industrial parks and factories, shallower depth of the lake, more reclaimed areas resulting from increased residential areas as subdivision and industries. The second scenario is the establishment of Mega Dike perceived to boost the industrial development particularly of municipalities along its path. The lake would be reclaimed for residential and commercial purposes, fishing industries would decline, problem on waste is prevalent, and the lake water would have been polluted. The third scenario, and the most desired future condition is the Restored Lake where the lake's water is clear, deep and teeming with native fish. Open fishing has access to grater areas of the lake. The fourth and last scenario is ecotourism where the lake's potentials as a tourist destination would be developed and showcased. Given these scenarios, authors conceptualized optimal lake use which balances fisheries, ecotourism, water resources, power generation, and lake rehabilitation.

LAKES; USES; ENVIRONMENTAL MANAGEMENT; WATER RESOURCES; WATER MANAGEMENT; AQUATIC ENVIRONMENT; ENERGY GENERATION; RURAL COMMUNITIES; PUBLIC OPINION; PHILIPPINES

Project 2: exploring pollution monitoring proxies for characterizing urban lake environments: under the program ten years after Millennium Ecosystem Assessment of

Laguna de Bay [Philippines]: towards a sustainable future (OVPAA-EIDR 06-006). **Payot, B.D., Faustino-Eslava, D.V., Queño, K.L., Siababa, A.C.S.V., Macuroy, J.T., Estorque, P.C., Alvanza, G.A., Aviera, Y.K., Mirasol, M.J.** *College, Laguna (Philippines). TR-1860. 2018. 273 leaves.*

Laguna de Bay [Philippines], being the largest lake in the Philippines, is known to be a multiple-use resource that provides supporting, provisioning, regulating and cultural ecosystems services; such services may lead to its degradation. Conditions of the lake is affected both by environmental, biological and socioecological factors which is needed for holistic approach in lake restoration. Pollution is a major concerns in many urban lake environments, particularly at the Laguna de Bay. Thus, timely and relevant monitoring is a necessary to minimize environmental pollutants and their hazardous effects on the lake and its surrounding communities. This project aimed to assess pollutants signatures within the Laguna de Bay lacustrine environment by looking at water quality and heavy metal concentrations in lakebed sediment. This project reviewed the results of the sub-global assessment and compares them with more recent data for three of the lake's rivers: San Cristobal, San Juan, and the Molawin-Dampalit Rivers. Variations in basic parameters such as dissolved oxygen (DO), pH and temperature was published from the years after the assessment report until present. In addition, the Stream Visual Assessment Protocol (SVAP) developed by the United States Department of Agriculture was applied to four rivers at the southern portion of Laguna de Bay. Aside from the water quality of the lake, biological indicators have been eminent in the assessment of water bodies. Plakton are key components of the dynamics of pelagic ecosystem and can tolerate wide-range of environmental conditions making them excellent indicators of environmental stress. Corbicula fluminea across sampling stations have similar linear morphometric measurements. Compositional mapping of the sediments revealed the predominance of silica-and aluminum-rich materials in the lake sediments. To determine lake sediment quality, 75 cm to 100 cm cores were extracted from the South Bay of the lake and analyzed for their geochemical compositions. Various industrial process result in harmful emissions that contain different pollutants, which in many cases contain heavy metals. This study aimed to develop an alternative method using environmental magnetism techniques as most heavy metals are magnetic in character, and some that are non-magnetic can be associated with materials that are naturally magnetic.

LAKES; WATER RESOURCES; WATER POLLUTION; WATER QUALITY; PLANKTON; CORBICULA FLUMINEA; SEDIMENT; ENVIRONMENTAL FACTORS; MONITORING; PHILIPPINES

Project 4: Assessing Socio-Ecological System (SES): visioning a sustainable future of Laguna de Bay [Laguna, Philippines]: under the program Ten Years after the Millennium Ecosystem Assessment of Laguna de Bay: towards a sustainable future. **Espaldon, M.V.O., Rebancos,**

C.M., Alaira, S.A., Tatlonghari, C.M., Dimasuay, G.L.B., Lacson, J.A.M., Macale, L.S., Gapaz, R.B., Tapia, J.M.L., Tapay, S.D., Fermalan, G.B. *College, Laguna (Philippines). TR-1862. May 2018. 164 leaves.*

As an integral part in achieving the goal of studying the Laguna Lake [Philippines] system, this project looked into the social dimension. In doing so, the project utilized a Socio-Ecological System (SES) approach. The approach centers on the relationship between human society and nature on multiple sectional samplings. Major work of the project was centered on gathering information through various surveys of 17 barangays [villages] across the different municipalities surrounding the south bay of the Laguna Lake. These surveys were used to determine the perception of the communities towards the lake system. In learning so, the objective of the project is to craft policies for the optimal use of the resources as well as the land and water spaces of the area. Scenario building then followed the perception analysis using the information gathered from the study. Additionally, work was also done to determine different possible approaches to clean the lake in order to prepare it for a transition into the optimal state identified. Perception analysis revealed that the uses of the Laguna Lake has not been for livelihood purposes. This has led the researchers to believe that neglect in the users could have stemmed from the lack of connection with the lake. This is emphasized by another result of the survey that shows a significant portion of the coastal community (around 11%) who dispose waste water in the lake. These destructive practices are identified to have been possibly caused by the communities' lack of access to sewage treatment facilities with around 88% of the community without access. Lack of segregating practices with the solid wastes where in almost half of the population (45%) do not practice segregation also affects the pollution situation significantly. This study was proved significant for the community as 63% see the lake worsening in condition 10 years from now. With this, desired changes with the lake were asked from the community and the following scenarios were identified and constructed: no fishing pen activities, an engineered lake scenario, and an ecotourism scenario. These scenarios were then combined for their best characteristics as well as to include proper sewage treatment plants as well as room for the projected highway to be constructed near the lake to create an optimal use scenario for the lake. Four technologies were identified which could be used for decreasing the pollution levels in the Laguna Lake: Aquatic Macrophyte Biosorption System (AMBS), Effective Microorganism, Sewage Treatment Plants, and Constructed Wetlands. These technologies have also been founded to be effective not only in some part of the Philippines but also in several countries. A Focus Group Discussion was then employed to ask the community members which of the technologies were more desired and acceptable to them for deployment. Participants wanted a pollution abatement technology that is sustainable as much as it was effective in cleaning the lake water. With this, they identified, despite the large cost, Sewage Treatment Plants to be most effective and sustainable as well as innovative as more modern designs

could be implemented. Other outputs of the project include a segmentation analysis which could aid in the policy making determining which parts of the population were least aware of the different pollution problems. A policy forum called LEAP was also conducted to show not only the projects' policy recommendations but also the entire program outputs. A draft of the Laguna Lake book entitled Restoring Laguna de Bay: A Vital Natural Resource in Crisis was also completed and is red for printing as soon as editing is completed.

LAKES; WATER POLLUTION; WATER CONSERVATION; NATURAL RESOURCES; WATER QUALITY; LOCAL GOVERNMENT; RURAL COMMUNITIES; COMMUNITY INVOLVEMENT; RESOURCE CONSERVATION; ENVIRONMENTAL POLICIES; PHILIPPINES

San Cristobal Watershed [Philippines] vulnerability assessment to soil erosion and water pollution. **Daño, A.M., Fortus, K.R.M.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 25(1 and 2) p. 27-50. (Jan-Dec 2015).*

The study reviewed the characterization report of San Cristobal Watershed located in Laguna, Cavite, and Batangas [Philippines]. Its vulnerability to soil erosion and water pollution was assessed and mitigation and adaptive measures were recommended to address erosion and pollution hazards. Hazards and their contributory factors were determined through analysis of biophysical and socio-economic data and conduct of focus group discussion (FGD). Locations where hazards have been observed were recorded and inputted in the maps generated using geographic information system (GIS) software. The watershed provides various functions aside from contributing an estimated 5% of the total freshwater discharge to Laguna Lake. The study revealed that out of the total area of the watershed (14,162 ha), 1,173 ha located mainly in the upstream portion was zoned as highly vulnerable to soil erosion. Vulnerability of the water resource was attributed to the water quality problem brought about by the fast-paced conversion of agricultural lands into subdivisions and factory areas. Three vulnerability levels (very high, high, and moderate) were developed for specific stretches of the river system. The upstream portion of the river was classified as moderate due to lesser level of development in the area compared to the other portions of the watershed. In the formulation of a Watershed Management Plan, interventions should focus on minimizing soil erosion and improving the water quality of the river.

WATERSHED MANAGEMENT; WATERSHEDS; EROSION; WATER POLLUTION; ENVIRONMENTAL IMPACT ASSESSMENT; GEOGRAPHICAL INFORMATION SYSTEMS; PHILIPPINES

Social acceptability of pollution abatement technologies to improve the quality of Laguna de Bay [Philippines] . *Project 4: Assessing Socio-Ecological System (SES): visioning a sustainable future of Laguna de Bay [Laguna, Philippines]: under the program Ten Years after the Millennium Ecosystem Assessment of Laguna de Bay: towards a sustainable future, Espaldon, M.V.O.Rebancos, C.M.Tatlonghari, C.M.Dimasuay, G.L.B.Lacson, J.A.M.Macale, L.S.Gapaz, R.B.Tapia, J.M.L.Tapay, S.D.Fermalan, G.B..- College, Laguna (Philippines). TR-1862. May 2018. p. 121-134.*

LAKES; WATER POLLUTION; WATER QUALITY; POLLUTION; RESOURCE MANAGEMENT; PHILIPPINES; RURAL COMMUNITIES; SOCIAL PARTICIPATION

Towards a watershed health and vulnerability index. **Bantayan, N.C., Tiburan, C.L., Jr., Avellano, J.A., Carada, C.E.D., Montecillo, Ma.E.V.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 34.*

The watersheds of the Mount Makiling Forest Reserve, an ASEAN Heritage Park (MMFR-AHP), were evaluated on the basis of land cover and land use changes, hydrologic regimes and how these factors and their interactions impact the health of the watersheds of Laguna de Bay. This study focused on three watersheds namely; Molawin-Dampalit, Cambantoc and Tigbi. Initial results revealed that among the three watersheds, Tigbihas the highest forest cover in terms of its total area (5096%) followed by the Molawin-Dampalit, with the longest major tributary, (29.48%) and then the Cambantoc watershed (25.47%). Based on the 2015 Census of the Philippine Statistics Authority, Tigbi watershed which drains through the City of Calamba has a population of 454,4668, the Molawin-Dampalit watershed which drains through the town of Los Baños has a population of 112, 008, and Cambantoc watershed which drans throught the town of Bay has a population of 62,143. The sustainability of the provisioning and regulating services depend on the maintenance of health of these watersheds. A healthy watershed can provide sufficient water and productive soils that are requisites of the populace, agriculture sector, including fisheries. As watersheds reflect the intricate connections among land, water and other resources, an integrated assessment of the health of a watershed shouls include, at least the following:

water quality, hydrology, geomorphology, connectivity, biological, multi hazards and ecological footprint. This study assessed these factors using Geographical Information System (GIS) and remote sensing. Research results revealed that portions of the study watersheds are prone to drought between the months of January to July covering an area of up to 950 ha in 13 and 6 barangays [villahes] in Los Baños and Bay [Laguna, Philippines], respectively (Bantayan et al., 2014). In terms of landslide, the same study showed an estimated of 210 ha (3.51%) covering three barangays and two barangays in Los Baños and Bay are vulnerable.

WATERSHED MANAGEMENT; WATERSHEDS; FOREST RESERVES; WATER QUALITY; HYDROLOGY; GEOGRAPHICAL INFORMATION SYSTEMS; REMOTE SENSING

Vulnerability assessment of the La Mesa Watershed Reservation, Quezon City, Philippines. **Andres, E.P., Sabater, M.S., Espada, R.Jr., Calzeta, E.C., Arjona, R.C.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 25(1 and 2) p. 1-26. (Jan-Dec 2015).*

The vulnerability assessment of the La Mesa Watershed Reservation in Novaliches, Quezon City [Philippines] was conducted to provide the basis for the formulation of a sustainable watershed development and management plan. The guidelines on vulnerability assessment prepared by Daño (2006) of the Ecosystems Research and Development Bureau (ERDB) was also tested in the identification of vulnerable areas in the La Mesa Watershed. Four priority environmental hazards were assessed in the study area using a spatial analysis tool, the ArcGIS Model Builder. The composite map identified a total of 10.285 ha of very highly vulnerable areas distributed as follows: soil erosion (0.285 ha), landslide (0.014 ha), biodiversity loss (8.685 ha), and fire (1.141 ha).

WATERSHED MANAGEMENT; WATERSHEDS; EROSION; LANDSLIDES; SOIL MANAGEMENT; BIODIVERSITY; PHILIPPINES

Water quality of Laguna de Bay [Philippines] in relation to biological pollution. **Tamayo-Zafaralla, M.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the*

Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 30-32.

Biological pollution or biopollution of a body of water is one in which the amount of non-indigenous biological entities impacts of native aquatic communities, habitats and ecosystem functioning for a specific area of locality. Its intensity may be low, moderate or high and its distribution may be confined to just one locality, several, many, ot it may be all over the place. The combined amount and distribution of biopollution enables estimation of the impact. Impact estimation emphasizes on the change in the ecosystem and the magnitude of this change brought about by alien species invasion. Assessment of the impact is especially focused on key species, type specific communities (e.g. primary producers), habitat alteration, habitat fragmentation, habitat loss, destruction of the so-called functional groups (e.g. decomposers), food web shifts, etc. Estimation of the impacts is for stated time period only primarily because the intention is to enable assessment of the time-related or temporal changes. For this reason, an adequate amount of quality information is required to calculate the magnitude of the impact. The use of biopollution is simple; it allows for quantifying impacts within any world region.

LAKES; WATER QUALITY; BIOLOGICAL PROPERTIES; POLLUTION; PHILIPPINES

P33 - SOIL CHEMISTRY AND PHYSICS

Application of Analytical Hierarchy Process (AHP) in generating Land Suitability Index (LSI) for sugarcane in Central Mindanao, Philippines. **Alburo, J.L.P., Garcia, J.N.M., Sanchez, P.B., Sta Cruz, P.C.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciecnes. 0859-3132. v. 25(1) p. 148-158. (Jun 2019).*

Sugarcane is one of the most promising industry in the Philippines and planted in any land in the country, particularly in Central Mindanao without prior assessment of the land to the crop. Application of an enormous amount of inputs to ensure better production is among common practice even in unsuitable areas. Generation of Land Suitability Index (LSI) in Central Mindanao as a major sugar cane district of Bukidnon province was made to identify the major factor that affects to sugarcane production, using Analytical Hierarchy Process (AHP) and GIS. The study was conducted last September 2015 to February 2016 on the 3 district of Bukidnon. Weights of six performance factors in determining LSI to sugarcane production were established using AHP. Soil depth was the most important among the factors. Utilizing the LSI, land sugarcane suitability maps were generated for the Central Mindanao. The results matched the validation by comparing the results with the actual yields from sugarcane growers, correlation analysis and other relevant data from the Regional Sugar Regulatory Authority. Soil water holding capacity has a significant positive

effect on the sugarcane yield while elevation and slope have significant negative effects. Don Carlos, Maramag and Quezon that are extensive sugarcane growing municipalities are highly suitable in the study and actual conditions.

SACCHARUM OFFICINARUM; SUGARCANE; LAND EVALUATION; LAND SUITABILITY; GEOGRAPHICAL INFORMATION SYSTEMS; SOIL ANALYSIS; SOIL CHEMICOPHYSICAL PROPERTIES; PHILIPPINES

Decreasing phosphorous sorption using fishpond sediment and goat manure in acid upland soil. **Hartono, A., Anwar, S., Putri, A.T., Yokota, K.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 118-126. (Jun 2018).*

Fishpond sediment and fishpond water at Petir village, Darmaga, Bogor, Indonesia have the potential as a soil ameliorant due to the nutrient content needed by crops. This present research sought to evaluate the phosphorus (P) sorption characteristics on acid soil Typic Hapludults Darmaga treated with fishpond sediment, fishpond water, goat manure and their combination, as well as conventional fertilizers. The research was conducted from March to August 2015. The treated soil samples were incubated for 1 week and 2 weeks under room temperature. The experimental design was completely randomized design with three replications. After 1 week or 2 weeks of incubation, soil samples from treatments were subjected to P sorption experiment. The data were simulated by Langmuir and Freundlich equations, wherein data was better simulated by the Freundlich equation. The Freundlich P sorption capacity (KF) value from the combined fishpond sediment and goat manure treatment was the lowest after1 week and 2 weeks of incubation. This treatment had a significantly higher n value than that of control after 1 week of incubation, however after 2 weeks incubation, the n value was not significantly different from the other treatments. From the KF and n values of Freundlich equation, it was suggested that a combination of fishpond sediment and goat manure was the best treatment needed to decrease P sorption capacity. The decrease of P sorption capacity should decrease the rate of P fertilizer applied by farmers.

UPLAND SOILS; ACID SOILS; SOIL CHEMICOPHYSICAL PROPERTIES; PHOSPHORUS; SOIL AMENDMENTS; FISH PONDS; SEDIMENT; GOATS; FARMYARD MANURE

Effect of soil properties on the bloom-forming ability of the cyanobacterium, Nostoc commune Vaucher, in Northern Luzon, Philippines. **Matinez-Goss, M.R.** *College, Laguna (Philippines). TR-1875. 2018. 41 leaves.*

Nostc commune Vaucher (BGA, blue-green alga) is a bloom-forming, edible cyanobacterium commonly in rice paddies and hilly places commonly in Northern Luzon, the Philippines. Its standing crop reached up to 673.3 g sq m fw, while its protein content ranged from 20-51% crude protein (CP). Over time, N. commune disappeared in three of the 15 places visited (including a survey in four provinces and seven towns). In one particular case, the BGA could reached up to 200 kg/ha/rice crop, f wt, in a rice paddy in Niog Torre, Mangatarem, Pangasinan in 1980s, but disappeared in the floodwater of the same site after recent visit into that place in 2011, or after 31 years. A taxonomic account of microalgae in the rice paddy yielded 112.5 times more algae than the floodwater algae. There were 3.67 times more diazothophic cyanobacteria in the soil than in the floodwater, of which N. commune was observed only in the soil, but in the soil than in the floodwater. A comparison of the soil properties of this soil (Tarlac clay loam) at two different times, showed highly significant differences (p less than or equal to 0.01) for CU, sand, and silt, and significant differences (p less than or equal to 0.05) for N, P, K, and clay. One of the common soil properties of the places that did not show any BGA bloom was their high amount of Cu (mean 6-19.74ppm). When a-test was conducted between the soils without BGA bloom (Group A) and those places with BGA bloom (Group B), significant differences (p less than or equal to 0.05) were noted in the following properties: Cu, Fe, Mn, pH sand and clay. After selecting and screening the 14 predicting soil variables, three were noted to be significant to the BGA bloom: copper, calcium, and clay. The relationship was best described in a fitted regression equation as : Biomass=-112.650+222.252 (Cu)+ 16.055 (clay) -12.307 (Ca), where 98.3%% sq R value) of the variability of the biomass can be explained by the given model. The concentration of Cu in the soils of Group B (with BGA bloom) were lower than that of Group A (without BGA bloom) (0.6-3.0 ppm vs. 6-19.74 ppm, mean, respectively). Principal Component Analyses (PCA) was another statistical analyses that was done to predict the BGA bloom. The PCA scatterplot showed the places without BGA bloom have high amounts of Cu, OM, N, Fe, and clay. The BGA showed that it magnified in its body both, N, and Cu, compared to the amount in the soil. Copper was noted to be 9-15x greater in the BGA than in the soil.

ALGAE; SPECIES; CYANOBACTERIA; COPPER; STATISTICAL METHODS; SOIL CHEMICOPHYSICAL PROPERTIES

Site characterization of coffee production areas under coffee-based agroforestry systems in La Trinidad Tublay and Atok, Benguet (Philippines). **Laurean, C.P., Fagyan, A.W., Pablo, J.P., Bao-idang, C.C., Moreno, N.A., Ramos, L.C.** *25. Federation of Crop Science Societies of the Philippines/1. Federation of Plant Science Associations of the Philippines Scientific Conference, , Apo View Hotel, Davao, City (Philippine), 16-21 Sep 2019. Philippine Journal of Crop Science (Philippines). 0115-463X. v. 44(Supplement no. 1) p. 110. (Sep 2019).*

Coffee production is one of the major livelihood in the province of Benguet [Philippines] and other provinces in the Cordillera region however no study on soil fertility assessment had been done on coffee-based agroforestry systems. The study was conducted to determine the morphological and chemical properties of soil planted with coffee under diverse shade trees on the major coffee production areas. The soil in the experiment sites are classified as Puguis Gravelly Loam in La Trinidad and Ambassador Silt Loam in Tublay and Atok, Benguet. A 1 m2 pit was dug on the foot slope, back slope and summit on each agroforestry system for the soil profile description. Based on the soil assessment, the experiment sites in Tublay and Atok where coffee trees are grown under alnus and mango, chayote and pine respectively have profiles that are dark yellowish to strong brown on the surface and yellowish red on the substratum. The areas in the La Trinidad where coffee were grown under alnus and pine have profiles that are brownish to dark brown on the surface and yellowish brown on the substratum and have gravels with fine friable structure. Most of the coffee growing areas have 15-30% slope, well drained, clay loam to silty clay loam texture, very deep soil which permits favourable rooting, and have high cation exchange capacity. The soils were extremely acidic ranges from 3.91 to 4.32 except for soils planted with coffee under alnus in Tublay and Atok which are very strongly acidic with pH of 4.69 and 4.89 respectively.

COFFEA; SOIL TYPES; SOIL CHEMICOPHYSICAL PROPERTIES; SOIL FERTILITY; SOIL; SOIL PROFILES; AGROFORESTRY; CROPPING SYSTEMS; PHILIPPINES

P34 – Soil biology

Formulation and application of multi-strain inoculant for agroforestry production (Theobroma cacao L. and Coffea liberica H.) production: formulation and application of multi-strain inoculant for agroforestry production. **Pampolina, N.M., Garcia, M.U., Anarna, J.A., Manalo, D.DC.** *Lipa Agricultural Experiment Station, Lipa, Batangas (Philippines). Quezon Agricultural Experiment Station, Tiaong, Quezon (Philippines). Rizal Agricultural Experiment Station, Tanay, Rizal (Philippines). College, Laguna (Philippines). TR-1915. 2018. 119 leaves.*

Among the driving force in poor agricultural production is infertile soil generally due to forest conservation and frequent chemical fertilization resulting to loss of beneficial soil microbes link to nutrient supply. This project was conceived to address this concern by formulating a multi strain inoculant intended for application to agricultural and agroforestry crops. This report presents promising outcome of reintroducing suitable microorganisms to agricultural (pinakbet) crops with attempts to practice agroforestry using coffee and cacao. A total of 105 isolates of beneficial microorganisms were isolated from different crops and purified. The best isolates were screened under nursery condition using plant height,

diameter, and biomass as parameters, evaluated under different farm levels to determine effective isolates that are developed into multi strain inoculant. Isolates that promote better behaviour were further mass produced with Centrosema pubescens Benth. and Leucaena leucocephalla as hosts and harvested as multi inoculant. The field performance of tested crops in terms of harvest was evaluated using RGBD by comparing effectiveness of multi strain inoculant with farmer's practice and statistically analyzed. The performance of multi strain was further demonstrated on selected crops with farm cooperators in the region. Results suggest efficacy of the inoculant in increasing yield and prolonging life span of crops, thereby providing additional harvest and income. It is recommended that additional field strains in other site conditions outside the region will be best to verify efficiency and efficacy as an alternative biofertilizer to inorganic source for farmers. The formulation of multi inoculant must be further optimized to determine mechanism of action by diverse soil microbiota through community analysis.

THEOBROMA CACAO; COFFEA LIBERICA; AGROFORESTRY; SOIL MICROORGANISMS; FERTILIZER APPLICATION; FERTILIZERS; INOCULATION; BIOFERTILIZERS

P40 - METEOROLOGY AND CLIMATOLOGY

Spectral response of 4 vegetation types during 2009-2010 occurrence of moderate Em Niño Oscillation in Cagayan River Basin [Philippines]. **Montoya, C.M.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 27(1) p. 1-26. (Jan-Dec 2017).*

An unusual warming of sea surface temperature (SST) along the equatorial Pacific was established in June 2009 to June 2010 which developed weak to moderate El Niño Southern Oscillation (ENSO). Time series vegetation indices of 4 vegetative covers derived from Moderate Resolution Imaging Spectroradiometer (MODIS) sensors were used to understand the effects of El Niño in Cagayan River Basin. The research process used in this study can serve as a guide for vegetation assessment and monitoring, particularly during an El Niño event, for timely crop assessment and monitoring. In general, the spectral mean test for 4 vegetation categories, namely, forest, agricultural crops, grassland, and woody plants showed that during ENSO years, vegetation index was lower, as shown by a lower mean Enhanced Vegetation Index (EVI) for 3 out of the 4 categories. Only forest areas do not seem to be significantly affected by the El Niño phenomenon. Grassland was the most affected during the ENSO study period. Woody plants such as shrubs and perennial trees were evidently affected by El Niño. Comparison of results based on T-test (at 95% confidence interval) showed that EVI was more accurate in determining the effect of drought on vegetation compared to Normalized Difference Vegetation Index (NDVI). In

general, the impact of El Niño to the 4 vegetation categories is more pronounced during summer season since there was adverse dry spell compared to non-summer months.

FORESTS; GRASSLANDS; PLANT COMMUNITIES; CLIMATE; CLIMATIC CHANGE; MONITORING; CROP MANAGEMENT; REMOTE SENSING; PHILIPPINES

Q - PROCESSING OF AGRICULTURAL PRODUCTS

Q02 - Food processing and preservation

Chemical composition and in vitro antioxidant and antibacterial activities of Sargassum vulgare C. Agardh from Lobo, Batangas, Philippines. **Arguelles, E.DL.R., Monsalud, R.G., Sapin, A.B.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 25(1) p. 112-122. (Jun 2019).*

Seaweeds are notable in producing diverse kinds of bioactive compounds with promising pharmacological properties. A study was conducted at the National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños [Philippines] from July to November 2018 to evaluate the proximate composition and potential antioxidant and antibacterial properties of a brown macroalga, Sargassum vulgare C. Agardh. Determination of the total phenolic compounds using Folin-Ciocalteu reagent showed that the dried algal biomass have a total phenolic content of 10.13 +- 0.166 mg GAE/g. Relative antioxidant efficiency showed that S. vulgare exerted potent radical scavenging activity in a concentration dependent manner with EC50 value of 37.2 +- 0.015 ug GAE. The tested algal extract exhibited radical scavenging activity that is dose-dependent and positively correlated to its phenolic content. On the other hand, proximate composition of the dried macroalga showed that S. vulgare contains high carbohydrate, ash and crude fiber content of 34.18+-0.32%, 27.09+-0.00%, and 22.59+-0.21 respectively. Methanolic extract of the macroalgal strain was subjected to microtiter plate dilution assay against a wide spectrum of pathogenic bacteria. S. vulgare showed pronounced activity against Staphylococcus aureus having MIC of 250 ug/ml. Aeromonas hydrophila, Bacillus cereus and Methicillin-resistant S. aureus were also moderately inhibited each having MIC of 500 ug/mL, 500 ug/mL, and 1000 ug/mL, respectively. Minimum bactericidal activity against S. aureus is higher than that of Bacillus cereus and Aeromonas hydrophila, having 500 ug/mL and 1000 ug/mL, respectively. On the other hand, Methicillin-resistant S. aureus exhibited MBC value of 1000ug/ml. This study showed the potential antioxidant and antibacterial activity of S. vulgare, which make it a suitable candidate for production of new bioactive compounds important for pharmacological and food industries.

SARGASSUM; SEAWEEDS; PROXIMATE COMPOSITION; PHENOLIC CONTENT; ANTIOXIDANTS; ANTIMICROBIAL PROPERTIES; PHILIPPINES

Development of processing technologies for Katmon (Dillenia philippinensis Rolfe. **Raymundo, L.C., de Villa, T.M., Ombico, M.T.** *College, Laguna (Philippines). TR-1832. 2014. 100 leaves.*

The project aim to develop new and value-added processed products from Katmon (Dillenia philippinensis Rolfe) fruit. The different studies conducted for Katmon include: drying kinetics of katmon, development and improvement of the formulation of katmon powdered sinigang mix and development of katmon into fruit roll, jam, ready-to-drink (RTD) beverage and katmon-turmeric juice drink. The standard process parameters and formulations for the different katmon processed products were developed. The physico-chemical and sensory properties of the developed products were determined. The drinking kinetics of katmon fruit was determined by drying the samples using the cabinet dryer. To determine the effect of temperature on the drying kinetics, the samples were dried at different temperatures (50, 60, and 70 deg C). The initial moisture content of the sample was determined using the oven drying method. The katmon fruit's average moisture content in the experiment was found to be 91%. The drying rates and curves at various temperature (50, 60, and 70 deg C) were calculated and plotted. An inverse relationship between moisture content and drying time was observed. The same relationship was observed between the drying temperature and drying time. The samples dried at 50 deg C had the longest drying time (900 min) followed those dried at 60 deg C (810 min). The samples dried at 50 deg C had the longest drying time (900 min). Also, the drying rate of the sample increased as the drying temperature was increased. In the illustrated graphs, no constant-rate period was observed. Hence, most of the drying took place at the falling-rate period which shows that the mechanism was governed by moisture diffusion. The average effective moisture diffusivities and drying time constants of the samples were found to increase at higher drying temperatures. The activation energy of Katmon powder was found to be at 29.46 kJ/mol. Katmon fruit was processed into powder and it was used in the development of powdered sinigang mix. Different formulations of katmon powder and 25% citric acid was generally acceptable and was compared with two commercial brands of sinigang mixes . Results revealed that developed sinigang mix was not significantly different in aroma, flavor and sourness from the two commercial brands. Also, the formulated mix had the same pH and titratable acidity but slightly lower bulk density as the commercial brands. To improve the intensity of flavor of the previously developed katmon sinigang mix, additional flavorings aside from the previously added ingredients by Garcia (2013) were added in the formulations. Also, the level of Katmon powder and citric acid were modified in the different treatment formulations. The most acceptable formulation was again compared with the previously developed sinigang mix and the commercial brand. Results

revealed that the new formulated sinigang mix with 35% katmon powder and 23% citriuc acid had a more flavorful aroma that the previously developed sinigang mix, and was highly comparable with the commercial brand. The mixes also had the sample pH and titratable acidity with the commercial brand. Katmon fruit roll was also developed by adding varying amounts of all-purpose flour (APF), papaya and banana purees. The most acceptable fruit roll formulation was fruit roll with 5% APF, fruit roll with 50% papaya puree, and fruit roll with 30% banana puree. Sensory evaluation indicated that katmon fruit roll with 50% papaya puree was the most acceptable among the three treatments. Processing of katmon fruit into jam revealed that the formulation with 1:0 to 0.75 fruit to sugar ratio was more acceptable in terms of color, texture, sweetness/sourness, spreadability and general acceptability than the other treatments. Studies on ready-to-drink katmon juice drink revealed that the 1:3 juice to water ratio is the most preferred dillution for the juice. Results of the physico-chemical properties of the katmon juice indicate that viscosity, total soluble solids (TSS), total titratable acidity (TTA) and Vitamin C content decreased as the dilution was increased. Improvement in the color of the previously developed katmon RTD juices (1:3) was conducted by adding turmeric extract. The 1:3 katmon juice to water was formulated with different levels (1,3 and 5%) of turmeric extract. The RTD katmon-turmeric juice with 3% turmeric extract was the most preferred formulation among the three treatments.

DILLENIACEAE; SPECIES; PROCESSED FOODS; PROCESSED PRODUCTS; ORGANOLEPTIC ANALYSIS; DRYING; TEMPERATURE

Plant-based snacks made from local mushrooms find a big market. **Hubilla, E.K.** *Agriculture (Philippines). 0118-857-7. v. 24 (3) p. 60-61. (Mar 2020).*

EDIBLE FUNGI; VARIETIES; FOOD PROCESSING; PROCESSED PLANT PRODUCTS; MARKETS; CROP MANAGEMENT; PLANT ESTABLISHMENT

Starting small, yet going big time with tuyo [dried herring]. **Lacson, S.P.** *Agriculture (Philippines). 0118-857-7. v. 24 (3) p. 62-64. (Mar 2020).*

HERRINGS; PROCESSED ANIMAL PRODUCTS; FOODS; ENTERPRISES; DEMAND

Utilization of the indigenous crops of the Philippines: an answer to food and nutrition security. **Algar-Carbonera, A.F.C.** *UPLB Centennial Professorial Chair Lecture, College, Laguna (Philippines), 29 Mar 2019. College, Laguna (Philippines). 2019.*

Most indigenous crops in the country are often neglected for food use because it is not yet introduced in the market and no further processing has been explored. However, studies

have been proven that many indigenous crop have great economic potential because of their significant nutritional and functional benefits. Because of this, the utilization and application as ingredient indigenous crops to food products to improve their nutritional value are increasing in popularity. Three indigenous and underutilized crops of the Philippines were introduced in the lecture namely the Balbas bakiro (Momordica cochinchinensis Spreng.), Philippine edible Canna (Canna indica Linn), and Ligikway (Abelmoschus manihot). Since researches about these Philippine crops are limited especially in the area of food utilization, the lecture introduced these crops to the public including its potential for the development of different food products with added nutritional and functional benefits. The nutritional composition and functional properties of the crops were also presented in order to show the possible processed products that can be developed and to understand the effect of the different processing conditions on its properties. For the Balbas bakiro, the mature fruit was found to have exceptionally highly lycopene, beta-carotene, and Vitamin A contents as well as antioxidant activity. Even if it was processed and made into functional ingredients, the bioactive compounds were still retained in appreciable amounts. Application of the Balbas bakiro aril powder in some commercially existing products such as cheese spread and yogurt drink have improved its nutritional properties and have satisfied the definition of 'Vitamin A fortified food'. For the Philippine Edible Canna, the rhizome was made into flour and starch and was analyzed for its proximate composition and basic functional properties. Results show that most of its value are within the acceptable range according to the Codex and USDA standards. The flour was used and made into products such as cookies and energy bars and results of sensory evaluation showed good general acceptability. Lastly, for the Lagikway, the leaves were reported to have high contents of Vitamin A, Vitamin C, and minerals specially iron and calcium. The leaves were made into powdered form and was used as an ingredient to improve the nutritional value of an existing product which is chips. The reported different nutritional and functional properties of the three selected indigenous plants showed the potentials that may lead ta an increase in its consumption and utilization. This will help improve the food security, nutrition, and health of the country's population.

MOMORDICA; CANNA; CANNA INDICA; ABELMOSCHUS; SPECIES; INDIGENOUS ORGANISMS; FOOD PROCESSING; ORGANOLEPTIC ANALYSIS; NUTRITIVE VALUE; PROCESSED PLANT PRODUCTS; FOOD SECURITY

Q04 - Food composition

Isolation, characterization, and identification of probiotic lactic acid bacterium from Sabeng, a Philippine fermented drink. **Navarro, R.R., Faronillo, K.M.L., Eom, S.H., Jeon, K.H.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 127-136. (Jun 2018).*

The Philippines has many traditional fermented food products still awaiting research. One of these is sabeng, a probiotic drink prepared by fermenting washed unpeeled raw sweet potatoes in rice washing. Lactic acid bacteria (LAB) were isolated from sabeng and evaluated as potential probiotic. The isolates were screened for acid tolerance, bile tolerance, antioxidant activities [% 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity and reducing power], cell hydrophobicity, antimicrobial activities, and enzyme activity. Following isolation and purification, six LAB isolates were obtained: SF37, SF38, SF39, SF40, SF41, and SF42. After screening, only SF42 was found to be acid- and bile-tolerant. It had a % DPPH scavenging activity of 39.39%, an absorbance of 0.48 in the reducing power equivalence assay and a higher than 90% hydrophobicity. It was subjected to antimicrobial assay and found to have antimicrobial activities against Bacillus subtilis, Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella typhimurium and Vibrio parahaemolyticus. Using API ZYM, SF42 was also found not to produce B-glucuronidase, a carcinogenic enzyme, thereby supporting its safe use as probiotic. Sequence identification using BLAST showed SF42 as Lactobacillus plantarum at 100% similarity.

FERMENTED FOODS; LACTIC ACID BACTERIA; LACTOBACILLUS; PROBIOTICS; IDENTIFICATION; ISOLATION; PHILIPPINES

Promotion and utilization of IPB [Institute of Plant Breeding] Var 6 corn grits in selected schools in Los Baños, Laguna [Philippines]: School-based Feeding Program quality protein white corn grits. **Pua, L.B., Beltran, M., Bautista, M.A., Gabatin, A.L., Salazar, A.M., Calumpang, S.M.F.** *Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Agriculture and Food Science. Philippines Univ. Los Baños, College Laguna (Philippines). Inst. of Human Nutrition and Food. Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Human Ecology. College, Laguna (Philippines). TR-1913. 2017. 17 leaves.*

ZEA MAYS; MAIZE; VARIETIES; FOOD CONSUMPTION; NUTRITIVE VALUE; FEEDING; EDUCATIONAL INSTITUTIONS; PHILIPPINES

S - HUMAN NUTRITION

S01 - HUMAN NUTRITION - GENERAL ASPECTS

Utilization of the indigenous crops of the Philippines: an answer to food and nutrition security. **Algar-Carbonera, A.F.C.** *UPLB Centennial Professorial Chair Lecture, College, Laguna (Philippines), 29 Mar 2019. College, Laguna (Philippines). 2019.*

Most indigenous crops in the country are often neglected for food use because it is not yet introduced in the market and no further processing has been explored. However, studies have been proven that many indigenous crop have great economic potential because of their significant nutritional and functional benefits. Because of this, the utilization and application as ingredient indigenous crops to food products to improve their nutritional value are increasing in popularity. Three indigenous and underutilized crops of the Philippines were introduced in the lecture namely the Balbas bakiro (Momordica cochinchinensis Spreng.), Philippine edible Canna (Canna indica Linn), and Ligikway (Abelmoschus manihot). Since researches about these Philippine crops are limited especially in the area of food utilization, the lecture introduced these crops to the public including its potential for the development of different food products with added nutritional and functional benefits. The nutritional composition and functional properties of the crops were also presented in order to show the possible processed products that can be developed and to understand the effect of the different processing conditions on its properties. For the Balbas bakiro, the mature fruit was found to have exceptionally highly lycopene, beta-carotene, and Vitamin A contents as well as antioxidant activity. Even if it was processed and made into functional ingredients, the bioactive compounds were still retained in appreciable amounts. Application of the Balbas bakiro aril powder in some commercially existing products such as cheese spread and yogurt drink have improved its nutritional properties and have satisfied the definition of 'Vitamin A fortified food'. For the Philippine Edible Canna, the rhizome was made into flour and starch and was analyzed for its proximate composition and basic functional properties. Results show that most of its value are within the acceptable range according to the Codex and USDA standards. The flour was used and made into products such as cookies and energy bars and results of sensory evaluation showed good general acceptability. Lastly, for the Lagikway, the leaves were reported to have high contents of Vitamin A, Vitamin C, and minerals specially iron and calcium. The leaves were made into powdered form and was used as an ingredient to improve the nutritional value of an existing product which is chips. The reported different nutritional and functional properties of the three selected indigenous plants showed the potentials that may lead ta an increase in its consumption and utilization. This will help improve the food security, nutrition, and health of the country's population.

MOMORDICA; CANNA; CANNA INDICA; ABELMOSCHUS; SPECIES; INDIGENOUS ORGANISMS; FOOD PROCESSING; ORGANOLEPTIC ANALYSIS; NUTRITIVE VALUE; PROCESSED PLANT PRODUCTS; FOOD SECURITY

Field trial of the updated monitoring and evaluation protocol for local government and nutrition workers. **Africa, L.S., Carada, W.B., Querijero, N.J.V.B., Tandang, N.** *Municipality, M.T.M. National Nutrition Council , Taguig, 1630 Metro Manila (Philippines). College, Laguna (Philippines). TR-1887. Sep 2018. p. 127.*

The University of the Philippines Los Baños, through the Institute of Human Nutrition and Food, College of Human Ecology and the Institute of Governance and Rural Development, College of Public Affairs and Development had developed the Nutrition Results Framework (NRF) as basis for measuring the national and local government unit's (LGUs) organizational contributions in achieving desirable results in nutrition in the Philippines. The NRF consists of two complementary monitoring and evaluation subsystems known as the National Nutrition Sector Results-based Monitoring and Evaluation Framework (NNSRMEF) and the Local Government Nutrition Monitoring and Evaluation System (LGNMES). The LGNMES has two components: the institutional component is known as the Local Nutrition Organization Capacity Assessment Component (LNOCAC)while the worker's components is the Performance Appraisal of Local Nutrition Workers (PALNW). This Project entitled Field Trial of the Updated Monitoring and Evaluation Protocol for Local Government and Nutrition Worker was implemented to field test the LNOCAC and PALNW tools and guidelines in different regions, provinces, cities, municipalities and villages. Specifically, it aims to: 1)report the evaluators' perception on the LNOCAC and PALNW; 2)report the perception of the members of LNC who were evaluated on the evaluation process and tools; 3)assess the inter-rater reliability in the LNOCAC and PALNW measurements; and 4) compare the 2016 MELLPI scores with the 2016 LNOCAC scores. A total of 44 Monitoring and Evaluation Team (MET) members from Regions A and B participated in the field trial. At least 2-3 members in the selected regional, provincial, city and municipal monitoring and evaluation teams (R/P/C/M/MET) were involved in the project. In the assessment of the performance of nutrition workers, the reliability of the tool developed for the evaluation of the performance of the BNSs [Barangay Nutrition Scholars] is established when used by the MMETs [Municipal Monitoring and Evaluation Team] in Province B. High degree of reliability and complete agreement among MMETs in City A are noted for the functions Planning and Organizing respectively. In Province C, the reliability of tool for BNSs is realized only in the function organizing when used by the MMETs in Municipality G and H. The good performance of the tool for the monitoring and evaluation of the MNAOs [Municipal Nutrition Action Officers] in the performing their functions is again evident among the PMETs [Provincial Monitoring and Evaluation Team] in Province C. For the final performance scores of LGUs [local government units] using LNOCAC tools, the consensus scores of the METs were considered, adapting the weight allocation of 70-30 for the Form 1a and Form 1b, respectively. Further, assessment of the inter-measure reliability and agreement

considering the generated consensus performance scores was done with comparison to the scores provided by the other team. Based on the findings, the reliability and consistency of the tools are indeed realized when used in monitoring and evaluating the local government at the provincial level. The LGNMES is ready for implementation as long as METs will undergo a standard orientation on how to use a maximize its potential in solving the problem of malnutrition. Those who will adapt this should bear in mind that the results of the monitoring and evaluation using the new protocol should address the gaps in the implementation of nutrition programs and projects in the community and household levels and not merely for awarding purposes. The authors recommended for the immediate implementation of the LGNMES because there is an urgent call to make the nutrition monitoring and evaluation system relevant and addressing the bottlenecks of nutrition improvement.

LOCAL GOVERNMENT; EVALUATION; MONITORING; NUTRITION POLICIES; HUMAN ECOLOGY; HUMAN NUTRITION

S40 - Nutrition programmes

Promotion and utilization of IPB [Institute of Plant Breeding] Var 6 corn grits in selected schools in Los Baños, Laguna [Philippines]: School-based Feeding Program quality protein white corn grits. **Pua, L.B., Beltran, M., Bautista, M.A., Gabatin, A.L., Salazar, A.M., Calumpang, S.M.F.** *Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Agriculture and Food Science. Philippines Univ. Los Baños, College Laguna (Philippines). Inst. of Human Nutrition and Food. Philippines Univ. Los Baños, College, Laguna (Philippines). Coll. of Human Ecology. College, Laguna (Philippines). TR-1913. 2017. 17 leaves.*

ZEA MAYS; MAIZE; VARIETIES; FOOD CONSUMPTION; NUTRITIVE VALUE; FEEDING; EDUCATIONAL INSTITUTIONS; PHILIPPINES

Summative evaluation of the 'Promote Good Nutrition' training program. *National Nutrition Council , Taguig, 1630 Metro Manila (Philippines). Philippines Univ. Los Baños, College Laguna (Philippines). Inst. of Human Nutrition and Food. College, Laguna (Philippines). TR-1900. Jan 2019. 97 leaves.*

Malnutrition continues to be prevalent among Filipinos, especially children. The Promote Good Nutrition (PGN) is a component of the Accelerated Hunger Mitigation Program (AHMP) which was started in 2007 under President Gloria Macapagal Arroyo and continued under Aquino administration and made a regular program of the National Nutrition Council (NCC). The general objective of the PGN was to improve the knowledge, attitudes, and practices of families to demand adequate nutrition and safe foods. The project aims to

assess the extent to which outputs and outcomes were achieved, the quality of the documentation program, assess the process of implementation, efficiency of the program inputs in relation to the accomplishment of desired outcomes, to evaluate the PGN program in terms of relevance and objectives in relation to AHMP context of LGUs, and identify important lessons for recommendation to future activities. A mix quantitative (survey) and qualitative techniques such as focus group discussion and key informant interviews (FGD, KII) was used in data collection. The PGN conducted a total of 4,776 batches of training, involving 138,257 city/numicipal and barangay implementers from 80 provinces and the National Capital Region. The PGN increased the number of 0-6 months old infants that are exclusively breastfed and increased the number of children 6-24 months given complementary foods. The PGN also helped decrease the number of pre-school children with below normal low weight for their age, and increased the consumption of vegetables and eggs. The PGN training generally resulted in the enhancement of health-seeking behavior among mothers, in more responsible parenting as well as greater consciousness about good health for themselves and their family. PGN trainings aim to enabling people to manage their own limited resources and break the cycle of nutrition problems. However, problems and solution need to be contextualized, because problems evolve and people move on. It is recommended that PGN training be sustained. For its sustainability, the following are recommended: 1.Institutionalize PGN trainings from the National to the local levels; 2.Build in continuing quality improvement of training content and processes; 3.Explore the use of multi-media and blended channels of training; 4.Develop an evaluation scheme across levels.

MALNUTRITION; TRAINING COURSES; TRAINING PROGRAMMES; DIET; DIFFUSION OF INFORMATION

T - PULLATION

T01 - PULLATION

Assessment of physical-chemical properties and metal concentrations in leachate from selected open dumpsites in the Philippines (research note). **Ortega, R.M.D., Otico, P.J., Bernal, R.I., Deocadiz, E.S.** *Sylvatrop (Philippines). The Technical Journal of Philippine Ecosystems and National Resources. 0115-0022. v. 27(1) p. 85-109. (Jan-Dec 2017).*

Local dumpsite leachates were studied to understand their basic characteristics. The study aimed to assess the characteristics of leachate in terms of physical-chemical properties, metal concentrations, and other inorganic compounds in leachates collected from open dumpsites. The data generated from the study would provide baseline information on the characteristics of 'dumpsite' leachate. Seventy-six sets of representative samples were

collected from 38 selected open dumpsites in the Philippines during the 2006 to 2008 sampling activities. Each site consisted 2 leachate samples for physical-chemical, metals analyses and other inorganic compounds. Leachate samples were sourced from waste seeps, flows, or ground slumps located within the study sites. Physical-chemical parameters such as Chemical Oxygen Demand (COD) (15–18,104 mg/L), chloride (7–2,945 mg/L), color (20–5,000 mg/L), alkalinity (4–10,435 mg/L), pH (6.83–9.22), total hardness (30–2,864 mg/L), ammonia (0.010–5.77mg/L), nitrite as nitrogen (0.010–59.70 mg/L), orthophosphate, total, reactive (0.010–9.12 mg/L), total solids (272–12,387 mg/L), total dissolved solids (55–10,987 mg/L), and total suspended solids (17–1,870 mg/L) were analyzed. Metal concentrations in leachate such as cadmium (0.001–0.079 mg/L), copper (0.005–0.498 mg/L), lead (0.010–6.84 mg/L), and zinc (0.002–2.17 mg/L), and other inorganic constituents of leachate such as calcium (1.81–1,080 mg/L), iron (0.010–3,312 mg/L), magnesium (0.079–275.8 mg/L), potassium (1.22–1500 mg/L), and sodium (0.04–1,676 mg/L) were likewise analyzed. The wide ranges of concentrations suggested that the characteristics of leachate may vary from site to site.

LEACHATES; CHEMICOPHYSICAL PROPERTIES; SOLID WASTES; METALLIC ELEMENTS; PHILIPPINES

Estrogenic pollutants: impacts on reproductive health of fish in Laguna de Bay [Philippines].
Paraso, M.G.V. *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 33.*

Laguna de Bay receives a complex mixture of industrial effluents, agricultural runoff, and municipal wastewaters from its extensive watershed. Recent studies detected significant levels of the hormone 17 betha-estrodoil (E2) in lake water samples that confirm its contamination with human and/or animal excreta. Moreover, increased estrogen biomarker responses in collected fish were observed. Both caged and feral male common carp (Cyprinus carpio) demonstrated testicular abnormalities and vitellogenin synthesis that are indicative of exposure not only to E2 but also to potential estrogen-mimicking compounds. Although no obvious signs of illness were seen in fish, exposure to estrogenic pollutants

could decrease fish fecundity, which might have negative implications on the sustainability of fish populations.

CYPRINUS CARPIO; CARP; REPRODUCTIVE HEALTH; OESTROGENS; WILD ANIMALS; FERTILITY; LAKES; POLLUTION; PHILIPPINES

Optimization and validation of a differential pulse anodic stripping voltam-metric (DPASV) method for trace analysis of inorganic arsenic in contaminated water. **Magalona, M.L., Peralta, M.M., Lacsamana, M.S., Sabularse, V.C., de Guzaman, C.C.** *Journal of ISSAAS (Philippines). The International Society for Southeast Asian Agricultural Sciences. 0859-3132. v. 24(1) p. 137-151. (Jun 2018).*

The maximum contamination limit set by the U.S. Environmental Protection Agency (EPA) for arsenic in drinking water is 10 ppb in view of the adverse effects of chronic arsenic exposure on human health. Hence, there is a need to develop an inexpensive, field-operable method that can quantify arsenic at or below this concentration to ensure compliance with EPA regulations without exposure of the analyst to toxic arsine gas. An electroanalytical method was optimized and validated to analyze trace inorganic arsenic as As(III) and total As (As(III) + As(V)) using differential pulse anodic stripping voltammetry with a gold disk as the working electrode, Pt/Ti rod as the auxiliary electrode, and Ag/AgCl as the reference electrode. The study was conducted at the Institute of Chemistry, University of the Philippines Los Baños [Philippines] from June 2015 to October 2016. The electroanalytical method was found to be precise and sensitive based on the resulting RSD values (13%). It also had a satisfactory percent recovery of 91% for As(III) and 81% for As(V). The limit of detection of As(III) and As(V) were 2.24 and 6.96 ppb, respectively while the limit of quantification of As(3) and As(5) were 7.49 and 23.19 ppb, respectively. The total arsenic content of groundwater samples obtained by this method was validated with inductively coupled plasma – optical emission spectrophotometry, and statistical analysis using the t-test showed that the two methods were not significantly different. This in expensive and rapid method allows for speciation species found in field water samples and will be a great boon for monitoring water quality for farming communities that rely on raw groundwater for cooking and drinking.

WATER QUALITY; WATER SUPPLY; WATER; POLLUTION; GROUNDWATER; ARSENIC COMPOUNDS; ANALYTICAL METHODS

Project 2: exploring pollution monitoring proxies for characterizing urban lake environments: under the program ten years after Millennium Ecosystem Assessment of Laguna de Bay [Philippines]: towards a sustainable future (OVPAA-EIDR 06-006). **Payot, B.D., Faustino-Eslava, D.V., Queño, K.L., Siababa, A.C.S.V., Macuroy, J.T., Estorque, P.C.,**

Alvanza, G.A., Aviera, Y.K., Mirasol, M.J. *College, Laguna (Philippines). TR-1860. 2018. 273 leaves.*

Laguna de Bay [Philippines], being the largest lake in the Philippines, is known to be a multiple-use resource that provides supporting, provisioning, regulating and cultural ecosystems services; such services may lead to its degradation. Conditions of the lake is affected both by environmental, biological and socioecological factors which is needed for holistic approach in lake restoration. Pollution is a major concerns in many urban lake environments, particularly at the Laguna de Bay. Thus, timely and relevant monitoring is a necessary to minimize environmental pollutants and their hazardous effects on the lake and its surrounding communities. This project aimed to assess pollutants signatures within the Laguna de Bay lacustrine environment by looking at water quality and heavy metal concentrations in lakebed sediment. This project reviewed the results of the sub-global assessment and compares them with more recent data for three of the lake's rivers: San Cristobal, San Juan, and the Molawin-Dampalit Rivers. Variations in basic parameters such as dissolved oxygen (DO), pH and temperature was published from the years after the assessment report until present. In addition, the Stream Visual Assessment Protocol (SVAP) developed by the United States Department of Agriculture was applied to four rivers at the southern portion of Laguna de Bay. Aside from the water quality of the lake, biological indicators have been eminent in the assessment of water bodies. Plakton are key components of the dynamics of pelagic ecosystem and can tolerate wide-range of environmental conditions making them excellent indicators of environmental stress. Corbicula fluminea across sampling stations have similar linear morphometric measurements. Compositional mapping of the sediments revealed the predominance of silica-and aluminum-rich materials in the lake sediments. To determine lake sediment quality, 75 cm to 100 cm cores were extracted from the South Bay of the lake and analyzed for their geochemical compositions. Various industrial process result in harmful emissions that contain different pollutants, which in many cases contain heavy metals. This study aimed to develop an alternative method using environmental magnetism techniques as most heavy metals are magnetic in character, and some that are non-magnetic can be associated with materials that are naturally magnetic.

LAKES; WATER RESOURCES; WATER POLLUTION; WATER QUALITY; PLANKTON; CORBICULA FLUMINEA; SEDIMENT; ENVIRONMENTAL FACTORS; MONITORING; PHILIPPINES

Water quality of Laguna de Bay [Philippines] in relation to biological pollution. **Tamayo-Zafaralla, M.** *Ten years after Millennium Ecosystem assessment of Laguna de Bay [Philippines]: towards a sustainable future: project 1: assessment of geophysical hazards in urban lacustrine systems: project 2: exploring pollution monitoring proxies for characterizing urban lake environments: project 3: land use change and impacts on watersheds of large*

urban lakes: project 4: assessing socio-ecological systems: visioning sustainable future of Laguna de Bay, Espaldon, M.V.O.Ramos, N.T.Payot, B.D.Bantayan, N.C..- College, Laguna (Philippines), 2018. Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management,Lake Ecosystem Assessment in the Philippines: a Science and Policy Forum for Sustainable Laguna Lake Management, Tagaytay City (Philippines). TR-1863. 22-23 Nov 2016. p. 30-32.

Biological pollution or biopollution of a body of water is one in which the amount of non-indigenous biological entities impacts of native aquatic communities, habitats and ecosystem functioning for a specific area of locality. Its intensity may be low, moderate or high and its distribution may be confined to just one locality, several, many, ot it may be all over the place. The combined amount and distribution of biopollution enables estimation of the impact. Impact estimation emphasizes on the change in the ecosystem and the magnitude of this change brought about by alien species invasion. Assessment of the impact is especially focused on key species, type specific communities (e.g. primary producers), habitat alteration, habitat fragmentation, habitat loss, destruction of the so-called functional groups (e.g. decomposers), food web shifts, etc. Estimation of the impacts is for stated time period only primarily because the intention is to enable assessment of the time-related or temporal changes. For this reason, an adequate amount of quality information is required to calculate the magnitude of the impact. The use of biopollution is simple; it allows for quantifying impacts within any world region.

LAKES; WATER QUALITY; BIOLOGICAL PROPERTIES; POLLUTION; PHILIPPINES