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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.** 3 *Department of Science and Technology, Bicutan, Taguig City (Philippines). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. TR-1826.* 2016. 4 6 5

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

1. Subject category
2. Title
3. Author (s)
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5. TR No.
6. Date
7. Conference title, place, and date
8. Journal title, volume, number, page and date of publication
9. Abstract
10. AGROVOC DESCRIPTORS

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C- EDUCATION, EXTENSION AND INFORMATION

C10 Education

Knowledge sharing enablers and disablers in the Palayamanan farmer field school in the uplands of Silang, Cavite [Philippines]. **Biag-Manalo, H.H.M.; Biag-Manalo, H.H.M.; Flor, B.P.G.; Suva, M.M.; Paunlagui, M.M.; Miranda, R.B.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 54-63 (Apr 2015).*

Investigating and addressing the low knowledge sharing among Farmer Field School (FFS) participants entail an understanding of the factors facilitating and hindering knowledge sharing in FFS sites especially in the uplands, which is the most neglected area in terms of agricultural development in the Philippines. This case study documented and analyzed the communication and non-communication factors that enable and disable knowledge sharing from the Palayamanan FFS participants to their community in the uplands of Brgy. [villages] Adlas, Silang, Cavite [Philippines]. Individual informal interviews with 14 Palayamanan FFS farmers and field notes were used in data collection. The identified communication and non-communication factors have implications on how to facilitate knowledge sharing from Palayamanan FFS participants to their community in the uplands. There are strong indications that communication factors, particularly trusted communication participants, farmers' field as communication context and messages shared enable knowledge sharing, and farmers; perceived negative feedback or effect disables knowledge sharing. There are also palpable indications that non-communication factors, particularly that to-see-is-to-believe attitude of the farmers and altruism facilitate knowledge sharing, and produce-does-the-sharing attitude of the farmers hinders knowledge sharing. Findings in this research can facilitate rethinking of extension strategies and policies to enhance knowledge sharing in the uplands.

FARMERS; HIGHLANDS; AGRICULTURAL DEVELOPMENT; INFORMATION EXCHANGE; DIFFUSION OF INFORMATION; RURAL AREAS; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

C20 Extension

Academics and scientist as biotech communicators : perspectives, capabilities, and challenges in Southeast Asia. **Tome, K.G.N.; Navarro, M.J.; Aldemita, R.R.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 44-57 (Aug 2014).*

University professors and public sector scientist are regarded as highly credible sources of information on biotechnology. Hence, their role in science communication, particularly on biotechnology is critical. A survey was conducted to investigate how academic and scientists involved in crop biotechnology view science communication and their role in public awareness and understanding. Two hundred seventeen respondents from 63 different academic and research institutions in the Philippines, Malaysia and Indonesia were asked to answer a questionnaire (onsite and through electronic mail). A five-point Likert scale was used to determine the view of the respondents about science/biotech communication. Although they noted the importance of science communication, only an average of 11 percent of their working time was devoted to it, with most devoted to research and instruction. Most of them (40%) had low level of engagement activity *1 to 10 activities/year) mostly conducted for students or staff from other institutions and farmers with an objective of

fostering awareness and understanding on biotech, creating public acceptance towards biotech, and addressing issues concerning the risks and benefits of biotech. A total of 31 respondents (10%) have attended training on science communication, which were mostly sponsored by non-government organizations. With more funds for science communication activities, additional training and career incentives, they would be more encouraged to conduct more science communication activities. The respondents feel that an integration of science/biotech communication as theme or activity in mainstream organizations or professional societies to enable growth in the field through constant exchange of ideas and experience will lead to more informed public about biotechnology. Nevertheless, when asked about public acceptance on biotechnology, majority (73%) said that the public has accepted the technology signified by the adoption of biotech products in the country.

SCIENTISTS; PUBLIC SECTOR; TEACHERS; BIOTECHNOLOGY; COMMUNICATION; DIFFUSION OF INFORMATION; RESEARCH INSTITUTIONS; UNIVERSITIES

AgriDoc App: a mobile rice farm management application tool. **Caballong, N.L.; Barroga, R.F.; Alday, P.A.A.; Pangilinan, J.K.C.; Carbungco, P.V. 48.** Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 39 (Jul 2018)*.

Smartphone and tablet technology innovates knowledge delivery and decision support for farmer-entrepreneurs and agriculture extension workers. Through software application tool (app), farm and crop data can be organized, stored, retrieved and reprocessed to provide just-in-time knowledge, and simple information. In this new kind of systems users will be empowered for more knowledge-based and informed decision making. The authors present the implementation design of a mobile app tool called AgRiDOC App, which allows users to record day-to-day major farming and management operations and monitor rice crop growth. Using the app, users are able to quickly and easily keep track of their activities and expenditures. It has a geo-visualization feature which allows users to view and geotag their farms through satellite maps. The app also provides important information such as the primary needs and concerns of the rice crop for every crop age and growth stage, recommendations from the PalayCheck System. In addition, it gives comprehensive descriptions of released rice varieties, and links to rice knowledge banks and other tools and websites. AgRiDOC App works on Android devices, and is available in Google PlayStore for free. It has now more than 500 registered users.

ORYZA SATIVA; RICE; PRODUCTION; FARM MANAGEMENT; DECISION SUPPORT; MOBILE UNITS; COMPUTER SOFTWARE

Climate change-ready technologies teaching styles and preferences: the case of 12 TecVoc high schools in the Philippines. **Manalo, J.A., Bautista, A.M.F., Hallares, R.T., Berto, J.C., Paulino, T.C., Saludez, F.M., Villaflor-Mesa, J., Maramara, R.M.** 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. 40 (Jul-2018).*

PhilRice, DA-BAR [Department of Agriculture-Bureau of Agricultural Research], and the Department of Education are working on a project to create climate change ready schools. Among its key components is to document the best styles and preferences in teaching climate change-ready technologies. Teaching climate change-related topics remains an uncharted territory despite its relevance and urgency especially in relation to climate change adaption. In this Project, participating teachers from 12 Technical-Vocational high schools nationwide were trained on the intersections between climate change and rice production at the PhilRice Central Experiment Station Nueva Ecija [Philippines]. After their training, they were then asked to integrate the lessons in their respective classes. In this paper, the teachers delivered teaching demonstrations on topics of their choice under the climate change and rice production domain. They designed the whole teaching demonstration from choosing the topics to be discussed, teaching styles, and other elements of teaching. Participant observation during the teaching demonstration proved useful in documenting the responses of the students on the lecture delivered by the teachers. In-depth interviews with the participating teachers were conducted to reflect on the choices they made. Focus group discussions with the teachers and school officials who came to the demonstration as well as with some students were also conducted. Results show that localization and edutainment approaches appear to be the most preferred teaching styles. It was learned that the student learn best if the topics are fitted to the conditions in their community. Hands-on activities, on the other hand facilitate understanding of some complex topics such as the Minus-One Element Technique. This paper forwards several critical reflections on the methods that best convey lessons on climate change-ready technologies.

CLIMATIC CHANGE; EDUCATIONAL INSTITUTIONS; EXTENSION ACTIVITIES; DIFFUSION OF INFORMATION; PHILIPPINES

Farmers' participation in integrated pest management under the Palayamanan Program in Camarines Sur, Philippines. **Oliver, P.F.; Dizon, J.T.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 40-49. (Dec 2016).*

The study was conducted to analyze farmers' participation in the Integrated Pest Management (IPM) under the Palayamanan program in three municipalities in Camarines Sur, Philippines, namely, Buhi, Ocampo and San Fernando. A correlation analysis was done to determine the relationship between the farmers' socio-economic and psychological characteristics, and institutional factors and IPM practice. The level of farmers' participation in IPM showed that respondents in Buhi were at the partnership level, those in Ocampo were at the consulting level, while those in San Fernando were at the informing level. Based on chi-square analysis, the factors that were significantly correlated with participation in IPM were monthly income; knowledge about IPM; and trainings, technical assistance, and financial/credit availability. The major recommendations of farmer-respondents in the IPM practice were to encourage other farmers to continuously practice IPM to lessen pesticides usage and reduce expenses on farm inputs, and further increase technical, financial assistance and trainings to IPM farmers under the Palayamanan Program.

FARMERS; PARTICIPATION; INTEGRATED PEST MANAGEMENT; LOCAL GOVERNMENT; EXTENSION PROGRAMMES; TRAINING PROGRAMMES; DIFFUSION OF INFORMATION; PHILIPPINES

New and improved Palay stat: your one-stop shop for your rice data needs. **Malasa, R.B.; Tabalno, R.F.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 38-39 (Jul 2018)*

In national development, the aspirations of a policy is to attain national goals and achieve a fair measure of success. There is a need to map out strategic plans, set up machinery for execution, and monitor the implementation process (Shangodoyin, D.K. and Lasisi, T.A., 2011). This proves that statistics has a vital and relevant role not only in the national development but as well in the countryside level. With this in mind, in 2014, the Philippine Rice Research Institute (PhilRice) developed and introduced an interactive web-based information system called the Rice-based Socioeconomic Information System (RBSEIS) and later on renamed as PalayStat system. The PalayStat system is created to cater rice researchers and policy makers in need of accessible rice-related information. Since August 2016, PalayStat has been viewed 12,221 times and browsed through 2,360 sessions. Also, the system have received very good ratings from user's feedbacks', averaging 4.74 out of 5. Since PalayStat is an effective tool in providing data to user's feedbacks', averaging 4.74 out of 5. Since PalayStat is an effective tool in providing data to users, additional rice-related information for public consumption were included such as 16 statistical tables from the Statistical Series On The Rice Economy study. These time-series datasets (1970-2014) consist of palay/rice supply and demand, input-use and production costs, returns and losses, and palay/rice marketing covering 83 provinces from 16 regions. In collaboration with the Philippine Statistics Authority (PSA), these datasets are updated annually both in national and provincial summaries. To further improve the system, additional functionalities were developed such as dynamic search options and broader search keywords, bigger database on publications, maps and other references, and better website design and user-friendly experience. PlayStat aims to be the main one-stop portal for rice researchers on the Philippine rice industry.

RICE; STATISTICAL DATA; DIFFUSION OF INFORMATION; INFORMATION TECHNOLOGY; COMMUNICATION TECHNOLOGY

Rice stories in the mainstream media: the case of PhilRice [Philippine Rice Research Institute]. Nidoy**, M.G.M.; Manalo J.A., IV.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 46-55 (Apr 2018).*

Drawing on from media monitoring study conducted with the support of the Philippine Rice Research Institute's (PhilRice) Development Communication Division from August to December 2015, and using the Agenda setting Theory as its theoretical lens, this paper argues on the need to explore more creative ways of presenting scientific information to the public. As it stands, good science is inadequate to merit attention by the mainstream media. PhilRice is the Philippine's lead agency for rice research and development. Specifically, the aim of this research was to scrutinize how the Philippine media reports about rice and rice agriculture. The monitoring covered 149 print publications, 70 websites, and 25 radio and TV stations. Content analysis was conducted paying careful attention to the types of stories media published, sections where the story landed, and public relations (PR) value of each story. This research also identified media champions with respect to the extent and PR value attached to their coverage of rice stories. Phone interviews and online conversations with media practitioners, i.e. news producers, researchers, and writers were conducted. Results reinforce earlier

studies saying that agriculture stories, in this case rice, hardly occupy front pages or are given sufficient attention by the Philippine media. Controversy is a key element for agriculture stories to be published. Recommendations on enhancing public understanding of rice stories are presented.

ORYZA SATIVA; RICE; MASS MEDIA; DIFFUSION OF INFORMAT ION; RESEARCH; TECHNOLOGY

Tubungan farmers [Male Farmers' Association in Tubungan town Iloilo, Philippines] train on quality assurance, marketing operations. **Toreno, S.M.H**. *Agriculture (Philippines) v. 23 (1) p.48-49 (Jan 2019).*

FARMERS; FARMERS ASSOCIATIONS; TRAINING PROGRAMMES; DIFFUSION OF INFORMATION; MARKETING; POSTHARVEST TECHNOLOGY; FARMING SYSTEMS; QUALITY ASSURANCE; PHILIPPINES

Youth and agriculture messaging: the what, when, and how of netizen engagement. **Manalo, J.A.; Corpuz, D.C.P.; Paulino, T.C.; Bautista, A.M.F.; Berto, J.C.; Hallares, R.T.; Saludez, F.M.; Villaflor-Mesa, J.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 38 (Jul 2018)*.

Social memes are increasingly being used to convey messages of key importance to netizens. In this paper, the authors analyzed the types of interactions generated by 55 memes uploaded in the Infomediary Facebook page. These memes conveyed different messages with youth and agriculture as the central theme. They were posted from February to September 2017. The types of interaction being referred to are the number of likes, comments, reach, and shares generated by these memes. Results show that the post reach range from 1,100 to 4,000. Noticeable and severe fluctuations among these posts were recorded in September in which a meme reached 72,000 users. This meme was on the positive effects and benefits received by farmers through their interaction with the infomediaries in their community. Infomediaries are high school students mobilized to serve as information providers in their respective communities. The top 10 most viewed photos were posted either Wednesday or Friday, consistently at 6PM. The hashtags RiceAndYoungPeople and InfomediaryCampaign were consistent in the top ten post with the highest number of reach. In terms of the interactivity of users, 11 out of the 55 photos, representing 1/5 of the total number of photos posted from February to September 2017, were commented by Facebook users. Data also show that photos posted during February to March 2017 have the most number of comments. Most of the user's comments express support and agreement with the advocacy of the Infomediary Campaign. This paper also forwards recommendations on how to deal with declining post reach and how to boost youth engagement in social media campaigns targeting climate action and agriculture, in general.

AGRICULTURE; YOUTH; DIFFUSION OF INFORMATION; EXTENSION ACTIVITIES

C30 Documentation and information

Knowledge sharing enablers and disablers in the Palayamanan farmer field school in the uplands of Silang, Cavite [Philippines]. **Biag-Manalo, H.H.M.; Biag-Manalo, H.H.M.; Flor, B.P.G.; Suva, M.M.; Paunlagui, M.M.; Miranda, R.B.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 54-63 (Apr 2015)*.

Investigating and addressing the low knowledge sharing among Farmer Field School (FFS) participants entail an understanding of the factors facilitating and hindering knowledge sharing in FFS sites especially in the uplands, which is the most neglected area in terms of agricultural development in the Philippines. This case study documented and analyzed the communication and non-communication factors that enable and disable knowledge sharing from the Palayamanan FFS participants to their community in the uplands of Brgy. [villages] Adlas, Silang, Cavite [Philippines]. Individual informal interviews with 14 Palayamanan FFS farmers and field notes were used in data collection. The identified communication and non-communication factors have implications on how to facilitate knowledge sharing from Palayamanan FFS participants to their community in the uplands. There are strong indications that communication factors, particularly trusted communication participants, farmers' field as communication context and messages shared enable knowledge sharing, and farmers; perceived negative feedback or effect disables knowledge sharing. There are also palpable indications that non-communication factors, particularly that to-see-is-to-believe attitude of the farmers and altruism facilitate knowledge sharing, and produce-does-the-sharing attitude of the farmers hinders knowledge sharing. Findings in this research can facilitate rethinking of extension strategies and policies to enhance knowledge sharing in the uplands.

FARMERS; HIGHLANDS; AGRICULTURAL DEVELOPMENT; INFORMATION EXCHANGE; DIFFUSION OF INFORMATION; RURAL AREAS; TECHNOLOGY; TECHNOLOGY TRANSFER; PHILIPPINES

E- AGRICULTURAL ECONOMICS, DEVELOPMENT AND RURAL SOCIOLOGY

E10 Agricultural economics and policies

Knowledge, attitude, perception and willingness-to-pay survey for imposing carbon tax in the Philippines. **Eleazar, P.J.M.; Demafelis, R.B.; Matanguihan, A.E.D.; Tongko-Magadia, B.D.; Gatdula, K.M.; Predo, C.D**. *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 1-10 (Dec 2017).*

The global movement to curb carbon dioxide emissions to mitigate climate change has led to the development of several technologies and researches that use renewable energy to reduce fossil fuel consumption and consequently, reduce harmful emissions. This paper aims to share information that will help develop a carbon tax policy in the Philippines. A face-to-face dichotomous choice, contingent valuation was conducted to elicit the willingness-to-pay of the respondents from 544 households in two localities namely Antipolo and Isabela, [Philippines] representing the urban and rural areas, respectively. Also, their knowledge, attitude, and practices towards climate change were surveyed. The information gathered is a primary step in identifying factors to consider in developing the carbon tax rate that will be acceptable to the Filipino consumers. The data gathered in this study is limited to the imposition of carbon tax on the electricity and transportation sector-the two sectors which contribute more than 50% of the Philippines' total carbon dioxide emission. The result of the survey showed a very low affirmation on the willingness-to-pay a carbon tax, not exceeding 50% of the total respondents, which may be attributed to the current social status of the Filipino people when most have yet to satisfy their basic needs. The respondents' expenditure for the subject commodities sums to about 50% of their total monthly household' expenses (Antipolo: 13.06% of MHE is for electricity, 32.39% for fuel, and 10.37% for fare; Isabela: 13.60% of MHE is for electricity; 23.01% for fuel, and 9.24% for fare).

CARBON; TAXES; CLIMATIC CHANGE; VALUATION; HOUSEHOLDS; CONSUMER EXPENDITURE; HUMAN BEHAVIOUR; PHILIPPINES

Liberica: the barako of all coffee varieties. **Anon**. *Agriculture (Philippines) v. 22 (10) p. 42-43 (Oct 2018).*

COFFEA; VARIETIES; COFFEE INDUSTRY; PRODUCTION; CONSUMPTION; FLAVOUR

Vegetables: the need for supply diversification. **Dy, R.** *Agriculture (Philippines) v. 23 (1) p.34-35 (Jan 2019).*

VEGETABLES; PRODUCER PRICES; HIGHLANDS; LOWLAND; SUPPLY; DIVERSIFICATION; LEGUME

E14 Development economics and policies

Crop roadmaps poorly implemented. **Sarian, Z.B.** *Agriculture (Philippines) v. 23 (1) p.54-55 (Jan 2019).*

COCOS NUCIFERA; ANIMAL HUSBANDRY; SMALL FARMS; INTERCROPPING; DIVERSIFICATION; FARMERS; FARMS; MARKETS ;POSTHARVEST TECHNOLOGY

Development of coir coloring filler and peat-based handicraft. **Lumata, R.L., Peñamora, L.J., Baya. L.J.B., Tagactac, C.M., Lumata, A.L.** 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. 117 (Jul-2018).*

Currently, stocks of coir are utilized mainly for geotextile and a few handicrafts whereas cocopeat is used as base material for fertilizer development for vegetables. Moreover, coir and peat are produced from coconut husks using the the PCA's fabricated 12HP mobile decorticating machine which has been distributed to several regions in the country as part of KEDP program. In this on going research, novel products are developed for art and crafts which is intended to be tested by the K-12 program in their art classes. The parameters involved for coir coloring fillers are coir size, color concentration, and toxicity analyses of dyes. The coloring art fillers were used for making several portraits which can substitute commercial fillers which are either made of egg shell and other non-organic materials. Cocopeat has been tested as a substitute for plaster of paris in making figurines using white glue as binder; however, several other types of binders are being studied. Plaster of paris, also known as dehydrated gypsum, comes from a nonrenewable resource whereas cocopeat is composed of 60%-70% of the total weight of coconut husks which can be collected thousands of tons each year as Philippines is the second largest coconut producer in the world. This product development from coconut aims to develop high value products which come from a highly sustainable waste resource from coconut (husks) which are just normally burned in copra processing.

COCONUTS; COIR; HUSKS; PROCESSING; HUSKING; PRODUCT DEVELOPMENT; TECHNOLOGY; PEAT; HANDICRAFTS

Modification of developed lowland technologies to address production constraints in the highlands. **Sabigan, N.A., Batacan, J.D., Credo, A.M.S., Conception, M.S., Romero, M.V., Ilar, G.Y.** 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. 120 (Jul-2018)*.

Heirloom Rice varieties are popularly grown in the highlands of Cordillera Administrative Region (CAR). These varieties have exceptional cooking quality, flavor, aroma, texture, color and nutritional value, commanding high demand and price in both local and international market. However, there are several constraints in the production of heirloom rice, including low yield due to nutrient deficiencies, rice diseases such as blast and bacterial blight, and pest like rats and aquatic worms. At present, newly developed technologies yielded significant impacts in the productivity and sustainability in lowland rice production. These innovations could potentially provide similar results in addressing production constraints when introduced in the highlands. The Heirloom Rice Project conducted on-site field testing of four mature lowland technologies in strategic heirloom rice producing areas from the provinces of Benguet, Mountain Province, Kalinga, and Ifugao [Philippines]. Ten techno-demo set-ups were established for each technology. The modified Dapog Technology aims to address the seedling damage and low seed germination at the seedbed caused by aquatic worm activities. Aside from providing additional income, Integrated farming through the Rice Duck Technology could serve as alternative natural management of snails and weeds. Controlled Irrigation Technology could potentially enhance production in suspected zinc-deficient terraces due to waterlogged practice of irrigation. Through the Community Rat Trap Barrier System, yield losses due to rodents could be significantly reduced. The project also conducted soil analysis using the Minus One Element Technique (MOET) to determine nutrient deficiencies in problematic soils. Carbonized Rice Hull (CRH) used in the Modified Dapog limited aquatic worm activities as indicated by reduced castings in the seedbed. Better crop growth was also documented in plots using alternate wetting and drying irrigation method. Final results of the on-going study will be used in the modification of the technologies in crafting location-specific technology versions.

ORYZA SATIVA; INDIGENOUS ORGANISMS; VARIETIES; LOWLAND; TECHNOLOGY; HIGHLANDS; TECHNOLOGY TRANSFER; DIFFUSION OF INFORMATION

Plant varietal registration and photodocumentation of traditional rice varieties: a means to countryside development. **Alvariño, J.B., Mananghaya, T., Ferrer, M., Duldulao, M., Niones, J., Romero, M.V., Perez, L.** 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. 116-117 (Jul-2018).*

Introduction of modern rice varieties has eventually led traditional rice varieties (TRVs) to extinction thus PhilRice initiated conservation activities to save these valuable genetic resources. Philippines houses a significant number of diverse TRVs mostly kept by Indigenous People (IP) and upland rice farmers yet lack of documentation hence, they were unprotected and vulnerable to illegal claims. A total of 179 traditional rice varieties were collected throughout the Philippines from 2014 to 2017 and these TRVs remains unregistered in the Bureau of Plant Industry (BPI). In this study, 179 collected Philippine TRVs were used in photo-documentation of eight distinct qualitative traits. It aims to establish the defensive protection of the collected TRVs from illegitimate ownership claims and create an individual TRV profile through morphological characterization and photo-documentation. Comprehensive photo-documentation was done from seedling to

post harvest. Auricle in vegetative, open and close spikelet; and whole plant in reproductive stage; matured panicle, rough rice, dehulled and polished grains in post-harvest. A total of 72 TRVS has a complete photo-documentation and 21 characterization data was selected by BPI for Plant registry: 15 for qualitative and 6 for quantitative traits. There are 27 traditional rice varieties already included in Philippine Traditional Rice Varieties catalog volume I and 41 TRVs has been submitted to BPI for plant varietal registration. Selected morphological traits, name of TRVs, origin (municipality and province) and PhilRice collection number are included in the registry information sheet. Certificate of registration for individual TRVs will be issued by BPI. Data on morphological characterization of registered TRVs will be available in BPI's website.

ORYZA SATIVA; RICE; REGISTRATION; RURAL ENVIRONMENT; COMMUNITY DEVELOPMENT

Rabbit industry in the rise. **Veneracion, A.M.** *Agriculture (Philippines) v. 22 (10) p. 56-60 (Oct 2018).*

RABBITS; PRODUCTION; TECHNOLOGY; INDUSTRY; PROCESSING; FARMERS; RURAL AREAS; TOURISM; LAPIN (ORYCTOLAGUS); PRODUCTION

SL Agritech ignites new hope for Marawi [Philippines] through farming. **Anon.** *Agriculture (Philippines) v. 22 (10) p. 46-47 (Oct 2018).*

ORYZA SATIVA; RICE; HYBRIDS; SEED PRODUCTION; CROP MANAGEMENT; RECLAMATION; FARMING SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; FARMERS; PHILIPPINES

E16 Production economics

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).*

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 and processing in the uplands and highlands farming communities as intercrop and rotating crop of corn, fruit-trees, sugarcane and plantation crop-based areas even to the extent of backyard/garden-type production. With proper delivery of various project interventions, successful undertakings have been felt due to the establishment of public-private partnership among Local Government Units, DAR [Department of Agrarian Reform]and DENR [Department of Environment and Natural Resources]. Such intervention aggressively pushed soybean production and utilization in ARCDP-covered areas and the notable interest of the Peoples Organizations composed of CORDEV, MGSK, Esperanza MPCI, Seventh-Day Adventist church/schools, MASREDECA, KERDS, VIBANARA MPCI, Bacnor East Soya Growers Association, Franciscan of Our Lady of Divine Providence, NELAC and Bintawan Soybean Growers and Processor. They are instrumental in the increasing production of soybeans in Region 02 from almost zero in 2010 to 1,750 hectares in June 2017 (cultivated by farmers in 25 farming communities). Furthermore, the program had improved the uplands conventional farming systems, supportive of crop diversification and increase income, soil fertility enhancement, organic farming and food

security because intake of protein-rich soybeans means reduced satiety for rice and dependence on disease-causing and expensive animal-based protein foods for improved households health and nutrition. The active involvement of women in soybean food processing empowered them somehow in terms of income generation and as local market of raw soybeans in Cagayan Valley, aside from the households' local consumption of raw materials as protein ingredients for swine indigenous feeding. It is also worthy to note that farming households and even young generations already appreciated consumption of soybeans for reasons of having healthy food lifestyle.

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

Improving productivity and profitability of rice farming in Southeast Asia through best management practices. **Pame, A.R.P., Stuart, A.M., Vithoon jit, D., Kieu, N.T., Pustika, A.B.** 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. 40-41 (Jul-2018).*

Closing yield gaps plays a key role in achieving food security. In the major irrigated rice granaries of Southeast Asia, there is a considerable gap between actual yield and attainable yield; with exploitable yield gaps ranging from 23-47% recently reported in Central Thailand, Southern Vietnam, and Central Java, Indonesia. Closing such yield gaps would increase the total annual production of rice, thus, helping to meet the food demands for the growing human population of Asia. This can be accomplished through sustainable intensification. However, this needs to be achieved under increasing scarcity of resources, such as land and water, whilst minimizing negative environmental effects. Best management practices embedded in the national programs of Thailand (Cost Reduction Operating Principles); Vietnam (1 Must Do, 5 Reductions); and Indonesia (Integrated Crop Management) were evaluated and adapted for the local conditions through farmer participatory demonstration field trials over a minimum of two cropping seasons. Following the application of best management practices in Central Thailand, nitrogen fertilizer inputs were reduced by 58% per season with no yield penalty, while profit increased by 26% (100 USD/ha) compared with current farmer's practice. In southern Vietnam, the mean number of pesticide applications and phosphorous fertilizer rates per season were reduced by 57% and 25%, respectively, with a 19% increase (175 USD/ha) in profit. In central Java, Indonesia, mean yield increased by 8% per season. Furthermore, profit increased by mean of 38% (113 USD/ha) per season. These results indicate that adoption of best management practices can enhance the productivity and profitability of intensive rice production in Southeast Asia.

ORYZA SATIVA; RICE; CROP MANAGEMENT; PRODUCTIVITY; PROFITABILITY; FOOD SECURITY; SUSTAINABILITY; YIELD INCREASES; RESOURCE MANAGEMENT; SOUTH EAST ASIA

E20 Organization, administration and management of agricultural enterprises of farms

Adoption of rice crop insurance in the Philippines: lessons from farmer's experience. **Bordey, F.H.; Arida, I.A.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 24-34 (Apr 2015).*

Crop insurance is one of the mitigating mechanisms that farmers can use to cope with reduced rice production and income due to typhoons, floods, landslides, droughts, and pest and diseases. However, few Filipino rice farmers insure their crops. This study assessed the rice farmer's perception and awareness level about crop insurance. Determinants of crop insurance adoption were identified using probit estimation. One out of 10 farmers had enrolled in rice crop insurance at least once from 2007 to 2011. The major reasons for enrollment are attractive remuneration policy and facilitating access to credit. The key reasons for non-enrollment are added financial burden and lack of understanding about insurance. Probit estimation revealed that the area planted to rice, farmer's sex, access to remittances and capital, and participation in seminars related to rice farming are significant and positively affect the probability of adopting insurance.

ORYZA SATIVA; RICE; FARMERS; CROP INSURANCE; DISASTERS; PESTS; PLANT DISEASES; FARM MANAGEMENT; FARMERS; PHILIPPINES

Big mistakes in agribusiness can be devastating. **Sarian, Z.B.** *Agriculture (Philippines) v. 23 (1) p.56-57 (Jan 2019).*

FARMING SYSTEMS; AGROINDUSTRIAL SECTOR; INVESTMENT; FINANCING; INVESTMENT REQUIREMENTS

Coffee industry in the eyes of an academician. **Papa, A.G.** *Agriculture (Philippines) v. 23 (1) p.46-47 (Jan 2019).*

COFFEE INDUSTRY; AGRICULTURAL PRODUCTS; OCIOCULTURAL ENVIRONMENT; SCIENTISTS; PHILIPPINES

Evaluation of the impact of agricultural insurance program of the Philippine Crop Insurance Corporation (PCIC) on agricultural produces in Cagayan Valley [Philippines]. **Conrado, V.D., Onate, B., Tuscano, J., Torio, E., Umingan, M.J., Paat, N.K.** 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. 44-45 (Jul-2018).*

This study aimed to evaluate the impact of agricultural insurance of the Philippine Crop Insurance Corporation (PCIC) on corn farmers in Cagayan Valley Region, Philippines. A total of 500 corn farmers and were randomly taken as respondents classified into the following treatments: 250 corn farmers with insurance (118 with indemnity claims and 132 without indemnity claim) from PCIC agricultural insurance subscribers for 2014 and 2015 matched with 250 without insurance from the RSBSA list. These treatment groups were further divided according to farm size: 0.5 ha and below, greater than 0.5 ha to 1.0 ha and greater than 1.0 ha. The t-test was used to test the difference on net farm income of farmers on corn production between groups. Farmers with insurance with indemnity claim have have significantly higher net farm incomes per hectare than those without insurance. When farmers were not grouped by farm size, farmers with insurance with claims have higher net incomes than farmers with insurance but indemnity claims in both years 2014 and 2015. Likewise, farmers with insurance and with indemnity claims have higher net income than those farmers without insurance. When farmers were grouped according to farm size, similar result was found in large farms (greater than 1.0 ha). It is therefore concluded that there is significant impact of receiving agricultural insurance indemnity claims on the net farm income of farmers in corn production. Hence, it is recommended that

policies, programs and efforts of the government and the PCIC be directed towards enhancing the factors that increase the availment of and review of indemnity coverage of agricultural insurance.

MAIZE; PLANT PRODUCTION; AGRICULTURAL INSURANCE; EVALUATION; FARMERS; INCOME; PHILIPPINES

People simply love the native lechon. **Sarian, Z.B.** *Agriculture (Philippines) v. 23 (1) p.60-61 (Jan 2019).*

SWINE; INDIGENOUS ORGANISMS; FOOD TECHNOLOGY; PROCESSING; FOODS; ANIMAL HUSBANDRY; SUPPLY BALANCE; PROFIT

Resiliency of the native pig industry. **Yap, J.P.Jr.** *Agriculture (Philippines) v. 23 (1) p.42-44 (Jan 2019).*

SWINE; INDIGENOUS ORGANISMS; INDUSTRY; FARMS; INCOME; LOCAL GOVERNMENT

Voices from the field: needs of small-scale Filipino rice farmers. **Palis, F.G.; Diaz, C.; Todcor, G.; Flor, J.R.; Tanzo, I.; Datoon, R.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 64-75 (Apr 2015).*

This paper presents an assessment of needs and coping mechanisms of small-scale rice farmers in the Philippines. Various ethnographic methods were used in the study. Focus group discussions among farmers and key informant interviews among agricultural staff and extension workers were conducted in 51 villages of 19 municipalities in six provinces of the country. Household survey was conducted among 923 farmers in the provinces of Agusan del Norte, Iloilo and Isabela [Philippines]. The major needs faced by small-scale Filipino rice farmers ranged from overcoming biotic and abiotic stresses, economic sufficiency, structural sufficiency, to be the most knowledge in rice farm management and technologies. Sufficient capital prevailed to be the most common need in rice farming. Other specific needs include low input cost, higher paddy price, access to equipment and post-harvest facilities, adequate irrigation system, farm-to market roads, overcoming biotic stresses such as pests and diseases, overcoming abiotic stresses such as flooding and drought, and improved knowledge on rice farm management and technologies. Some needs and constraints were found to be location-specific such as biotic and biotic stresses, but were interrelated. Adoption of key technologies promoted in the PalayCheck system to increase rice production remains a great challenge since these technologies such as the site specific nutrient management are closely interrelated with timely availability of sufficient financial capital. Farmers were found to manage and cope by borrowing money from informal lenders who charge them with high interest rates, and traders that require farmers to sell their products immediately after the harvest with a low paddy rice. These situations entrapped our rice farmers in a cycle of poverty, hence pro-farmer policies and programs that addressed real needs of farmers should be in place: easy access to formal financial institutions with low interest rates and simplified credit requirements ; a competitive price for paddy ; reduction in costs of inputs; livelihood programs to farmers and their households; access to post-harvest facilities; better irrigation systems and road infrastructure; and most of all strengthening farmer organizations. A working multi-stakeholder partnership among farmer organizations. Department of Agriculture and local government units are imperative in addressing the needs of farmers to increase rice production, farming households' income and addressing the needs of farmers to increase rice production, farming households' income and achieving the country's goal of rice self-sufficiency.

ORYZA SATIVA; RICE; FARMERS; FARMING SYSTEMS; SMALL FARMS; POVERTY; CROP MANAGEMENT; TECHNOLOGY; INNOVATION ADOPTION; PHILIPPINES

E21 Agro-industry

Narrowing the yield and cost gaps: a comparative efficiency of rice farming in the Philippines. **Bordey, F.H., Beltran, J.C., Arida, I.A., Litonjua, A.C., Lapurga, M.G.C., Collado, W.B.** 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. 44 (Jul-2018)*.

This project assessed the causes of yield variations across rice-producing in the Philippines. Estimates of technical (TE) and allocative (AE) efficiencies of rice farmers were computed using the 2011-2012 rice-based farm household survey. Factors that can improve efficiencies were determined. Factors that can increase yield and reduce cost were also assessed. Result showed that at 75% TE, farmers are generally producing only 75% of the maximum potential production, given farmers' input combinations. On the other hand, farmers' mean AE was estimated at 81%. This implies that farmers could have generated the same level of production using only 81% of the actual production cost, given the input prices. The potential cost reduction is about 19%. Mean TE and AE estimates varied across the major rice-producing provinces. Model estimates confirmed that education, training, membership in organizations, and land ownership can positively influence TE of farmers. However, organization was the only variable found to affect AE, which necessitates further study. TE was also found to contribute to yield increase but its yield increment was smaller than the effect of high-quality seeds and access to irrigation water. Similarly, results indicated that improvement in AE can further reduce the cost. Improved yield adoption of quality seeds, and mechanized harvesting and threshing were also found as cost-reducing factors. Provincial differences matter when it comes to the effects of farm inputs on yield and input prices on unit cost. Hence, it is imperative to assess provincial rice farming conditions, strategize on the right combinations of farm inputs, allocate on the cost-reducing but efficient technologies, and recommend location-specific interventions. Policymakers and planners can use this information in crafting sustainable location-specific rice programs that can contribute to improve the competitiveness of the rice industry.

RICE; PLANT PRODUCTION; CROP YIELD; PRODUCTION COSTS; EFFICIENCY; FARMERS; PHILIPPINES

E70 Trade, marketing and distribution

Effect of transaction costs on farmers' market participation in the Philippines rice sector. **Cuevas, A.C.; Clarete, R.L.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 35-44 (Apr 2015).*

A market participation model with transaction costs was utilized to look into the effects of different transaction cost variables on farmers' rice market participation as a net seller. The results showed that the coefficients of the rice farming as the main source of income, irrigation, farm size, access to informal credit, and wage rate variables have the expected signs and are highly significant while the coefficients of the first class municipalities and cities, distance from the nearest wholesale markets, and number of years of education variables are significant at the 10%. These variables affect the farmers' decision on whether to participate in the market or not. On the other hand, except for the distance to the nearest wholesale market, farm

experience and land ownership, all other explanatory variables have an effect on marketed supply with all coefficients having the expected signs. Marginal effects, both conditional and unconditional, were also computed. The marginal effect decompositions for the irrigation, farm size, access to informal credit, number of years of education and the first class municipalities and cities variables showed that increase in marketed supply can be attributed to both increased market participation and increased marketed supply among participants.

ORYZA SATIVA; RICE; FARMERS; PARTICIPATION; MARKET PRICES; MARKET STABILIZATION; FARM INCOME; FARM MANAGEMENT; COSTS; MODELS; PHILIPPINES

F- PLANT SCIENCE AND PRODUCTION

F01 Crop husbandry

Appreciating organic farming. **Hilario, F.A.** *Agriculture (Philippines) v. 23 (1) p.52-53 (Jan 2019).* 1 ill.

CROPS; ORGANIC AGRICULTURE; ORGANIC FERTILIZERS; CLIMATIC CHANGE; ECOSYSTEMS; QUALITY; SOIL FERTILITY; PESTS

Assessment of potential plant growth promoting compounds produced in vitro by endophytic bacteria associated with Nipa Palm (Nypa fruticans). **Cruz, J.A.; Cadiente, M.K.M.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 74-82 (Dec 2016)*.

The study determined the plant growth promoting compounds produced in vitro by endopytic microorganisms isolated from nipa palm (Nypa fruticans). These compounds include indoleacetic acid (IAA) production, 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase activity, phosphate solubilization, siderophore production, nitrogen fixation, and starch hydrolysis. Nitrogen-free medium was used to isolate endophytic bacteria. Fifty-one isolates from nipa palm (roots, bark, leaves, etc.) taken in Bulacan, Quezon, and Agusan provinces were screened for the production of growth-promoting compounds. Forty-two isolates produced IAA, six were able to produce siderophore as shown by orange halo around the colonies, and 21 showed ACC deaminase activity. Of the 51 isolates, 37 dissolved precipitated tricalcium phosphate as shown by clearing zone around isolates grown in Pikovskaya's medium. Thirty-six isolates the nitrogen-fixing bacteria while 18 isolates were able to hydrolyzed starch. Five isolates were selected from among 51 isolates for further study. Selection was based on their growth rates. IAA production and phosphate solubilization. Endophytic bacteria associated with nipa palm produced growth-promoting compounds that may promote plant growth. However, assessment was done in vitro only. Evaluation of the selected isolates under growth room and screenhouse conditions is recommended to determine its effectiveness as plant growth promoter.

NYPA FRUTICANS; BACTERIA; SPECIES; IN VITRO; ENDOPHYTES; IAA; PLANT GROWTH SUBSTANCES

Bothered by what the fortune teller told him [Mr. Camelo Ramos of San Pablo City Philippines], memoirs of an Agri Journalist. **Anon.** Agriculture (Philippines) v. 23 (1) p.50 (Jan 2019).

CARICA PAPAYA; VARIETIES; NEPHELIUM LAPPACEUM; PLANTING; FARMS; INCOME; FARMERS

Bougainvilleas becoming the new trend? **Sarian, Z.B.** *Agriculture (Philippines) v. 22 (10) p. 44-45 (Oct 2018)*

BOUGAINVILLEA; ORNAMENTAL PLANTS; VARIETIES; LANDSCAPING; GRAFTING

Carbon sequestration in organic and conventional corn production system. **Aquino, A.L.; Sta. Cruz, P.C.; Zamora, O.B.; Aguilar, E.A.; Lasco, R.D.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 11-18 (Dec 2017).*

Global warming brought about by increasing concentration of green house gases (GHG) in the atmosphere, particularly that of CO sub 2, is a major concern due to its impact on climate change. The intensity and frequency of typhoons, drought and flooding increased due to the change in climate and these have a negative impact on crop productivity and food security. Alternative farming practices that can potentially reduce CO sub 2 emission and optimize the efficiency of plant and soil carbon sequestration is therefore necessary. Thus, this experiment was conducted to determine and compare the potential contribution of organic and conventional corn production systems on carbon sequestration based on plant biomass and soil organic carbon accumulation. The field experiment was conducted at the Central Experiment Station, Pili Drive, UP Los Baños, College Laguna [Philippines] from June to September 2012 for the wet season experiment, and from February to May 2013 for the dry season experiment. Four fertilizer treatments and two corn cultivars served as mainplot and subplot, respectively, and were laid out in split-plot in RCBD with three replications. The cultivars evaluated were USM Var 10, a high yielding open-pollinated variety and Crystal, a farmer-selected open-pollinated cultivar. Fertilizer treatments were control, inorganic fertilizer (138 kg N from urea), and organic fertilizer in the form of vermicompost. The rate of vermicompost used during the wet season was 8 t/ha while during the dry season 8 and 10 t/ha was used. Data on root and shoot biomass and organic carbon content, soil organic carbon, and bulk density were monitored at 30 and 60 days after sowing during the wet season and until 90 days after sowing during the dry season. Plant carbon (C) sequestration was calculated based on root and shoot biomass and on the carbon content of plant tissues. Soil C sequestration was calculated based on soil organic carbon content, soil depth and bulk density. For both wet and dry season experiments, the use of inorganic fertilizer contributed to highest total plant C sequestration. Between the two cultivars, USM Var, a 10 high yielding open-pollinated variety, contributed more to C sequestration. Soil C sequestration was likewise highest using inorganic fertilizer, but values did not differ during the wet and dry season. The total carbon sequestration using inorganic fertilizer was undeniably much greater than using vermicompost. However, considering the adverse environmental impacts of inorganic fertilizer, (i.e. CO2 emission during its manufacture, transport, and use; deterioration of soil and water quality; and impact on human) this may reduce its C sequestration potential.

ZEA MAYS; MAIZE; VARIETIES; CARBON; CLIMATIC CHANGE; SEQUENTIAL CROPPING; ORGANIC FERTILIZERS; GREENHOUSE EFFECT; PLANT PRODUCTION; INORGANIC FERTILIZERS

Comparison of rice yield, grain quality and some physiological parameters as affected by cultivation techniques. **Zhaowen Mo; Jianxin Wu; Jinyuan Tian; Qingshan Lin; Yijun Jiang; Meiyang Duan; Shenggang Pan; Hua Tian; Xiangru Tang**. *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 45-50 (Dec 2014).*

Field experiments were conducted in 2010 and 2011 to compare the yield, grain quality and some physiological parameters of five super inbred rice varieties as affected cultivation techniques. Grain yield, yield components, grain quality, and physiological parameters [leaf net photosynthentic rate (Pn), leaf relative chlorophyll content (SPAD value), granule-bound starch synthase (GBSS) activity and grain soluble starch synthase (SSS) activity] were measured. Both cultivation and variety significantly affected the grain yield in 2010 and 2011. The cultivation technique of integrated use of seedling-strengthening agent, super rice special fertilizers and rice quality promoter (CI) significantly increased rice yield by 16.92 - 21.73% compared to the cultivation technique of local farmer management (CL). The significant increase in yield due to CI may be attributed to increase in number of panicle and seed setting rate and enhancement of some physiological parameters. The CI significantly increased brown rice rate, milled rice rate and head rice rate by 0.36 - 0.57%, 1.74 - 1.81% and 4.41 - 11.48% respectively, due to higher leaf net photosynthetic rate (pn), leaf relative chlorophyll content (SPAD value), granule-bond starch synthase (GBSS) activity and grain soluble starch synthase (SSS) activity) during grain formation stage. Thus the increase in grain yield and quality is associated with yield component and some physiological parameters. This work highlights the positive impact of the cultivation technique using seedling-strengthening agent, super rice special fertilizers and rice quality promoter (CI) on the grain yield and grain quality of super inbred rice.

ORYZA SATIVA; RICE; VARIETIES; GRAIN; QUALITY; SEEDLINGS; CROPPING SYSTEMS; CULTIVATION; CROP MANAGEMENT; FERTILIZERS

Cook with culinary herb you grow. **Espiritu, M.L.** *Agriculture (Philippines) v. 22 (10) p. 32-33 (Oct 2018)*.

ROSEMARY; CULINARY HERBS; PLANTING; CUTTINGS; COOKING; ROMARIN

Development of an integrated crop management (ICM) package for rice in saline prone areas for increased productivity. **Desamero, N.V., Castro, R.C., Alibuyog, A.Y., de Peralta, G.C., Inovejas, E.L.C., Pojas, S.V., Pungitan, L.S., Galanza, A.J.G., Mendoza, J.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 84*.

Globally, soil salinity is the major cause of crop failure and low productivity. The degree to which seawater intrusion affects these areas varies with time and space as it is influenced by seasonal and annual changes in river flow. Combining reclamatory measures with proper soil, water, and crop management practices and of modern salt-tolerant varieties can possibly break the yield barrier in saline areas. The study aims to improve rice productivity in salt-affected areas through the development of an integrated crop management package. Three pilot provinces: Ilocos Sur, Camarines Sur, and Cagayan were identified as the study sites during the WS 2017. Field experiments were established to identify the highest yielding varieties and identify the best fertilizer application for salt-affected areas. In Sta. Maria, Ilocos Sur, only Salinas 20 and 18 produced a yield of more than 5 tons/ha which showed a yield of advantage of 13.2% and 13.9%, respectively over the check. ANOVA showed a significant difference between entries in terms of yield in terms of yield and their agronomic parameters. Using Contrast Analysis, only Salinas 20 significantly outoperformed the checks. The higher yield of Salinas 18 and 20 can be attributed to its number of filled grains (111/panicle), tillering ability (15

tillers/hill) and dense grains (25g). Salinas 5 and Bigante plus were preferred by farmers because of their tillering ability and long panicles. In Sta. Teresita, Cagayan, the entries ranged from 3.5 t/ha to 5.5 t/ha but were not significantly different. Salinas 6, 7 and 18 had the highest yields. For the fertilizer trial in Libmanan, Camarines Sur, there was no significant interaction between variety and fertilizer treatments. However, Salinas 6 performed better under different fertilizer treatments compared to NSIC Rc240. Among the fertilizer treatments, highest yield was observed from the plants that were given with 60-30-30 kg N-P sub 2 O sub 3-K sub 2 O/ha.

ORYZA SATIVA; CROP MANAGEMENT;FERTILIZER APPLICATION; SALINE SOILS; SALINITY; PRODUCTIVITY

Effects of high night temperature on grain quality under field chamber system condition. **Ke Liu; Xiaoyan Wang; Bilin Lu; Xiaohai Tian; Punzalan, B.R.; Laza, R.C.; Yunbo Zhang.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 56-62 (Dec 2017).*

Temperature increase during night time as a result of global warming is greater than during daytime and is projected to accelerate in the future. However, little information is known about grain quality responses to a small increase in night time temperature. Field experiments were conducted to IRRI [International Rice Research Institute] in 2010 wet season (WS) and 2011 dry season (DS) to evaluate the effects of high night temperature on grain quality. Ten varieties originated from different countries were grown in temperature-controlled filled chambers. Increase of 3.9 deg C and 3.8 deg C in night temperature was imposed on the plants from 40-120 days after transplanting (DAT) from 1900 h to 0600 h. The results showed that the chalkiness in most rice varieties was increased by HNT, especially the chalk size in grain (10-50% and 50%), but there were no significant differences in AC, BR and MR between HNT and LNT. Grain weight was reduced under HNT in all test rice varieties as a result of decrease in grain width. There was no significant effect of HNT on grain length, which resulted in the increase in length/width ratio. These results suggest that chalkiness was more sensitive to HNT than other grain quality characteristics. In regard to this, researchers should put more attention on the formulation of chalky grain in the future to improve the resistance of rice to increasingly warmer night.

ORYZA SATIVA; RICE; GRAIN; QUALITY; GROWTH CHAMBER; CROP MANAGEMENT; AIR TEMPERATURE; ENVIRONMENTAL TEMPERATURE; PLANT CONDITION; FIELD EXPERIMENTATION

Effect of different foliar sprays on biomass and yield of mungbean (Vigna radiata Wilczek) grown inderwater deficit. **Reyes, J.A.O.; Macahilig, R.A.B.; Eliseo, M.A.M.; Ocampo, E.T.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 69 (Jul 2018).*

Foliar spraying is a known technique in fertilizer application, it involves direct entry of the nutrients through the stomatal opening of the leaves. Recent studies suggest that its application also helps in adaptation of plants on certain environmental stresses. In this study, the different effects of foliar sprays on drought tolerance of mungbean (Vigna radiata Wilczek) was conducted at the Institute of Plant Breeding. CAFS, UPLB

[College of Agriculture and Food Science, University of the Philippines Los Baños] under screenhouse and field conditions. Foliar sprays included abscisic acid (ABA), gibberellic acid (GA sub 3), glutathione (GSH), potassium nitrate (KNO sub 3), carrageenan (Car) and salicylic acid (SA). Applications were made using suggested concentrations from different drought related studies: ABA and GA sub 3(1mum), SA, GSH and KNO sub 3 (50mum) 1:10 v/v carrageenan: water; and were applied via spraying 3 days after the initiation of drought, 30 days after planting. The greenhouse experiment was laid out in randomized complete block design with split-plot (mainplot,water regime; subplot, variety and sub-sub-plot, foliar spray). Under greenhouse conditions, significant differences in root dry matter were observed across treatments. It was observed that 'drought' plants treated with SA, GA sub 3 and KNO sub 3 had significantly higher root dry matter, however well-watered plants still showed the highest dry matter content. The field experiment was laid out in randomized complete block using 4 mungbean varieties (Pagasa 3, 7, 5 and 19) combined with water regime and foliar spray as one treatment. Under field conditions there was an increase in dry matter of 13-30% in 'drought' plants sprayed with GA sub 3, KNO sub 3 GSH and ABA. These same plants also had increased in seed yields under drought conditions. Results suggest that these foliar sprays have the potential to increase tolerance of mungbean plants to drought stress.

VIGNA RADIATA; CARRAGEENANS; FOLIAR APPLICATION; CROP YIELD; BIOMASS; DROUGHT STRESS

Effects of various organic emulsifiers on crop growth and weed control. Jang, S.J.; Kim, K.R.; Yun, Y.B.; Kuk, Y.I. *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 63-70 (Dec 2017).*

The research aims to determine the promotional effects of various organic emulsifies (sugar bubble, natural detergent, loess sulfur, brown rice vinegar, and powder soap) on lettuce, Chinese cabbage, radish, cucumber, and barley; investigate whether the increase in crop growth by the emulsifiers is related to photosynthetic efficiency (quantum yield), chlorophyll and carotenoid contents; and to evaluate the herbicidal effects of the organic emulsifiers on common lambs quarters (Chenopodium album L.), curly dock (Rumex crispus L.), dandelion (Taraxacum officinale L.), and barnyard grass (Echinochloa crus-galli (L.) P. Beauv.). Plant height and shoot fresh weight in the radish, Chinese cabbage, and lettuce increased from 15-51 % using sugar bubble, 11-49% using brown rice vinegar, and 8-48% using natural detergent at 1, 3, 5, and 10% concentrations in the greenhouse. Plant height and shoot fresh weight of cucumber and barley did not increase with emulsifier treatment. The increase in crop growth by the emulsifiers was not related to photosynthetic efficiency (quantum yield), chlorophyll and carotenoid contents. Germination rate, shoot and root growth in cucumber and barley were 100% inhibited by brown rice vinegar, powder soap, and loess sulfur at 3% and 5% concentrations in Petri dish bioassays. Shoot and root growth in barley and cucumber were also 100% inhibited by brown rice vinegar at 3% and 10% concentrations, respectively, and loess sulfur at 10% and 5%, respectively in soil experiments. Shoot and root growth in common lambs quarters, curly dock, and dandelion were 100% inhibited by 3% concentrations of all emulsifiers tested (sugar bubble, brown rice vinegar, powder soap, and loess sulfur) in Petri dish bioassays. In a greenhouse study, curly dock was 28-30% and 47-100% controlled by foliar applications of brown rice vinegar and loess sulfur, respectively, at 3, 5, and 10% concentrations, and dandelion was 46-55% controlled by loess sulfur at 5% and 10% concentrations. The

results of this study suggest that organic emulsifiers tested can be used to increase crop growth and provide in-row weed control for transplanted vegetable crops.

VEGETABLE CROPS; WEEDS; WEED CONTROL; EMULSIFIERS; ORGANIC AGRICULTURE; GROWTH; APPLICATION METHODS

Growth of Jatropha curcas L. under different short rotation-based agroforestry in Cuenca, Batangas, Philippines. **Paelmo, R.F.; Villancio, V.T.; Paelmo, G.G.; Castillo, A.S.A.; Visco, R.G.; Carandang, W.M.** *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 34-44.*

The global climate change heightened the interest and concern of towards green economy. The Philippines, being one of the countries in Southeast Asia that is vulnerable to the impacts of climate change, crafted the Biofuels Act of 2006 mandating the transportation sector to use the biofuel blends. One of the potential alternative energy sources which pro-actively caters to the mitigation and adaption of climate change and rehabilitation of marginal land is biofuel plant species. Jatropha curcas L. is among the plant-based fuel substitute considered to have a potential as biodiesel as well as for land rehabilitation. This study assessed the growth performance of J. curcas grown in an agroforestry-based system in the marginal upland of Mt. Maculot San Isidro Cuenca, Batangas, Philippines. Specifically, it aimed to determine the growth of J. curcas under different short rotation forestry (SRF)-based agroforestry system and identity the most suitable planting configuration scheme of J. curcas for rehabilitation of marginal lands based on its vegetative growth. Research results showed that the production system had significant influence on the growth performance of J. curcas grown in the SRF-based agroforestry system. Among the important growth parameters influenced by the planting configuration are root collar diameter, height and aboveground biomass production. All the planting configurations produced sturdy J. curcas indicating its potential suitability to sites exposed to strong winds. Acceptable shoot-root ratio of 1:1 and 1:2 are likewise produced in all the planting configuration and SRF-based agroforestry system. However, J. curcas is best grown in SRF-based agroforestry system with A. mangium and E.deglupta (4x2 m spacing) in the marginal upland area of Cuenca, Batangas, Philippines.

JATROPHA CURCAS; AGROFORESTRY; BIOFUELS; FOREST REHABILITATION; CLIMATIC CHANGE; MARGINAL LAND; PHILIPPINES

Improved rice yield monitoring using remote sensing and crop simulation model. **Alosnos, E., Radam, E.D., Quicho, E., Setiyono, T., Romuga, G., de Rios, J., Quilang, E.J., Mabalay, M.R., Arocena, A., Maloom, J., Raviz, S., Laborte, A., Barbieri, M.** 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. 119-120.*

Development of rice yield monitoring system is very important for scienctific researchers, agricultural planners and policymakers, particularly in areas where ground observations are sparse and inconsistent. An objective, accurate, cheaper, and faster method of monitoring rice yield is needed for more effective formulation and implementation of agricultural services, technologies, and policies that would contribute to the country's rice self-sufficiency and food security. The study was conducted to investigate the potential of integrating

Synthetic Aperture Radar (SAR) - based remote sensing and crop simulation model ORYZA for large-scale operational monitoring of rice yield. Result of rice yield simulations conducted during dry season (DS) and wet season (WS) of 2016-2017 showed the good performance of the integrated SAR-ORYZA yield estimation system in terms of the level of agreement with actual yields. The agreement between simulated and actual yields substantially improved with increasing spatial aggregation (i.e from provincial to regional-level). The aggregated Root Mean Squared Error (RMSE) and index of Agreement (IOA) at provincial-level were 0.57 t/ha and 0.84, respectively; whereas at regional-level the RMSE and IOA were 0.46 t/ha and 0.89, respectively. In terms of yield performance, highest average yield were recorded in Nueva Ecija for both DS (6.39 t/ha) yield performance, highest average yields were recorded the highest average yields in both DS (5.73 t/ha) and WS (4.46 t/ha). Quantile regression analysis of simulated yields revealed that provincial-level yield gaps between maximum attainable yield and average farm yield were relatively higher DS (0.52-3.27 t/ha) than WS (0.64-2.36 t/ha). Information on yield gaps is very important for spatial targeting of interventions and prioritization of research and development (R and D) recommendations that have higher impacts. The study demonstrated that application of remote sensing and crop modeling techniques could further enhance rice yield monitoring in the Philippines.

ORYZA SATIVA; CROP YIELD; MONITORING; REMOTE SENSING; RADAR; CROP PERFORMANCE; MODELS

Income rise with mechanized rice: higher yield and quality through mechanized inbred rice seed production. **Ferriol, A.G.S., Ramos, R.C., Brena, S.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 90 (Jul 2018)*.

To help reduce costs and improve production and postproduction efficiencies, appropriate mechanization and postharvest technologies must be developed, promoted, and eventually be adopted by farmers and seed producers. Hence, it is necessary to develop a standard protocol of mechanized seed production from planting to drying of seeds. Three seedling establishment methods, using mechanical transplanter, precision seeder and manual transplanting of NSIC Rc160 (FS) were used in DS and WS 2017. Each method of crop establishment was replicated thrice in the field using 0.25 ha paddy per replicate. Two rotavations, 2 harrowings, 1 levelling and 1 final levelling was done for land preparation. Field inspection was conducted 20DAT; maximum tillering; the on-set of flowering; and two weeks before harvest by PhilRice SeedTech staff and designated seed analysts from BPI-NSQCS [Bureau of Plant Industry-National Seed Quality Control Services]. At final inspection both in DS and WS 2017 field purity was observed high in all treatments. At final inspection both in DS and WS 2017 field purity was observed high all treatments. Seed viability, vigor and seedling emergence tests of seeds established using transplanters and those planted manually resulted in high seed quality. Expenses incurred was slightly higher in manually transplanted, owing to the higher seed yield obtained in using transplanter, net income was considerably higher also. The trials made on mechanical transplanting in both PhilRice-CES [Central Experiment Station] and Negros in WS2017 confirmed the great potential of using mechanical transplanting in inbred seed production. Mechanization, or the use of machines in farming, can bring down the cost of labor particularly for labor-intensive crops like rice. However, further

trials must be considered in the improvement of the procedures for direct-seeding using Korean precision seeder.

ORYZA SATIVA; RICE; SEED PRODUCTION; QUALITY; SEED; MECHANIZATION; PLANT ESTABLISHMENT

Mushroom sprouts in Ponsinao [Candaba, Pampanga, Philippines]. **Frediles, C.** *Agriculture (Philippines) v. 22 (10) p. 36-37 (Oct 2018)*

EDIBLE FUNGI; PRODUCTION; RICE STRAW; GROWING MEDIA; MARKETING; FARMERS ASSOCIATIONS; PHILIPPINES

Optimizing seed potato production by aeroponics in China. **Kexiu Wang; Wei Hu; Yingwei Ai; Jianjun Hu; Kaiyun Xie; Mingxia Tang; Yuming Wang; Peter Vander Zaag**. *Philippine Journal of Crop Science (Philippines) v.42 (1) p. 69-74 Apr 2017.*

Aeroponics is being enthusiastically adopted by many private companies and public institutions in China as a viable means to produce minitubers. A series of experiments were conducted, with two contrasting varieties. Chuanyu 117 and Mira, to help refine the techniques and to strive for greater productivity. Experiments were conducted at Chengdu, Sichuan during the spring season from February to June and the autumn season from the late September to February. Large differences were observed between nutrient solutions tested. The cheapest MS based treatment solution with NH sub 4 CI as the nitrogen source yields in the highest tuber weight per unit area.

SEED POTATOES; VARIETIES; AEROPONICS; TUBERS; OPTIMIZATION METHODS;CHINA

Paclobutrazol application to increase the productivity of different rice ecotypes under rainfed lowland conditions. **Magtalas, ,M.P., Agustin, A.M.L., Vizmonte, P.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 85 (Jul 2018).*

Aside from rainfed rice varieties, other ecotypes are also cultivated under rainfed lowland ecosystem. Paclobutrazol (PBZ), one of the most well-known plant growth regulators is generally considered as growth retardant but has the ability to improve yield of tillering crops by increasing the number of tillers or panicles. This study aimed to determine the effect of PBZ on the growth and yield response of different rice ecotypes under rainfed condition. The experiment was laid out in split-plot design with PBZ concentrations (0, 250, 500 ppm) as main-plot applied at 14 days after transplanting (DAT) while rice ecotypes, i.e. rainfed lowland (PSB Rc14), irrigated lowland (NSIC Rc222), upland-special quality (Dinorado) and lowland-special quality (NSIC Rc216) as sub-plot , arranged in RCBD with three replications. Rainfall is the only source of water from 14 DAT until harvesting. Water level below soil surface was 44-66 cm with fluctuating soil moisture content of 18-76% from DAT until harvesting. Cracks were observed from early stage until harvesting indicating soil drying. PBZ temporarily suppressed plant height at 28 DAT of different rice ecotypes as plants were able to recover at 35 DAT resulting to even taller plants at maturity. PBZ also increased tiller number as early as one week after

application contributing to higher number of panicle at maturity. Other agronomic parameters, i.e. panicle length, numbers of spikelet and filled spikelet including percent filled grains per panicle, and biomass also improved with PBZ application. Most importantly, grain yield increased PBZ application at different concentrations for each rice ecotype. A lower concentration (250 ppm) of PBZ had the highest grain yield for lowland rice ecotype, i.e. PSB Rc14 (Rainfed) and NSIC Rc222 (irrigated); while higher concentration (500 ppm) for special-quality rice, i.e. Dinorado (traditional upland) and NSIC Rc216 (irrigated lowland).

ORYZA SATIVA; VARIETIES; ECOTYPES; PACLOBUTRAZOL; APPLICATION RATES; CROP YIELD; TILLERING; RAINFED FARMING; LOWLAND

Productivity of rice genotypes in response to flooding stress and crop management. **Peralta, L.C.; Desamero, N.V.; Cruz, R.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 75 (Jul 2018).*

Yields range from 1.0 to 2.0 t/ha flood-prone rainfed lowlands. Rice yields can be improved by using food-tolerant rice genotypes and appropriate crop management. This field study assessed the grain yields of three rice genotypes in response to flooding stress, seedling ages (i.e., 21 and 44 days), and post-flood N applications. Plants were subjected to 50cm floodwater depth for 14 days from 21 to 35 days after transplanting. Results showed that in the Control (2-3 cm flood water depth) and with no post-flood N application (NPFNA), grain yields of PSB Rc82 Cahireng Ag+ Sub1, and PR41543-B-14-2-1-2 ranged from 3.8 to 6.0 t/ha using 21-day old seedlings and from 3.9 to 6.5 t/ha using 44-day old seedlings. Based on the control yields of PSB Rc82 were reduced by 36.5% with NPFNA, 22% with N application at 2 days after de-flooding (DAD), and 25.9% with N at 7 DAD for 21-day old seedlings. With 44 day old seedlings, yields of PSB Rc82 were reduced by 40.4% with NPFNA, 31.3% with N at 2 DAD, and 16.7% with N at 7 DAD. Based on the Control, yields of Ciherang Ag+ Sub1 were reduced by 30.0% with NPFNA, 34.3% with N at 2 DAD, and 25.9% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of Ciherang Ag+ Sub1 were reduced by 61.5% with NPFNA, 49.12% with N at 2 DAD, and -13.16% with N at 7 DAD. Based on the Control, yields of PR41543-B-14-2-1-2 were reduced by 23.7% with NPFNA, 36.4% with N at 2 DAD, and 25.0% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of PR41543-B-14-2-1-2 were reduced by 18.0% with NPFNA, 41.86% with N at 2 DAD, and 25.0% with N at 7 DAD.

ORYZA SATIVA; GENOTYPES; PRODUCTIVITY; CROP MANAGEMENT; FLOODING; TOLERANCE; CROP YIELD

Proper maintenance and care of bonsai. **Yap, J.P.Jr.** *Agriculture (Philippines) v. 22 (10) p. 26, 28-29 (Oct 2018).*

BONSAI; PLANT TRAINING; CROP MANAGEMENT; WATERING; ORGANIC FERTILIZERS; FERTILIZER APPLICATION; FOLIAR APPLICATION

Rainfall indices for a weather index-based crop insurance for rice. **Capistrano, A.O.V.; Quilang, E.J.P.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 9-18 (Apr 2018).*

This paper analyzed the applicability of two sets of rainfall indices for a weather index-based crop insurance (WIBCI) for rice against low rainfall cover in Dumangas, Iloilo, [Philippines] WS2013. WIBCI is a new type of risk-transfer-mechanism (RTM) being tested in the Philippine that operates on the principle of having pre-agreed indices set per weather variable between the insurer and insured. Claims happen when these indices are considered 'breached' or are not met in the case of low rainfall cover for a particular period. Operation-wise, the WIBCI product is revolutionary and could be a potentially quick-responsive climate change adaption measure. However, new as it is, questions on the applicability of the product, particularly the indices, have to be evaluated and scrutinized. Validation points used in this study were breach assessments via the WIBCI product's procedure and its consistency with actual drought incident reports. Average yields of the community relative to WIBCI farmers' individual yields were also used to validate consistency of breaches or no breaches among enrollees. Results of yield analysis relative to each community's average yield showed 95.7% of enrollees have low yields. When matched with the breaches assessed using the existing indices, only 52 enrollees breached the indices. Overall validity of the existing index via consistency of breached indices with low yields was only 70% but the 30% mismatch was still significant from an insurance business standpoint hence, a postulated set of indices specific to the location were developed for comparison. With the postulated indices, only 20 enrollees breached the indices which were much lower in number and more acceptable considering the absence of PAGASA's [Philippine Atmospheric, Geophysical and Astronomical Services Administration] official drought incident reports. However, consistency analysis revealed that a much higher basis risk was incurred when using the postulated index which was mostly due to the mismatch of 'no breaches' and low actual grain yields.

ORYZA SATIVA; RICE; CLIMATIC CHANGE; DROUGHT; CROP YIELD; CROP INSURANCE; RAIN GAUGES; RAIN; ENVIRONMENTAL IMPACT ASSESSMENT; ; SOIL WATER DEFICIT; WEATHER REPORTS

Ratooning response of the different lowland rice (Oryza sativa L.) varieties during the dry season under VSU [Visayas State University] conditions. **Ruales, D.M. , Bañoc, D.M.** 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. 119 (Jul-2018)*.

This study was conducted under irrigated lowland conditions which aimed to determine the growth and yield performance of different lowland rice varieties to ratooning; to identify varieties that perform better with apparently high ratoon yield and to determine the profitability of ratooning using different lowland rice varieties during the dry season under VSU conditions. The area was laid out in a Randomized Complete Block Design (RCBD) with three replications. The treatments were designated as follows: T sub 1-PSB Rc18, T sub 2-PSB Rc82, T sub 3-NSIC Rc128, T sub 4-NSIC Rc160, T sub 5-NSIC Rc212, T sub 6-NSIC Rc214, T sub 7-NSIC Rc216, T sub 8-NSIC Rc218, T sub 9-NSIC Rc222, T sub 10- NSIC Rc226, T sub 11-NSIC Rc290, T sub 12-NSIC Rc292, T sub 13-NSIC Rc298, T sub 14-NSIC Rc300, T sub 15-NSIC Rc370, T sub 16-NSIC Rc302, T sub 17-NSIC Rc344, T sub 18-NSIC Rc352. The agronomic characteristics of the different lowland rice varieties that were significantly affected by ratooning were the number of days from harvesting of the main crop to heading and maturity, plant height (cm), leaf area index (LAI) and fresh straw yield (t/ha). The yield and yield components such as number of productive tillers/hill, percent unfilled grains, panicle length (cm), panicle weight (g), weight

of 1,000 grains (g) and grain yield were significantly affected by the treatments tested. The highest net income of PhP 14,889.50 was obtained in NSIC Rc212 which was indicated with the highest grain yield of 1.76 t/ha. Then, the different lowland rice varieties namely; NSIC Rc212, 222, 214, 216 and 300 significantly attained the highest percentage of regrowth and apparently these varieties also gave a profitable investment when ratooned during the dry season under VSU conditions.

ORYZA SATIVA; VARIETIES; LOWLAND; RATOONS; RATOONING; YIELDS; DRY SEASON; CROP RESIDUES; PHILIPPINES

Rediscovering the hidden terraces of Negros Occidental [Philippines]. **Yap, J.P.Jr.** *Agriculture (Philippines) v. 22 (10) p. 38-40 (Oct 2018)*.

ORYZA SATIVA; VEGETABLE CROPS; FRUIT TREES; ORGANIC AGRICULTURE; RURAL AREAS; TOURISM; PHILIPPINES

Response of cotton to tillage and post-emergence herbicides in wheat-cotton system in Pakistan. **Usman, K.; Khan, N.; Yazdan, F.; Din, S.U.; Ayatullah**. *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 61-70 (Aug 2015).*

Conservation tillage with broad-spectrum herbicides may have the potential to control weeds and enhance cotton (Gossypium hirsutum L.) yield. Field experiment was conducted in 2010 and 2011 at Agriculture Research Institute, D.I. Khan, Pakistan to examine tillage and herbicide effects on weed control and cotton yield in wheat-cotton system. The experiment was arranged in split plot in RCBD with 4 replications. The main plot treatment comprised of three tillage systems, including zero (ZT), reduced (RT), and conventional tillage (CT), while the sub plot was weed control treatments namely, haloxyfop-R-menthyl 10.8 EC (108 g a.i./ha), lactofen 24 EC (168 g a.i./ha), haloxyfop + lactofen, hand weeding, and weedy check. Broad-spectrum herbicides (haloxyfop +lactofen) reduced weeds by 92 and 94%, and produced highest lint yield (1222 and 1515 kg/ha) in 2010 and 2011, respectively. Relative weed density was modified by tillage with lowest values recorded in CT. Howver, RT with broad-spectrum herbicides had then maximum weed reduction and lowest dry weed biomass (DWB). Reduced tillage with broad-spectrum herbicides produced maximum plant height, 100-seed weight, and lint yield. This combination is an optimum weed management strategy that contributes significantly to cotton production. However, if deep-rooted perennial weeds persist, CT with broad-spectrum herbicides may be occasionally required.

GOSSYPIUM HIRSUTUM; COTTON; HERBICIDES; CONSERVATION TILLAGE; YIELDS; WEED CONTROL; COTTON INDUSTRY; FIELD EXPERIMENTATION; PAKISTAN

Revival of Kapeng barako: a case study of Liberica coffee (Coffee liberica L.) production at Katy's Farm in Lipa City, Batangas (Philippines). **Dizon, A.P.R.; Ramilo, J.L.M.; Salazar, B.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 75-76 (Jul 2018)*.

Lipa City is the birthplace of the coffee industry in the Philippines -- with the first plantings in 1740 being kapeng barako or Liberica coffee (Coffee liberica L.) However, due to myriad reasons, the local coffee industry was swept over by other industries. Katy's Farm, owned by Col. Nicetas Katigbak, may be considered a prime Liberica coffee farm in the country and the lead advocate in the revival of Liberica coffee in the country. Hence, the case study was conducted from April 2014 to March 2015 to describe the production and management operations and the profitability of the coffee nursery and a 3-ha Liberica coffee parcel of the model Liberica farm. At Katy's Farm, coffee trees were spaced 3.85 m x 4.0 m layout, with each tree having three orthotropic branches. Trees were watered manually during dry months and rain-fed the rest of the year. Weeds were controlled manually, while other pest and diseases were primarily controlled using chemical means. Organic and inorganic fertilizers were applied thrice a year. For seed and seedling production, red ripe berries were selectively harvested, depulped, subjected to flotation test, fermented, washed, dried, and sorted. Good seeds were sown in coir-based medium, pricked, and transplanted into polyethylene bags at matchstick/butterfly stage. Seedlings were maintained under 60-80% shade, watered daily, fertilized monthly, and sold after reaching 8-leaf-pair stage. For roasted and ground coffee production, red ripe berries were wet-processed and dried, and the resulting parchment coffee beans were brought to a commissioned secondary processor. A total of 85,000 seedling was produced in 2014, with a net return of about PhP3 million and an ROI of 11.45. On the other hand, the net return from 521 kg processed coffee in 2014 was valued at PhP147,000 with an ROI of 1.89.

COFFEA ARABICA; COFFEE; SEEDLINGS; PLANTING; CROP MANAGEMENT; FARMS; PROFITABILITY; PHILIPPINES

Rice Crop Manager: enhancing the yields and profitability of rice farmers in the Philippine through innovative ICT approach. **Dela Torre, J.C., Limpiada, R., Castillo, R., Collado, W.** 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. 42-43 (Jul-2018).*

The Philippines, being the world's eighth largest rice producer, still has very small rice area harvested as compared with other major rice growing areas in Asia (GRISP), 2013). Most of the rice areas across the country are typically small and can vary in yield, fertilizer use, and crop growing conditions. The adoption of crop management practices tailored to a specific field condition can contribute to increased yields and profitability of rice farming. Through 'precision agriculture', field-specific information can be easily and effectively acquired from rice farmers and they can rapidly receive a crop management recommendation specific to their field and rice-growing conditions at low cost. Rice Crop Manager is a free, browser-based decision tool developed and released in the Philippines on 2013. It uses scientific principles and modern computing approach to provide nutrient and crop management guideline tailored to irrigated-and rainfed-lowland rice-growing condition in the Philippines. The guideline provided in the form of one-page print-out or SMS contains actionable advices which matches the cropping practices and needs of the specific field conditions of the farmer. RCM addresses management constraints which can vary across fields and other rice growing conditions, and aims to increase the yield or productivity, as well as income of rice farmers in the Philippines with improved crop management. Through collaborative research with the Department of Agriculture, RCM is periodically enhanced with the

new scientific findings and information on rice farming. RCM also helps increase the effectiveness of our extension services and accelerate the flow of information from research to farmers.

ORYZA SATIVA; RICE; CROP MANAGEMENT; DECISION SUPPORT; INFORMATION TRANSFER; FARMERS; CROP YIELD; PROFITABILITY; PHILIPPINES

Rice Crop Manager Philippines provides more increases in yield and profit to lower yielding farmers. **Velasco, T., Tafere, K.L., Jardinero, B., Moscoso, E., Castillo, R., Chivenge, P., Callado, W.** 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. 42 (Jul-2018).*

Since its release in 2013 through the Department of Agriculture, the web-based decision support tool Rice Crop Manager Philippines (RCM; http//webapps.irri.org/ph/rcm/) has consistently shown that farmers can increase their yields and profits through field- and season-specific nutrient management, which involves recommending fertilizer NPK for a targeted yield and, more importantly, proper timing of fertilizer N application. From 2013 to 2017, 760 on-farm field experiments were conducted for irrigated (90%) and rainfed (10%) rice for seven cropping seasons in eight provinces across the Philippines. The performance of the nutrient management component of RCM in terms of grain yield and added net benefit was compared to the farmers' fertilizer practices (FFP). Across locations and agro-ecologies, RCM proved to increase yield by 359 kg/ha/season (428 in the DS, 289 in the WS) with an added net benefit of 5101 PhP/ha/season (6158 in the DS, 4015 in the WS) compared to FFP. Further classification based on measured yields from FFP show that lower yielding farmers reap more benefits from RCM than higher yielding farmers. Farmers who typically yield less than 4.0 t/ha obtained greater increases in yield and added benefit (610 kg/ha/season; 9138 PhP/ha/season; 20% of 760) than farmers who typically yield greater than 6.0 t/ha (182 kg/ha/season; 2640 PhP/ha/Season; 24% of 760). Based on agro-ecology, RCM provided a slightly higher increase in yield and added net benefit for rainfed (377 kg/ha/season; 5564 Php/ha/season) than for irrigated (357 kg/ha/season; 5048 PhP/ha/season) rice. Despite the low percentage of rainfed trials from 2013 to 2017, RCM has since expanded its trials to more rainfed locations across the Philippines. In order for RCM to provide more benefits to rice farmers across the Philippines regional and local agricultural extension workers using RCM should be targeting farmers who typically yield 4 t/ha and below as well as farmers growing rainfed rice.

ORYZA SATIVA; RICE; CROP MANAGEMENT; DECISION SUPPORT; INFORMATION TECHNOLOGY; NUTRITIONAL REQUIREMENTS; FERTILIZER APPLICATION; YIELD INCREASES; PROFIT

Risk heat-stress induced spikelet sterility of irrigated lowland rice using RIDEV V2 Model simulations. **Punzalan, B.R., Alcantara, A.J., Vergara, D.K, Aunario, J.K.S., Shi, W., Ye, C., Kumar, U., Psco, R.M., Shreestha, S., Laza, R.C., DingKuhn, M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 80. (Jul 2018).*

Studies show that daytime temperature above 35°C and night-time temperature above 25°C may significantly reduce rice yields by including spikelet sterility when they coincide with flowering, the sensitive stage of crop. Simulations to assess heat-induced spikelet sterility (Ster-Heat) of three popular Philippine rice varieties (IR64; NSIC Rc222; NSIC Rc238) and heat-tolerant aus variety Nagina 22 were conducted using RIDEV (Rice Development Model) V2, a model for rice phenology and sterility based on crop microclimate and panicle temperature. In-depth simulations to evaluate temporal patterns involved General Circulation Models-derived climate data of Los Baños, Laguna (1981-2000, 2010-2049) and Maligaya, Nueva Ecija (1978-1997, 2010-2029); 12 sowing dates representing each month of the year; and two anthesis times (Anth Time): 10.00 and 11.00 H. In both sites, the highest incidence of Sterheat is expected to coincide with the hottest month of the year. The difference in SterHeat between AnthTime 10.00 h and 11.00 h is considerable for Philippine cultivars. Regardless of anthesis time, advancing sowing in the dry season from January to December would reduce the incidence of SterHeat of Philippine cultivars. This strategy may also be considered during the wet season, but may be less crucial. Findings of this study may serve as decision-making tool for stakeholders to mitigate the effects of global warming, specifically SterHeat, by adjusting cropping calendar.

ORYZA SATIVA; VARIETIES; SPIKELETS; INFERTILITY; INFLORESCENCES; TEMPERATURE; PLANTING DATE; MODELS; CLIMATIC CHANGE; GREENHOUSE EFFECT

SL Agritech ignites new hope for Marawi [Philippines] through farming. **Anon.** *Agriculture (Philippines) v. 22 (10) p. 46-47 (Oct 2018)*.

ORYZA SATIVA; RICE; HYBRIDS; SEED PRODUCTION; CROP MANAGEMENT; RECLAMATION; FARMING SYSTEMS; TECHNOLOGY; TECHNOLOGY TRANSFER; FARMERS; PHILIPPINES

Strategies and support systems needed by farmers in conversion to organic agriculture. **de Guzman, L.E.P.; Mercado, Ma. F.O.; Bon, S.G.; Pontessor, A.L.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 39-40 (Jul 2018).*

ORGANIC AGRICULTURE; CERTIFICATION; FARMERS; SUPPORT MEASURES; MARKETS

Organic agriculture (OA) has a strong potential for building resilient food systems through farm diversification and building soil fertility. It offers alternatives to conventional agriculture where energy-intensive production inputs such as synthetic fertilizers and pesticides are applied. OA is also an excellent adaptation, as well as mitigation strategy for climate change. However, many farmers who opted to convert to OA have found conversion to be unsupported, isolating, and stressful experience. Thus, a four-year DA-BAR [Department of Agriculture-Bureau of Agricultural Research]-funded research was implemented to identify constraints to conversion and develop strategies and support systems for farmers who are converting to OA. The research covered the provinces of Benguet, Camarines Sur, Sorsogon, Northern Samar, Leyte, Antique, Iloilo, and Misamis Oriental [Philippines]. Considering the province specific constraints, conversion can be facilitated through the following strategies and support systems: (1) Organize farmers into associations; (2) Gradually

convert to OA to avoid drastic reduction in yield; (3) Apply organic fertilizers based on recent soil analysis; (4) Establish the appropriate quantitative measures of the buffer zone; (5) Make use of the research results; (6) Information dissemination on available organic inputs in the market; (7) Regulate the marketing and use of synthetic chemical fertilizers and pesticides; (8) Aggresive and sustained multi-media promotion of OA; (9) Create a niche market for organic produce and products: (10) Aggresive and sustained conduct of trainings on OA; (11) Provide support for processing of organic produce; (12) Make certification affordable and accessible; (13) LGUs to encourage and support farmers' conversion to OA; (14) Strict implementation of the provisions of RA 10068 and local ordinance re OA; and (15) Encourage and revive gardening activities in schools. Overall, the identification of constraints to conversion, development and dissemination of strategies and support systems for farmers, and strengthening the knowledge base of farmers will increase the rate of successful conversion to OA.

Sustainable spawn and pure cultures of selected edible mushroom using coconut (AROD, LAGT and MRD) Ligno-Cellulosic media. **Lumanta, R.L**. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 37 (Jul 2018).*

EDIBLE FUNGI; GROWING MEDIA; MYCELIUM; COCONUTS; LIGNOCELLULOSE; HYBRIDIZATION; FLOWERS; SPIKELETS

The study gives emphasis on generating novel coconut-based technology for mushroom cultivation to address the issue on food security where current practice utilizes substantial volume of grains as media for mushroom. Sustainable resources from coconut wastes generated from plantation areas, buko stores, and from hybridization program were evaluated as culture media substitutes. The fresh and spent coconut male flower of Laguna tall (LAGT), Malayan Red Dwarf (MRD), and spent Aromatic Green Dwarf (AROD) were evaluated as nutrient substitute to potato in producing Potato Sucrose Agar (PSA). The mycelial growth rates (MGR) were determined by taking the radius of mycelia grown in agar media in cm/day. The MGR of Lentinus edodes are both higher in LAGT and MRD vs. PSA. There is no significant difference however among the MGRs of PSA, MRD, and LAGT for milky mushroom. In addition, there is no significant difference at p0.05 using Least Significant Difference (LSD) test in the MGR of Hypsizygus tessellatues in PSA, MRD, and LAGT. The dry weight of mycelia recorded the highest in MRD and LAGT fresh and spent male flowers as compared to PSA and AROD husk. Furthermore, spawn production of Pleurotus eryngii, Calocybe indica, and Hypsizygus tessellatues obtained the fastest colonization in coconut spikelets. Sorghum and Coconut male flowers are better substrates in shiitake spawn production. In conclusion, coconut waste substrates are good alternatives for crop-based media in mushroom spawn and pure culture production especially now that climate change is bringing disruption in the global food production. Furthermore, the results of this study shall also pave way to coconut waste management and novel product development.

Voices from the field: needs of small-scale Filipino rice farmers**. Palis, F.G.; Diaz, C.; Todcor, G.; Flor, J.R.; Tanzo, I.; Datoon, R.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 64-75 (Apr 2015).*

This paper presents an assessment of needs and coping mechanisms of small-scale rice farmers in the Philippines. Various ethnographic methods were used in the study. Focus group discussions among farmers and key informant interviews among agricultural staff and extension workers were conducted in 51 villages of 19 municipalities in six provinces of the country. Household survey was conducted among 923 farmers in the provinces of Agusan del Norte, Iloilo and Isabela [Philippines]. The major needs faced by small-scale Filipino rice farmers ranged from overcoming biotic and abiotic stresses, economic sufficiency, structural sufficiency, to be the most knowledge in rice farm management and technologies. Sufficient capital prevailed to be the most common need in rice farming. Other specific needs include low input cost, higher paddy price, access to equipment and post-harvest facilities, adequate irrigation system, farm-to market roads, overcoming biotic stresses such as pests and diseases, overcoming abiotic stresses such as flooding and drought, and improved knowledge on rice farm management and technologies. Some needs and constraints were found to be location-specific such as biotic and biotic stresses, but were interrelated. Adoption of key technologies promoted in the PalayCheck system to increase rice production remains a great challenge since these technologies such as the site specific nutrient management are closely interrelated with timely availability of sufficient financial capital. Farmers were found to manage and cope by borrowing money from informal lenders who charge them with high interest rates, and traders that require farmers to sell their products immediately after the harvest with a low paddy rice. These situations entrapped our rice farmers in a cycle of poverty, hence pro-farmer policies and programs that addressed real needs of farmers should be in place: easy access to formal financial institutions with low interest rates and simplified credit requirements ; a competitive price for paddy ; reduction in costs of inputs; livelihood programs to farmers and their households; access to post-harvest facilities; better irrigation systems and road infrastructure; and most of all strengthening farmer organizations. A working multi-stakeholder partnership among farmer organizations. Department of Agriculture and local government units are imperative in addressing the needs of farmers to increase rice production, farming households' income and addressing the needs of farmers to increase rice production, farming households' income and achieving the country's goal of rice self-sufficiency.

ORYZA SATIVA; RICE; FARMERS; FARMING SYSTEMS; SMALL FARMS; POVERTY; CROP MANAGEMENT; TECHNOLOGY; INNOVATION ADOPTION; PHILIPPINES

F03 Seed production and processing

Adaptability of lotus (Nelumbo nucifera) cultivation in the Philippines. **Rivera, J.M., Corales, R.G., Sajor, J.T., Park, T.H., Lee, J.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 84 (Jul 2018)*.

Lotus (Nelumbo nucifera Gaertn) is a perennial water plant that grows in swamps, lakes, and ponds. It can also be grown under container cultivation. Basically, all parts of the lotus plant are edible, and known to have some medicinal benefits. The propagation of lotus in the Philippines is very limited. With our vast water areas including some rice environments, growing lotus can open up opportunities for additional source of food and income in the rural communities. Pot and field experiments on the adaptability assessments of lotus under Philippine condition were conducted at PhilRice Central Experiment Station Maligaya, Science City of Muñoz,

Nueva Ecija [Philippines] starting in 2017. Results showed that lotus seeds pre-germinated for 5 days are better on container production while seeds pre-germinated for 7 days are good under field condition. Field grown lotus were 103cm tall with leaf diameter of 44 cm at 115 days after planting. Lotus grown under container was 65 cm tall and 18 cm leaf diameter. One lotus plant produced 4 to 15 rhizomes with diameter range from 19 to 23mm under field condition. Clay soils were also found to be better growing medium for lotus than garden soils.

NELUMBO NUCIFERA; GERMINATION; SEEDS; ADAPTABILITY; CLAY SOILS; MEDICINAL PROPERTIES; PHILIPPINES

Endocarp removal and Trichoderma (Trichoderma spp.) application improved seed germination and seedling growth of Arabica coffee (Coffea arabica L.). **Eres, K.D.C.; Salazar, B.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 68 (Jul 2018).*

The presence of endocarp usually results in physical dormancy in coffee, hence, an experiment was conducted from November 2015 to February 2016 in Los Baños, Laguna [Philippines] to determine the effects of genotype, endocarp removal, and Trichoderma (Bio-Quick) application on seed germination and seedling growth of coffee. Two Arabica genotypes (Red Bourbon and Yellow Bourbon) were subjected to five seed sowing treatments: (1) naked seed -- endocarp manually removed; (2) parchment seed -- endocarp intact; (3) parchment seed + Trichoderma, (4) starch paste-coated parchment seed + Trichoderma, and (5) parchment seed sown in Trichoderma-soil mix. While the two varieties have comparable germination percentage across treatments, results showed that yellow Bourbon reached the butterfly stage 10 days earlier, but Red Bourbon produced longer seedlings with more profuse roots and with better survival rate. Manual removal of the endocarp resulted in higher germination percentage and advanced the attainment of matchstick and butterfly seedling stages by 3 weeks and 1-2 weeks, respectively, relative to seeds with intact endocarp (Treatment 2). While all treatments involving Trichoderma (Treatments 3-5) were not as effective as endocarp removal in increasing germination percentage, these treatments were effective in substantially enhancing seedling growth in terms of shoot length, rooting intensity, and in improving seedling survival rate. The results of the experiment suggest that endocarp removal is principally suitable for small-scale seedling production, but its tedious process makes Trichoderma treatments more applicable for large-scale seedling production.

COFFEA ARABICA; GERMINATION; SEEDS; SEEDLINGS; GROWTH; TRICHODERMA; SPECIES

Improving the seed production yield in PhilRice Negros [Philipines] through utilization of nutrient management tools. **Mondejar, C.L.C.; Osano-Palanog, M.J.; Pantin, F.L.A.; Bello, G.E.; Dogeno, L.A.G.; Parina, C.J.; Norbe, M.A.D.; Austria, R.F.; Etchon, M.A.; Palanog, A.D.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 78-79.*

In order for PhilRice Negros [Philippines] to continuously satisfy and sustain seed requirements in the Visayas, assessment of the current nutrient status of the seed production areas of PhilRice Negros is important. Information on the field situation is significant for appropriate fertilizer recommendations to achieve the target of increasing the productivity levels of the station. Site-specific nutrient management for the seed production of PhilRice Negros will enable to dynamically adjust fertilizer use, by supplying optimum amounts of nutrients at critical time points in the crops' growth to produce high yields. Nutrient management tools namely Rice Crop Manager (RCM), Minus-One Element Technique (MOET) and Leaf Color Chart (LCC) were used to diagnose the actual and current nutrient status in the seed production area. Recommendations from RCM and MOET were considered for the amount and type of fertilizer applied. And, LLC were used to identify when will be the best time to apply fertilizers. The physical characteristics of the sites with regards to position in the landscape, irrigation and drainage pattern were considered in the identification of sampling points representing the variability of the site. Nitrogen was the most obvious deficient nutrient in the MOET set-up, which agreed to the rate of nitrogen recommended by the RCM. All areas were found to be significantly deficient in nitrogen. Phosphorus was found to be deficient in fields of Group 1. Likewise, phosphorus, zinc and copper were found deficient in the fields of Group IV. The data were consolidated and used to generate the fertilization map and guide of the seed production areas in PhilRice Negros.

ORYZA SATIVA; RICE; SEED PRODUCTION; YIELDS; FERTILIZER APPLICATION; LEAVES; COLOUR; NUTRITIONAL REQUIREMENTS; PHILIPPINES

On-pod storage extends seed viability and enhance seedling vigor of cacao (Theobroma cacao L.) . **Salazar, B.M., Zuniega, J.S., Ignacio, R.M.A. Tejano, M.S.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 82-83 (Jul 2018).*

Seed recalcitrance of seasonal tropical perennial crops like cacao (Theobroma cacao L.) limits the potential of the crop for seed storage, propagation, and genetic resource conservation. Hence, a study was conducted from March to April 2018 in Los Baños, Laguna [Philippines] to determine the effect of different storage methods and duration on seed viability and seedling vigor of cacao, and thereafter, to identify effective and practical storage methods for cacao seeds. Freshly-extracted and seeds-on-pod were subjected to six storage methods: (1)control -- seeds were kept under ambient conditions; (2)aluminum foil storage -- seeds were wrapped in aluminum foil; (3)coir dust storage -- seeds covered with moist coconut coir dust; (4)on-pod storage -- pods were kept under ambient conditions; (5)on-pod + coir dust storage -- pods were covered with moist coir dust, and; (6)on-pod + low temperature storage --pods were kept in 15 deg C-cold room. Seeds were stored accordingly, and withdrawn and sown in germination beds on a weekly interval. Results showed that seed storage in aluminum foil or in coir dust were both ineffective as precocious germination (100%) on-storage occurred within the first week of treatment. On the other hand, all on-pod storage treatments (with or without covering in coir dust or placement in low temperature) prevented vivipary, maintained seed viability (60-100%), and increased seedling vigor even 5 weeks after storage (WAS). These treatments were all effective in minimizing electrolyte leakage and in keeping seed moisture content (36-38%) much higher relative to the

critical level (20% MC). All fruits in on-pod storage treatments, however, rotted on 6 WAS, thereby rendering all seeds damaged and non-viable. Results suggest that effective seed storage duration can be extended beyond 5 WAS thru on-pod storage methods by providing treatments that would effectively control pod rotting.

THEOBROMA CACAO; FRUIT; STORAGE; SEED; VIABILITY; SEEDLINGS

Real-time surveillance of pest abundance and incidence to optimize yield and quality of rice seed production in PhilRice Negros [Philippines]. **Mondejar, C.L.C.; Osano-Palanog, M.J.; Pantin, F.L.A.; Bello, G.E. Dogeno, L.A.G.; Parina, C.J.; Norbe, M.A.D.; Austria, R.F.; Etchon, M.A.; Palanog, A.D.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 77-78 (Jul 2018).*

Rice areas in the Visayas [Philippines]include 430,378 ha of irrigated and 516,567 ha of rain-fed ecosystems. One of the commitments of PhilRice Negros is to produce nationally released seeds for the whole Visayas region. At present, the actual yields obtained at the station are low and the seed quality of the harvest compromised due to insect pests and diseases. Monitoring activities are very important in determining yield- and quality-limiting factors to develop decision guides for the pest management in seed production. The method includes field scouting for diseases, sweeping to determine insect population and quadrat sampling for weed population. Then, sampling paddies that represents the crop stage, variety planted and method of crop establishment was set to further describe the field situation. Sampling method to gather quantitative data through quadrat sampling was later systematized. All observed signs, pest damage, disease symptoms and weed population within the quadrat were recorded. Economic threshold level (ETL) and pest to defenders' ratio (P:D were used to support decisions for the management strategies to be implemented. The insect pests closely monitored during the early to mid tillering stage of rice growth were the green leafhopper, vector of rice tungro virus (RTV). RTV caused significant damage even during dry season if not controlled. An alternative host of RTV, Echinochloa sp. was also dominant in the area. During dry season, yellow stemborer was the major pests in the vegetative and reproductive stage. In the 7th week of DS2018, stemborer damaged was already at ETL (greater than or equal to 5% deadhearts) in some of the fields. These insect pests were controlled before they can significantly affect the yield. Comparison of damages with in the previous and subsequent week was used to determine the appropriateness of control measures implemented.

ORYZA SATIVA; RICE; SEED PRODUCTION; SEED; QUALITY; PEST INSECTS; MONITORING; PEST CONTROL

F04 Fertilizing

Appreciating organic farming. **Hilario, F.A.** *Agriculture (Philippines) v. 23 (1) p.52-53 (Jan 2019).*

CROPS; ORGANIC AGRICULTURE; ORGANIC FERTILIZERS; CLIMATIC CHANGE; ECOSYSTEMS; QUALITY; SOIL FERTILITY; PESTS

Development of an integrated crop management (ICM) package for rice in saline prone areas for increased productivity. **Desamero, N.V., Castro, R.C., Alibuyog, A.Y., de Peralta, G.C., Inovejas, E.L.C., Pojas, S.V., Pungitan, L.S., Galanza, A.J.G., Mendoza, J.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 84*.

Globally, soil salinity is the major cause of crop failure and low productivity. The degree to which seawater intrusion affects these areas varies with time and space as it is influenced by seasonal and annual changes in river flow. Combining reclamatory measures with proper soil, water, and crop management practices and of modern salt-tolerant varieties can possibly break the yield barrier in saline areas. The study aims to improve rice productivity in salt-affected areas through the development of an integrated crop management package. Three pilot provinces: Ilocos Sur, Camarines Sur, and Cagayan were identified as the study sites during the WS 2017. Field experiments were established to identify the highest yielding varieties and identify the best fertilizer application for salt-affected areas. In Sta. Maria, Ilocos Sur, only Salinas 20 and 18 produced a yield of more than 5 tons/ha which showed a yield of advantage of 13.2% and 13.9%, respectively over the check. ANOVA showed a significant difference between entries in terms of yield in terms of yield and their agronomic parameters. Using Contrast Analysis, only Salinas 20 significantly outoperformed the checks. The higher yield of Salinas 18 and 20 can be attributed to its number of filled grains (111/panicle), tillering ability (15 tillers/hill) and dense grains (25g). Salinas 5 and Bigante plus were preferred by farmers because of their tillering ability and long panicles. In Sta. Teresita, Cagayan, the entries ranged from 3.5 t/ha to 5.5 t/ha but were not significantly different. Salinas 6, 7 and 18 had the highest yields. For the fertilizer trial in Libmanan, Camarines Sur, there was no significant interaction between variety and fertilizer treatments. However, Salinas 6 performed better under different fertilizer treatments compared to NSIC Rc240. Among the fertilizer treatments, highest yield was observed from the plants that were given with 60-30-30 kg N-P sub 2 O sub 3-K sub 2 O/ha.

ORYZA SATIVA; FERTILIZER APPLICATION; CROP MANAGEMENT; SALINE SOILS; SALINITY; PRODUCTIVITY

Effect of endophytic bacterial inoculation on banana, Musa acuminata cv. Lakatan. **Benzon, H.R.L.; Mendoza, D.M.; Cosico, W.C.; Torreta, N.K.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 12-21 (Aug 2014).*

Banana is one of the most popular fruit in the world and is a top export commodity in the Philippines. This study aimed to assess the response of banana to endophytic bacterial inoculation (EBI) and to develop a simple technology that farmers can easily adopt. EBI presents multiple positive potential benefits to crops like banana, including increase in plant growth and nitrogen fixing capabilities, and may serve as an alternative to intensive fertilizer use. The first of the two experiments was done to test the effects of EBI on Musa acuminata cv. Lakatan. Of the treatments used, the plants treated with the isolate MUCp 12 were significantly greater in plant height and pseudostem diameter, which was comparable to those treated with inorganic fertilizer treatment. The root dry weight and total dry matter yield were also enhanced significantly, as well as in the phosphorous and total potassium content of inoculated plants. EBI also significantly increased phosphorous uptake. A second experiment, designed to test the combined effects of EBI and inorganic fertilizer applications, was shown to considerably but not significantly enhance plant height. A significant increase in

pseudostem diameter was seen most in the treatment with combined 60-60-60 fertilizer and MUCp 14 treatment. However, the effect of this treatment was not significantly different from inoculation with isolate MUCp 12 alone and inoculation combined with a lower rate of inorganic fertilizer application. This suggests that inoculation alone can increase pseudostem diameter. Even though isolates MUCp 12 and MUCp 14 increased the shoot dry weight, total dry matter yield, and P content of banana, when combined with either 30-30-30 or 60-60-50 fertilizer treatments, the effect seemed to be unfavorable. The same observation was seen in the N content when isolate MUCp 12 was used. The improved growth and development of the inoculated plants could be attributed to the production of growth promoting substances by the endophytic bacteria. It is recommended that inoculation with bacterial endophytes should be done during nursery stage for seedling establishment. Proper identification and characterization of the bacterial endophytes and growth promoting substance are highly advised. Further research involving field trials using modified inoculation methods are recommended.

MUSA ACUMINATA; MUSA (BANANAS); VARIETIES; GROWTH; ENDOPHYTES; INOCULATION; BACTERIA; FERTILIZER APPLICATION

Effect of nitrogen, bio-fertilizer, and silicon application on yield and yield components of rice (Oryza sativa L.)
Panahi, A.; Aminpana, H.; Sharifi, P. *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 76-81 (Apr 2015).*

A field experiment was conducted in Neka, Mazandaran, north of Iran, to determine the effect of nitrogen (N), N sub 2-fixing bacteria (Azospirilum + Azotobacter), and silicon (Si) on rice grain yield and yield components. Treatments were N rates (0, 75, 150 kg/ha), bio-fertilizer application (inoculation with or without Azospirillum + Azotobacter), and Si rates (0, 150, 300 kg/ha). Rice grain yield was significantly affected by N rate, bio-fertilizer application and Si rate. The interaction between N rate and bio-fertilizer rate was significant for yield. With bio-fertilizer application, grain yield was significantly increased as N rate increased from 0 to 75 kg N/ha, but slightly reduced at 150 kg/ha N rate. Without bio fertilizer application, the highest grain yield was obtained in plots applied with 150 kg N/ha. Regardless of N rate and bio-fertilizer application, the highest grain yield (5287 kg/ha) was observed in plots applied with 300 kg Si/ha. Nitrogen application significantly increased plant height, tiller number per m sup 2, grain number per panicle, 1000-grain weight, biological yield, harvest index, grain N concentration, and grain N uptake across bio-fertilizer applications and Si rates. Across N and Si rates, plant height, tiller number per m sup 2, grain number per panicle, biological yield, harvest index, grain N concentration, and grain N uptake were significantly increased with bio-fertilizer application. Moreover, Si application increased significantly plant height, tiller number per m sup 2, grain number per panicle, 1000-grain weight, biological yield, harvest index, grain N uptake across bio-fertilizer applications and N rates. This study proved that bio-fertilizer application could reduce chemical N application rate with increase in rice grain yield.

ORYZA SATIVA; RICE; NITROGEN FERTILIZERS; SILICON; NITROGEN FIXING BACTERIA; RHIZOBACTERIA; FERTILIZER APPLICATION; CROP YIELD

Effects of different fertilizer regimes on the nut production of coconut (Cocos nucifera L.). **Crisostomo, S.D., Dela Cruz, C.D.V., Palis, M.M., De Lima, J.D., Licas, J.M., Reaño, C.E., Baylon, G.G., Canja, L.H.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 85-86 (Jul 2018).*

Coconut (Cocos nucifera L.) is one of the economically important crops in the Philippines and with the adverse changes in climate, it may be tremendously affected. The study aims to develop integrated nutrient management (INM) and to see the impact of bio-fertilizer on the productivity of coconut. Four different locations namely Palawan, Northern Samar, Zamboanga City and Davao City [Philippines] were selected to represent the four climate types in the Philippines. Five treatments in which application of recommended inorganic fertilizer and in addition of microbial fertilizer with mycorrhiza were assessed. The four experimental sites showed different responses on the different level of fertilizers. Sites from Zamboanga City and Palawan showed that quarterly split different level of fertilizer. Sites from Zamboanga City and Palawan showed that quarterly split application + recommended PCA fertilizer rate was the most suitable fertilizer regime based on the nut yield of 11,252 and 6,247 respectively. Furthermore, in Northern Samar and Davao City, the semi-annual split application + recommmended PCA fertilizer rate has the highest nut yield with 5,537 and 12,745 respectively. The results suggested that the effect of split application varies on the climate type as affected by rainfall or the amount of moisture in the soil. Morevover, it was evident that the treatments with addition of bio-fertilizer, Mykovam sup TM may not be significantly showed positive response it may increase the nut yield despite the reduction of half of PCA fertilizer application. These findings may be beneficial in respect of improving coconut yield.

COCOS NUCIFERA; NUTS; PRODUCTION; BIOFERTILIZERS; FERTILIZER APPLICATION; APPLICATION RATES; APPLICATION METHODS

Extent and determining factors of nutrient management practices in major irrigated rice-rice cropping systems in the Philippines. **Magahud, J.C., Dalumpines, S.L.P., Lincuna, A.E.Jr., Collado, W.B., Sanchez, P.B.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 86 (Jul 2018)*.

Trends in fertilizer applications and rice straw management should be known to develop appropriate nutrient management recommendations for major rice areas. As such, the study was conducted to assess the extent, kinds and rates of fertilizer inputs, and the nature of rice straw management in the major irrigated rice-rice cropping system of the Philippines. It also determined the factors that affect applications of such inputs relative to expected rice yields irrigation water sources. A survey was conducted from 2012 until 2015 in 61 rice farms. A questionnaire was used to gather information about farmers' fertilizer applications and rice straw management during wet and dry cropping seasons. Results showed that farmers applied chemical and nitrogen (N), while most applied phosphorus (P), and potassium (K) fertilizers every season. Chemical fertilizers were usually applied two or three times every season. Most commonly used fertilizer materials were urea and 14-14-14. The average amount of chemical fertilizer application was 7 bags/ha. Mean seasonal NPK

rate was 106-24-24 kg/ha. Higher amounts of chemical fertilizers were applied in farms that produce high yields and irrigated by national and communal irrigation systems compared to farms that produce low yields and irrigated by rivers and deep wells. Most farmers did not apply foliar, Zinc, and organic fertilizers, and most practiced open burning of rice straw. The study suggests that application of chemical and N fertilizers is a universal practice among farmers in the major rice-rice cropping systems of the Philippines. The study also confirms that N is applied in highest amounts among fertilizer nutrients, and that open burning of rice straw is a common practice among Filipino rice farmers. Diagnostic tools can be used to optimize efficiency of N fertilizers, and to monitor soil N and K levels. The incorporation of rice straw is also recommended.

ORYZA SATIVA; RICE; STRAW; NUTRITIONAL REQUIREMENTS; FERTILIZER APPLICATION; NPK FERTILIZERS; APPLICATION RATES; PHILIPPINES

Fertilizer integration on intercrop: implications on cacao growth, yield, bean quality, disease occurrence and profitability under rubber tree. **Mamon, N.S. Jr.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 81 (Jul 2018)*.

This study was conducted to investigate the effects of different rates of urea and vermicompost on the growth and yield of the cacao trees under mature rubber for one fruiting season (February to December 2015). The experimental design was factorial on a Randomized Complete Block Design with 15 treatments. The treatments were three rates of urea (0, 100 and 200 g/tree) and five rates of vermicompost (0, 1.5, 3.0, 4.5 and 6.0 kg/tree). The trunk circumference, leaf length and width, number of pods developed and harvested, pod and bean character, soil OM%, leaf Nitrogen content and prevalence of pest and diseases were evaluated. The application of 200g urea per tree produced significant increase from 4.86 to 8.44 kg (73.66% increase) in weight of harvested pods and from 23.32 to 26.40 g/pod(13.21% increase) dry bean weight and significant decrease in the pod index from 43.39 to 38.45 (11.36% decrease). Moreover, the heaviest and thickest pod husk was obtained from plants treated with 100 grams urea + 1.5 kg vermicompost. The highest mean number of beans/pod was obtained from trees applied with 100-200 g urea + 1.5 - 3.0 kg vermicompost. The soil organic matter content (%) and leaf N was slightly increased by application of fertilizer treatments. Pod borer infestation and nematode population were significantly affected by application of urea and vermicompost Application of 100 g urea/tree or 3.5 bags/ha gave the highest return of investment and was the most profitable source of nutrient.

THEOBROMA CACAO; COCOA BEANS; QUALITY; RUBBER; INTERCROPPING; GROWTH; CROP YIELD; FERTILIZER APPLICATION; UREA; COMPOSTING; OLIGOCHAETA; APPLICATION RATES; PROFITABILITY

Grain yield and agronomic efficiency of UPLB rainfed lowland rice breeding lines. **Sobreviñas, A.E., Briz, C.M., Magnaye, A.M.A., Malabanan-Bauan, K.B., Lalican, D.J., Sta. Cruz, P.C., Borromeo, T.H., Hernandez, J.E.** 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. 64-65 (Jul-2018)*.

Fertilizers are applied to provide plants with the optimum amount of nutrients to attain desired yield. Not all of the nutrients applied are used by the plant translated to increase in yield, and this could be a factor of the plant genotype. Plant breeders aim to develop cultivars that can translate nutrient application to yield increase efficiently. In this study, a nutrient use experiment was conducted in 2017 in Los Baños, Laguna [Philippines] to evaluate the yield performance and nutrient use efficiency of 10 UPLB-bred rainfed rice breeding materials under three fertilizer levels (0-0-0 kg/ha NPK, 120-60-60 kg/ha NPK and 60-30-30 kg/ha NPK ranged from 3.24% was 2164.87% kg/ha and yield increase from 0-0-0 to 120-60-60 kg/ha NPK ranged from 3.24% to 106.93%, with the highest yield increase obtained from Purification Line 2. Nutrient use efficiency was measured in terms of agronomic efficiency (AE), which measures the impact of nutrient application to yield. At 120-60-60 kg/ha NPK, mean agronomic efficiency was 3.83 kg grain per kg nitrogen (AEN) and 7.66 kg grain per kg phosphorus (AEP) and potassium (AEK). At 60-30-30 kg/ha NPK, mean AEN was 3.09, and mean AEP and AEK were 6.19. Among genotypes, highest AE for nitrogen, phosphorus and potassium were observed at 60-30-30 kg/ha NPK for Purification Line 2: AEN at 11.2, and AEP and AEK at 22.49. High nutrient use efficiency of breeding materials can be useful factor to determine parentals in developing rice cultivars that are nutrient-responsive in terms of yield performance.

ORYZA SATIVA; VARIETIES; PROGENY; RAINFED FARMING; GRAIN; YIELD INCREASES; NUTRIENT UPTAKE; NPK FERTILIZERS; FERTILIZER APPLICATION

Growth and yield performance of lowland rice (Oryza sativa L.) PSB Rc18 as influenced by different levels of nitrogen and potassium fertilizers. **Amac, D.A.P., Cagasan, U.A**. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 86-87 (Jul 2018)*.

This study aimed to 1) evaluate the growth and yield performance of lowland rice PSBRc 18 as influenced by different levels of nitrogen and potassium fertilizers; 2) determine the potential level of nitrogen and potassium fertilizers that would give optimum yield; 3) determine the interaction effects of N and K levels on the growth and yield of lowland rice; and 4) assess the profitability of using different levels of nitrogen and potassium fertilizers in lowland rice production. An experimental area of 332.5 sqm was laid out in split plot arranged in RCBD with three replications. The nitrogen levels were designated as the mainplot: N sub 1 = 60 kg/ha N and N sub 2 = 120 kg/ha N. The Potassium levels as the subplot: K sub 0 = no fertilizer application (control), K sub 1 = 30 kg/ha K sub 2 O, K sub 2 = 60 kg/ha K sub 2O and K sub 3= 90 kg/ha. Application of 60 kg/ha N and 0-30 kg/ha K resulted in early heading of PSB Rc18. Likewise, application of 90 kg/ha K produced bigger leaf area index (LAI) than the control. PSB Rc18 applied with 60 kg/ha N without K fertilizer resulted in highest harvest index and produced a higher number and percent filled grains/panicle resulting in higher grain yield (t/ha). Application of 60 kg/ha N gave the highest net income of PhP 26,246.43/ha and rice plants not applied with potassium fertilizer resulted in highest net income of PhP 24,184.34/ha.

ORYZA SATIVA; LOWLAND; GROWTH; CROP YIELD; CROP PERFORMANCE; FERTILIZERS; APPLICATION RATES; PROFITABILITY

Improving the seed production yield in PhilRice Negros [Philipines] through utilization of nutrient management tools. **Mondejar, C.L.C.; Osano-Palanog, M.J.; Pantin, F.L.A.; Bello, G.E.; Dogeno, L.A.G.; Parina, C.J.; Norbe, M.A.D.; Austria, R.F.; Etchon, M.A.; Palanog, A.D.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 78-79.*

In order for PhilRice Negros [Philippines] to continuously satisfy and sustain seed requirements in the Visayas, assessment of the current nutrient status of the seed production areas of PhilRice Negros is important. Information on the field situation is significant for appropriate fertilizer recommendations to achieve the target of increasing the productivity levels of the station. Site-specific nutrient management for the seed production of PhilRice Negros will enable to dynamically adjust fertilizer use, by supplying optimum amounts of nutrients at critical time points in the crops' growth to produce high yields. Nutrient management tools namely Rice Crop Manager (RCM), Minus-One Element Technique (MOET) and Leaf Color Chart (LCC) were used to diagnose the actual and current nutrient status in the seed production area. Recommendations from RCM and MOET were considered for the amount and type of fertilizer applied. And, LLC were used to identify when will be the best time to apply fertilizers. The physical characteristics of the sites with regards to position in the landscape, irrigation and drainage pattern were considered in the identification of sampling points representing the variability of the site. Nitrogen was the most obvious deficient nutrient in the MOET set-up, which agreed to the rate of nitrogen recommended by the RCM. All areas were found to be significantly deficient in nitrogen. Phosphorus was found to be deficient in fields of Group 1. Likewise, phosphorus, zinc and copper were found deficient in the fields of Group IV. The data were consolidated and used to generate the fertilization map and guide of the seed production areas in PhilRice Negros.

ORYZA SATIVA; RICE; SEED PRODUCTION; YIELDS; FERTILIZER APPLICATION; LEAVES; COLOUR; NUTRITIONAL REQUIREMENTS; PHILIPPINES

Inorganic and microbial fertilizers enhance growth and yield of mungbean (Vigna radiata L. Wilczek) and peanut (Arachis hypogaea L.) in acid soil. **Azogue, H.R., Magnaye, A.M.A., Salazar, B.M., Sta Cruz, P.C.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 90-91 (Jul 2018)*.

Acid soils offer unfavorable growing conditions to legumes in a variety of ways, such as rendering nutrients unavailable for plant uptake and hindering soil microorganisms with which legumes form symbiotic associations with, and these often results in poor plant growth and low yield. Inorganic fertilizer application and enhancement of microbial activity in the soil can be explored to improve yield of legumes in acid soils. Hence, a two-season experiment was conducted in the UP Laguna-Quezon Land Grant in 2017 to evaluate the response of peanut and mungbean to inorganic and biofertilizers in highly acidic soil condition (pH 4.3-4.5). Peanut (var. Biyaya 16) and mungbean (var. Pag-asa 3 and Pag-asa 7) were planted under five fertilizer treatments: 0% recommended rate (RR) of inorganic fertilizer, 50% RR, 100%RR, 50%RR+VAMRI, and 50%RR+NitroPlus. Across cropping seasons, peanut applied with 50%RR+VAMRI had highest shoot biomass,

and had 12.76% and 30.49% more pod yield than plants with 50%RR and 100%RR respectively. Root biomass was highest in fully fertilized peanut followed 50%RR + either VAMRI or NitroPlus. In mungbean, 100%RR resulted in significantly highest shoot and root biomass in wet season. Relative to 50%RR+NitroPlus increased shoot weight by 242% and root weight by 81.83%, while 50% RR + VAMRI resulted in 46.47% more about and 14.80% more roots. In wet season, 50% RR+NitroPlus application enhanced yield by 5-10x relative to 0% and 50%RR, and was only 20% lower than yield of plants applied with 100% RR, VAMRI and NitroPlus. These show the potential of inorganic and microbial fertilizers in enhancing growth and yield of peanut and mungbean in acidic soil condition.

VIGNA RADIATA; ARACHIS HYPOGAEA; CROP YIELD; GROWTH; MICROORGANISMS; FERTILIZERS; INORGANIC FERTILIZERS; FERTILIZER APPLICATION; FERTILIZERS

Performance of lowland rice (Oryza sativa L.) NSIC Rc82 to different nutrient management strategies grown as a main crop and ratoon. **Bañoc, D.M., Sevillano, R., Libre, M.J.P., Asio, V.B.** 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. 92-93 (Jul-2018)*.

This study was conducted under lowland ecosystem aimed to evaluate the growth and yield performance of lowland rice NSIC Rc82 as influenced by nutrient management strategies grown as a main and ratoon crop; to determine an appropriate nutrient option that promotes better growth and yield performance of lowland rice; and assess the benefit of lowland rice production when grown as a main and ratoon crop to nutrient management strategies adopted. Fertilized plants grown either as main crop or ratoon significantly matured earlier than that of unfertilized control. Fertilized main crop exhibited significant protrusion of the flagleaf, produced markedly abundant number and longer nodal roots access length. For the ratoon crop, however, all agronomic characteristics were not significantly affected by the nutrient management options evaluated except the entire growth period of the ratoon and total number of nodal roots per hill. Relative to yield, yield component and harvest index (HI), all parameters were not significantly affected by the nutrient management strategies tested except the number of productive tillers and the weight of 1,000 grains. Main crop applied with inorganic fertilizers at 90-60-60 kg/ha N sub 1 P sub 2 O sub 3 K sub 2o (T sub 1) generated the highest net income of PhP 28,596.00. per hectare. For the ratoon crop, combined application of organic and inorganic fertilizers generated the highest net income of PhP 19,600.50. However, for combined cost and return analysis of both the main crop and ratoon, inorganic fertilized plants (T sub 1) generated the highest net income of PhP 43,678.00 while lowest net income was obtained in purely organic fertilized plants with PhP 5,931.25.

ORYZA SATIVA; VARIETIES; LOWLAND; CROP PERFORMANCE; RATOONS; RATOONING; NUTRITIONAL REQUIREMENTS

Physico-chemical properties of lowland aromatic rice NSIC 218 as influenced by water and fertilizer application. **Cagasan, U.A., Tamayo, N.V**. 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. 91 (Jul-2018)*.

This study aimed to assess the physicochemical properties of lowland rice NSIC Rc218 (milling potentials, physical and chemical properties) as influenced by water and fertilizer applications, and to determine the interaction effect of all parameters gathered on NSIC Rc218 as influenced by water and fertilizer applications. The experiment was laid out in Split Plot Randomized Complete Block Design (RCBD) with three replications. Water applications (WM sub 1-Flooded and WM sub 2-AWD) were designated as the main plot, while fertilizer application (T sub 1-No fertilizer as control, T sub 2-100-60-60 kg N, P sub 2 0 sub 5 and K sub 2 0/ha (RRIF), T sub 3-Vermicast at 10/t ha (RRVC), T sub 4-75% RRIF + 25% RRVC, T sub 5-50% RRIF + 50% RRVC and T sub 6-25% RRIF + 75% RRVC) were designated as the subplot. Results of the study indicate that the physicochemical properties of NSIC Rc218 were significantly (p0.05) enhanced when the crop was planted under alternate wet and dry (AWD) conditions and fertilized with 100-60-60 kg N, P sub 2 0 sub 3 and K sub 2 0/ha the recommended rate of inorganic fertilizer (RRIF), and in combination with a small percentage of organic fertilizer 75% RRIF + 25% of the recommended rate of vermicast (RRVC). Likewise, application of inorganic fertilizer significantly (p0.05) improved the percent recovery of brown rice, total milled rice, grain shape, and crude protein (CP) content of lowland rice NSIC Rc218 variety.

ORYZA SATIVA; LOWLAND; VARIETIES; CHEMICOPHYSICAL PROPERTIES; WATER MANAGEMENT; FERTILIZER APPLICATION; APPLICATION RATES; COMPOSTING; OLIGOCHAETA; INORGANIC FERTILIZERS

Production of onion (Allium cepa L.) using organic fertilizer. **Martin, R.D.; Galindez, J.L.; Lopez, L.L.M.A.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 76 (Jul 2018).*

A field experiment was conducted to evaluate the influence of organic fertilizer application in the production of organic onion. The study was conducted in a fully converted organic field at CLSU RM-CARES using the following treatments : T1-Control (no fertilizer), T2 - Compost (800g/sqm) applied before transplanting, T3 - vermicast (800g/sqm) applied before transplanting, T4 - Compost (400g/sqm) applied before transplanting and at 30 DAT. Results revealed that compost and vermicast application as biofertilizer had no influence on the height of onion at vegetative stage as well as on the diameter size and weight of individual bulb after harvest. However, application of combined compost and vermicast at the rate of 400g/sqm each of the fertilizer material applied before transplanting significantly increased the production of marketable bulb, yield per plot and computed yield per hectare. On the other hand, higher uptake of N,P and K was observed from onion plants fertilized with compost (400g/sqm) and vermicast (400g/sqm) applied before transplanting and 30 DAT. Follow up studies should be conducted to confirm and further explain the findings.

ALLIUM CEPA; ONIONS; ORGANIC FERTILIZERS; COMPOSTING; OLIGOCHAETA; NUTRIENT UPTAKE; NPK FERTILIZERS; FERTILIZER APPLICATION; TIMING

Promoting 4R nutrient management in maize with smallholder cooperatives in the Philippines. **Paduit, N., Pampolino, M., How, M.O., Oberthur, T.** 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. 41 (Jul-2018)*.

Maize is the second most important crop next to rice in the Philippines. Being a valuable crop in the country, there is a need for farmers to be aware of proper nutrient management to increase their yield and profit while maintaining balanced nutrient levels in the soil. This can be done by following the 4R nutrient stewardship principles-applying the right source of nutrients at the right rate, at the right time, and in the right place. Nutrient Expert sup R(NE) for maize is a decision support tool that provides field-specific fertilizer recommendations based on 4Rs. The authors conducted a pilot project with smallholder cooperatives in the Philippines on promoting adequate and wide scale use of responsible nutrient management through the use of Nutrient Expert sup N Maize. Three smallholder cooperatives from Tarlac, Pangasinan, and Nueva Vizcaya [Philippines] participated in this project. Nutrient Expert trainings were conducted to develop the capacity of the cooperatives to generate 4R-based fertilizer recommendations for their members. The trainings included: 1) participatory lecture discussion to introduce 4R nutrient management, 2) demonstration on how to use the NE tool, and 3) hands on exercises to promote experiential learning. Farmer meetings were held to introduce the concept of 4Rs and develop fertilizer recommendations using NE for members of the three cooperatives. Field demonstrations were established to showcase the effectiveness of NE recommendations. In Tarlac and Pangasinan, results from dry season 2016-17 showed that average yield with NE (9.50 t/ha) was higher than farmers' fertilizer practice (FFP) (7.98 t/ha). Gross profit was also higher in NE (PhP111,187) than FFP (PhP91,293). To further promote the use of NE, a farmers' field day, participated by 111 farmers, was conducted in Tarlac to emphasize the importance of the 4R concept in sustaining the productivity and profitability of farmers' fields, and to simulate farmers' interest in using the NE recommendation

ZEA MAYS; MAIZE; NUTRITIONAL REQUIREMENTS; FERTILIZER APPLICATION; COOPERATIVES; PHILIPPINES

Proper maintenance and care of bonsai. **Yap, J.P.Jr.** *Agriculture (Philippines) v. 22 (10) p. 26, 28-29 (Oct 2018).*

BONSAI; PLANT TRAINING; CROP MANAGEMENT; WATERING; ORGANIC FERTILIZERS; FERTILIZER APPLICATION; FOLIAR APPLICATION

Response of aromatic and non-aromatic rice on organic and inorganic fertilization. **Baradi, M .A.U.; Magno, M.F.A.; Solero, J.M.; Ancheta, R.G.; Romero, M.V.; Cruz, R.T.; Regalado, M.J.C.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 49-55 (Dec 2017)*.

Field experiments were conducted to study the effects of different fertilizers (control or no fertilizer, indigenous nitrogen supply (INS), indigenous phosphorus supply (IPS), indigenous potassium supply (IKS), LCC-based 1, LCC-based 2, rice straw, and chicken manure) on the agronomic characters of three rice varieties (Burdagol-Laguna type, a modern aromatic variety; Gal-ong, a pigmented aromatic traditional variety; and PSB Rc 82, a modern non-aromatic variety). The study was conducted during the dry and wet seasons of 2014 and 2015 in irrigated lowland ecosystem. The application of higher N levels using inorganic fertilizers (INS, IKS, LCC-based 1, LCC-based 2) gave the highest yields in both Burdagol (4.63-5.44 t/ha) and PSB Rc 82 (4.58-5.16 t/ha). This can be attributed to the high number of productive tillers and number of filled grains per panicle. Gal-ong gave the lowest yield (2.40 t/ha) due to its poor tillering ability although it produced the highest number of filled grains per panicle. The yield and number of filled grains per panicle of all the three varieties were significantly higher during the wet season (WS) than during dry season (DS). This may be due to the

availability of rainfall or more water during the wet season. Gal-ong, which is traditional aromatic variety from Kibungan, Benguet in the Cordillera Administrative Region, Philippines can be planted in the irrigated lowland rice ecosystem.

ORYZA SATIVA; RICE; VARIETIES; INDIGENOUS ORGANISMS; ORGANIC FERTILIZERS; INORGANIC FERTILIZERS; AGRONOMIC CHARACTERS; WET SEASON; DRY SEASON; FERTILIZER APPLICATION; APPLICATION RATES

Yield evaluation of Resource Use Efficient (RUE) rice (Oryza sativa L.) lines under reduced NPK levels. **Lopez, P.I.M.; Dela Rosa, D.G.M.; Magnaye, A.M.A.; Malabanan-Bauan, K.B.; Lalican, D.J.; Sta Cruz, V.C.; Borromeo, T.H.; Hernandez, J.E.; Ali, J.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 77 (Jul 2018).*

Fertilizer application is a major factor to increase rice yield. Application of the correct amount of fertilizer can be expensive and beyond the purchasing power of many farmers, which results in farmers' fertilizer application below the recommended rate (RR). Hence, resource use efficient rice varieties that can help farmers attain good yield at lower fertilizer input is needed. Yield performance of select resource use efficient (RUE) rice lines developed at the International Rice Research Institute was evaluated under under varying levels of NPK in 2017 wet season. Twenty RUE lines were tested at three fertilizer treatments: 120-60-60 kg/ha NPK (100% RR), 60-30-30 kg/ha NPK (50% RR), 0-0-0 kg/ha NPK (0% or control). Grain yield was characteristically higher when applied with 50% RR (22.01%) or (100% recommended rate (29.91%) compared to conrol. Five RUE lines showed significantly increased grain yield up to 57.14% when applied even with just 50% RR, which indicates the potential of these lines to improve farmer's yield with application of even as low as 50% RR. On the other hand, responsive of other eight RUE lines to additional nutrient application was observed with their significantly improved yield when applied with full RR as opposed to 50% RR only. Yield of 13 RUE lines as well as check varieties NSIC Rc 282 and NSIC Rc 418 did not differ significantly between 100% and 50% fertilizer levels, which suggests the possibility of attaining high yield even at lower fertilizer input cost. Top three promising lines were identified to have a similar yields at 50% and 100% RR, and with 17.17% yield advantage over mean check yield.

ORYZA SATIVA; RICE; EVALUATION; FERTILIZER APPLICATION; NUTRIENT UPTAKE; APPLICATION RATES; NPK FERTILIZERS

Zinc fertilization under optimum soil moisture condition improved the aromatic rice productivity . **Ali, H.; Sarwar, N.; Hasnain, Z.; Ahmad, S.; Hussain, A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 71-78 (Aug 2016)*.

Zinc deficiency is a barrier in achieving higher rice yield and also a cause of zinc malnutrition in developing countries. Various approaches are under study for zinc fertilization to meet the crop requirement. Thus the present study was carried out to see the impact of root applied zinc on rice productivity under variable irrigation regimes for two consecutive years 2009-2010. Various levels of zinc fertilization: (Zn sub 1) 0, (Zn sub 2) 8, (Zn sub 3) 10, (Zn sub 4) 12, and (Zn sub 5) 14 kg/ha were applied to soil under different irrigation

regimes; 6 (I sub 1), 8 (I sub 2), 10 (I sub 3), 12 (I sub 4) and 14 (I sub 5) irrigations. Two sites from major rice producing areas were selected for comparison. Rice plants significantly improved growth in terms of LAI, LAD and NAR with an increase in zinc and irrigation levels while the major increase was observed with 14kg zinc/ha under 12 irrigations. The crop plants were highly efficient in using available radiation when grown under 12 irrigations with 14kg Zn/ha. The paddy yield and yield parameters were correlated with higher growth rate and performed best under the treatment combination of I sub 4 Zn sub 5. Likewise, zinc fertilization under optimum moisture condition was also economically sustained. Rice growth and yields were substantially poor at lower application of zinc fertilizer and irrigation during both years under different ecological regions.

ORYZA SATIVA; RICE; NUTRITIONAL REQUIREMENTS; GROWTH; PRODUCTIVITY; AROMATIC COMPOUNDS; ZINC; FERTILIZER APPLICATION; SOIL WATER CONTENT; IRRIGATION

F06 Irrigation

Effects of alternate wetting and drying on rice farming in Bohol, Philippines. **Valdivia, C.M.D.; Sumalde, Z.M.; Palis, F.G.; Lampayan, R.; Umali, C.; Singleton, G.R**. *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 50-56 (Dec 2016).*

This paper examined how alternate-wetting and drying (AWD), a water saving technology, affected the economic aspect of lowland rice farming in Bohol [Philippines]. AWD was introduced in the Bohol Irrigation System (BIS) 1 in 2006. The changes in the area cultivated, yield, and mean net income of rice farmers were assessed using household panel data for 2005 and 2010. Descriptive statistics, comparison of means, and regression models were used to characterize the changes between the two periods. The mean and total rice areas cultivated were higher in 2010 compared to 2005. There were significant increases in the mean yield and net income of farmers, especially among those from the downstream areas. Regression analyses indicated that AWD might have had a significant contribution to changes in profit but not to yield. It was further confirmed that AWD did not cause yield penalty. Farmers, particularly those from the downstream areas, had a more reliable water supply after AWD implementation, resulting in a closing of the yield gap between upstream and downstream farmers.

ORYZA SATIVA; RICE; LOWLAND; PLANT PRODUCTION; DRYING; WATER CONSERVATION; WATER SUPPLY; TECHNOLOGY; IRRIGATION; PHILIPPINES

Zinc fertilization under optimum soil moisture condition improved the aromatic rice productivity. **Ali, H.; Sarwar, N.; Hasnain, Z.; Ahmad, S.; Hussain, A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 71-78 (Aug 2016).*

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producing areas were selected for comparison. Rice plants significantly improved growth in terms of LAI, LAD and NAR with an increase in zinc and irrigation levels while the major increase was observed with 14kg zinc/ha under 12 irrigations. The crop plants were highly efficient in using available radiation when grown under 12 irrigations with 14kg Zn/ha. The paddy yield and yield parameters were correlated with higher growth rate and performed best under the treatment combination of I sub 4 Zn sub 5. Likewise, zinc fertilization under optimum moisture condition was also economically sustained. Rice growth and yields were substantially poor at lower application of zinc fertilizer and irrigation during both years under different ecological regions.

ORYZA SATIVA; RICE; NUTRITIONAL REQUIREMENTS; GROWTH; PRODUCTIVITY; AROMATIC COMPOUNDS; ZINC; FERTILIZER APPLICATION; SOIL WATER CONTENT; IRRIGATION

F08 Cropping patterns and systems

Carbon storage of corn-based cropping systems in Isabela, Philippines. **Ocampo, N.P.; Zamora, O.B.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 20-29.*

Total carbon (C) storage of three corn-based cropping systems: monocropping (M), legume in crop rotation (CR) and intercropping (I) of selected farmers in Isabela were evaluated. The total C stocks were estimated at fallow period and crop maturity. Carbon stocks at fallow period served as reference point to measure the change in C stocks in various C pools. Carbon stored in herbaceous vegetation of the monocropping system was significantly lower than the other two systems at fallow period. However, the reverse was true at crop maturity. Carbon stock in surface litter of the monocropping system at crop maturity was significantly lower than the legume in crop rotation and intercropping systems. Only the intercropping system increased C stored in surface litter, and this was attributed to high crop diversity at crop maturity. C stock stored in the roots decreased in legume in crop rotation but increased in the two other systems. Total soil organic carbon (SOC) at fallow and crop maturity were ranked as follows: M (26.51 and 25.18 Mg/ha) I (25.68 and 24.62 Mg/ha) CR (25.28 and 24.59 Mg/ha). In general, there was a decrease in total SOC in the three cropping systems. The decrease in the total SOC was highest in the monocropping system (-1.33 Mg/ha), which was 1.25 (-1.06 Mg/ha) and 1.94 (-0.69 Mg/ha) times higher than the decrease in intercropping and legume in crop rotation, respectively. There was an increase in total system C stocks in monocropping (3.67 Mg/ha), intercropping system (2.36 Mg/ha) and the legume in crop rotation system (0.72 Mg/ha). Both monocropping and intercropping systems stored higher C than legume in crop rotation. However, the lower decrease in SOC and less chemical fertilizer input in the intercropping system contributed to C sequestration and less C emission than the monocropping system.

MAIZE; ZEA MAYS; LEGUMES; CARBON; STORAGE; CROP MANAGEMENT; INTERCROPPING; CONTINUOUS CROPPING; FALLOW; PHILIPPINES

Community-based forest management for resilience through agroforestry. **Lalican, D.J.; Visco, R.G.; Gascon, A.F.; Castillo, A.S.A.; Florece, L.M.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 19-29 (Dec 2017)*.

The study generally aimed to assess the agroforestry systems of Community-Based Forest Management (CBFM) sites to formulate policy recommendations for the implementation of agroforestry practices in the

study areas and other agroforestry sites. The practices of agroforestry, where woody perennials are deliberately used on the same land management unit as agricultural crops and/or animals, were characterized based on structure. The structural basis for classification refers to the composition and temporal arrangement of the different components such as annual crops, pasture/animals and trees/shrubs. The socio-economic and demographic characteristics of farmers were obtained using survey sampling from 122 households. Quadrant method was employed in acquiring agrobiodiversity. The method determined species diversity by counting the number of tree species and number of individuals under each species in quadrants for each farm. The soil properties and erodibility were determined through soil sampling, using modified erosion bar, and direct on-site measurements and laboratory analysis, respectively. Results revealed that farmers practiced shelterbelts/windbreaks-cum live trellis system in Liliw [Laguna, Philippines] and multilayer tree gardens in Sta. Maria [Laguna, Philippines]. The agrobiodivesity of agroforestry systems in both sites were moderately diverse from CBFM members while low diverse for non-CBFM members. Agrobiodiversity indices of agroforestry systems for CBFM members and non-CBFM in Liliw are 2.58 and 1.98, respectively while CBFM members and non-CBFM members in Sta. Maria are 2.72 and 0.78, respectively. Farms in both sites had low soil bulk density and erosion rates with high organic matter, nitrogen, phosphorous, and potassium contents. Regardless of the kind of agroforestry system practiced in the CBFM sites, it has been observed that agroforestry is indeed beneficial for both study sites.

FOREST MANAGEMENT; COMMUNAL FORESTS; FORESTRY; AGROFORESTRY; SOIL CHEMICOPHYSICAL PROPERTIES; SOIL DENSITY; BIODIVERSITY

Crop roadmaps poorly implemented. **Sarian, Z.B.** *Agriculture (Philippines) v. 23 (1) p.54-55 (Jan 2019).*

COCOS NUCIFERA; ANIMAL HUSBANDRY; SMALL FARMS; INTERCROPPING; DIVERSIFICATION; FARMERS; FARMS; MARKETS ;POSTHARVEST TECHNOLOGY

Effects of coconut partial shading on mungbean morphological characteristics and yield. **Alip, R.C.G.; Delfin, E.F.; Maghirang, R.G.; Rodriguez, M.C.B.; Sabanal, A.Q**. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 73-74 (Jul 2018)*.

Increasing coconut farm productivity through intercropping will provide more profit for the farmers compared to coconut monocropping. However, partial shading by coconut trees has been known to have adverse effect on the intercrop. This study was conducted to determine the performance of 24 mungbean entries grown as intercrop and monocrop at Quezon Agricultural Regional Experiment Station (QARES) in Tiaong, Quezon [Philippines] on July to September of 2017. Under coconut, the photosynthetically active radiation (PAR) was much reduced since PAR on a sunny day ranged from 397.03 umol m-2s-1 at 8am to 1508.01 umol m-2s-1 at 12 noon while in the open, PAR at 8 am was 1,733.14 umol m-2s-1 and 2,199.96 umol m-2s-1 at 12 noon. All mungbean entries grown under coconut had higher plant count relative to those grown in the open probably as a result of higher moisture conservation that favored seed germination. However, a significant reduction in the number of days to flowering (NDF) was observed among plants grown under coconut while partial shading

of coconut had no significant effect on mungbean's growth habit, biomass production and partitioning, internode distance as well as leaf area. On the other hand, the average yield obtained from mungbean grown as intercrop was significantly reduced by 65%, although the significant shade-variety interaction indicated differential response among varieties. Pag-asa 5 had the largest yield (715.17 kg/ha) under open field, while Pag-asa 3 had the highest yield (224.03 kg/ha) under coconut. PHL 18241 had the least reduction among entries while Pag-asa 5 had the largest yield reduction. The calculated harvest index (HI) did not show significant differences between growing conditions although HI under coconut was reduced by 28%. Yield had significant positive correlation with NDF, HI and root dry weight but was negatively correlated with plant stand, growth habit and green leaves dry weight.

COCOS NUCIFERA; VIGNA RADIATA; INTERCROPPING; MONOCULTURE; SHADE; SHADING; GROWTH; CROP YIELD

Growth of Jatropha curcas L. under different short rotation-based agroforestry in Cuenca, Batangas, Philippines. **Paelmo, R.F.; Villancio, V.T.; Paelmo, G.G.; Castillo, A.S.A.; Visco, R.G.; Carandang, W.M.** Philippine Journal of Crop Science (Philippines) v 39 (3) p. 34-44.

The global climate change heightened the interest and concern of towards green economy. The Philippines, being one of the countries in Southeast Asia that is vulnerable to the impacts of climate change, crafted the Biofuels Act of 2006 mandating the transportation sector to use the biofuel blends. One of the potential alternative energy sources which pro-actively caters to the mitigation and adaption of climate change and rehabilitation of marginal land is biofuel plant species. Jatropha curcas L. is among the plant-based fuel substitute considered to have a potential as biodiesel as well as for land rehabilitation. This study assessed the growth performance of J. curcas grown in an agroforestry-based system in the marginal upland of Mt. Maculot San Isidro Cuenca, Batangas, Philippines. Specifically, it aimed to determine the growth of J. curcas under different short rotation forestry (SRF)-based agroforestry system and identity the most suitable planting configuration scheme of J. curcas for rehabilitation of marginal lands based on its vegetative growth. Research results showed that the production system had significant influence on the growth performance of J. curcas grown in the SRF-based agroforestry system. Among the important growth parameters influenced by the planting configuration are root collar diameter, height and aboveground biomass production. All the planting configurations produced sturdy J. curcas indicating its potential suitability to sites exposed to strong winds. Acceptable shoot-root ratio of 1:1 and 1:2 are likewise produced in all the planting configuration and SRF-based agroforestry system. However, J. curcas is best grown in SRF-based agroforestry system with A. mangium and E.deglupta (4x2 m spacing) in the marginal upland area of Cuenca, Batangas, Philippines.

JATROPHA CURCAS; AGROFORESTRY; BIOFUELS; FOREST REHABILITATION; CLIMATIC CHANGE; MARGINAL LAND; PHILIPPINES

Integrated production of both milk and sweet aromatic young coconuts increase cocoland productivity. **Pamplona, P.P.; Pamplona, A.G.D.** *Agriculture (Philippines) v. 23 (1) p.36-40 (Jan 2019)* .

COCOS NUCIFERA; VARIETIES; DAIRY CATTLE; DIVERSIFICATION; FARMS;PRODUCTIVITY; MILK PRODUCTION; FORAGE; PRODUCTION; FARMING SYSTEMS

F30 Plant genetics and breeding

AMMI biplot model analysis of stability and adaptability of high yielding rice (Oryza sativa L.) genotypes in rainfed lowlands of the Philippines. **Sigari, T.A.; Orbase, M.A.R.; Desamero, N.V.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 65-74 (Aug 2014)*.

High genotype (G) by environment (E) Interaction (GEI) complicates the task of identification of rice genotypes with high yield in rainfed lowland (RFL) ecosystem. This paper examined 23 rice genotypes for yield and yield stability in the RFL rice ecosystem of the Philippines. The genotypes were evaluated in 12 environments composed of 3 locations over 4 wet seasons (2007-2010), in replicated RCBD. In each evaluation, amount of rain, standing water depth, and water table depth were recorded daily and the rice plants were measured for growth characteristics and yield. AMMI analysis was used to interpret the effects of G, E and GEI, on yield and yield stability. The AMMI analysis revealed that 44.4% of the total variation in grain yield was due to E, 22.2% to G, and 33.5% to GEI effects, with the first two principal components accounting for 51.7% of GEI to total sums of squares. The AMMI 2-biplot model depicted genotypes Azucena-M5R-2 (3), Raeline 3 (5) PSB Rc82 (11), MAHSURI (15) and IR72 (18) as highly stable across the environments, and genotypes SPYT-CAG5DS (14), PSBRc18 (2), PSB Rc10 (16), NSIC Rc138 (8), SGYT29-CAG05SDS (10), PSB Rc14 (7), and IR64 (13) as the most responsive for grain yield. The AMMI-biplot analysis allowed for easy visual identification of superior genotype for each set of environment. Increased number of test environment and use of stability indices, especially when large number of entries is included could entrance the accuracy of analysis and facilitate large number of genotypes with broad or specific adaptability.

ORYZA SATIVA; RICE; HIGH YIELDING VARIETIES; RAINFED FARMING; LOWLAND; AMMI; GENOTYPES; GENOTYPE ENVIRONMENT INTERACTION; CROP YIELD; ADAPTABILITY; PHILIPPINES

Analysis of genetic diversity of safflower (Carhamus tinctorius L.) genotypes using agro-morphological traits and molecular markers. **Safavi, S.M.; Pourdad, S.S.; Safavi, S.A.** *Philippine Journal of Crop Science (Philippines) v. 42 (2) p. 48-60 (Aug 2017).*

In spite of being one of the major oilseed crops, little is known about genetic diversity and relationships between species of safflower. Genetic variation in twenty safflower (Carthamus tinctorius L.) accessions was characterized by means of agro-morphological traits, random amplified polymorphic DNA (RAPD) and inter-simple sequence repeats (ISSR) markers. A field trial was conducted to evaluate 17 agro-morphological traits. To study RAPD and ISSR, initially, 53 primers were screened, of which 22 produced reproducible amplification products. Using 13 selected RAPD primers 74 markers were generated of which 60 were polymorphic (81.08%). The number of amplified bands varied from three to nine, with size range from 250 to 2,500 bp. The nine selected ISSR primers produced 50 bands across 20 genotypes, of which 48 were polymorphic (96.00%). The number of amplified fragments with ISSR primers ranged from three to eight and varied in size from 250 to 1,450 bp. By all primers (RAPD + ISSR), a total of 124 bands were detected, of which 108 bands (87%)

observed with combined markers data revealed high level of genetic variation existing among the accessions. Genetic relationship estimated using similarity coefficients (Jaccard's) values between different pair of accessions varied from 0.26-0.84 in RAPD, 0.28-0.86 in ISSR and 0.29 to 0.78 with combined markers suggested a variation (dissimilarity) ranging from 16 to 74%, 14-72% and 22-71%respectively. ISSR markers were relatively more efficient than the RAPD assay. The Mantel matrix correspondence test between two Jaccard's similarity matrices, showing statistical significant correlation between ISSR- and RAPD-based similarities. Cluster analysis based on combined data of both molecular markers (ISSR+RAPD) separated the accessions into 5 groups and based on morphological traits, RAPD and ISSR data accessions formed into four distinct groups. Classification schemes generated by morphologic and molecular markers data did not coincide. The grouping of accessions was supported by principal coordinate analyses (PCoA). It is suggested that ISSR and RAPD are effective markers system for detecting variation among safflower genotypes.

CARTHAMUS TINCTORIUS; SAFFLOWER; GENETIC VARIATION; GENOTYPES; GENETIC MARKERS; AGRONOMIC CHARACTERS; CARTHAMUS TINCTORIUS; CARTHAME; VARIATION GENETIQUE; GENOTYPE; MARQUEUR GENETIQU

Analysis of grain yield stability in rainfed lowland rice lines using Ammi biplots. Madrid, I.J.; Borines, N.O.; Hernandez, J.; Sta. Cruz, P.; Borromeo, T.; Lalican, D.; Ben, S.; Magnaye, A,M.; Cayaban, E.; Ladia, E.; Enriquez, F.; Orbon, C.; Machica, T.C.; Agreda, V.; Arroyo, C. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 74 (Jul 2018).*

Development of cultivars with high and stable performance across environments is one of the keys to a sustainable rice production. Thus, evaluation of genotypes for adaptability and stability has become an essential part of breeding programs. The current study was conducted to evaluate the grain yield stability of rainfed lowland rice lines and to identify genotypes with high and stable yield. Sixty rainfed lowland rice lines were planted during 2017 wet season in Cagayan, Laguna, Camarines Sur, and Iloilo, following an augmented row column design with two replications in each location. Grain yield differed significantly (P0.01) as affected by varying genotypes, environments, and genotype x environment (GxE) interaction. Highest mean grain yield across the four locations was observed in G60 (GSR IR2-DQ3-D1-S1) with 3.8 t/ha. Based on AMMI 1, genotypes G60, G56 (IR107891-B-B-954-3-1), G15(PR39288-B-4-2-2-1-3-1), G40 (GSR IR2-DQ41-L3-R1), G58 (GSR IR2-DQ25-S2-Y1), G9 (BRGYT 4), G46 (IR 106317-16-2-2-1), and G38 (GSR IR2-DQ30-L1-Y1) have the higher mean yield than the average yield across locations. In terms of growing environment, highest grain yield for each genotype was observed in Iloilo. From the AMMI 2 biplot, Camarines Sur and Cagayan had stronger interactive forces than Laguna and Iloilo. Genotypes G10 (PR39920-B-15-1-15-1), G11 (PR41561-B-8-Sal717-1-3), G15, G16 (PR40872-B-2-3-2-1-2-1), G32 (IR15L1504), G46, G56, and G60, are not sensitive to environmental interaction; while entries G21 (PR43482-13-1-1-3), G51 (PR42167-B-B-27-1-3-1), and G5 (Raeline 7) have high interaction with the environment. The most stable genotypes across environments are G22(IR15L1656), G30 (IR107891-B-B-1253-1-1), G37 (GSR IR2-DQ2-S1-S1), G56, and G58. Overall, G60 is

considered as the best genotype among the rainfed rice lines evaluated due to its high yield, high adaptability, and non-sensitivity to environmental interactions.

ORYZA SATIVA; GENOTYPES; PROGENY; RAINFED FARMING; LOWLAND; EVALUATION; CROP YIELD; GENOTYPE ENVIRONMENT INTERACTION

Assessing response variation of selected rice genotypes under waterlogged condition. **Concepcion, J.S.; Desamero, N.V.** 8. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 72 (Jul 2018).*

Next to flash-flooding, stagnant water stress due to gradual increase in water level up to 80cm lasting for weeks or months has been a bottleneck in rice cultivation in submergence-prone areas. To address this concern, a genotype screening protocol and small scale facility was developed to assess the performance of rice genotypes under stagnant water condition. NSIC Rc222, PSB Rc68, IR242, IR46 and four mutant-lines were used as test genotypes and 1cum plastic water tanks with steel braces were used as screening facility. The 21-day old seedlings were planted in pots containing approximately 2kg of paddy soil. Stress was imposed 10 days after transplanting starting at 5cm from the base of the plant. Water level was raised by 5 cm at 2-day interval until it reaches 50cm, and maintained until harvest stage. Significant variation in maturity among genotypes observed, with IR64 and kawilan-IVC2011WS 324-6 maturing earliest with 105 DAS, and IR42 maturing the latest (123 DAS). Significant variation was observed in average in average internode distance, culm diameter, panicle number, and root length were identified as contributing traits explaining 78.84% of observed variation. A significant positive linear correlation in number of nodes with culm diameter, (r=0.9300) was generated. Axillary branch development was observed in IR42, PSB Rc68, PR41908-Tanggiling-IVC2010DS 6-2, and Kawilan-IVC2011WS 324-6 producing 1-2 branches from the main tiller, usually initiating at the 4th node from the base. All genotypes were observed to have aerenchyma formation in the root and stem as adaptive mechanism for anoxia due to waterlogged condition. Significant variation in response of rice genotypes under stagnant water condition was elucidated. To further establish and quantify the severity of stress, a second phase trial will be conducted comparing stress condition with non-stress condition.

ORYZA SATIVA; GENOTYPES; DROUGHT STRESS; WATERLOGGING; GROWTH; INTERNODES

Bridging past and future of rice germplasm through PhilRice Genebank Collection and Conservation. **Nombrere, J.M.Z., Mananghaya, T.E., Ferrer, M.C., Alvarino, J.B., Mallari, R.P., Newingham, M.C., Duldulao, M., Alfonso, D., Castro, J.R., Niones, J.M.** 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. 96 (Jul-2018).

Rice in the Philippines has traversed through ages in the archipelago. As a country with extremely varied topography, the Philippines had a diverse reservoir of rice germplasm cultivated. This includes the traditional rice varieties (TRVs) or landraces that contains valuable genes that can be used to develop new varieties with improved yield potential, higher nutritional quality, and higher tolerance of the stresses for future climatic

conditions. However, due to changing environmental condition and substitution of TRVs with modern varieties, rice diversity faced extinction through the years. Thus the collection of rice germplasm has been a part of the continuous conservation effort at PhilRice Genebank. From 2012 to 2017, PhilRice Genebank has managed to collect and conserve 4,053 rice germplasms, where in 49.29% was traditional varieties. It was followed by advanced/improved cultivars, breeding lines, farmer's lines, wild cultivars and unidentified biological classification which were mostly donated by farmers. Most of the collections came from Luzon (1,185) where the province of Nueva Ecija has contributed a total of 387 germplasms. On the other hand, 443 rice germplasm collected from Mindanao and 135 germplasm from the Visayas. Currently, PhilRice genebank stores 16,298 rice collections, of which 7,129 were assigned as accessions. The collection of traditional cultivars and indigenous germplasm grown in various rice areas and deposited in a national genebank, will facilitate protection of genetic wealth as well as safeguarding Philippine germplasm's rich diversity.

ORYZA SATIVA; GERMPLASM; GERMPLASM COLLECTIONS; GERMPLASM CONSERVATION; RESEARCH INSTITUTIONS

Characterization of the QTL linked to tungro and green leafhopper resistance in rice (Oryza sativa L.) using advance backcross population. **Waing, F.P.; Pocsedio, A.E.; Fernando, T.C.; Alberto, R. T.; Waing, K.G.D.; Romero, G.O.; Tabanao, D.A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 20-30 (Aug 2016).*

Resistance to rice tungro virus (RTSV) and green leafhopper (GLH) found in the Indian landrace, ARC 11554, was previously localized on the short arm of rice chromosome 4 flanked by markers RM8213 and RM3471. This study aimed to infer the haplotype of the introgression region in backcross lines, determine the backcross line containing the resistance region that is most suitable for developing a mapping population, and narrow down the region of the putative chromosomal position of the resistance QTL using tightly linked molecular markers in an F2 mapping population. Fifty-five backcross line (11 BC sub 2 F sub 6 and 44 BC sub 4 F sub 4) in NSIC Rc138 backgrounds were used for haplotype characterization. Of the 55 lines, 22 backcross lines that resembled the donor region in chromosome 4 were selected for marker similarity analysis. Marker similarity ranged 81-96% among the BC sub 2 F sub 6 and 89-99% among BC sub 4 F sub 4 lines. Mapping population composed of 1,014 BC sub 5 F sub 2 were established from the cross between NSIC Rc138 and ARC138-4-5-5-2-30. The BC5 F2:3 lines were screened for tungro and GLH resistance. QTL detected for RTSV resistance accounted for 17.43% of the total phenotypic variance explained (PVE) and the GLH resistance QTL had a PVE of 19.19%. Two peaks were observed: one on the left side of RM8213 (RM335-RM16428) and a secondary peak on the right (RM16434-RM16497). The primary signal (peak LOD) was located in the RM16425-RM16427 region, the size of which is only 0.5 kb. This confirmed that the very strong resistance of ARC11554 is due to cosegregation of resistance genes conferring resistance to RTSV and GLH.

ORYZA SATIVA; RICE; BACKCROSSING; CHROMOSOMES; RICE TUNGRO VIRUS; TUNGRO DISEASE; NEPHOTETTIX VIRESCENS; GENETIC RESISTANCE; PHENOTYPES; GENETIC MARKERS; GENETIC MAPS

Coconut varietal resistance screening against coconut scale insect under field exposure trial. **Fernandez, E.C.J., Vasquez, M.S.C., Sison M.L.J., Emmanuel, E.E., Rivera, S.M., Rivera, R.L., Lasina, R.S., Delos Santos, L.B., Larupay, J.G.B., Reaño, C.E., Galvez, H.F.** 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. 106-107 (Jul-2018)*.

Host resistance screening of the PCA-ZRC coconut germplasm was performed at East Side area, Isabela City, Basilan [Philippines] under natural insect infestation. The test palms consisting of five seedlings per variety were laid out in three plots under stands of coconut palms heavily and homogenously infested with coconut scale insect (CSI). The coconut germplasm consisted of 23 tall, 24 hybrid, and 25 dwarf varieties. Coconut seedlings were observed for signs of successful infestation of insect crawlers 7 days after transplanting. Monitoring for CSI localization on coconut leaflets and establishment of different development stages were continued every 15, 30 and 60 days. The infested leaflets were rated for percent leaf damage (%LD) for yellowing due to insect feeding. Analysis of Variance (ANOVA) using nested design with variety nested within ecotype and repeated measures analysis revealed that mean %LD is significantly different among ecotypes and among varieties nested within each ecotype. Pairwise mean comparison using Tukey's studentized range test (HSD) with palm means as data showed that January 2016 is the period with the highest variance among all data periods. Subsequently, pairwise mean comparison using Fisher's least significance difference (LSD) with %LD as data were performed for this time period and revealed the most and least preferred varieties among the three coconut ecotypes. Varieties with mean %LD below 40% (mild to moderate resistance) were selected as the least preferred varieties, while varieties with %LD of 100% were identified as the most preferred varieties. Sanchez Mira (SCHT), West African X Tagnanan (WXT x TAGT), and Aguinaldo (AGDT), with mean %LD values of 36.33, 28.5 and 28.06 respectively, were selected as least preferred varieties while Baguer (BAGD), Cameron Red (CRD), and Kiamba (KIAD), all dwarf varieties and with mean %LD of 100% were the most preferred varieties by CSI.

COCOS NUCIFERA; COCONUTS; SELECTION; PEST INSECTS; PEST RESISTANCE; FIELD EXPERIMENTATION; LEAVES; INFESTATION

Combining ability of quality protein maize inbred lines for seedling tolerance to drought stress. **Pfunde, C.N.; Mutengwa, C.S.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 1-12 (Aug 2016).*

Drought stress is a major constraint for maize seedlings in sub-Saharan Africa where temperatures can reach up to 40 deg C following planting. Failure of the plant to withstand drought stress at seedling stage implies that there is a reduced crop stand, which translates to reduced yield. The objectives of this study were to estimate general combining ability (GCA) and specific combining ability (SCA) effects and gene action for morpho-physiological traits of quality protein maize (QPM) inbred lines subjected to seedling drought stress. Twenty-one QPM inbred lines were crossed using a North Carolina mating design II. Forty-five hybrids which produced enough seed were evaluated under optimum and stressed conditions. Three control hybrids were included to make 48 treatments. The inbred lines and 48 hybrids were planted under simulated drought stress conditions in polyvinyl chloride pipes at 25% and 75% of field capacity over 21 d in a randomized complete block design replicated 3 times. General combining ability accounted for a greater percentage of the treatment sum of squares, suggesting that additive gene action was more important than non-additive gene action for the expression of seedling traits under drought conditions. Inbred lines L2, L4, L16, and L18 were the best lines that exhibited high GCA effects, and were also parents to four of the five single crosses with the best

SCA effects for most traits. As a result of their superior GCA and SCA effects under drought stress, these inbred lines are recommended for inclusion in QPM breeding programmes aimed at developing drought tolerant cultivars.

ZEA MAYS; MAIZE; HYBRIDS; INBRED LINES; GRAIN CROPS; DROUGHT STRESS; DROUGHT RESISTANCE; MALNUTRITION; PROTEIN DEFICIENCIES; SEEDLINGS; SEED PRODUCTION; COMBINING ABILITY

Cloning and molecular characterization of chalcone synthase gene from mulberry (Morus alba L.). **Calumpang, C.L.F.; Laurena, A.C.** *Philippine Journal of Crop Science (Philippines) v. 42 (2) p. 1-9 (Aug 2017).*

Two members of the chalcone synthase (CHS) enzyme superfamily of type 3 polyketide synthases (PKSs) are CHS and resveratrol synthase, which synthase flavonoids and resveratrol, respectively, and exhibit health and anti-fungal properties. This study aimed to clone, sequence and analyze partial CHS gene sequences from mulberry (M. alba L.) leaves using designed and published primers. CHS genes were isolated and cloned from mulberry genomic DNA through PCR-based methods using primers based on conserved regions of members of the CHS super family of type 3 PKSs. The 584-bp PCR amplicon generated two CHS clones having high sequence identity (80%) with CHS sequences from other plant sources. Phylogenetic analysis with other plant sources exhibited clustering of both sequences together with other angiosperm CHS sequences, specifically with decots, which is consistent with mulberry classification. The CHS partial sequence corresponded to a 195 amino acid deduced protein, which exhibited several predicted conserved domains, including enzyme activity site and dimer interface. Catalytic and conserved amino acid residues among CHS enzymes were present. Three-dimensional homology modeling predicted a homodimeric protein with high homology to alfalfa CHS crystal structure.

MORUS ALBA; LEAVES; CHALCONES; MOLECULAR CLONING; CLONES; DNA; NUCLEOTIDE SEQUENCE; FLAVONOIDS

Developing next generation submergence tolerant rice breeding lines from single cross PSB Rc10 x NSIC Rc194 (IR64-Sub1). **Concepcion, J.S., Ticman, H.T., Bagarra, J.C., Buluran, R.J.D., Valida, G.D., Balmeo, K.R.P., Santiago, N.D., Ramos, A.V., Bandonill, E.H., Desamero, N.V.** 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. 104 (Jul-2018)*.

With the increasing threat in rice production due to climate change affecting flash flood-prone areas, there is a need to develop new submergence tolerant varieties with high grain yield, biotic stress tolerance, and good grain quality. A total of 160 F sub 1 plants were generated from PSB Rc10 and NSIC Rc194 single cross, wherein 1500 F sub 2 plants were established and subjected to submergence stress evaluation at seedling stage. Subsequent agronomic characterization, line selection, and uniformity evaluation from F sub 3-F sub 6 generations yielded 18 fixed recombinant inbred lines (RILs). Fixed RILs were subjected to comparative field performance under submergence stress at vegetative stage in 2017DS, and evaluated for grain quality and biotic stress resistance. RILs had comparable survival with NSIC Rc194 (98%) and FR13A (99%) ranging from 73% to 100% at 21 days after de-submergence. Yield potential under favorable condition ranged from 4.276

t/ha to 6.409 t/ha averaging to 5.631 t/ha wherein 4 (22%) RILs yielded higher by 12% to 83% compared with parental NSIC Rc194 (2.709 t/ha. A total of 17 (94%) RILs yielded higher 12% to 83% compared with parental NSIC Rc194 (2.709 t/ha). Seven (39%) RILs were identified to have resistance to Rice Blast, 13 (72%) with intermediate resistance to Bacterial Leaf Blight and 14 (78%) with resistance to Tungro under field condition. All RILs were scored as intermediate resistant to stem borer, brown plant hopper, and green leaf hopper. RILs had low to intermediate gelatinization temperature, wherein nine RILs (50%) had intermediate to low amylose content ranging from 16.9 to 21.2. A total of 8 elite RILs were selected based on survival, yield potential, biotic stress resistance, and grain quality and are possible nominees to National Cooperative Testing for submergence condition.

ORYZA SATIVA; INBRED LINES; CROP YIELD; AGRONOMIC CHARACTERS; CROP PERFORMANCE; TESTING; WATER TOLERANCE

Development and characterization of nine new Hibiscus hybrids. **Magdalita, P.M.; Cayaban, M.F.H.; Gregorio, M.T.; Silverio, J.V.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 31-45 (Aug 2016).*

Breeding and selection of a new set of Hibiscus hybrids using imported germplasm and locally available varieties was done to develop varieties with unique flower colors and forms. Nine new hybrid varieties were selected and release based on flower characteristics and plant growth habit. These hybrids include: Hibiscus rosa-sinensis 'Patricia B. Licuanan' belonging to the 'Women in Education Series', a solferino purple flower named after Dr. Patricia B. Licuanan, Commissioner on Higher Education and UP Regent, Hibiscus rosa-sinensis 'St. Bridget College belonging to the 'Women Saints Series' and Institutions named after them is a bluish (RHCC 85A) flower with barium yellow edging and the Centennial Flower of this College; Hibiscus rosa-sinensis 'Araceli A. Dans' under the 'Women Artist Series', is a nasturtium orange flower, named after Ms. Araceli A. Dans, a famous woman artist noted for the 'Calado Series embroidery; Hibiscus rosa-sinensis 'Che-che Lazaro', under the 'Women in Public Service Series' is a strawberry red flower, named after the fearless investigative journalist Ms. Cecilia B. Lazaro. This series also includes: Hibiscus rosa-sinensis 'Pia S. Cayetano', a fuchsia purple flower named after UP regent Pia S. Cayetano and Hibiscus rosa-sinensis 'Vilma Abaya-Dimacuha', an environmentalist and the former lady mayor of Batangas City. The rest of the Hibiscus hybrids belong to the 'Women in Science Series' including: Hibiscus rosa-sinensis 'Fe V. del Mundo', a tangerine orange flower named after Dr. Fe V. del Mundo, a National Scientist for Pediatrics; Hibiscus rosa-sinensis 'Solita F. Camara-Besa', an old rose of red-purple flower named after a well-known medical doctor and educator, and Hibiscus rosa-sinensis 'Ledivina V. Cariño', a bright orange flower named after an accomplished educator and researcher, Dr. Ledivina V. Cariño, Academician of the National Academy of Science and Technology (NAST) of the Philippines.

Development of rapid screening protocol for corn tolerance to calcareous, high pH soils. **Austria, R.E.G., Decalsota, J.C., Ocampo, A.M., Pascual, P.R., Salazar, A.M., Ocampo, E.T.M**. 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. 66 (Jul-2018)*.

Four hundred and sixteen accessions of the Philippine native corn germplasm were screened for tolerance to calcareous high pH soil under field and greenhouse conditions from 2015-2017. Yield performance and plant height, ear height, total ear weight, stand count, number of ears, ear length ,ear diameter, kernel weight, shelling percentage, moisture content, and projected yield (calculated by plot area) were evaluated. Projected grain yield ranged from zero to 9.97 t/ha across all trials conducted in Adlawon, Cebu City [Philippines] (pH 7.2); Sibonga (pH 7.3); and Barili (pH 7.2). It was found from the tray experiments that shoot length and dry matter yield seedlings were significantly and positively correlated (P0.0001, R2.

ZEA MAYS; GERMPLASM; TESTING; CALCAREOUS SOILS; ALKALINE SOILS; STRESS; TOLERANCE; CROP PERFORMANCE; CROP YIELD; AGRONOMIC CHARACTERS; EVALUATION

Differential gene expression analysis of stress-responsive rice PPBG3. Differential gene expression analysis of stress-responsive rice (Oryza sativa L.) LMS mutant using RNA-Seq- based approach. **Undan, J.R., Maron, L., Arbelaez, J.D., Terauchi, R., McCouch, 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. 94 (Jul-2018)*.

The lesion mimic senescence (LMS) mutant in rice (O.sativa) used in this study was identified from population of an elite japonica rice cultivar Hitomebore generated by ethly-methanesulfonate (EMS) treatment. Genetic linkage analysis identified a mutation in Os02g0639000 gene transcript and was named OsLMS. The cDNA libraries was prepared and was sequenced using HiSeq 2,500 (100-bp reads) for RNA-sequencing. Differential gene expression analysis in lms mutant revealed a total of 863 differentially expressed genes in relation to wild type. There are 126 genes exclusively showed transcript abundance and 737 genes were found to have transcript reduction. From the 126 genes that were up-regulated, 123 genes were annotated and are involved in monooxygenase, iron-ion binding, ADP binding, heme-binding activity, protein kinase, serine type endopeptidase, terpene synthase activity and protein phosphorylation. On the other hand, from 737 genes that were down-regulated, 698 were annotated and mostly involved in gene expression, intracellular organelle part, cellular macromolecule biosynthetic process, RNA metabolic process, ribosome, nucleic acid binding and peptide biosynthetic process. Elucidation of the mechanism of each useful group of genes that found up/down regulated in this study would help us further in the understanding of the molecular aspect of stress response of rice and of plants in general.

ORYZA SATIVA; GENE EXPRESSION; TRANSCRIPTION FACTORS; MUTANTS; RNA; STRESS

Diversity analysis of sugarcane (Saccharum officinarum) using Simple Sequence repeat (SSR) markers. **Acedera, J.L.L., Rasco, J.L.S., Mendoza, M.R.R., Abustan, M.A.M., Lalusin, A.G.** 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. 105-106 (Jul-2018)*.

Since its release in 2013 through the Department of Agriculture, the web-based decision support tool Rice Crop Manager Philippines (RCM; http://webapps.irri.org/ph/rcm/) has consistently shown that farmers can increase their yields and profits through field- and season-specific nutrient management, which involves

recommending fertilizer NPK for a targeted yield level and, more importantly, proper timing of fertilizer N application. From 2013 to 2017, 760 on-farm field experiments were conducted for irrigated (90%)and rainfed (10%) rice for seven cropping seasons in eight provinces across the Philippines. The performance of the nutrient management component of RCM in terms of grain yield and added net benefit was compared to the farmers' fertilizer practices (FFP). Across locations and agro-ecologies, RCM proved to increase yield by 359 kg/ha/season (428 in the DS, and 289 in WS) with an added net benefit of 5101 PhP/ha/season (6158 in the DS, 4015 in the WS) compared to FFP. Further classification based on measured yields from FFP show that lower yielding farmers reap more benefits from RCM than higher yielding farmers. Farmers who typically yield less than 4.0 t/ha obtained greater increases in yield and added net benefit (610 kg/ha/season; 9138 PhP/ha/season; 20% of 760) than farmers who typically yield greater than 6.0 t/ha (182 kg/ha/season; 2640 PhP/ha/season; 24% of 760). Based on agro-ecology, RCM provided a slightly higher increase in yield and added net benefit for rainfed (377 kg/ha/season; 5564 PhP/ha/season) than for irrigated (357 kg/ha/season; 5048 PhP/ha/season) rice. Despite the low percentage of rainfed trials from 2013 to 2017, RCM has since expanded its trials to more rainfed location across the Philippines. In order for RCM to provide more benefits to rice farmers across the Philippines, regional and local agricultural extension workers using RCM should be targeting farmers who typically yield 4 t/ha and below as well as farmers growing rainfed rice.

SACCHARUM OFFICINARUM; SUGARCANE; GENETIC MARKERS; GENETIC DISTANCE; GERMPLASM

DNA fingerprinting of National Seed Industry Council (NSIC) related sweet potato (Ipomoea batatas (L.) Lam). **Bañega, S.F., Abustan, M.A.M., Mendoza, M.R.DLR., Lalusin, A.G.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings, Legaspi City, Albay (Philippines). *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 106-107 (Jul-2018)*.

Sweet potato varieties (25) registered in the National Seed Industry Council (NSIC) were used in the study. DNA fingerprinting, a method that is more accurate than morphological characterization was conducted in order to distinguish the twenty five NSIC released sweet potato varieties. Ten Ipomoea-based Simple Sequence Repeats (SSR)primers were screened. A range of 100-320 base pairs were observed across all loci and a total of 49 alleles were scored, wherein 48 were polymorphic and one was monomorphic. Statistical analyses revealed a mean value of 11.19 alleles per locus. Low to moderately high allelic frequencies were obtained in all primers except in IBSSR08. The highest PIC value was obtained in IBS11 with a value of 0.96. A phylogenetic diagram was constructed and eight main clusters at similarity coefficient 0.50 were formed. From the banding patterns generated across the ten loci, it was observed that each locus has a unique banding pattern in each genotype. Unique fragments were amplified in few of the sweet potato varieties were determined which will be useful for the identification, differentiation of varieties and marker assisted breeding programs of sweet potato.

IPOMOEA BATATAS; VARIETIES; DNA FINGERPRINTING; CHROMOSOME BANDING

Enhanced organic phosphate utilization by over-expression of OsACP1 [gene coding phosphatase isolated from Oryza sp.] and OsPAP1 [O.sativa purple acid phosphate 1] genes in rice (Oryza sativa L.). **Woon-Ha Hwang;**

Soo-Kwon Park; Dong-Jin Shin; Manigbas, N.L.; Min-Hee Nam; In-Jung Lee; Don-Hoon Kim. *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 17-23 (Apr 2015).*

Phosphorus is one of the most important macro-elements for plant growth and development. It can easily combine with other minerals, however, when converted into insoluble form, phosphate may not be available for plant use. Among insoluble phosphates, organic phosphate (Po) accounts for 20-80% of the total phosphate on soil. Po should be hydrolyzed by phosphatases so that it can be absorbed by plants. OsACP1 (gene coding phosphatase isolated from Oryza sp.) and OsPAP1 (O.sativa purple acid phosphate 1) genes (gene coding phosphatase isolated from Oryza sp.) have been studied in rice, while their function has not been fully investigated. In this study, transgenic rice, OsACP1-OX1 and OsPAP1-OX, were generated by Agrobacterium-mediated transformation in the Japonica rice cultivar Dongjinbyeo to determine the utilization and uptake of Po by over-expression of endogenous. OsACP1 and OsPAP1 genes. Transgenic lines were selected based on the OsACP1 and OsPAP1 gene expression. Homozygous plants of the T3 generation were used. Transgenic plants with over=expression of OsACP1 and OsPAP1 showed higher phosphatase activity than the wild type. Po is then hydrolyzed such that more Pi is absorbed in the transgenic plants than the wild type. Plant height and tiller number were increased by 120-200% in the transgenic plants. These results indicate that OsACP1 and OSPAP1 could enhance the organic phosphate uptake and utilization in rice and ultimately increase efficiency in phosphate used and increase productivity.

ORYZA SATIVA; RICE; VARIETIES; ORGANIC FERTILIZERS; PHOSPHATE FERTILIZERS; TRANSGENIC PLANTS; GENE EXPRESSION; NUTRIENT UPTAKE

Evaluation of cassava (Manihot esculenta Crantz) varieties for growth parameters, yield, and development of postharvest physiological deterioration. **Sazon, L.A., Abustan, M.A., Mendoza, M.R. 48.** Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 88 (Jul 2018).*

The study was conducted in the experimental field of the Institute of Plant Breeding located in Tranca Bay, Laguna [Philippines] from June 2017 to April 2018. The experiment aimed to evaluate the growth parameters, yield and development of postharvest physiological deterioration of 14 new and two check cassava varieties. It was laid out in a randomized complete block design (RCBD) with three replications. Results showed significant differences in mean plant height, height at first branching and angle of first branch at a= 0.05 with values ranging from 23cm-306cm, 41cm-144cm and 22 deg C-41 deg C respectively. No significant differences were observed in the weight of marketable and non-marketable root and harvest index. However, 10 out of 14 new varieties obtained relatively higher yield than the two check varieties in terms of marketable yield with mean yield between 24.83 t/h-40.14 t/ha. In terms of postharvest physiological deterioration (PPD), the varieties exhibited PPD ranging from 5% to 58%. Out of the fourteen new varieties lower mean PPD were observed in 3 entries compared to KU50 (check variety) and 11 varieties showed higher mean PPD than Lakan 1 (check variety). The results of the study suggest that the 14 entries evaluated are promising cassava varieties for possible cultivation to enhance farmers' production.

MANIHOT ESCULENTA; VARIETIES; EVALUATION; GROWTH; CROP YIELD; POSTHARVEST PHYSIOLOGY

Evaluation of sterility expression of thermosensitive genic male sterile (TGMS) rice (Oryza sativa L.) lines. **Lopez, P.I.M., Dela Rosa, A.M., Solis, R.O., Hernandez, J.E.** 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. 93 (Jul-2018)*.

Use of TGMS can be a commercially viable approach for two line-hybrid rice seed production because of its simplicity in terms of parental seed multiplication and broader choice of parents for hybrid development. The stability of sterility of TGMS lines in the target environment is an important parameter that must be established to ensure the production of pure hybrid seeds. Evaluation of TGMS lines is important in identifying stable lines that minimize the risk of producing impure hybrids due to fluctuations in temperature at critical periods. In this study, three TGMS lines planted at different sowing dates were evaluated for sterility expressions during 2016 wet season, in Calauan, Laguna [Philippines]. Sowing was conducted weekly from first week of May to last week of July in order to observe stability of the sterility expression. Pollen sterility for TG1 and TG3 remained within the range of sterile to completely sterile whereas TG2 ranged from partially sterile to completely sterile across different sowing windows. On the other hand, spikelet sterility ranged from 98% to 100%. TG1 remained completely sterile across sowing windows compared to the other 2 lines. In addition to this, the basic agronomic traits such as number of days to flowering, plant height and number of productive tillers were gathered. The days to flowering for TG1 is 91 days with the mean height of 90.7 cm. TG1 showing both good sterility expression and agronomic traits, is an ideal female parent to use both for parental line development and F1 seed production in Calauan, Laguna from May to July sowing windows. Further evaluation of their sterility as well as fertility restoration under wider range of environments and broader sowing windows is recommended.

ORYZA SATIVA; PROGENY; GENES; GENE EXPRESSION; POLLEN; SPIKELETS; PLANTING

Genetic divergence of South East Asian rice varieties revealed by simple sequence repeat (SSR) markers. **Raneses, M.A.M., Caguiat, X.G.I., Ferrer, M.C., Alfonso, D.O., Santiago, J.C., Bulatao, R.M., Nombrere, J.M., Castro, J.R., Vilayheuang, K., Devarajan, T., Kamaruzaman, R., Mulya, K., Lestari, P., Sabran, M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 109-110 (Jul 2018).*

Rice is one of the oldest domesticated crops with rich genetic diversity. Genetic information of this germplasm is a prerequisite in crop breeding programs. Thus, the study aimed to assess the genetic diversity of 100 rice germplasm composed of local, improved and check varieties from South-East Asian countries (Indonesia, Malaysia, Laos and Philippines) through simple sequence repeat (SSR) markers. Genetic diversity among the entries is 43%. The number of alleles per microsatellite locus ranged from 2 to 5, averaging 3.2 alleles per locus. Polymorphism information content (PIC) values ranged from 0.17 (RM25934) to 0.71 (RM144) with an average of 0.42. The UPGMA cluster analysis showed the 100 varieties grouped into two major clusters with seven groups at 0.70 similarity coefficient. Majority of the Philippine rice varieties grouped in clusters 1 and 7

while large number of varieties from Indonesia and Laos are in clusters 3 and 4. On the other hand, varieties from Malaysia were clustered in 5 and 6. Moreover, the highest similarity (0.96) was observed between Widas (Indo20) and Inpari HBD (Indo21), Sekembang (Mal 10) and MR 81 (Mal17), Beua nam (Laos14) and Nam yen (Laos15), Wagwag raois (Phil13) and Katsyam tabao (Phil16). However, lowest similarity (0.24) was obtained between Telurikan (IndoC2) and Ria (Mal3), Ria (Mal3) and Limbayan (MalC1). The study showed variability of 100 rice germplasm that would be useful for varietal improvement through the use of 20 SSR markers. Information on the genetic variability at molecular level is suitable to identify, develop and acquire genetically unique germplasm that compliments existing cultivars. This information will benefit the plant breeders especially in countries of Southeast Asia in choosing varieties for generating new inbred and hybrid lines.

ORYZA SATIVA; VARIETIES; GENETIC VARIATION; GENETIC MARKERS; GERMPLASM; SOUTH EAST ASIA

Genetic diversity and geographic dispersion in Thymus spp. as detected by RAPD [Random Amplified Polymorphic DNA] markers. **Yousefi, V.; Najaphy, A.; Zebarjadi, A.; Safari, H.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 82-88 (Apr 2015)*.

Thyme, as an aromatic medicinal plant and a perennial and woody herb Lamiaceae has commercial, pharmaceutical and perfumery potentialities. Thymus is taxonomically a very complex genus with high frequency of hybridization and introgression among sympatric species, and some species of this herb are endemic to Iran. From the chemical point of view, important biochemical components such as thymol and carvacrol are known in thyme. In the present study, 13 Thymus spp. accessories collected from different geographic areas of Iran along with one accession from England (Thymus vulgaris) were analyzed by Random Amplified Polymorphic DNA (RAPD) markers using 20 primers to discover genetic polymorphism. A total number of 510 bands were detected from 20 RAPD primers, of which 483 (94.315) were polymorphic with an average of 24.15 polymorphic bands per primer. The size range of the amplified products was 200-4000 bp. UPGMA cluster analysis was carried out using Jaccard similarity coefficients based on PAPDS. The dendrogram obtained from the method classifies the 14 thymes accessions into four major groups. Scatter biplot based on principal coordinate analysis (PCoA) also revealed four groups and confirmed the results of clustering method with some minor disagreements. The accessions were relatively grouped according to the location where they had been collected. The molecular variation assessed in the study could elucidate largely geographic dispersion of the thyme accessions, and in combination with biochemical characteristics, can be useful to improve the efficiency of selection and breeding programs.

THYMUS (GENRE);THYME; SPECIES; GENETIC RESOURCES; GENETIC MARKERS; RAPD; DRUG PLANTS; GENETIC POLYMORPHISM; MEDICINAL PROPERTIES; CHEMICOPHYSICAL PROPERTIES

Genetic diversity of spinach (Spinacia oleracea L.) landraces from the Center of Origin, Iran. **Sabaghnia, N.; Asadi-Gharneh, H.A.; Mohebodini, M.; Janmohammadi, M.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 38-45 (Apr 2018)*.

Eighty one Iranian spinach landraces accessions were evaluated for 13 agro-morphological traits. Data from 2 yr experiment of the native accessions were subjected to multivariate analysis using cluster analysis. The

dendrogram of cluster analysis in both years revealed eight and nine major groups, respectively. The highest variations were recorded for days to flowering, leaf area, number of lateral branches, 1000-seed weight and leaf yield traits. Twelve genotypes were identified as favorable genotypes due to their high values for most of measured traits especially leaf yield performance. The observed genetic differences among the investigated landraces are potentially significant to breeding program for obtaining high leaf yield cultivars and it may be achievable though hybridization of the contrasting forms from distinct clusters. The study raised the possibility that selection based on the morphological traits would be advantageous for recognition of high productive genotype(s).

SPINACIA OLERACEA; SPINACH; GENETIC VARIATION; GERMPLASM COLLECTIONS; LEAVES; AGRONOMIC CHARACTERS; EVALUATION; SELECTION; IRAN ISLAMIC REPUBLIC

Genotypes differences in sap bleeding rate among diverse rice cultivars under different soil moisture conditions. **Cabral, M.C.J.; Niones, J.M.; Kano-Nakata, M.; Suralta, R.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines). v.43 (Supplement no. 1) p. 67-68 (Jul 2018)*.

ORYZA SATIVA; VARIETIES; GENOTYPES; SAP; NUTRIENT TRANSPORT; WATER UPTAKE; DROUGHT; SOIL; SOIL WATER CONTENT; WATERLOGGING

Soil water uptake, one of the key determinants for drought adaptation is largely dependent on root system developmental responses to water deficit. Bleeding sap is a manifestation of root pressure related to physiological traits of the root system. This study evaluated the sap bleeding rate of eight rice genotypes with diverse root responses under various soil moisture conditions and determined the effects on yield. The genotypes were established in the field in split plot design in RCBD under two water stresses: continuously waterlogged (CWL) and progressive drought (PDR) stress and grown until maturity. Xylem sap sampling was done at flowering stage between 7:00-9:00am using pre-weighed cotton towel placed on the cut surface of the stump and wrapped in plastic film with rubber band. The cotton was weighed again after 1 hr and the increase in weight was used to compute the sap bleeding rate. There were significant interactions between genotypes and water stress on sap bleeding rate. Relative to CWL, rice varieties DRS63 and NSIC Rc158 had significant increase in sap bleeding rate by 31.1 and 12.5% under PDR while the other genotypes showed significant reductions ranging from 46.8 to 96.3%. Drought significantly reduced shoot biomass and yield in most genotypes except in DRS63, KDML 105, Kinandang Patong and YTH304, relative to CWL control. Yield positively correlated with sap bleeding rate under drought while the two traits were negatively correlated under CWL. The results indicate that higher sap bleeding rate under drought during flowering may imply that some genotypes adapted to drought (e.g. DRS63) may have the ability to efficiently regulate soil water uptake during earlier growth stage and make it readily available at critical stage such as during the post flowering drought and hence increase in sap bleeding rate. Further data analysis and studies are being conducted to validate the initial findings.

Grain yield and agronomic efficiency of UPLB [University of the Philippines Los Banos] rainfed lowland rice breeding lines. **Sobreviñas, A.E., Briz, C.M., Magnaye, A.M.A., Malabanan-Bauan, K.B., Lalican, D.J., Sta. Cruz, P.C., Borromeo, T.H., Hernandez, J.E.** 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. 64-65 (Jul-2018)*.

Fertilizers are applied to provide plants with the optimum amount of nutrients to attain desired yield. Not all of the nutrients applied are used by the plant translated to increase in yield, and this could be a factor of the plant genotype. Plant breeders aim to develop cultivars that can translate nutrient application to yield increase efficiently. In this study, a nutrient use experiment was conducted in 2017 in Los Baños, Laguna [Philippines] to evaluate the yield performance and nutrient use efficiency of 10 UPLB-bred rainfed rice breeding materials under three fertilizer levels (0-0-0 kg/ha NPK, 120-60-60 kg/ha NPK and 60-30-30 kg/ha NPK ranged from 3.24% was 2164.87% kg/ha and yield increase from 0-0-0 to 120-60-60 kg/ha NPK ranged from 3.24% to 106.93%, with the highest yield increase obtained from Purification Line 2. Nutrient use efficiency was measured in terms of agronomic efficiency (AE), which measures the impact of nutrient application to yield. At 120-60-60 kg/ha NPK, mean agronomic efficiency was 3.83 kg grain per kg nitrogen (AEN) and 7.66 kg grain per kg phosphorus (AEP) and potassium (AEK). At 60-30-30 kg/ha NPK, mean AEN was 3.09, and mean AEP and AEK were 6.19. Among genotypes, highest AE for nitrogen, phosphorus and potassium were observed at 60-30-30 kg/ha NPK for Purification Line 2: AEN at 11.2, and AEP and AEK at 22.49. High nutrient use efficiency of breeding materials can be useful factor to determine parentals in developing rice cultivars that are nutrient-responsive in terms of yield performance.

ORYZA SATIVA; VARIETIES; PROGENY; RAINFED FARMING; GRAIN; YIELD INCREASES; NUTRIENT UPTAKE; NPK FERTILIZERS; FERTILIZER APPLICATION

Heterosis of intra and inter-group F sub 1 rice hybrids derived from genotypically-clustered parentals. **Valdez, J.P.C., Gramaje, N.V., Agustin, A.M.L.** 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. 103-104 (Jul-2018)*.

With the concept of heterosis, hybrid rice breeders maintain hundreds to thousands of genotypes and continue to acquire more to expand the diversity of parentals to increase the chance of developing heterotic hybrid. With the advent of molecular markers, identification of variation between two parents or even thousands of parents becomes more accurate. Grouping or clustering of parentals or even thousands of parents becomes more accurate. Grouping or clustering of parentals using molecular data is proven effective in developing heterotic hybrids. In PhilRice Hybrid Breeding, parentals were grouped or clustered using molecular data. Hence, this study was conducted to evaluate the field performance of inter-group and intra-group hybrids that were clustered using molecular data. A total of 53 entries composed of 14 inter-group hybrids, 15 intra-group hybrids, 22 parentals, 1 hybrid check, and 1 inbred check were evaluated in the field during 2018 DS following RCBD with two replications. Results showed that in terms of grain yield, 60% in inter-group hybrid had at least 5% mid-parent heterosis while only 42% for intra-group. For check heterosis, 90% in inter-group hybrids had at least 5% yield advantage over hybrid check while only 75% in intra-group hybrid;

and 80% in inter-group hybrid had at least 15% yield advantage over inbred check while only 75% in inta-group hybrids. The results showed that there is higher chance of generating heterotic hybrids in inter-group hybrids than in intra-group crosses.

ORYZA SATIVA; HYBRIDS; HETEROSIS; GENOTYPES; GRAIN; YIELDS; GENETIC MARKERS; CROP PERFORMANCE; EVALUATION

Identification of tightly-linked markers for the genic male sterile gene of ms-IR36 in rice (Oryza sativa L.) **Zhou, L.; Liang, S.; Ponce, K.; Ye, G.; Zhao, X.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 1-7 (Apr 2015).*

Recurrent selection is being adopted by rice breeders to broaden the genetic diversity of the breeding population, quickly assemble desirable alleles from multiple sources and increase the chance of obtaining outstanding recombinants. Nuclear male sterile genes can be utilized in recurrent selection to facilitate intermating. A male sterile mutant of the popular variety IR 36, ms-IR36 is used in most recurrent selection programs in rice to facilitate intermating and eliminate hand emasculation. The male sterility of ms-IR36 was conferred by a recessive nuclear gene, designated as ms. In this study, selective genotyping applied to an ms-IR36/Jamaica 3 F2 population locvated to ms gene onto the short arm of chromosome 2. Using 565 male sterile plants from selected F3 families of ms-IR36/Zileng 8-3, the ms gene was fine mapped to a 28-kb region between SSR markers, RM12351 and RM12354 with genetic distances of 0.8 and 0.09 cM. Six markers tightly linked to the ms gene were used in the development of new male sterile lines through backcrossing, tightly linked markers can be used in selecting homozygous fertile plants from recurrent selection programs.

ORYZA SATIVA; RICE; MALE INFERTILITY; GENES; GENETIC VARIATION; BREEDING METHODS; GENETIC MARKERS

Influence of high temperature on chlorophyll fluorescence and its varietal variation in rice**. Aung Kyaw Phyo, Nam-Jing Chung**. *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 59-68, Apr 2017*. 14 graphs; 1 table. Bibliography (58 ref). Received Feb 2019. UPLB Main Library, College, Laguna (Philippines)

This study was carried out to find varietal response to heat stress by chlorophyll fluorescence. Chlorophyll fluorescence is closely correlated with photosynthetic rate. Field-grown rice were dug up at the grain filling stage, and moved to the plant growth chamber, where the temperatures were set up one after another starting from low to high temperature (25 approx 45 deg C). Fo, Fm and Fvl Fm were measured after the first dark-adaptation, and OJIP transient was measured after the second dark-adaptation. Results showed that, in all cultivars, maximum quantum efficiency of PSII phytochemistry (FvlFm) and the area above the fluorescence transient decreased as temperature increased, and both dropped abruptly at 45 deg C indicating the damage occurred in the PSII center. Among rice cultivars, damages to photosynthetic apparatus as suggested by maximum quantum efficiency of PSII phytochemistry and OJIP transient curves, which imply the presence of varietal variation in heat tolerance of rice photosynthesis. 99\4

ORYZA SATIVA; RICE; VARIETIES; HEAT; FLUORESCENCE; CHLOROPHYLLS; HEAT TOLERANCE

Leaf counting: an effective seed production technique of ensuring flowering sychronization of hybrid rice parents. **Gramaje, L.V., Luciano, V.P., Ablaza, M.S.F., Duran, P.L.H., Caguiat, J.D.** 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. 117-118 (Jul-2018).*

Producing enough seeds from hybrid seed production areas is a bottleneck in achieving sufficient supply of hybrid seeds for commercial cultivation. Because parental lines of rice hybrids usually differ in their growth duration, obtaining a well synchronized flowering is a major problem. Synchronization of flowering is key in achieving high seed yield in hybrid seed production. However, synchronization of flowering is difficult to achieve and highly dependent characteristics of both the parents (particularly maturity) and highly affected by external factors such as fertilizer and water management, and even stresses. Usually, synchronization is improved by manipulating planting dates (staggered sowing), fertilizer management water management, and GA sub 3 application . A new and improved technique called 'leaf number determination' was developed by Chinese breeders to optimize synchronization of flowering of hybrid parents. The study was conducted at PhilRice CES. Specifically, it aims to determine the number of leaves that coincide with the initial heading for both parents and improve flowering synchronization of PhilRice-bred hybrids. A total of six parent lines composed of three CMS and three restorer (IR80559A x PR34302, IR79128A x PR31559 and IR68897A x IR73013), were established in replicated trial by row crossing method of AxR seed production. Leaf counting started when first true leaf emerged up to flag leaf emergence. Leaf number was recorded every three days to 10 sample plants per entry. Only main culm leaves were counted. Analysis of variance for number of leaves at flag leaf emergence revealed significant differences among parent lines. Across combinations, IR80559A x PR34302 had 0.7 leaf difference, 0.59 for IR79128A x PR31559 and 1.5 leaf difference was observed to IR68897A x IR73013 cross combination. The result can be the basis of sowing interval in AxR seed production. Leaf count method can be instrumental in flowering synchronization of hybrid parent lines.

ORYZA SATIVA; HYBRIDS; FLOWERING; SYNCHRONIZATION; LEAVES; SEED PRODUCTION

Local adaptability tests of promising inbred under Isabela [Philippines] condition. **Pasicolan, H.R., Gawat, N.R**. 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. 94-95 (Jul-2018).*

The province of Isabela is one of the major rice granaries in the Philippines. The physical area for irrigated rice land is 161,723 hectares (PAS2015). Average yield in Isabela is 4.46 t/ha (PAS 2014) which is slightly greater than the national average of 4.28 t/ha (PhilRice Statistics 2002). Farmers in Isabela grow several varieties of inbred rice every season. Hence, there is a need to continuously evaluate promising inbreds in order to come up with a location specific varietal recommendation. The trial was established under direct seeded and transplanted rice culture at PhilRice-Isabela during the 2017 dry and wet seasons following the randomized complete block design with three replications. Promising entries were evaluated in terms of yield potential, agronomic characteristics and resistance to insect pests and diseases. During the dry season of the direct seeded rice culture, HHZ3-SAL13-YL1-SAL1 (99264.33 kg/ha) significantly out yielded all the test entries While during WS, C9386-B-7-2-3 (7653.52) kg/ha, obtained the highest yielder. This entry garnered a yield advantage

of 5.69% over the best check NSIC Rc222 (7240.84 kg/ha). During the dry season of the transplanted rice culture, HHZ3-SAL13-YL1-SAL1 (9,096.66 kg/ha) significantly out yielded all the test entries followed by IR10A323 (8751.39 kg/ha) and IR09N538 (8575.50 kg/ha). While during the wet season IR09A136 (7931.21 kg/ha) out yielded all the test entries. HHZ3-SAL13-YL1-SAL1, performed well during dry season for both direct seeded and transplanted rice culture. While during wet season IR09A136 performed well both DSR and TPR, and C9386-B-7-2-3 for DSR wet season in San Mateo, Isabela. These data will be used to supplement NCT evaluation for possible release of these promising inbred lines.

ORYZA SATIVA; INBRED LINES; ADAPTABILITY; DIRECT SOWING; TRANSPLANTING; CROP YIELD; EVALUATION; WET SEASON; DRY SEASON; PHILIPPINES

Mass screening of rice under intermittent reproductive drought. **Marcelo, V.A.C., Niones, J.M., Desamero, N.V.** 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. 93-94 (Jul-2018).*

Drought is major abiotic constraint in rice reproductive phase which could significantly reduce grain yield. One strategy to effectively develop drought tolerant genotypes is to screen rice under targeted population environment. Efficiency of selection not only depends on high yield but its combination with good drought response and correlated traits. Field studies were conducted in a period of three years (2015-2017) to phenotype and identify advance breeding lines with tolerance to drought stress. A total of 3238 test entries were screened wherein 305 (9.4%) genotypes were selected based on high yield/plant (greater than or equal to 10 g/plant), good phenotypic acceptability (PAcp less than or equal 5), moderate to high drought tolerance (leaf rolling score (LRS) less than or equal to 3 and leaf canopy temperature (LCT) of 24 deg C-36 deg C) under two to three cycles of reproductive drought (greater than or equal to-21 kPa at 10% soil moisture) along with significantly moderate to high correlated traits to yield that were confirmed with principal component, cluster and correspondence analyses. Yield per plant of advanced lines range from 0-42.2 g, averaging on 7.3 g, with 547 genotype (17%) yielding higher than tolerant check, PSB RC68 (11.2 g/plant). To date the selected genotype putatively tolerant to reproductive drought stress have been advanced to both divergent water trials in observational nurseries (150 test entries) and 30 lines under multi-environmental testing in rainfed lowland drought-prone environments.

ORYZA SATIVA; TESTING; SELECTION; PLANT POPULATION; ENVIRONMENT; DROUGHT

Mestiso 29 (NSIC Rc244H), a PhilRice-bred three-line hybrid rice variety (Oryza sativa L.) for irrigated lowland ecosystem. **dela Cruz, I.A.; de Leon, J.C.; Rigor, A.T.; Baldedara, L.S.; Gramaje, L.V.; del Rosario, C.D.; Ablaza, M.S.F.; Carampatana, J.E.; Tabanao, D.A.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 75-80 (Aug 2014).*

The success of exploiting heterosis in rice as a key approach to curbing rice shortage by increasing domestic production necessitates the availability of adapted superior hybrids. The study aimed to evaluate the morpho-agronomic merits, grain yield potential, grain quality and reaction to biotic stress of Mestiso 29 (M29) against

an inbred check (PSB Rc82) and a hybrid check (Mestiso 7). Hybrid variety development was done by crossing standards testers with assembled male parents on the source nursery. Progency of the IR68897A x PR34302R cross exhibited positive heterosis in the testcross and re-testcross nurseries and was advanced for performance testing. The promising hybrid underwent a series of grain yield potential, phenotypic acceptability and adaptability evaluation in multiple locations, for 7 seasons, with the designation PR36020H. Following the successful national testing and panel evaluation PR36020H, developed by the hybrid rice breeding program of PhilRice, was released as NSIC Rc244H in 2011, locally known as Mestiso 29. M29 matured earlier than PSB Rc82 (110 DAS) was shorter than both checks (104 cm), recorded relatively high average grain at 7.03 t/ha and attained maximum yield of 10 t/ha. It demonstrated superiority over PSB Rc82 by 18 .4% with season means and 27.1% during the wet seasons (WS), and gained positive yield advantage of 10.2% over Mestiso 7 during the WS. The grains are long (7.2 mm) and slender (2.1 mm) with intermediate amylose content and other qualities comparable to that of PSB Rc82. M29 was softer and smoother than PSB Rc82 in cooked form but gained lower acceptability rating than Mestiso 7 by least 20% in both raw and cooked form. It was more susceptible to blast and sheath blight that both checks not more resistant to bacterial leaf blight than Mestiso 7. This variety was recommended for national cultivation in both dry and wet seasons, under the irrigated lowland ecosystem following transplanted culture, except for areas with incidence of bacterial leaf blight, blast and tungro.

ORYZA SATIVA; RICE; VARIETIES; HYBRIDS; IRRIGATED FARMING; LOWLAND; HETEROSIS; BREEDING METHODS; AGRONOMIC CHARACTERS; GRAIN; YIELDS

Molecular characterization of Hoya mindorensis Schlechter by microsatellite markers. **Widiarsih, S.; Siar, S.V.; Lalusin, A.G.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 58-64 (Aug 2014).*

Hoya mindorensis Schlechter is an ornamental plant endemic to the Philippines. The aim of this study was to identify microsatellite primers that could discriminate different accessions of H. mindorensis and to determine the genetic diversity in those accessions. Sixteen accessions collected from different areas in the Philippine were used as plant materials. Since no microsatellite primer has been established for Hoya genus, 12 primer in Amsoniakearneyana (Apocynaceae) were utilized. Among them, four compatible SSR markers were successfully transferred. An average of 6.5 bands per primer set was obtained, 4.75 of it was polymorphic. The total polymorphic bands obtained were as high as 73.1%. The molecular characterization suggested that these accessories can be grouped by Jaccard similarity test into four clusters. Further studies utilizing the four compatible primers to analyze genetic diversity within other species of Hoya or among species of Hoya genus was suggested to check whether the primers would also be transferable to other Hoya species or only to H. Mindorensis.

ASCLEPIADACEAE; ORNAMENTAL PLANTS; INDIGENOUS ORGANISMS; MICROSATELLITES; POLYMORPHISM; GENETIC VARIATION

Molecular characterization of taro [Colocasia esculenta (L.) Schott] using microsatellite markers. **Rasco, J.L.S.; Mendoza, M.R.R.; Abustan, M.A.M.; Lalusin, A.G.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 65-73.(Dec 2016)*.

Diversity of 46 taro [Colocasia esculenta (L.) Schott] accessions from the National Plant Genetic Resources Laboratory, Institute of Plant Breeding-Crop Science Cluster was analyzed using simple sequence repeats (SSR) to identify genetically different accessions that can be used as parents for taro varietal improvement. High quality DNA was isolated following modified Doyle and Doyle extraction protocol for taro and used for polymerase chain reaction (PCR). Fifteen sets of SSR primers based on taro, cassava and citrus sequences were used to amplify fragments. From these SSR primers, 10 resulted to band amplication. Polymorphic Information Content (PIC) was computed based on the bonding pattern produced. It ranged from 0.69-0.96 which indicated high genetic diversity. A dendrogram generated using NTSYS-pc formed 8 clusters using Jaccard's coefficient at 0.72. Among the clusters, there was no association between geographic origin and genotypes of germplasm resources observed. The results suggest that the accessions even within location are diverse, hence, can be used for taro breeding programs.

COLOCASIA ESCULENTA; TARO; DNA; GENETIC MARKERS; GENOTYPES; GERMPLASM; GENETIC VARIATION

Molecular characterization of transgenic rice (Oryza sativa L.) plants overexpressing mesophyll-specific carbonic anhydrase gene. **Mercado, M.A., Bagunu, E., Anonuevo, J.J., Montecillo, F., Reyes, J., Balahadia, C.P., Lin, H., Xin, Y., Coushoff, S., Quick, W.P**. 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. 61-62 (Jul-2018)*.

Carbonic anhydrase is an important enzyme in C4 photosynthesis, catalyzing the conversion of carbon dioxide to bicarbonate in the mesophyll cytosol. In this study, IR64 rice plants transformed with Maize carbonic anhydrase 1 gene driven with ZmPEPC promoter for mesophyll cytosol-specific expression and tagged with AcV5 epitope tag (ZmCA1-AcV5) were evaluated using different molecular techniques. Genomic PCR results showed 24 positive plants for the transformed gene. Immunoblotting showed protein expression in 16 out of 24 PCR positive plants. Varying copy number of genes was also observed in the Southern blot analysis. Cytological immunolocalization of cross-section of rice leaf samples showed strong protein expression of ZmCA1-AcV5 in cytosol of both mesophyll and bundle sheath cells of rice. T0 rice plants expressing the ZmCA1-AcV5 will be advanced for further screening and will later on be used as parent material for the gene-stacking of C4-photosynthesis related genes in rice.

ORYZA SATIVA; C4 PLANTS; TRANSGENIC PLANTS; GENES; GENE EXPRESSION; CARBONATE DEHYDRATASE

Morpho-agronomic and molecular characterization of hybrid rice NSIC Rc318H (Mestiso 48). **Garcia, K.A.A.; Caguiat, J.D.; Gramaje, L.V.; Millas, R.A.; Ablaza, A.S.F.; Baldedara, L.S.; dela Cruz, I.A.; Rigor, A.T.; Tabanao, D.A.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 69-77 (Apr 2018).*

Exploitation of male sterility genes in hybrid rice substantiates heterosis and increased vigor in F1 hybrids. Selection pressure on a limited number of traits during line development has resulted to similar morphological features among modern rice varieties with phenotypic and genotypic characterization being the best way to effectively factor out obscurity. This study aimed to evaluate grain yield and quality, characterize morpho-agronomic traits, assess reaction to biotic stresses, and to determine the molecular profile of Mestiso 48. Data

indicated that it exhibited more than 15% yield advantage over the check Variety, PSB Rc82, in 50% of the valid trials across regions. Its long and slender grains are comparable with the check but have slightly higher amylase content. Sensory evaluation revealed that a panel of consumers preferred Mestiso 48 over PSB Rc82 and IR64 in its cooked state at 73.9%. Its plants are slightly taller than PSB Rc82 at 109 cm and mature at 110 d after sowing across seasons. Generally, Mestiso 48 is moderately resistant to green leaf hopper and shows intermediate reaction to brown plant hopper and yellow stem borer. Molecular characterization revealed that Mestiso 48 and its female parent are indica whereas its male parent is japonica. This evidence not only explains the superior performance of this particular hybrid, but also justifies the necessity to consider heterotic groupings in breeding programs. Both parent lines and the hybrid were observed in a subcluster composed of improved varieties in a phylogenetic tree which inferred high levels of genetic similarity. It was released by the registry number NSIC Rc318H. Since then, it has set the standard for hybrid rice varieties not only for the breeding program at the Philippine Rice Research Institute, but also on a national level through the National Cooperative Testing. Farmers have responded positively to Mestiso 48 in participatory varietal selections in multiple sites across the country since 2015 wet season.

ORYZA SATIVA; RICE; HYBRIDS; GENOTYPES; PHENOTYPES; MALE INFERTILITY; AGRONOMIC CHARACTERS; GRAIN; YIELDS; QUALITY; ORGANOLEPTIC ANALYSIS

Morphological and dry matter yield of rice genotypes in response to drought stress and rewatering at vegetative stage. **Faustino, G.P. ; Hernandez, J.E.; Desamero, N.V.; Cruz, R.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 72-73 (Jul 2018).*

Screening of drought-tolerant rice genotypes has focused on water use efficiency and maximizing grain yield under rainfed lowland condition. However, it is equally important to assess plant morphological responses such as leaf rolling and leaf tip drying as they are practical drought stress indicators and also influence yield. This pot study in the screenhouse exposed 17 rice genotypes to drought stress at vegetative stage for 20 days (i.e., 15-35 days after transplanting or DAT), rewatering for 10 days (i.e, 36-46 DAT), and assessed soil water status, plant morphological changes, and aboveground dry matter yields. Each pot had a volume of 10 L and contained 8 kg of well-fertilized Maligaya clay soil. Soil moisture content and soil strength were assessed by gravimetric and penetrometer methods, respectively. Results showed that the 20-day drought treatment period was characterized by the decrease in average soil moisture content from 60.5 to 0.7% and increase in average soil strength from 0 to 3.0 MPa across the drought treatment pots. Out of 17 rice genotypes tested, only 8 genotypes namely: PSB Rc14, NSIC Rc416, GSR-21, RAELINE-10, NSIC Rc282, CT 9993-5-10-1-M, UPL Ri-5, and NSIC Rc160 survived after the vegetative drought stress and rewatering treatments. The performance of these genotypes could be attributed to slow progression of leaf rolling [i.e., scores of 1 to 4 for the 8 genotypes vs. 1 to 5 (tightly rolled) for the rest of the genotypes], leaf tip drying [i.e., scores of 1 to 4 vs. 1 to 5 (100% drying of leaf the lamina)], and lower reduction in aboveground dry matter yield based on the well-watered Control. Moderate or slow progression of leaf rolling and leaf tip drying could have contributed to

relatively higher photosynthetic activity by maintaining photosynthetic leaf area thereby minimizing reduction in dry matter yield.

ORYZA SATIVA; GENOTYPES; DROUGHT RESISTANCE; DROUGHT STRESS; WATERING; LEAVES; BIOMASS

Morphological, molecular, cytogenetic and agronomic evaluations of rice (Oryza sative L.) mutants cv. NSIC Rcl44. **Tapic, R.T.; Alfonso, A.A.; Dela Cruz, Q.D.; Avellanoza, E.S.; Espejo, E.O.; Nogoy, F.M.C.; Agustin, A.M.L.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 30-39 (Dec 2016).*

Using induced mutation in any breeding program requires a thorough verification of the authenticity of the derived mutants. Field evaluation of the promising lines is useful to assess stability of its agronomic performance. In this study, 10 mutant lines together with the wild type NSIC Rc144 were characterized using phenotypic, molecular and cytogenetic traits. Field evaluation was set up in two seasons (wet and dry) following Randomized Complete Block Design using two check cultivars (PSB Rc 82 and NSIC Rc 144). Result of morphological characterization showed similarity as well as deviation in some traits of mutants from its original cultivar. Molecular characterization using 39 SSR markers revealed mutation-induced polymorphism. Cluster analysis using morphological data in comparison with molecular data revealed authenticity of the mutants as derived from NSIC Rc 144. It further displayed that molecular approach appeared effective than morphological approach since there is less ambiguity compared to the phenotypic data analyzed. Cytogenetic evaluation did not give much information in terms of changes in chromosome configuration of the mutants. Field evaluation revealed significantly higher performance of the 2 mutants for it out-yielded the wild type and the check cultivars.

ORYZA SATIVA; RICE; VARIETIES; MUTANTS; FIELDS; EVALUATION; AGRONOMIC CHARACTERS; CYTOGENETICS; MOLECULAR GENETICS; GENETIC MARKERS

Multiplex SSR-PCR analysis of genetic diversity and redundancy in the Philippine rice (Oryza sativa L.) germplasm collection. **Delos Reyes, J.L.; Panes, V.A.; Tabanao, D.A.; Romero, G.O.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 22-43 (Aug 2014).*

Rice germplasm conservation is vital ensuring the availability of a rich gene pool for future varietal improvement programs. However, with limited resources for gene banking, there is a need to identify and prioritize unique accessions in the PhilRice gene bank for maximum resource utilization. A robust and unequivocal way to identify duplicated is through multiplex SSR-PCR DNA fingerprinting. The present study established the optimal concentrations and reactions conditions for the successful amplification of PCR products using a multiplex panel composed of rice simple sequence repeat (SSR) markers, namely RM312, RM316, RM514 and Rm171. The panel was then used to analyze the genetic diversity and identify duplicates among the 427 rice germplasm accessions with similar or identical variety names from the PhilRice genebank. A total of 15 alleles were detected at the 4 SSR loci. The polymorphism information content (PIC) values of the SSR markers were moderately high ranging from 0.459 to 0.643. A dendrogram was constructed using the Dice similarity coefficient and the UPGMA algorithm. The multiplex SSR-PCR panel produced unique profiles of 31 accessions that, being genetically distinct, should be maintained as part of the main collection of the

genebank. There were 17 accession identified as possible redundants having a bootstrap value greater than 95%. Additional SSR and morphological markers will be required to further strengthen the evidence for redundancy, and hence justify removal of unnecessary duplicates from the collections.

ORYZA SATIVA; RICE; GERMPLASM; GENES; DNA FINGERPRINTING; GENE BANKS; GERMPLASM COLLECTIONS; GENETIC MARKERS

Multivariate analysis of phenotypic and anatomic characteristics associated to lodging resistance among rice genotypes under direct-seeded condition. **Marcelo, P.N., Marcelo, V.A., Tapic, R., Manangkil, O.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings, Legaspi City, Albay (Philippines), 2-7 Jul 2018.

Lodging is the bending over of the rice culm caused by weak plant phenotype and external factors (rain, soil and wind) that can dramatically reduce grain yield and seed quality. Push Resistance (PR) measures plant resistive force and serves as a direct gradation of resistance to lodging. This study characterized 43 rice genotypes resistant to lodging in terms of PR, phenotypic and anatomical framework. Five genotypes have significantly better culm strength (1.01-1.08 kgf) than both resistant and susceptible checks, NSIC Rc240 and PSB Rc4 respectively. Positive correlation (r0.33-0.58)** to PR were observed on 15 agro-morphological traits while negative association (r-0.31 - -0.38)** to Number of Culm (NCLM) and Panicle (NPLM)per linear meter. Furthermore, PR was associated positively to Culm Wall Thickness (CWT), Number of Adaxial (NADVB) and Abaxial (NABVB) vascular bundles with an r value of 0.35 - 0.40. PR and 21 correlated traits were delineated into six principal components after Promax rotation that explained 84.68% of the total variation. Moreover, cluster analysis seperated the test entries into four groups. NSIC Rc300, Rc360, Rc396 and PR45299-14-3-2-B were identified as lodging resistant genotypes based on cluster with high values of PR, leaf blade length and width, ligule length, flag leaf length and width, diameter of 1st to 5th internode, length of 4th and 5th internode, panicle and culm lengths, plant height, NADVB, NABVB and CWT. However, NCLM and NPLM were found to be low. Identification of these traits and genotypes related to PR is crucial in sustaining increases in potential yield, breeding for lodging resistance and location-specific varietal recommendations.

ORYZA SATIVA; PHENOTYPES; DIRECT SOWING; STEMS; LODGING; LODGING RESISTANCE

NSIC Rc298: the first released variety for irrigated lowland direct wet-seeded rice system. **Manigbas, N.L.; Manangkil, O.E.; Barroga, W.V.; Solis, R.O.; Padolina, T.F.; Arocena, E.C.; Rico, E.P.; Parinas, J.F.; Dancel, J.M.; Marcelo, P.N.M.; Rillon, J.P.; Santiago, G.dC.; Bandonill, E.H.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 81-86 (Aug 2014).*

Seedling vigor, anaerobic germination, lodging resistance to the major pests and diseases, and yield are the major traits that are considered in the development of new cultivars for direct wet-seeded rice system. Several genetic donors and breeding populations have been tested for these traits under field and laboratory conditions. NSIC Rc298 was derived from a cross between PR29253-96-1 and AR32-4-5-2 in 2002DS designated as PR34159. It was selected and advanced for several years until nomination to the National Cooperative Test in 2008. The breeding line, PR34159-13-1, passed the Multi-location Adaption Trial in 2011 and recommended

for release in 2012. NSIC Rc had a 5.6 yield advantage over PSB Rc82, a popular high-yielding variety in irrigated lowland. It has anaerobic germination tolerance which is a desirable trait for direct wet-seeding and with wide spectrum resistance to major insect pest and diseases. The grain quality is comparable to both PSB Rc82 and IR64. This is the first rice variety recommended for direst wet-seeding cultivation.

ORYZA SATIVA; RICE; VARIETIES; IRRIGATED FARMING; LOWLAND; WETLAND RICE; CULTIVATION; PROGENY; DIRECT SOWING; AGRONOMIC CHARACTERS

NSIC RC 418 (Sahod Ulan 14): a new UPLB [University of the Philippines Los Baños]-developed rainfed lowland rice variety (Oryza sativa L.) for dry-seeding. **Lalican, D.J.; Escamos, S.H.; Cayaban, E.B., Jr.; Bon, S.G.; Magnaye, A.M.M.; Malabanan-Bauan, K.B.; Hernandez, J.E.; Sta. Cruz, P.C.; Borromeo, T.H.; Sinohin, A.M.; Alzona, F.D.; Magsino, E.A.; Felix, A.DR.** *Philippine Journal of Crop Science (Philippines) v. 42 (2) p. 66-69 (Aug 2017).*

Rainfed rice fields in the Philippines is estimated to be around 30% of the total rice production area and produce about 4.5 M mt of rice annually. Although most breeding efforts in rice are focused on irrigated rice agroecosystems, development of new cultivars for rainfed lowland rice areas is still pursued. The University of the Philippines Los Baños-Rice Varietal Improvement Team (UPLB-RVIT) has produced several rainfed lowland rice varieties over the years both for transplanted and dry-seeded culture. C9270-B-3-1-3-2 released as NSIC Rc 418 is the latest rainfed lowland rice variety developed by UPLB-RVIT for dry-seeding. C9270-B-3-1-3-2 is derived from a cross between C7652-2B-7-4 and C8212-B-1-2. It was identified as a promising line for dry seeding in the UPLB Preliminary Yield Trial (PYT), and was entered to the National Cooperative Test (NCT) in 2011. C9270-B-3-1-3-2 was evaluated for 4 wet seasons in 3 rainfed rice locations, and was recommended for release as NSIC Rc 418 or Sahod Ulan 14 in 2015. It is medium-maturing, semi-dwarf rainfed rice, with 13.1% and 18.9% yield advantage over check varieties PSB Rc 14 and NSIC Rc 192, respectively. It has intermediate reaction to diseases such as rice blast, bacterial leaf blight and sheath blight, has resistance to stemboreres and exhibits intermediate reaction to hoppers. NSIC Rc 418 also has excellent grain quality with good milling potential, intermediate amylase content (Value), and good acceptability in both raw and cooked form.

ORYZA SATIVA; VARIETIES; RAINFED FARMING; IRRIGATED RICE; AGROECOSYSTEMS; LOWLAND; DISEASE RESISTANCE; PEST RESISTANCE

NSIC Rc438 variety suitable for wet seeding and transplanting culture in irrigated lowland areas. **Braceros, R.C., Pautin, L.R., Padolina, T.F., Arocena, E.C., Dela Cruz, A.A., Duque, M.J.C., Osoteo, G.M., Pariñas, J.F., Manangkil, O.E.** 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. 95.*

Developing new variety for direct wet seeded and irrigated lowland ecosystem is very important to sustain rice productivity needed for the country's food security. For the past decades, advances in plant breeding techniques helped improved new varieties with useful genetic traits which made them more stable and widely adaptable. One of these elite lines, PR37241-3-1-2-1-1 was developed in 2006 using Marker-Aided Selection breeding for bacterial leaf blight resistance and was extensively evaluated in NCT 2012DS to 2013WS and in

MAT from 2014WS to 2015WS. In 2016, PR37241-3-1-2-1-1 passed the standards for yield and other agronomic traits, pest reactions and grain quality for national recommendation in Luzon and Visayas. It was formally approved by the National Seed Industry Council (NSIC) on November 2016 and was registered NSIC 2016 Rc438 with local name Tubigan 38. Tubigan 38 matures in 106 days with number of productive tillers of 13, and medium height measuring 98cm yield was consistently 5 to 6.3 t/ha across season and with a maximum yield of 10.2 t/ha in Luzon. Its stability was contributed by good reactions to the major insect pests and diseases such as blast, bacterial blight, sheath blight, white and yellow stem borers, and green leaf hoppers. However, it should not be planted in tungro hot spot areas. This variety also passed grain quality standards including eating quality. It has intermediate amylose content (19.3%) with medium (6.5mm) and intermediate shape of (2.9mm), with premium milling recovery (72.2%), fair brown rice (77.9%) and grade 2 head rice recovery (40.7%). It has good eating quality and high acceptability in raw compared to PSB Rc82 and IR64.

ORYZA SATIVA; VARIETIES; ADAPTATION; BREEDING METHODS; SELECTION; VARIETY TRIALS; TRANSPLANTING; SOWING; LOWLAND; IRRIGATED LAND

On-farm conservation and management of crop diversity in Barangay [village] Magahis, Tuy, Batangas [Philippines]. **Aguilar, C.H.; Antesco, D.K.; Barrera, W.; Biguelme, M.; Borines, N.O.; Descalsoto, G.I.; Madrid, I.J.; Malunes, L.J.; Saracanlao, R.J.; Borromeo, T.; Altoveros, N.; Dayo, M.H.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 79.*

The continuous cultivation and management of a diverse set of crop population is essential for a farming community's sustainable development. Though conservation approaches for plant genetic resources in years ahead are already in place, economic pressures and preferences by the farmers continues to challenge agro-biodiversity and traditional farming system. This study was conducted to: 1)assess crop diversity maintained by farmers in Brgy. [village] Magahis, Tuy, Batangas, [Philippines], 2)Know the farm conservation and management practices of crop diversity by the farmers, 3)determine the socio-economic factors that influence farmers' crop conservation practices, and 4)determine possible solutions to address arising concerns about on-farm conservation in the said community. Fifteen farmers of various age were gathered for a focus-group discussion, followed by one-on-one interview, and then by resource mapping of the site. There is considerable crop diversity in Brgy. Magahis, Tuy, Batangas that is being maintained through the years. The farmers practice different seed supply systems with majority of them having their own supply every season. This diversity, however, is vulnerable to loss due to economic disadvantages, selection, and changes in agricultural practices. There is a need to devise a strategy to convince and involve the farmers in the national plant diversity conservation efforts. Narrowing the gap between formal and informal seed supply systems is also important. The development of market niches for traditional varieties and on-farm conservation awareness campaign should also be conducted.

CROPS; BIODIVERSITY; FARMS; RESOURCE CONSERVATION; FARMERS; FARMING SYSTEMS; PHILIPPINES

Overexpression of maize NADP-malic enzyme (ME) cDNA gene tagging with ACV5 epitope into rice (Oryza sativa L.). **Bagunu, E., Lin, H.C., Covshoff, S., Montecillo, F., Anonuevo, J.J., Mercado, M.A., Salazar, P., Lim, L., Reyes, J., Yin, X., Quick P**. 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. 62 (Jul-2018)*.

The NADP-malic enzyme (ME) is a key enzyme of the C sub 4 photosynthesis pathway in NADP-ME type C sub 4 plants such as maize. It catalyzes the decarboxylation of malate in the bundle sheath cells to supply CO sub 2 to Rubisco. The full-length cDNA encoding the maize (Zea mays) specific C₄ NADP-malic enzyme was expressed in rice (Oryza sativa L.) under the control of the bundle sheath specific Zoysia japonica PCK (ZjPCK)promoter. The gene was tagged with AcV5 epitope so that it will be detected during the analysis of immunoblotting and immunolocalization. In this study, the T₀ transgenic rice plants were characterized using molecular and biochemical techniques. PCR analysis showed 58 positive plants for the transformed gene but only 16 plants have protein expression based on immunoblotting analysis. Varying copy number of ME gene insertion was also observed in the Southern blot analysis. In the cross-section of transgenic rice leaf, immunolocalization studies using confocal microscope showed that maize NADP-ME was not only localized in bundle sheath cells but also in the mesophyll cells of transgenic rice plants, taken together, transgenic plants expressing the NADP-ME gene will be advanced for further screening to obtain homozygous lines and will later on be used for the gene-pyramiding of C sub 4- photosynthesis related genes to make a C sub 4 Rice Prototype.

ORYZA SATIVA; MAIZE; GENES; GENE EXPRESSION; DNA; MALIC ENZYME; TRANSGENIC PLANTS

Participatory evaluation and adaptive trial of resources-use of efficient rice lines in Lopez, Quezon and Pamplona, Camarines Sur [Philippines]. **Dela Rosa, D.G.M., Lopez, P.I.M., Bonza, J.R.M., Magnaye, A.M.A., Malabanan-Bauan, K.B., Lalican, D.J., Bon, S.G., Sister, L.E., Borromeo, T.H., Hernandez, J.E., Ali, J**. 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. 102-103 (Jul-2018).*

In varietal development, selection of promising rice lines based on combination of researcher's empirical data and farmers's preference is crucial to ease farmer varietal adoption once the lines become released as new varieties. This study, which is part of the development of Resource-use Efficient Rice (RUE) rice lines, aimed to identify acceptable and adaptable RUE lines for rainfed lowland condition in line with farmer preferences. In 2017 wet season, six on-farm adaptive trials of 20 RUE lines were established in Lopez, Quezon (Region 4-A) and Pamplona, Camarines Sur (Region 5). Evaluation of the RUE lines were based on grain yield, yield adaptability and farmers' phenotypic acceptability (PA) rating. GxE analysis across locations showed that six RUE lines were generally adaptable in the target environment. What-won-where biplot per municipality identified the top performing RUE lines with high yield adaptability, namely IR1-12-D10-S1-D1 (3477.07 kg/ha) in Lopez, and IR1-DQ121-L19-L1 (3123.93 kg/ha) and IR1-12-Y4-Y1-D1 (3189.8 kg/ha) in Pamplona. These top-performers also had good phenotypic acceptability based on farmers' criteria including resistance to lodging, reaction to pest and diseases, maturity, panicle type and over-all crop stand.

ORYZA SATIVA; PROGENY; EVALUATION; PARTICIPATION; EXPERIMENTATION; CROP YIELD; PHILIPPINES

Patterns of variability in quantitative morpho-agronomic characteristics of Philippine traditional corn from selected provinces. **Bon, S.G.; Huelgas, V.C.; Roxas, G.R.; Salazar, A.M.** *Philippine Journal of Crop Science (Philippines) (Aug 2017).*

Two hundred recently collected traditional corn populations were characterized based on quantitative morpho-agronomic descriptors, aimed to assess the distribution and frequency of quantitative variation, determine the principal component of variation and similarity groupings of the collection. Data showed wide spread statistical range and high variance and standard deviation for kernel, tassel, plant and ear descriptors. Nine descriptors however, showed skewness, indicating aggregation of values towards either end of the range. Means indicated values closer to the unimproved corn types such as shorter plant heights, higher number of leaves, narrower stem diameter, lighter kernel weight, shorter ear length, early tasseling and silking, smaller kernel dimensions, smaller cob diameter, and non-synchronous flowering. As expected, collection were distributed over many classes ranging from 6 to all 10 frequency classes but generally falling within the 4 or 5 central classes. In general, values obtained indicated high variability of the collection having wide dispersion distributed to multi class ranges. A cumulative 74.6% of sample variability was contributed by 11 PCs with the first 3 principal components explaining about 44.48% of the sample variation. PC1 was composed of 22 variables representing plant, tassel and ear characteristics. PC2 included tassel peduncle length and number of kernel rows while PC3 identified 100-kernel weight and kernel width. Number of primary branches of tassel and rachis diameter where not found significant in all primary axes. The collection clearly scattered over the biplot space but no clear pattern of provenance association can be identified. Weak groupings can be observed for some collections from Masbate, Oriental Mindoro and Agusan del Sur [Philippines]. Cluster analysis further confirmed inherent morpho-agronomic variability of the collection set where maximum clustering was achieved at 15.75 Euclidean distance coefficient. The collection can be grouped into two clusters with 9 outliers. Cluster 2 was the larger group with 3 sub-clusters while Cluster I was composed of 18 collections. Cluster 2 maybe sub-grouped into 3 smaller clusters 2A, 2B, 2C. No clear association to provenances was established but 21 of the Masbate collection clustered in IIA and 8 of 14 Aklan and 7 of 10 Agusan del Sur collections both clustered in 2C. Cluster analysis validated high degree of variability of the collection set. The present study therefore confirmed the presence of considerable genetic diversity, outlined distribution patterns of variations observed and identified the principal components among the local corn germplasm. Recommendations were forwarded.

ZEA MAYS; MAIZE; VARIETIES; STATISTICAL METHODS; KERNELS; GERMPLASM; INDIGENOUS ORGANISMS; GENETIC VARIATION; AGRONOMIC CHARACTERS; PHILIPPINES

Phenotypically-desirable and PRSV-P tolerant papaya F sub 1 hybrids. **Magdalita, P.M., Signabon, F. B.** *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 75-83 (Apr 2017).*

The development of new papaya F sub 1 hybrids that are phenotypically-desirable and resistant to papaya ringspot virus-P (PRSV-P) is one of the important components of an integrated disease management strategy against the virus disease. While moderately tolerant varieties such as the Sinta provided some protection

against the disease, new virus strains could evolve and overcome the resistance, hence new resistant varieties are necessary. Partial diallel crossing scheme was used to generate F sub 1 hybrids between diverse inbred lines. Eight F sub 1 papaya hybrids were evaluated for desirable horticultural traits and reaction to PRSV-P. Three hybrids were selected: hybrids 4, 7 and 5. F1 hybrid 4 is better than other hybrids in terms of horticultural traits and virus reaction. It is a semi-dwarf, had stout stem, thick flesh, higher TSS and edible portion than Sinta. It had a reduced symptom severity, delayed disease onset, slow disease progress and rate of disease development reduced symptom severity, low disease index and lower virus, tire than Solo, indicating a moderately tolerant reaction of PRSV-P. Hybrid 7 is semi-dwarf, had stouter stem, thicker flesh, higher TSS and had higher edible portion than Sinta. It had a delayed disease onset, slower disease progress, and virus tire lower than Solo, also indicating a moderately tolerant reaction to PRSV-P. Hybrid 5 is also semi-dwarf, had high TSS and an attractive bright red flesh. However, it had an early disease onset, faster disease progress and rate of disease development, making it moderately susceptible to PRSV-P.

CARICA PAPAYA; PAPAYAS; HYBRIDS; SPOTS; DISEASE RESISTANCE; BREEDING METHODS; AGRONOMIC CHARACTERS; SYMPTOMS

Physiological and phenotypical characterization of transgenic rice double crosses with overexpressed maize phosphoenolpyruvate carboxylase and pyruvate, phosphate dikinase. **Legaspi, C.L., Lin, H., Karki, S., Coe, R., Covshoff, S., Bagunu, E., Añonuevo, J.J., Mercado, M.A., Salazar, I.P., Quick, W.P.** 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. 65 (Jul-2018).*

The success of the First Green Revolution in the 1960s paved the way to an increase in the production of major crops including wheat and rice. However, the amount of rice being produced now will not be enough to feed the growing population by 2050. Currently, efforts are underway to produce a rice prototype with C4 photosynthetic pathway. In this study, rice double crosses overexpressing maize phosphoenolpyruvate carboxylase (ZmPEPC) and pyruvate, phosphate dikinase (ZmPPDK) were characterized molecularly and phenotypically. Polymerase chain reaction and western blot analysis identified homozygous lines of ZmPEPC-28xZmPPDK-02, ZmPEPC-28xZmPPDK-11 and ZmPEPC-28xZmPPDK-29. Southern blot analysis showed that there was only one gene copy number for both ZmPEPC and ZmPPDK for all the crossing events. In addition, cytological immunolocalization had shown that ZmPEPC had intense expression in both the mesophyll and bundle sheath cells. On the other hand, ZmPPDK exhibited specific expression in the bundle sheath cell. Significantly lower glucose and fructose content were observed that the ZmPEPC-28xZmPPDK-02 event. Moreover, the three events exhibited significantly higher tillering in all of the crossing events compared with the wild type. It was also observed that the ZmPEPC-28xZmPPDK-29 had significantly improved tillering when compared to its parents. The height observed for ZmPEPC-28xZmPPDK-02 was significantly higher than the wild type and ZmPEPC-28xZmPPDK-11 was significantly shorter than the control and its parents. There were no significant differences observed in the biomass and yield of the three events when the compared with the wild type control, however, improved yield was observed in ZmPEPC-28xZmPPDK-11 compared with their parents. Further assessment on the starch content and metabolite profiling using GC-MS will be performed for a more in-depth characterization of the crosses.

ORYZA SATIVA; ZEA MAYS; TRANSGENIC PLANTS; GENE EXPRESSION; GENES; C4 PLANTS; PHOTOSYNTHESIS; PCR; IMMUNOBLOTTING

Practice of AMMI [Additive main effects and multiplicative interaction] and GGE biplot analysis of lentil genotypes assessment in multi-environment trials. **Turk, Z.; Kendal, E.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 30-48 (Dec 2017).*

Red lentil (Lens culinaris Medik.) as a rich source of the breeding program is the most important crop in Turkey. The stability and adaptability of lentil genotypes are very significant for the program decisions to release new varieties. Genotype x Environment Interaction (GEI) and AMMI (Additive main effects and multiplicative interaction) was used to make an estimation of the grain yield and to understand the GxE interaction patterns by examining the differential ranking of variety yields in multi-environments trials. Therefore, 6 lentil genotypes were used in the study. The experiments were laid out in randomized complete block design with 4 replications in 8 environments. The superiority of the genotypes was determined by the first two principal components (IPC1 and IPC2) and to create a two-dimensional GGE biplot. The sum of squares of the first two components were accounted by 58.07% and 19.80% for genotype x trait (GT), 44.89% and 24.14% for genotype x environment (GE), 59.86%, and 24.37% for environment x trait (ET), respectively. The GGE GRA biplot indicated that two mega-environments occurred among environments. On the other hand, 4 groups occurred among the traits based on the genotypes and environments. The results showed that G1 has general adaptability for all environments, while G2 and G3 showed specific adaptation to E3, E6, and E7. According to the biplot techniques, G3 came forward with the majority traits, while G2 came forward with only high yielding ones. The results of the GGE biplot indicated that G3 is suitable to be recommended for release, G5 has desirable origins for yield stability, and E7 is valuable to the environment for its quality and can be used in the lentil breeding program. The study revealed that a GGE biplot graphically displays interrelationships between the test environments as well as in between genotypes and traits by visual comparisons.

LENS CULINARIS; LENTILS; VARIETIES; AMMI; GENOTYPE ENVIRONMENT INTERACTION; GENOTYPES; CROPS; YIELDS; ADAPTABILITY; EXPERIMENTATION

Productivity of rice genotypes in response to flooding stress and crop management. **Peralta, L.C.; Desamero, N.V.; Cruz, R.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 75 (Jul 2018).*

Yields range from 1.0 to 2.0 t/ha flood-prone rainfed lowlands. Rice yields can be improved by using food-tolerant rice genotypes and appropriate crop management. This field study assessed the grain yields of three rice genotypes in response to flooding stress, seedling ages (i.e., 21 and 44 days), and post-flood N applications. Plants were subjected to 50cm floodwater depth for 14 days from 21 to 35 days after transplanting. Results showed that in the Control (2-3 cm flood water depth) and with no post-flood N application (NPFNA), grain yields of PSB Rc82 Cahireng Ag+ Sub1, and PR41543-B-14-2-1-2 ranged from 3.8 to 6.0 t/ha using 21-day old seedlings and from 3.9 to 6.5 t/ha using 44-day old seedlings. Based on the control

yields of PSB Rc82 were reduced by 36.5% with NPFNA, 22% with N application at 2 days after de-flooding (DAD), and 25.9% with N at 7 DAD for 21-day old seedlings. With 44 day old seedlings, yields of PSB Rc82 were reduced by 40.4% with NPFNA, 31.3% with N at 2 DAD, and 16.7% with N at 7 DAD. Based on the Control, yields of Ciherang Ag+ Sub1 were reduced by 30.0% with NPFNA, 34.3% with N at 2 DAD, and 25.9% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of Ciherang Ag+ Sub1 were reduced by 61.5% with NPFNA, 49.12% with N at 2 DAD, and -13.16% with N at 7 DAD. Based on the Control, yields of PR41543-B-14-2-1-2 were reduced by 23.7% with NPFNA, 36.4% with N at 2 DAD, and 25.0% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of PR41543-B-14-2-1-2 were reduced by 18.0% with NPFNA, 41.86% with N at 2 DAD, and 25.0% with N at 7 DAD.

ORYZA SATIVA; GENOTYPES; PRODUCTIVITY; CROP MANAGEMENT; FLOODING; TOLERANCE; CROP YIELD

Promising new red onion variety. **Yap, J.P.Jr.** *Agriculture (Philippines) v. 22 (10) p. 54-55 (Oct 2018)*

ALLIUM; ALLIUM CEPA; ONIONS; VARIETIES; AGRONOMIC CHARACTERS; KEEPING QUALITY; CROP PERFORMANCE

PVS [participatory varietal selection]: a strategy towards developing a sustainable community-based rice seed system. **Malonzo, O.C., Pasicolan, H.R., Gawat, N.R., Ulay, C.M.M.I**. 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 (Jul-2018).*

Majority of farmers are already aware of the 10-15% yield advantage in the use of high quality rice seeds. However, every season, smallholder rice farmers in North East Luzon [Philippines] are bothered with the perennial problem of what and where to get suitable rice varieties to plant. This problem exists even with the release of number of high yielding rice varieties by breeding institution like the Philippine Rice Research Institute as well as the presence of accredited seed growers nationwide. Thus, the development of a sustainable community-based rice seed system is envisioned. The Philippine Rice Research Institute-Isabela Branch Station in partnership with the Local Government Unit contributes to the realization of this goal through its study titled, 'Increasing Accessability and Adoption of High Yielding Rice Varieties', where varieties were demonstrated, selected, multiplied, and marketed to farmers. This 2018 Dry Season, eight varieties were demonstrated in every district involving 9 districts in Region 2 [Cagayan Valley], where good performing seed growers were taken as cooperators. Results of the Participatory Varietal Selection (PVS) conducted among farmers showed that in Roxas, Isabela, NSIC Rc222 was the most preferred variety, NSIC Rc224 in Quirino, and PSB Rc18 in Southern Cagayan. The PVS is an important strategy towards the development of local rice seed systems in communities.

ORYZA SATIVA; RICE; HIGH YIELDING VARIETIES; VARIETY TRIALS; FARMERS; PARTICIPATION

Response of wild and edible Musa spp. seedlings to limiting moisture stress. **Delfin, E.F.; Ocampo, E.T.M.; dela Cueva F.M.; Damasco, O.P.; Dela Cruz, F.; Dinglasan, E.G.; Gueco, L.S.; Herradura, L.E.; Molina, A.B**. *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 1-12 (Dec 2016).*

Banana, one of the world's leading crops is predicted to be highly vulnerable to drought conditions brought about by climate change. Identification of drought tolerant cultivars is one of the long term strategies of addressing the effect of climate change. The National Plant Genetic Resources Laboratory and the Bureau of Plant Industry of the Philippine Department of Agriculture maintain germplasm collections of edible and wild Musa spp. From the Philippines, Southeast Asia and Papua New Guinea (SEA/PNG) that have not been assessed for drought tolerance. Thus, this study was conducted to assess the drought response of 29 Musa genotypes from the germplasm collections at seedling stage under greenhouse condition. Drought was imposed on 3 mo-old tissue culture-derived seedlings by withholding water for 2-3 wk, while control plants were watered regularly. Under drought condition, the genotypes differed significantly in terms of plant growth, number of leaf cigars formed, specific leaf area, biomass production and partitioning as well as water use efficiency across water treatment. Only 28% of the banana genotypes allocated more biomass to the roots. Total leaf area production was influenced by significant interaction between water treatment and genotype. Significant genotypic differences in terms of relative leaf folding (RLF) and stomatal conductance were observed, with increased RLF as soil moisture content decreased. Stomatal conductances were significantly affected by the interaction between genotype and time of sampling. The genotypes also differed significantly in their water use efficiency (WUE) with increases ranging 1-70% under drought. WUE was found to be positively correlated with total plant dry weight, root volume, root dry weight and relative leaf folding. Based on the relative performance under drought cultivar, 'Gubao' (BBB) is the most drought tolerant based on total biomass production, root dry weight, root volume and WUE followed by 'P.K. Malaccacina' and 'Tindok'.

MUSA (BANANAS); VARIETIES; WILD PLANTS; MUSA BALBISIANA; DROUGHT; DROUGHT RESISTANCE; STOMATA; TRANSPIRATION; WATER USE; EFFICIENCY; GENOTYPES; GERMPLASM COLLECTIONS

Root response of rice (Oryza sativa L.) under deficient nitrogen condition using BC sub 1 F sub 4 recombinant inbred lines derived from US-2 and MALAY-2 crosses. **Manangkil, J.M., Mallari, R.P., Banting, M., Estrada, S., Castillo, M.P., Mananghaya, I.E., Niones, J.M**. 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. 92 (Jul-2018)*.

Nitrogen (N) is one of the most important nutrients in the rice plant and limited N supply can affect plant growth and development. Plant roots are important organs that supports the plant body and responsible for uptake of water and nutrients in the soil. Agronomic performance can be increased by improving the root system architecture. Thus, this study was conducted to evaluate the response of rice root in two nitrogen concentrations by determining the seminal root length, root biomass and the number of nodal roots. A total of 168 BC1F4 recombinant inbred lines (RIL) derived from US-2 and MALAY-2 crosses were grown in hydroponic condition with deficient (5um) and sufficient (500um) NH sub 4+ supply for eight days. Seminal root length under US-2 was 28 mm longer than MALAY-2 and RILs under different nitrogen concentrations. An increase in seminal root length, root biomass and the number of nodal roots of the two parent lines and RILs were observed under deficient nitrogen condition compared to sufficient condition. Mean value of RIL in three root

traits were comparable with US-2 in both nitrogen concentration. These results showed high genetic variation in root development in the mapping population and parentals in responses on the two nitrogen concentration.

ORYZA SATIVA; INBRED LINES; ROOTS; BIOMASS; ROOTING; NITROGEN

Screening for BBTV resistance and molecular characterization of gamma irradiated putative mutants of abaca using gene-specific markers. **Descalsota, G.I.L.; Lalusin, A.G.; Dela Viña, C.B.; Mendioro M.S.; Dizon, T.O.** *Philippine Journal of Crop Science (Philippines) v. 40 (1) p. 8-16 (Apr 2015).*

Screening for virus resistance and molecular characterization of 54 abaca lines generated from unirradiated and gamma-irradiated shoot tips of two abaca cultivars, Tinawagan Pula (TP) and Tangongon (TG) were conducted. Phenotyping for bunchy top, bract mosaic and mosaic diseases and PCR-based diagnosis for bunchy top have identified 14 gamma-irradiated TP lines (2,5,6,7,10, 12, 17, 19, 20, 21, 24, 26, 28, and 29) and two gamma-irradiated TG lines (37 and 53) as potential virus-resistant lines. Simple Sequence Repeat (SSR) and Resistance Gene Analogue (RGA) markers were used for molecular characterization. Eight out of 10 SSR markers and one out of two RGA markers tested produced amplification products. A total of 23 alleles and 18 banding patterns were detected using the 9 markers. The number of alleles per marker ranged two to five. Two alleles and 7 banding patterns not found in unirradiated TP were found in the gamma-irradiated TP plants while alleles and 7 banding patterns not found in unurradiated TG plants were found in the gamma-irradiated TG plants. The average Polymorphism Information Content (PIC) of 0.48 was obtained in both the gamma-irradiated TP plants and the unirradiated TP plants. However, a higher PIC value (0.54) was observed in the gamma-irradiated TG plants as compared with a lower PIC value of unirradiated TG plants (0.41). The increase in the PIC value is indicative of the higher genetic variability in the gamma-irradiated abaca plants created by exposure of gamma irradiation.

MUSA TEXTILIS; ABACA; GAMMA IRRADIATION; PCR; DISEASE CONTROL; PLANT DISEASES; DISEASE RESISTANCE; SELECTION; GENES; GENETIC MARKERS

Screening of rainfed rice lines under osmotic stress at seedling stage. **Malabanan-Bauan, K.B.; Magnaye, A.M.A.; Lalican, D.J**.; 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 70-71 (Jul 2018).*

Drought is a prevalent occurrence in rainfed rice areas, and developing varieties that can tolerate water deficit condition has been one of the major breeding objectives for rice. This is particularly important for the Philippines, where around 30% of rice lands are rainfed. Screening of breeding materials for drought tolerance as early as seedling stage is important especially for dry-seeded rice that is common in rainfed areas. This study evaluated the germination and seedling growth of UPLB-bred promising rice lines at varying levels of osmotic stress, and identified lines that exhibited water deficit tolerance at early seedling stage. Sixty-six promising rice lines including rainfed purification lines and wide hybridization-derived lines were tested at five water potential levels (control or 0, -0.25, 0-0.50, -0.75, and -1.0 MPa) imposed using varying strengths of polyethylene glycol (PEG 6000 MW) on filter paper. Highly significant differences among treatments were

detected for germination percentage, root length and shoot length. Germination percentage was similar from treatment 0 to -0.50 MPa, but it dropped significantly by 30% at -0.75 MPa, while only 27% germinated at -1.0 MPa across rice lines. Shoot and root length were also significantly reduced with decreasing water potential of the growing media. Drastic reduction in shoot length (69%) was observed at -0.50 MPa, while roots were 44.31% shorter at -0.75 MPa relative to control. Out of 66 rice lines, 20 promising lines (19 purification lines and one WH-derived line) were selected to have relative drought tolerance based on seed germination, shoot and root growth.

ORYZA SATIVA; PROGENY; SEEDLINGS; TESTING; GERMINATION; DROUGHT RESISTANCE; SOIL WATER DEFICIT

Seedling vigor of rice genotypes under water stress condition. **Barroga, W.V., Rafael, A.B., Marcelo, P.N.M., Manangkil, O.E.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings, Legaspi City, Albay (Philippines), 2-7 Jul 2018.

Seedling vigor is important for uniform crop establishment, weed competition and normal seedling growth under a wide range of field conditions. Flooded seeds with low seedling vigor during germination stage resulted to poor crop establishment and later to yield penalty especially in direct seedling cultivation. Nineteen rice genotypes with good phenotype were evaluated for early seedling vigor under water stress conditions. Entries were laid out in RCBD [randomized complete block design] with three replicates and flooded with 5 cm water level in steel tray for 21 days to identify vigorous genotype. Germination percentage, seedling length and seed vigor index (SVI) were measured 21 days after sowing. Genotypes were compared with Khao Hlan On, a landrace known with tolerance to flooding at germination and good seedling vigor. Germination percentage and seedling length showed significant correlations. Among genotypes evaluated, PR45297-42-2-1-1-3-1-B was the most vigorous which had germination of 48%, seedling length of 418 mm, and highest SVI of 20532. The line was statistically comparable with Khao Hlan On with 41% germination, seedling length of 462 mm, and SVI of 19142. PR45297-42-1-1-3-1-B had good seedling vigor under water stress conditions and with superior phenotype than the check variety. The line was selected for the development of variety for direct wet-seeding cultivation.

ORYZA SATIVA; GENOTYPES; SEEDLINGS; SEED CHARACTERISTICS; SEED; VIGOUR; DIRECT SOWING; DROUGHT STRESS

SSR-based genetic relationship in eggplant (Solanum melongena) genotypes with varying morphological response to drought. **Saracanlao, R.J.R.; Ocampo, E.T.M.; Canama, A.O.; Manaday, S.J.B.; Maghirang, R.G.; Delfin, E.F.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 57-64 (Dec 2016)*.

This study assessed the genetic diversity among selected eggplant accessions with different drought responses using simple sequence repeat (SSR) markers. Twenty eggplant accessions from Turkey, China, India, Laos, Taiwan, Africa and different provinces of the Philippines were analyzed for genetic diversity. The selections include 15 Solanum melongena and 5 genotypes from 4 Solanum species (S. ferox, S. linociera, S. parkinsonii and S. nodiflorum). Eighteen polymorphic SSR markers were used to establish the genetic relationship among the 20 eggplant accessions. The selected 18 polymorphic SSR primers amplified 46 alleles with the number of

alleles per primer ranging 2-4 and had an average of 2.6 alleles per primer. Null alleles were also detected in 5 SSR markers. The genetic relationship among 20 eggplant accessions was established based on UPGMA clustering. The dendrogram scale varied from 0.14 to 0.95 with a mean similarly of 0.54. At 0.70 similarity coefficient, S. melongena accessions mainly clustered together. The rest of the Solanum species (S. ferox, S. linociera, S. parkinsonii and S. nodiflorum) formed distinct single groups except for S. linociera, STL6. The highest similarity of 0.95 was obtained between S. melongena accessions while the least similarity was observed between S. nodiflorum and the rest of eggplant accessions used. The grouping of commercial varies with other landraces indicates that the commercial varieties used were similar to the landraces and that the commercial varies were bred from local materials. Cluster analysis did not distinctly separate the 20 accessions based on drought response. However, the results of the present study can be used in the selection of candidate eggplant accessions for the development of eggplant varieties for drought tolerance.

SOLANUM MELONGENA; AUBERGINES; VARIETIES; GENOTYPES; GENETIC MARKERS; DROUGHT RESISTANCE; GENETIC VARIATION; DROUGHT

'Sikat' and 'Sulit' new F sub 1 hybrid varieties of eggplant (Solanum melongena L.) **Hautea, D.M.; Taylo, L.D.; Quilloy, R.B.; Narciso, J.O.; Mostoles, M.D.J.; Bravo, C.R.; Salas, R.A.; Navasero, M.V.; Hautea, R.A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 46-54 (Aug 2016).*

Two new UPLB [University of the Philippines Los Baños] eggplant F sub 1 hybrids, 'Sikat' (NSIC 2015 Eg 05H) and 'Sulit' (NSIC 2015 Eg06H) were developed and approved for national commercial cultivation by the Bureau of Plant Industry-National Seed Industry Council (NSIC) in 2015. The eggplant F1 hybrids were evaluated in 15 field trials across 6 sites in the Philippines under the National Cooperative Testing for Vegetable during CY 2011-2014. 'Sikat' and 'Sulit' demonstrated significantly higher than or comparable yield potential (total and marketable yield) with the commercial hybrid check in 14/15 trials for at least one cropping season. Marketable yield advantage of 'Sikat' and 'Sulit' over the check variety ranged from 32.35-133.05% and 7.47-55.99%, respectively. Morphologically, 'Sikat' has erect to prostate growth habit and plant height at initial harvest of 46-96 cm. Fruits are medium size in length (15-22cm), 3.32-4.37 cm in diameter, purple and cylindrical with rounded apex. 'Sulit' has comparable plant height (43-92 cm) than 'Sikat' 2.96-3.90 cm in diameter, purple and cylindrical with rounded apex. Both hybrids were observed to have comparable field reactions to natural infestation of eggplant anthropod pests and field infection by bacterial wilt and fruit rot.

SOLANUM MELONGENA; AUBERGINES; VARIETIES; HYBRIDS; GERMPLASM; ARTHROPODA; VEGETABLE CROPS; EVALUATION; FIELD EXPERIMENTATION; AGRONOMIC CHARACTERS

SSR markers for mango (Mangifera indica L.) cultivar identification and genetic characterization. Sales, **E.K.; Butardo, N.G.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 30-38 (Dec 2017).*

he study identified SSR markers that can discriminate the different mango cultivars in the Philippines. It was conducted to select markers that are specific for Philippine Carabao Mango that can be used as a diagnostic kit for true to type variety. Two hundred mango samples were collected and evaluated while 49 SSR primers were screened for their utility in assessing the identity of the said mango cultivars. Out of these 49 primers, 29

primers were selected for further analysis. Based on the generated molecular data, e.g. allele size, fragments amplified, polymorphic information content (PIC) and powers of discrimination, the 29 primers were able to discriminate carabao cultivars over that of other cultivars sampled. An arbitrary genotypic assignment was also established to further show the differences among the cultivars/samples evaluated. The results show that the primers selected can be used to validate the authenticity of the carabao strain as labelled.

MANGIFERA INDICA; MANGOES; VARIETIES; GENETIC MARKERS; DNA; EXTRACTION; IDENTIFICATION; SELECTION

Sterility inducing cytoplasm: its effect on agronomic performance of F sub 1 rice hybrids. **Corpuz, M.V., Agustin, A.M.L., Gramaje, L.V., Caguiat, J.D., Tapec, R.T.** 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. 103 (Jul-2018).*

Production of bulk amount of seeds in hybrid seed production for commercial cultivation is not possible without the use of sterility mechanism. However, sterility inducing cytoplasm is reported to have negative effect that could be inherited and affect the performance of F1 hybrids. Three-line hybrid is based on cytoplasmic male sterility (CMS) and fertility restoration system. CMS line is caused by expression of a mitochondrial gene which causes the production of non-viable pollen without affecting other functions of the plant. In this study, field performance of rice hybrids generated from five CMS and maintainer lines crossed to five restorer lines were evaluated in replicated trial. It specifically aimed to (1) compare the performance of A X R and B X R crosses (2) evaluate the extent of sterility-inducing effect to yield components, and (3) identify CMS line with high restorability. Based on the result, performance of some hyrids generated from A x R significantly differ to B x R crosses in most of the yield related traits such as plant height, maturity, percent productive tiller, 1000 grain weight and percent fertility. Among the hybrids, PR20A x PR36246-Hy-1-19-2-2R (11t/ha), PR19A x PR36414R (10.30t/ha), IR79128A x PR36414R (9.85t/ha) were the top yielders. Moreover, PR19A x PR35749-HY recorded the highest percent fertility of 90.64%, while PR19B x PR35749-HY obtained the lowest percent fertility of 56.48%. This indicates that sterility inducing cytoplasm did not affect the performance in terms of yield, and other important yield components such as percent fertility and 1000 grain weight to specific A x R crosses. This can be attributed to the strong restoring ability of the R lines and good restorability of the CMS lines.

ORYZA SATIVA; HYBRIDS; CROP YIELD; AGRONOMIC CHARACTERS; CYTOPLASMIC MALE STERILITY; CROP PERFORMANCE

Timely supply of genetically pure TGMS parental lines using microsatellite markers. **Flora, C.R., Pablo, C.H.D., Saludares, R.A.G., Brena, S.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 109 (Jul 2018).*

Hybrid rice technology offers an opportunity in increasing rice yields and income of farmers. The increase yield in the use of hybrid can be achieved only if it is genetically pure. It is estimated that 1% impurity in the hybrid

seed leads to yield reduction up to 100 kilogram per hectare (Mao et al., 1996). Thus, assessment of seed genetic purity is necessary. In the past, Grow-out test has been the basis for genetic purity evaluations. In GOT, replicated field observations are time-consuming space demanding and has an environmental dependence. The limitations of grow-out test have been overcome by the development of molecular markers which is considered as fast and accurate method in determining genetic purity. In this study, seed purity analyses were conducted through grow-out test and DNA fingerprinting of TGMS lines. Three identified set of markers (RM1, RM127, and RM511) were identified that could distinguish were used in genetic purity analysis of 9 seed lots of TGMS parental lines produce in the Male Fertile Environment in DS2017. With a set of 3 microsatellite markers (RM1, RM127, and RM511), all the tested TGMS parental lines were clearly distinguished as statistically comparable in seed purity. This indicated that any of these markers might be able to utilize foe determination of genetic purity. This validation of the identified markers was done with conventional grow out test. This showed that the identified microsatellite markers were time effective since analyzed samples do not need to grow until maturity. Additionally from time saving and resources, this also indicated that the use of the identified informative microsatellite markers in genetic purity assessments can eliminate the intrinsic bias of the grow-out test and gives an accurate information assured a timely supply of genetically pure seeds of public hybrids.

ORYZA SATIVA; HYBRIDS; DNA FINGERPRINTING; GENETIC MARKERS; MICROSATELLITES

Validation of DNA sequencing of waxy gene for amylose of selected traditional rice varieties through iodine staining method. **Romero, M.V., Mamucod, H.F., Huliganga, R.C., Corpuz, G.A., Enriquez, J.O.S., Millas, R.A., Tabanao, R.A.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 108 (Jul 2018).*

Amylose content (AC) is the most important factor affecting not only cooking and eating quality but also processing behavior of rice. Amylose is synthesized by the granule-bound starch synthase (GBSS) enzyme encoded by the WAXY locus in chromosome 6. The wild type allele, Wxa, is commonly found in cultivars from Indica subspecies while the Wxb allele is commonly distributed in Japonica subspecies. Base substitutions from G T in Wxb allele decrease splicing efficiency which affect the enzyme activity of GBSS and results in an endosperm with lower levels of amylose. This study determined the DNA sequence for WAXY locus for amylose content of 87 traditional rice varieties (TRVs) and validated through the iodine staining method. DNA was extracted from two-week old rice seedlings of TRVs. Polymerase chain reaction was performed in order to detect G/T base substitution and (CT)n repeats in the WAXY locus. Sequence analyses revealed polymorphism in the WAXY locus for AC showing G/T substitution SNP, and variation in (CT)n repeats. The functional nucleotide polymorphisms (FNP), G at the G/T base substitution and (CT) repeats nt 16, for intermediate to low AC were observed in 80 TRVs. A total of 75 TRVs showed similar findings when subjected to amylose analysis using iodine staining method. The difference in the genotypic and phenotypic data for some TRVs can be attributed to environmental factors leading to variation of about 6% in the AC of a certain variety. This study established an excellent match between the results of the iodine staining method for AC determination and DNA sequencing of waxy gene.

ORYZA SATIVA; VARIETIES; INDIGENOUS ORGANISMS; DNA; NUCLEOTIDE SEQUENCE; GENES; ADAPTABILITY; HEAT TOLERANCE

F50 Plant structure

Pollen morphometrics of four coffee (Coffea sp.) varieties grown in the Philippines. **Chong, S. M.L.; Constantino-Santos, D.M.A.; Cao, E.P.** *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 1-7 (Dec 2014).*

Coffee (Coffea sp.) is one of the most valuable commercial crops worldwide. Studying pollen grains may be useful in collecting information for plant morphology and genetic. This study utilized traditional and modern geometric morphometrics to examine pollen grains of four commercially-grown coffee varieties in the Philippines, namely, Coffea arabica, C. canephora, C. liberica var. liberica and C. liberica var. Dewevrei. Pollen grain samples were examined at 200x magnification using an Olympus Bx43 light microscope. Digital images and measurement of the pollen grains in both polar and equatorial views were taken for morphometric analyses using CellSens and tpsDig2 software. C. arabica was the most distinct variety in terms of parameters, and had the largest pollen while C. liberica var. liberica had the smallest. C. liberica var. liberica and C. liberica var Dewevrei were the most similar, but can be separated taxonomically beyond the variety level. C. canephora was more similar to C. arabica than to C. liberica in terms of size measurements, while PCS and CVA plots revealed greater overlap of C. canephora with C. liberica. This study is pioneering in the use of landmark-based analysis to determine variations in pollen morphology. This is also among the first studies to use morphometric analysis on the genus coffea.

COFFEA ARABICA; COFFEA CANEPHORA; COFFEA LIBERICA; COFFEE; VARIETIES; POLLEN; PLANT ANATOMY; PHILIPPINES

F60 Plant physiology and biochemistry

AMMI biplot model analysis of stability and adaptability of high yielding rice (Oryza sativa L.) genotypes in rainfed lowlands of the Philippines. **Sigari, T.A.; Orbase, M.A.R.; Desamero, N.V.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 65-74 (Aug 2014).* Summary (En). 2 graphs; 6 tables.

High genotype (G) by environment (E) Interaction (GEI) complicates the task of identification of rice genotypes with high yield in rainfed lowland (RFL) ecosystem. This paper examined 23 rice genotypes for yield and yield stability in the RFL rice ecosystem of the Philippines. The genotypes were evaluated in 12 environments composed of 3 locations over 4 wet seasons (2007-2010), in replicated RCBD. In each evaluation, amount of rain, standing water depth, and water table depth were recorded daily and the rice plants were measured for growth characteristics and yield. AMMI analysis was used to interpret the effects of G, E and GEI, on yield and yield stability. The AMMI analysis revealed that 44.4% of the total variation in grain yield was due to E, 22.2% to G, and 33.5% to GEI effects, with the first two principal components accounting for 51.7% of GEI to total sums of squares. The AMMI 2-biplot model depicted genotypes Azucena-M5R-2 (3), Raeline 3 (5) PSB Rc82 (11), MAHSURI (15) and IR72 (18) as highly stable across the environments, and genotypes SPYT-CAG5DS (14), PSBRc18 (2), PSB Rc10 (16), NSIC Rc138 (8), SGYT29-CAG05SDS (10), PSB Rc14 (7), and IR64 (13) as the most

responsive for grain yield. The AMMI-biplot analysis allowed for easy visual identification of superior genotype for each set of environment. Increased number of test environment and use of stability indices, especially when large number of entries is included could entrance the accuracy of analysis and facilitate large number of genotypes with broad or specific adaptability.

ORYZA SATIVA; RICE; HIGH YIELDING VARIETIES; RAINFED FARMING; LOWLAND; AMMI; GENOTYPES; GENOTYPE ENVIRONMENT INTERACTION; CROP YIELD; ADAPTABILITY; PHILIPPINE

Evapotranspiration and water use efficiency of irrigated lowland rice at dry season early planting with varying nitrogen levels. **Agustin , I.D., Agustin, A.M.L., Vismonte, P.T.Jr.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 83.*

Water scarcity due to climate change and increasing water competition threatens the productivity of irrigated lowland rice because of its high water requirement. This scenario has been happening in the Rice Bowl of the country because many areas are not receiving enough irrigation water during the dry season especially those areas far from water dams. In these areas, many farmers are practicing early planting to take advantage of residual moisture and rainfall. Hence, this study was conducted to evaluate the water use (ET) and water use efficiency (WUE) of early and normal planting of dry season rice with varying Nitrogen levels. A two-factor field experiment was conducted in Nueva Ecija [Philippines] during 2018 dry season rice cropping using Split-plot design with planting date (November 1st and December 1st) as main-plot and Nitrogen level (0,90, 120, LCC Kg N/ha as sub-plot with three replications. Plot size was 20 sqm with three pails each to measure water use (ET). Early planting is characterized by relatively higher average temperature (minimum and maximum) and relative humidity but lower solar radiation and wind speed. Grain yield had no significant difference between planting dates; however, early planting had lower ET resulting to higher WUE. Among N levels, 120 kg N had highest GY, WUE and Agronomic Efficiency of N across planting dates. The result suggests the possibility of adjusting planting date during dry season for lower water requirement without consequences on yield thereby higher WUE. Another set of experiment will be conducted to verify the results.

ORYZA SATIVA; IRRIGATED RICE; LOWLAND; PLANTING; DRY SEASON; EVAPOTRANSPIRATION; WATER USE; EFFICIENCY

Effect of solar radiation regime, season and location on yield components of popularly grown rice (Oryza sativa L.) genotypes. **Mercado, M.A., Perdiguera, K.N., Marajas, I.R., Hernandez, J., de Guzman, L.E., Sta. Cruz, P.** 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. 61 (Jul-2018).*

Solar radiation is one of the environmental factors that limit the formation of yield components in rice due to its effect on storage organ formation and grain filling, which are different processes necessary for the production of grain. In this study, three rice genotypes (Mestiso19, NSIC Rc222 and PSB Rc18) were planted in

five different environments: (1) 2014 wet season at Muñoz, Nueva Ecija; (2) 2015 dry season at Muñoz, Nueva Ecija; (3) 2014 wet season at Musuan, Bukidnon; (4) 2014 wet season at Los Baños, Laguna and (5) 2015 dry season at Los Baños, Laguna to determine the effect of solar radiation at a particular growth stage on each yield component. Variability in average incident solar radiation from each environment was observed in five environments. Analysis of variance showed significant differences in the genotype x environment interaction for panicle m-2, 1000 grain weight and harvest index. Correlation analysis for dry season environments showed that the number of spikelets per panicle showed positive relationship with solar radiation during reproductive stage while percentage filled spikelets demonstrated strong positive relationship with solar radiation during ripening stage. In the wet season environments, strong positive relationship was observed with solar radiation during ripening stage. This study confirms that the number of spikelets per panicle is greatly influenced by the solar radiation intercepted by the crop during the reproductive stage and the percentage of filled spikelet is due to the solar radiation during the ripening stage of the crop.

ORYZA SATIVA; GENOTYPES; GENOTYPE ENVIRONMENT INTERACTION; CROP YIELD; SOLAR RADIATION; WET SEASON; DRY SEASON; ENVIRONMENT

Genetic diversity and geographic dispersion in Thymus spp. as detected by RAPD [Random Amplified Polymorphic DNA] markers. **Yousefi, V.; Najaphy, A.; Zebarjadi, A.; Safari, H.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 82-88 (Apr 2015)*.

Thyme, as an aromatic medicinal plant and a perennial and woody herb Lamiaceae has commercial, pharmaceutical and perfumery potentialities. Thymus is taxonomically a very complex genus with high frequency of hybridization and introgression among sympatric species, and some species of this herb are endemic to Iran. From the chemical point of view, important biochemical components such as thymol and carvacrol are known in thyme. In the present study, 13 Thymus spp. accessories collected from different geographic areas of Iran along with one accession from England (Thymus vulgaris) were analyzed by Random Amplified Polymorphic DNA (RAPD) markers using 20 primers to discover genetic polymorphism. A total number of 510 bands were detected from 20 RAPD primers, of which 483 (94.315) were polymorphic with an average of 24.15 polymorphic bands per primer. The size range of the amplified products was 200-4000 bp. UPGMA cluster analysis was carried out using Jaccard similarity coefficients based on PAPDS. The dendrogram obtained from the method classifies the 14 thymes accessions into four major groups. Scatter biplot based on principal coordinate analysis (PCoA) also revealed four groups and confirmed the results of clustering method with some minor disagreements. The accessions were relatively grouped according to the location where they had been collected. The molecular variation assessed in the study could elucidate largely geographic dispersion of the thyme accessions, and in combination with biochemical characteristics, can be useful to improve the efficiency of selection and breeding programs.

THYMUS (GENRE);THYME; SPECIES; GENETIC RESOURCES; GENETIC MARKERS; RAPD; DRUG PLANTS; GENETIC POLYMORPHISM; MEDICINAL PROPERTIES; CHEMICOPHYSICAL PROPERTIES

Genotypes differences in sap bleeding rate among diverse rice cultivars under different soil moisture conditions. **Cabral, M.C.J.; Niones, J.M.; Kano-Nakata, M.; Suralta, R.R.** 48. Crop Science Society of the

Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines). v.43 (Supplement no. 1) p. 67-68 (Jul 2018)*.

ORYZA SATIVA; VARIETIES; GENOTYPES; SAP; NUTRIENT TRANSPORT; WATER UPTAKE; DROUGHT; SOIL; SOIL WATER CONTENT; WATERLOGGING

Soil water uptake, one of the key determinants for drought adaptation is largely dependent on root system developmental responses to water deficit. Bleeding sap is a manifestation of root pressure related to physiological traits of the root system. This study evaluated the sap bleeding rate of eight rice genotypes with diverse root responses under various soil moisture conditions and determined the effects on yield. The genotypes were established in the field in split plot design in RCBD under two water stresses: continuously waterlogged (CWL) and progressive drought (PDR) stress and grown until maturity. Xylem sap sampling was done at flowering stage between 7:00-9:00am using pre-weighed cotton towel placed on the cut surface of the stump and wrapped in plastic film with rubber band. The cotton was weighed again after 1 hr and the increase in weight was used to compute the sap bleeding rate. There were significant interactions between genotypes and water stress on sap bleeding rate. Relative to CWL, rice varieties DRS63 and NSIC Rc158 had significant increase in sap bleeding rate by 31.1 and 12.5% under PDR while the other genotypes showed significant reductions ranging from 46.8 to 96.3%. Drought significantly reduced shoot biomass and yield in most genotypes except in DRS63, KDML 105, Kinandang Patong and YTH304, relative to CWL control. Yield positively correlated with sap bleeding rate under drought while the two traits were negatively correlated under CWL. The results indicate that higher sap bleeding rate under drought during flowering may imply that some genotypes adapted to drought (e.g. DRS63) may have the ability to efficiently regulate soil water uptake during earlier growth stage and make it readily available at critical stage such as during the post flowering drought and hence increase in sap bleeding rate. Further data analysis and studies are being conducted to validate the initial findings.

Morphological and physico-chemical characteristics of 'Red Creole' Allium cepa L. in three production areas in the Philippines. **Del Carmen, DR.; Espigol, A.M.D.; Nuevo, P.A.; Masilungan, G.D.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 13-19 (Dec 2016).*

A survey was conducted in the three major onion growing areas in the Philippines, namely, Mindoro Occidental, Nueva Ecija, and Pangasinan to augment and update the limited available data on the local 'Red Creole' variety. This was followed by laboratory determination of the morphological and physico-chemical characteristics of bulb onions that affect the taste, flavor and postharvest behavior of the produce. Correlation between these characteristics was also investigated. These are deemed important as basis in developing effective interventions and/or strategies in the produce quality and marketing systems improvement. Results showed that onions obtained from Nueva Ecija are superior in terms of size and compressive strength while onions obtained from Mindoro have the highest pungency values. Onions from Pangasinan are small with the lowest weight value but have the thickest leaf sheath. Bulb weight is positively related to compressive strength, but is negatively related to total soluble solids. Bulb height also shows positive correlation with compressive strength and negative correlation with total solids. The bulb's equatorial diameter and firmness

are also negatively correlated. Lastly, onion's outer leaf sheath thickness is also positively correlated with pungency.

ALLIUM CEPA; ONIONS; VARIETIES; CHEMICOPHYSICAL PROPERTIES; SEED WEIGHT; PETIOLES; PHILIPPINES

Optimizing the doses of Moringa (Moringa oliefera L.) leaf extract for salt tolerance in maize. **Ali, A.; Abbas, M.N.; Maqbool, M.M.; Arshad, M.I.; Jan, M.; Qayyum, A.; Lee, D.J**. *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 84-89 (Apr 2017)*.

Salinity is a major agricultural problem that adversely affects maize yield. Maize is a major fodder crop which necessitates the improvement of its vegetative performance under salt stress using different doses of moringa leaf extract (MLE). With the objective to tolerate the salt stress, 5 levels of moringa leaf extract concentrations [control, 5%, 10%, 15% and 20%] were foliarly sprayed on maize seedlings raised in saline (70 mM NaCl) and non-saline (0 mM NaCl) hydroponic Hoagland solutions. Plants were harvested 4 wk after applying salt stress and foliage spray of leaf extract. The following morphological characters (shoot length, root length, shoot fresh weight, root fresh weight, shoot dry weight, root dry weight, shoot root ratio) and biochemical parameters (sodium and potassium contents) were evaluated. The experiment was laid out in ARD in factorial arrangement with 5 replicates. The data collected was subject to statistical analysis at 1% probability level and DMR was used to separate the significant treatment means. The results showed that moringa leaf extract improved the shoot and root growth significantly. Moringa leaf extract proved to be helpful in reducing Na and increasing the K content of the leaf.

MORINGA OLEIFERA; ZEA MAYS; SALINITY; MAIZE; LEAVES; PLANT EXTRACTS; SEEDLINGS; SALT TOLERANCE; AGRONOMIC CHARACTERS

Phytochemical screening and assessment of health-related bioactivities of phenolic compounds from yacon [Smallanthus sonchifolius (Poepp. and Endl.) H. Robinson] leaves and tubers. **Reyes, C.T.; Villagen, R.C.P.; Rodriguez, E.B.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 1-11 (Aug 2014)*.

Yacon [Smallanthus sonchifollius (Poeppig and Endlicher) H. Robinson], a tuber crop originally cultivated in the Andean region of South America, has been used as food and in traditional medicine by the native inhabitants for centuries. This study determined the nutritional value of yacon grown in Nueva Ecija [Philippines], characterized the phenolic constituents and evaluated their health-related bioactivities. By proximate analysis, a 100-gram sample of freeze-dried yacon tuber was found to contain low levels to protien (2.43 g), moderate level of fiber (4.47 g) and high level of carbohydrates (73.8 g). A 100 g sample of dried yacon leaves contained high level of protein (15.24 g) and fiber (5.67 g), and moderate level of lipids (2.81 g). Potassium comprised more than 50% of the total mineral content of yacon leaves and tuber, as determined by ICP-OES. Phytochemical screening showed the presence of phenolics, alkaloids, sesquiterpene lactones, terpenoids and triterpenoids; and absence of cyanogenic glysides, saponins and glucosinolates in yacon leaves and tubers. The total phenolic contents of the tuber and leaf extracts, as estimated by the Folin-Ciocalteu method (in terms of mg GAE per 100 g sample and mg QE per 100 g sample) were : tuber methanol extract (164.2 ± 16.9 and 167.5 +- 15.0), leaf decoction extract (3,489.4 +- 129.9 and 3,484.7 +- 142.1) and leaf methanol extract (529.2+-52.4

and 214.8 +- 46.1). Descending two-dimensional paper chromatography, TLC and RP-HPLC analyses of the phenolic extracts and their products from acid- and base-hydrolysis showed that caffeic and its esters and derivatives were the major phenolic components. Quantification by RP-HPLC showed high levels (in terms of mg per 100 g sample) of a caffeic acid ester in the tuber extract (155.32 ± 0.67) and leaf decoction (186.72 ± 4.55), caffeic acid in the based-hydrolyzed leaf decoction (395.3 +- 0.7) and ferulic acid in the acid-hydrolyzed leaf decoction (43.32 +- 7.00). Results from chromatographic analyses corroborated by the isolation and identification of the following compounds by silica gel open column chromatography. Sup 1 H-NMR spectroscopy and melting point determination; caffeic acid from leaf decoction based-hyrolysed extract, and ferulic acid from leaf decoction acid-hydrolyzed extract. The phenolic extracts were found to have significant DPPH radical scavenging activity. Furthermore, the phenolic extracts exhibited significant anti-lipoperoxidative activity on rat liver microsomes comparable to a commercial supplement containing silymarin extract, which is recommended for hepatoprotection. Using duck embryo CAM vascular irritation assay, the phenolic extracts were found to possess an anti-inflammatory activity comparable to hydrocortisome.

POLYMNIA SONCHIFOLIA; SPECIES; LEAVES; TUBERS; ANTIOXIDANTS; PHENOLIC COMPOUNDS; MEDICINAL PROPERTIES; PROXIMATE COMPOSITION

F61 Plant physiology - Nutrition

Enhanced organic phosphate utilization by over-expression of OsACP1 [gene coding phosphatase isolated from Oryza sp.] and OsPAP1 [O.sativa purple acid phosphate 1] genes in rice (Oryza sativa L.). **Woon-Ha Hwang; Soo-Kwon Park; Dong-Jin Shin; Manigbas, N.L.; Min-Hee Nam; In-Jung Lee; Don-Hoon Kim.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 17-23 (Apr 2015).*

Phosphorus is one of the most important macro-elements for plant growth and development. It can easily combine with other minerals, however, when converted into insoluble form, phosphate may not be available for plant use. Among insoluble phosphates, organic phosphate (Po) accounts for 20-80% of the total phosphate on soil. Po should be hydrolyzed by phosphatases so that it can be absorbed by plants. OsACP1 (gene coding phosphatase isolated from Oryza sp.) and OsPAP1 (O.sativa purple acid phosphate 1) genes (gene coding phosphatase isolated from Oryza sp.) have been studied in rice, while their function has not been fully investigated. In this study, transgenic rice, OsACP1-OX1 and OsPAP1-OX, were generated by Agrobacterium-mediated transformation in the Japonica rice cultivar Dongjinbyeo to determine the utilization and uptake of Po by over-expression of endogenous. OsACP1 and OsPAP1 genes. Transgenic lines were selected based on the OsACP1 and OsPAP1 gene expression. Homozygous plants of the T3 generation were used. Transgenic plants with over=expression of OsACP1 and OsPAP1 showed higher phosphatase activity than the wild type. Po is then hydrolyzed such that more Pi is absorbed in the transgenic plants than the wild type. Plant height and tiller number were increased by 120-200% in the transgenic plants. These results indicate that OsACP1 and OSPAP1 could enhance the organic phosphate uptake and utilization in rice and ultimately increase efficiency in phosphate used and increase productivity.

ORYZA SATIVA; RICE; VARIETIES; ORGANIC FERTILIZERS; PHOSPHATE FERTILIZERS; TRANSGENIC PLANTS; GENE EXPRESSION; NUTRIENT UPTAKE

F62 Plant physiology - Growth and development

Dry matter production and partitioning in eight newly-developed F1 TGMS-based rice hybrids. **Salazar, B.T.; Talavera, M.A.A.; Ortiguerro, M.L.G.; Masajo, T.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 73 (Jul 2018).*

The study aimed to characterize dry matter production and partitioning in recently developed F1 thermo-sensitive genetic male sterile (TGMS)-based rice hybrids of PhilRice Los Baños and UP [University of the Philippines] Los Baños. The experiment was laid out in a randomized complete block design at the UPLB [University of the Philippines Los Baños] Central Experiment Station in Dry Season 2017 with 16 entries and 4 replications per entry. Assimilate partitioning and total dry matter production was determined by getting the sample oven-dry weights, while grain yield was estimated by getting the 10 m2-plot yield. Across entries, aboveground biomass ranged from 2.5 to 4.0 g/sqm at seedling stage, 200-300 g/sqm at maximum tillering , 600-1600 g/sqm at flowering, and 1500-1800 g/sqm grain maturity. During maximum tillering, leaf blade and culm accounted for 46% and 54% respectively, of the aboveground biomass. At reproductive stage, 33% of the biomass from vegetative structures was diverted to the developing spikelet at flowering, and further to 51% to the grains at maturity. This pattern of dry matter production and partitioning in eight entries translated to a grain yield of 6.1 to 6.8 t/ha, which is comparable to the grain yield of M73, the most recently released TGMS hybrid.

ORYZA SATIVA; F1 HYBRIDS; BIOMASS; GRAIN; YIELD COMPONENTS; PLANT DEVELOPMENTAL STAGES

Effect of different amino acid sources on aromatic rice production. **Taja, B.C., Gonzales, M.A.** 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. 62-63 (Jul-2018)*.

Organic farming system on rice growing was now being adapted by several aromatic rice farmers however; nitrogen source for this particular culture of this type of rice has a need to be explored. The improvement of organic aromatic rice production with the supplementation of nitrogen by different amino acid sources to increase plant growth and development; higher yield, and as well as to enhance its aroma and quality is the aim of this study. The aromatic rice variety E9 was treated with different amino acid sources such as fish amino acid (FAA) (1 part fish innards: 1 part molasses), kuhol amino acid (1 part kuhol meat: 1 part molasses), seaweed extract (ar-arosep) (ar-arosep) (1 part ar-arosep: 1 part molasses), soybean amino acid (1 part soybean blend: 1 part molasses) and with no spraying/no amino acid source as control. Spraying the crop with 5% concentration of the different amino acid sources starting at 10 DAT and weekly thereafter was done in Randomized Complete Block Design (RCBD) with three replications. Results showed that treatments have significant difference in terms of plant height at maturity, percent filled grains and computed yield per hectare. Treatments with amino acids sources have more filled grains than the control 40.19% in soybean amino acid, 39.91% in fish amino acid, 39.89% in kuhol amino acid and 36.08% in seaweed extract. Soybean amino acid has the highest plant height at maturity (104.87cm). Though E9 has slight to moderate aroma

based on the majority of respondents in the aroma tests, the soybean amino acid have the highest percentage of respondents who rated strong aroma in leaf aroma test (8.33%) and grain aroma test (20%).

ORYZA SATIVA; AMINO ACIDS; FLAVOUR COMPOUNDS; ORGANIC AGRICULTURE

Effect of seeding depth on dry direct seeded rice in rainfed lowland. **Bueno, C.S., Carandang, R.B., Banayo, N.P.M.C., Kato, Y.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 87 (Jul 2018)*.

Seedling vigor, an indicator of good crop performance and high yield, is one of the important factors to consider under dry direct seeding for rice (DDSR). It is highly affected by several factors including seeding depth. To determine the effect of seeding depth on seedling growth and yield, the authors conducted a glasshouse trial using nine different genotypes (PSBRc10, NSICRc 222, NSIC Rc282, NSICRc 346, NSICRc 348, NSICRc 420, NSICRc 434, IRUPLi7, IR107891-B-B-1092-1-1) at saturated soil moisture and a field trial using five varieties (PSBRc10, NSICRc 222, NSIC Rc282, NSIC Rc 346, NSICRc 348) at field capacity moisture at 1 cm, 4 cm and 7 cm seeding depths. Seedling emergence observed at 5 and 6 days after seeding (DAS) from glasshouse trial was significantly higher at 1-cm and 4-cm depths compared with 7-cm depth. However at 7 DAS, emergence was comparable among seeding depths. Coleoptile and mesocotyl lengths were significantly higher at 4-cm and 7-cm depths with significant varietal differences. Leaf growth and development were significantly faster at 1 cm seeding depth. Varietal differences were significantly pronounced at 4 cm and 7 cm seeding depths. Seedling emergence from the field trial at 7 DAS, was significantly higher at 7 cm seeding depth. However at 14 DAS, seedling emergence was similar among seeding depths. No significant differences among varieties were detected for mesocotyl and coleoptile lengths, but seeding depth had significantly increased mesocotyl elongation. Plant height, leaf rank of the main tiller and shoot biomass were significantly higher in plants sown at 7 cm when measured at 7 and 18 DAS. Seeding depth had no effect on grain yield, total biomass, panicle number, sink size and fertility rate, but significant varietal differences existed. Deeper seed placement under dry soil condition showed an initial growth advantage which can be an important and practical option under DDSR. Further studies need to be conducted to maximize management possibilities to sustain vigor and rapid growth to improve yield in drought-prone rainfed areas.

ORYZA SATIVA; DIRECT SOWING; SOWING DEPTH; CROP PERFORMANCE; SEEDLINGS; VIGOUR

Evaluation of cassava (Manihot esculenta Crantz) varieties for growth parameters, yield, and development of postharvest physiological deterioration. **Sazon, L.A., Abustan, M.A., Mendoza, M.R. 48.** Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 88 (Jul 2018).*

The study was conducted in the experimental field of the Institute of Plant Breeding located in Tranca Bay, Laguna [Philippines] from June 2017 to April 2018. The experiment aimed to evaluate the growth parameters, yield and development of postharves physiological deterioration of 14 new and two check cassava varieties. It

was laid out in a randomized complete block design (RCBD) with three replications. Results showed significant differences in mean plant height, height at first branching and angle of first branch at a= 0.05 with values ranging from 23cm-306cm, 41cm-144cm and 22 deg C-41 deg C respectively. No significant differences were observed in the weight of marketable and non-marketable root and harvest index. However, 10 out of 14 new varieties obtained relatively higher yield than the two check varieties in terms of marketable yield with mean yield between 24.83 t/h-40.14 t/ha. In terms of postharvest physiological deterioration (PPD), the varieties exhibited PPD ranging from 5% to 58%. Out of the fourteen new varieties lower mean PPD were observed in 3 entries compared to KU50 (check variety) and 11 varieties showed higher mean PPD than Lakan 1 (check variety). The results of the study suggest that the 14 entries evaluated are promising cassava varieties for possible cultivation to enhance farmers' production.

MANIHOT ESCULENTA; VARIETIES; EVALUATION; GROWTH; CROP YIELD; POSTHARVEST PHYSIOLOGY

Exogenous application of amino acid proline on three rice varieties under aerobic condition. **Agalos, S.Q., Gonzales, M.A.** 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. 66 (Jul-2018)*.

Proline is an amino acid known as precursor of 2-acetyl 1-pyrroline (2AP) that carries such fragrance in rice grains, and plays an important role in plant metabolism and development in various type of stresses such drought (John Pitchel et. al. 2012). Three rice varieties representing different types: aerobic non aromatic (NSIC Rc192), white aromatic (E9) and pigmented aromatic (P14) studied to determine the effect of different levels of proline on their growth and yield in aerobic conditions. Analytical grade proline from Sigma Aldrich was used as foliar application at 150ppm, 450ppm and 750ppm dose levels (with 0.1% Tween-20 solution each level) during 30 DAT and during the flowering stage of the three varieties. The experiment was laid out in split plot RCBD. Both leaf and grain aroma was rated by 16 evaluators based on test scale 1- absence of aroma, 2- slight aroma, 3-moderate aroma and 4- strong aroma. The different varieties have varied responses with the different concentrations of proline application. E9 contains slight aroma in the control while the rest of the treatments was rated moderate to accumulated during the leaf and aroma tests but there is higher level of aroma accumulated during the leaf stage. Growth rate increases as the dosage level increases from 150 ppm and 450 ppm, however, the highest concentration (570 ppm) had low growth rate than the dosage level 450ppm due to more pest infestation and disease.

ORYZA SATIVA; VARIETIES; PROLINE; AEROBIOSIS; GROWTH; CROP YIELD; FLAVOUR COMPOUNDS

Identification of endophytic bacteria isolated in talahib (Saccharium spontaneum L.) (sic) roots. **Jardinero, K.J.J., Cruz, J.A., Suralta, R.R., Ordonio, R.L**. 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. 64 (Jul-2018)*.

Endophytic bacteria are endosymbiotic microorganisms prevalent among plants that colonize its intracellular spaces and do not cause plant disease or significant morphological changes. Wild grasses such as talahib

(Saccharium spontaneum L.) are under explored as source of growth promoting endophytic bacteria for commercial application to crops. The beneficial endophytic bacteria isolated in talahib roots were in-vitro screened for its plant growth promoting activities and the promising isolates were identified using Biolog OmniLog Identification System. The Burk's medium, a nitrogen-free medium was used in isolating the potential endophytes. A total of 19 isolates from talahib roots obtained from Science City of Muñoz and San Jose City, Nueva Ecija [Philippines]were tested for the production of growth-promoting compounds. These compounds include indoleacetic acid (IAA) production, phosphate solubilization and starch hydrolysis. Out of 19 isolates, four produced IAA in culture. One of the most important mechanisms involved in plant-growth promotion is the bacterial excretion of phytohormones, such as IAA. Nine isolates showed positive in phosphorus stabilization by the formation of clearing zone around the isolates grown in Pikovskaya's medium. Among the 19 isolates evaluated, two possessed the capability to utilize stach. Three out of 19 isolates were selected based on their performance on the in-vitro screening. In this paper, two endophytic bacteria namely, Burkholderia plantarii and Acinetobacter baumanni were biochemically identified. These endophytes associated with talahib roots produced growth-promoting compounds that may stimulate plant growth. Present findings conclude that talahib roots can be a good source for isolating beneficial microbes. However, several in-vitro assay tests and evaluation of the selected isolates under screen house conditions is highly recommended to further determine its efficacy as plant-growth enhancer.

SACCHARUM SPONTANEUM; ROOTS; ENDOPHYTES; BACTERIA; PLANT GROWTH STIMULANTS; IAA; STARCH; HYDROLYSIS

Leaf counting: an effective seed production technique of ensuring flowering sychronization of hybrid rice parents. **Gramaje, L.V., Luciano, V.P., Ablaza, M.S.F., Duran, P.L.H., Caguiat, J.D.** 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. 117-118 (Jul-2018).*

Producing enough seeds from hybrid seed production areas is a bottleneck in achieving sufficient supply of hybrid seeds for commercial cultivation. Because parental lines of rice hybrids usually differ in their growth duration, obtaining a well synchronized flowering is a major problem. Synchronization of flowering is key in achieving high seed yield in hybrid seed production. However, synchronization of flowering is difficult to achieve and highly dependent characteristics of both the parents (particularly maturity) and highly affected by external factors such as fertilizer and water management, and even stresses. Usually, synchronization is improved by manipulating planting dates (staggered sowing), fertilizer management water management, and GA sub 3 application . A new and improved technique called 'leaf number determination' was developed by Chinese breeders to optimize synchronization of flowering of hybrid parents. The study was conducted at PhilRice CES. Specifically, it aims to determine the number of leaves that coincide with the initial heading for both parents and improve flowering synchronization of PhilRice-bred hybrids. A total of six parent lines composed of three CMS and three restorer (IR80559A x PR34302, IR79128A x PR31559 and IR68897A x IR73013), were established in replicated trial by row crossing method of AxR seed production. Leaf counting started when first true leaf emerged up to flag leaf emergence. Leaf number was recorded every three days to 10 sample plants per entry. Only main culm leaves were counted. Analysis of variance for number of leaves at

flag leaf emergence revealed significant differences among parent lines. Across combinations, IR80559A x PR34302 had 0.7 leaf difference, 0.59 for IR79128A x PR31559 and 1.5 leaf difference was observed to IR68897A x IR73013 cross combination. The result can be the basis of sowing interval in AxR seed production. Leaf count method can be instrumental in flowering synchronization of hybrid parent lines.

ORYZA SATIVA; HYBRIDS; FLOWERING; SYNCHRONIZATION; LEAVES; SEED PRODUCTION

Performance of lowland rice (Oryza sativa L.) NSIC Rc82 to different nutrient management strategies grown as a main crop and ratoon. **Bañoc, D.M., Sevillano, R., Libre, M.J.P., Asio, V.B.** 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. 92-93 (Jul-2018)*.

This study was conducted under lowland ecosystem aimed to evaluate the growth and yield performance of lowland rice NSIC Rc82 as influenced by nutrient management strategies grown as a main and ratoon crop; to determine an appropriate nutrient option that promotes better growth and yield performance of lowland rice; and assess the benefit of lowland rice production when grown as a main and ratoon crop to nutrient management strategies adopted. Fertilized plants grown either as main crop or ratoon significantly matured earlier than that of unfertilized control. Fertilized main crop exhibited significant protrusion of the flagleaf, produced markedly abundant number and longer nodal roots access length. For the ratoon crop, however, all agronomic characteristics were not significantly affected by the nutrient management options evaluated except the entire growth period of the ratoon and total number of nodal roots per hill. Relative to yield, yield component and harvest index (HI), all parameters were not significantly affected by the nutrient management strategies tested except the number of productive tillers and the weight of 1,000 grains. Main crop applied with inorganic fertilizers at 90-60-60 kg/ha N sub 1 P sub 2 O sub 3 K sub 2o (T sub 1) generated the highest net income of PhP 28,596.00. per hectare. For the ratoon crop, combined application of organic and inorganic fertilizers generated the highest net income of PhP 19,600.50. However, for combined cost and return analysis of both the main crop and ratoon, inorganic fertilized plants (T sub 1) generated the highest net income of PhP 43,678.00 while lowest net income was obtained in purely organic fertilized plants with PhP 5,931.25.

ORYZA SATIVA; VARIETIES; LOWLAND; CROP PERFORMANCE; RATOONS; RATOONING; NUTRITIONAL REQUIREMENTS

Root developmental response of selected rice varieties under progressive drought conditions. **Gaetos, G.C.S.; Divina, C.C.; Kalaw, S.P.; Reyes, R.G.; Mananghaya, T.E.; Niones, J.M.; Suralta, R.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 71 (Jul 2018).*

Drought stress can affect the plant physiology status, metabolic activities and other related processes concerning growth and development. This study aims to characterize the root cell structure and root developmental response in relation to dry matter production under progressive drought (PDR) stress using the a root box system. NSIC Rc416, PSB Rc68 and IR64 rice varieties were subjected to PDR and non-stress

conditions. The experiment was laid out in RCBD with three replications. The effect of water stress in the physiological and cellular structure of rice showed that significant changes in morphological, physiological and cellular development in response to PDR in relation to non-stress condition. It is notable that a significant reduction of shoot biomass (SDW) compared with the non-stress conditions. This significant SDW reduction was attributed to less root development and reduced cellular structure, which led to dry matter reduction.

ORYZA SATIVA; VARIETIES; ROOTS; PLANT PHYSIOLOGY; DROUGHT STRESS; WATER DEPRIVATION

Root trainer technology for rubber developed. **Anon**. *Agriculture (Philippines) v. 23 (1) p.53 (Jan 2019).*

RUBBER; ROOTS; ROOTING; PLANT TRAINING; TECHNOLOGY; PLASTICS; PLANT CONTAINERS

H- PLANT PROTECTION

H10 Pests of plants

Characterization of the QTL linked to tungro and green leafhopper resistance in rice (Oryza sativa L.) using advance backcross population. **Waing, F.P.; Pocsedio, A.E.; Fernando, T.C.; Alberto, R. T.; Waing, K.G.D.; Romero, G.O.; Tabanao, D.A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 20-30 (Aug 2016).*

Resistance to rice tungro virus (RTSV) and green leafhopper (GLH) found in the Indian landrace, ARC 11554, was previously localized on the short arm of rice chromosome 4 flanked by markers RM8213 and RM3471. This study aimed to infer the haplotype of the introgression region in backcross lines, determine the backcross line containing the resistance region that is most suitable for developing a mapping population, and narrow down the region of the putative chromosomal position of the resistance QTL using tightly linked molecular markers in an F2 mapping population. Fifty-five backcross line (11 BC sub 2 F sub 6 and 44 BC sub 4 F sub 4) in NSIC Rc138 backgrounds were used for haplotype characterization. Of the 55 lines, 22 backcross lines that resembled the donor region in chromosome 4 were selected for marker similarity analysis. Marker similarity ranged 81-96% among the BC sub 2 F sub 6 and 89-99% among BC sub 4 F sub 4 lines. Mapping population composed of 1,014 BC sub 5 F sub 2 were established from the cross between NSIC Rc138 and ARC138-4-5-5-2-30. The BC5 F2:3 lines were screened for tungro and GLH resistance. QTL detected for RTSV resistance accounted for 17.43% of the total phenotypic variance explained (PVE) and the GLH resistance QTL had a PVE of 19.19%. Two peaks were observed: one on the left side of RM8213 (RM335-RM16428) and a secondary peak on the right (RM16434-RM16497). The primary signal (peak LOD) was located in the RM16425-RM16427 region, the size of which is only 0.5 kb. This confirmed that the very strong resistance of ARC11554 is due to cosegregation of resistance genes conferring resistance to RTSV and GLH.

ORYZA SATIVA; RICE; BACKCROSSING; CHROMOSOMES; RICE TUNGRO VIRUS; TUNGRO DISEASE; NEPHOTETTIX VIRESCENS; GENETIC RESISTANCE; PHENOTYPES; GENETIC MARKERS; GENETIC MAPS

Coconut varietal resistance screening against coconut scale insect under field exposure trial. **Fernandez, E.C.J., Vasquez, M.S.C., Sison M.L.J., Emmanuel, E.E., Rivera, S.M., Rivera, R.L., Lasina, R.S., Delos Santos, L.B., Larupay, J.G.B., Reaño, C.E., Galvez, H.F.** 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. 106-107 (Jul-2018)*.

Host resistance screening of the PCA-ZRC coconut germplasm was performed at East Side area, Isabela City, Basilan [Philippines] under natural insect infestation. The test palms consisting of five seedlings per variety were laid out in three plots under stands of coconut palms heavily and homogenously infested with coconut scale insect (CSI). The coconut germplasm consisted of 23 tall, 24 hybrid, and 25 dwarf varieties. Coconut seedlings were observed for signs of successful infestation of insect crawlers 7 days after transplanting. Monitoring for CSI localization on coconut leaflets and establishment of different development stages were continued every 15, 30 and 60 days. The infested leaflets were rated for percent leaf damage (%LD) for yellowing due to insect feeding. Analysis of Variance (ANOVA) using nested design with variety nested within ecotype and repeated measures analysis revealed that mean %LD is significantly different among ecotypes and among varieties nested within each ecotype. Pairwise mean comparison using Tukey's studentized range test (HSD) with palm means as data showed that January 2016 is the period with the highest variance among all data periods. Subsequently, pairwise mean comparison using Fisher's least significance difference (LSD) with %LD as data were performed for this time period and revealed the most and least preferred varieties among the three coconut ecotypes. Varieties with mean %LD below 40% (mild to moderate resistance) were selected as the least preferred varieties, while varieties with %LD of 100% were identified as the most preferred varieties. Sanchez Mira (SCHT), West African X Tagnanan (WXT x TAGT), and Aguinaldo (AGDT), with mean %LD values of 36.33, 28.5 and 28.06 respectively, were selected as least preferred varieties while Baguer (BAGD), Cameron Red (CRD), and Kiamba (KIAD), all dwarf varieties and with mean %LD of 100% were the most preferred varieties by CSI.

COCOS NUCIFERA; COCONUTS; SELECTION; PEST INSECTS; PEST RESISTANCE; FIELD EXPERIMENTATION; LEAVES; INFESTATION

Does rice fight back? total phenolics of TKMG and TN1 rice varieties as defense mechanism against rice stem borer (Scirpophaga innotata). **Cacerez, J.C.A.; Abilgos-Ramos, R.G.; Dela Cruz, M.B.; Viz, J.A.; Pacada, I.G.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 69-70 (Jul 2018).*

Phenolic compounds are secondary metabolites that play an important role in plant defense mechanism against pests and diseases. Rice stem borer (SB) is an important insect pest causing up to 30% yield loss. Thus, this study was conducted to evaluate the total phenolic content (TPC) of leaves and stems of resistant (TKM6) and susceptible (TN1) rice check varieties infested by SB. Screen house experiment was set up on PhilRice-Agusan. Samples were collected 36 days before and nine days after SB introduction. Total phenolic content (TPC) was determined using spectrophotometric method. Results showed that in comparison to the TPC values of samples before SB introduction, TPC of control and infested leaves of both check varieties decreased by 51.03% to 60.64% after SB introduction. A 12.84% and 11.07% decrease in TPC was also observed in the control stem of TKM6 and TN1, respectively. No significant change in TPC value was observed in infested TKM6 stem while a decrease of 28.04% was observed in infested TN1 stem. After SB introduction, higher TPC

in the control leaves was observed in TKM6 than in TN1 while comparable TPC was observed in infested leaves of both check varieties. However, the TPC values of control and infested leaves of both TKM6 and TN1 had no significant differences. For controls stems, TN1 had higher TPC than TKM6. Higher TPC in infested stems was observed in TKM6 than in TN1. The TPC of infested TKM6 stem was 17.39% higher than the control while the TPC of infested TN1 stem was 19.09% lower than the control. The changes in TPC may demonstrate the role it plays in rice plant defense against herbivores such as SB.

ORYZA SATIVA; VARIETIES; PHENOLIC CONTENT; SCIRPOPHAGA; PEST RESISTANCE

DuPont technology gives hope against hoppers. *Agriculture (Philippines) v. 22 (10) p. 34-35 (Oct 2018).*

ORYZA SATIVA; NEPHOTETTIX VIRESCENS; NILAPARVATA LUGENS; INSECTICIDES; INFESTATION; YIELD INCREASES

Farmers' participation in integrated pest management under the Palayamanan Program in Camarines Sur, Philippines. **Oliver, P.F.; Dizon, J.T.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 40-49. (Dec 2016).*

The study was conducted to analyze farmers' participation in the Integrated Pest Management (IPM) under the Palayamanan program in three municipalities in Camarines Sur, Philippines, namely, Buhi, Ocampo and San Fernando. A correlation analysis was done to determine the relationship between the farmers' socio-economic and psychological characteristics, and institutional factors and IPM practice. The level of farmers' participation in IPM showed that respondents in Buhi were at the partnership level, those in Ocampo were at the consulting level, while those in San Fernando were at the informing level. Based on chi-square analysis, the factors that were significantly correlated with participation in IPM were monthly income; knowledge about IPM; and trainings, technical assistance, and financial/credit availability. The major recommendations of farmer-respondents in the IPM practice were to encourage other farmers to continuously practice IPM to lessen pesticides usage and reduce expenses on farm inputs, and further increase technical, financial assistance and trainings to IPM farmers under the Palayamanan Program.

FARMERS; PARTICIPATION; INTEGRATED PEST MANAGEMENT; LOCAL GOVERNMENT; EXTENSION PROGRAMMES; TRAINING PROGRAMMES; DIFFUSION OF INFORMATION; PHILIPPINES

Patterns of species richness and diversity of arthropods associated with rice in PhilRice Negros [Philippines] seed production. **Mondejar, C.L.C.; Osano-Palanog, M.J.; Pantin, F.L.A.; Bello, G.E.; Dogeno, L.A.G.; Parina, C.J.; Norbe, M.A.D.; Austria, R.F.; Etchon, M.A.; Palanog, A.D.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, ,Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 78.*

Patterns of species diversity and community structure of arthropods associated with rice were investigated at PhilRice Negros seed production. Pest insects are among the main constraints in the seed production of the station. Rigorous analysis may help identify ecological mechanisms underlying the dynamics of pest insect

populations in agrosystem and effectively managed insect pests. Biodiversity inventories include collection of arthropods through sweeping and identification up to species level. Shannon and Simpson indices were calculated to measure species richness and diversity within community. Sorenson's coefficient was likewise calculated to determine similarity between communities. Diversity index for insect pest (IP) and natural enemies (NE) during WS2017 ranges from 0.35-1.91 and 1.33-2.09, respectively. Rice bug was the most dominant insect pests during WS2017, followed by green leafhopper (GLH) and yellow stemborer (YSB). During DS2018, the diversity index ranges from 0.26-1.55 and 0.67-1.89 for IP and NE, respectively. The most dominant insect pests were adult whorl maggot followed by GLH and white-backed planthopper (WBP). The pesticide application to manage GLH and YSB was the reason of the decrease in diversity index. GLH was the most dominant insect pests during vegetative, while YSB during reproductive and rice bug during ripening stage of growth in WS2017. A significant reduction of these insect pest population was observed during DS2018. This may imply that an appropriate control management was executed. The field data obtained will constitute the baseline data for the planned implementation of Integrated Pest Management.

ORYZA SATIVA; SEED PRODUCTION; PEST INSECTS; ARTHROPODA; BIODIVERSITY; PHILIPPINES

Phenotypic resistance mechanism of rice germplasm against yellow stem borer (Scirpophaga incertulas). **Castro, J.; Regalario, J.; Dela Cruz, M.; Francia, F.J.; Duldulao, M.; Santiago, G.; Rillon, G.; Pacada, I.; Niones, J.; Ferrer, M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 76 (Jul 2018)*.

ORYZA SATIVA; VARIETIES; GERMPLASM; PEST RESISTANCE; INFESTATION; EVALUATION; SCIRPOPHAGA INCERTULAS; WET SEASON

Yellow stem borer (S. incertulas) is one of the most devastating insects of rice worldwide, reducing rice yield up to 43% in irrigated rice and may become more serious year after year if it is not controlled. One reliable method to control this insect is to use resistant cultivars. Thus, this study was conducted to determine associated phenotypic traits with stem borer resistance. A total of 50 accessions were subjected to field evaluation during 2017 wet season under natural infestation condition. Control varieties TN1 and TKM-6 were used as susceptible and resistant check varieties respectively. Standard descriptor for rice by Biodiversity International was used as a guide to gather morphological information at vegetative and reproductive stages. The infestation was correlated with leaf pubescence, color thickness, stem diameter and plant height. PhilRice accessions have diverse morphological features and exhibited varying response to stem borer. This information can help breeders, select appropriate parent resistant to stemborer, in varietal improvement, development of new plant type and broadening genetic basis.

Real-time surveillance of pest abundance and incidence to optimize yield and quality of rice seed production in PhilRice Negros [Philippines]. **Mondejar, C.L.C.; Osano-Palanog, M.J.; Pantin, F.L.A.; Bello, G.E. Dogeno, L.A.G.; Parina, C.J.; Norbe, M.A.D.; Austria, R.F.; Etchon, M.A.; Palanog, A.D.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside

development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 77-78 (Jul 2018).*

Rice areas in the Visayas [Philippines]include 430,378 ha of irrigated and 516,567 ha of rain-fed ecosystems. One of the commitments of PhilRice Negros is to produce nationally released seeds for the whole Visayas region. At present, the actual yields obtained at the station are low and the seed quality of the harvest compromised due to insect pests and diseases. Monitoring activities are very important in determining yield- and quality-limiting factors to develop decision guides for the pest management in seed production. The method includes field scouting for diseases, sweeping to determine insect population and quadrat sampling for weed population. Then, sampling paddies that represents the crop stage, variety planted and method of crop establishment was set to further describe the field situation. Sampling method to gather quantitative data through quadrat sampling was later systematized. All observed signs, pest damage, disease symptoms and weed population within the quadrat were recorded. Economic threshold level (ETL) and pest to defenders' ratio (P:D were used to support decisions for the management strategies to be implemented. The insect pests closely monitored during the early to mid tillering stage of rice growth were the green leafhopper, vector of rice tungro virus (RTV). RTV caused significant damage even during dry season if not controlled. An alternative host of RTV, Echinochloa sp. was also dominant in the area. During dry season, yellow stemborer was the major pests in the vegetative and reproductive stage. In the 7th week of DS2018, stemborer damaged was already at ETL (greater than or equal to 5% deadhearts) in some of the fields. These insect pests were controlled before they can significantly affect the yield. Comparison of damages with in the previous and subsequent week was used to determine the appropriateness of control measures implemented.

ORYZA SATIVA; RICE; SEED PRODUCTION; SEED; QUALITY; PEST INSECTS; MONITORING; PEST CONTROL

Yield response of Brontispa longissima infestation in coconut palms. **Orense, J.C., Imperial, Ma. L.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 80 (Jul 2018).*

The effect of Brontispa longissima (Gestro) infestation to coconut yield was studied in three sites in the Bicol Region, Philippines representing three experimental techniques in yield assessment. Artificial defoliation of very young leaves of coconut had no significant effect on the number of nuts per bunch, the number of buttons, weight of nuts, weight of husked nut, weight of fresh meat and weight of copra. Natural infestation with immediate intervention (with the introduction of Tetratichus brontispae) lowered pest infestation and damage level, hence no yield loss was detected. Observation on natural occurence of Brontispa infestation with no intervention significantly reduced the number of nuts per bunch [Y= 3.9407-4.0446(X)] and number of buttons per bunch [Y=13.7195-13.3106 (X)]. Weight of whole nut, weight of husked nut, weight of fresh meat and weight of copra were not affected by the infestation. Average rainfall had significant positive effect on the number of buttons and nuts in naturally infested coconut palms. It has likewise a significant effect on the number of buttons of artificially defoliated palms.

COCOS NUCIFERA; PEST INSECTS; INFESTATION; CROP YIELD; LOSSES; DEFOLIATION

Biological control of onion pink root using antagonistic strains of bacteria. **Rahanandeh, H.; Moshayedi, M.; Hamzeh, A.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 71-78 (Dec 2017)*.

Pink root disease of onion is one of the most destructive causes of yield loss in the crop field. Some 380 strains of bacteria were covered from onion's rhizosphere and purified on NA media. Out of these strains, 31 exhibited high antagonistic effects as shown in the dual-culture tests. Antagonistic potential of the selected bacteria were evaluated by their ability to produce antibiotics, volatile metabolites and siderophore and were selected for greenhouse experiments. The segregated antagonictic bacteria belong to the 5 species namely Bacillus laterosporus-, B. subtilis, Pseudomonas fluorescent, P. putida bv. B and P. aeroginosa. Biocontrol test on onion bulbs was performed by soil drenching with the factors arranged in a completely randomized design with 31 treatments and 3 replicates. P. fluorescent biovl MM- 19 and P. fluorescent biov. IV MM-252 showed the greatest effect on reduction of disease severity and growth parameters.

ALLIUM CEPA; ONIONS; MICROBIAL PESTICIDES; BACTERIAL PESTICIDES; BIOLOGICAL CONTROL; PLANT DISEASES;

Endemic fungal disease is involved in anamorph reproduction in Citrus cultivars in Malabing Valley, Kasibu, Nueva Vizcaya [Philippines]. **Yago, J.I., Mangahas, J.A.V., Valdez, J.R.G., Gonzales, J.M., Sana, E.A., Namujhe, J.L.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 89 (Jul 2018)*.

Citrus production started in 1960s in Malabing Valley, Kasibu, Nueva Vizcaya [Philippines]. Dominant cultivars are Mandarin such as Satsuma and Ponkan which makes Nueva Vizcaya as the Citrus Bowl of the Philippines. However, quality of fruits started to diminish due to pests and diseases. Early this year, new symptoms on the leaves were visible with small lesions. Thus, the study tried to document the casual agent of an endemic foliar disease and investigate the pathogenesis in Mandarin citrus cultivars. Infected young leaves were collected, isolated and purified into pure culture for characterization. Pure culture in plates with potato dextrose agar (PDA) were incubated for 1 week prior to morphological characterization. In-vitro pathogenesis was also conducted to confirm the identity of the disease. Prominent appearance of whitish mycelia on stomatal gradient on the abaxial portion of leaves. Infected leaf samples were turned yellow 2 weeks after colonization following falling of infected leaves with leaf rot disease (LRD). Full mycelial growth was observed in PDA plates 3 days after incubation. The presence of falcate-shaped macroconidia and microconidia with 1 to 8 celled conidia while unipolar and bipolar germination were observed 2 days after dispersal from conidiogenous cell. Formation of appresoria and haustoria were prominent and that the casual agent is in asexual stage, In-vitro colonization was observed on the stomatal portion of the leaves fully colonized by mycelia 14 days after inoculation. Based on morphological characterization and etiology of symptoms, the casual agent was identified as asexual stage infecting leaves. Hence, the casual agent of LRD was identified as Fusarium solani. This information, proved that the disease is an endemic disease at Malabing Valley, Kasibu, Nueva Vizcaya.

This is the first documented report showing the detailed morphological characteristics and etiology of signs and symptoms of LRD of Mandarin in the Philippines.

CITRUS; VARIETIES; LEAVES; ROTS; FUSARIUM SOLANI; SYMPTOMS; AETIOLOGY; PATHOGENICITY; PHILIPPINES

Evaluation of different inoculation methods for the induction of spot blotch caused by Helminthosporium sativum in wheat. **Ibrahim, T.; Bano, A.; Chaudhary, H.J.; Imran, M.; Mehmood, Z.; Hassan, S.W.; Muhammad, N.; Naqvi, S.A.H.; Munis, M.F.H**. *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 27-33* (*Dec 2014).*

The present investigation was conducted to evaluate the effectiveness of different inoculation methods of Helminthosporium sativum in wheat. H. sativum is a seed-borne and soil-borne pathogen and is well known for spot blotch. In this study, four different surface and systematic inoculation methods were used to see their affects on growth and biochemical changes in wheat. Results demonstrated that the surface infection (foliar inoculation) is not a very useful method for the induction of disease. Seedling physiology and biochemical analyses proved systematic infection (root inoculated) to be a very expedient way for efficient inoculation of H. sativum. Root inoculation showed significant decrease in relative leaf water content, whereas root length and root to shoot ratio were also reduced significantly. Foliar inoculation has shown significant decrease in chlorophyll and sugar content of leaves while other methods have shown increase in both parameters. Protein contents were significantly decreased in soil inoculation at seeding treatment while other treatments have shown non-significant changes. All the inoculation treatments have shown decrease in superoxide dismutase (SOD) activity. SOD activity decreased significantly in soil inoculation before sowing treatment while other inoculation methods showed non-significant differences. These results demonstrated that root to shoot ratio, relative water content and total protein contents estimation are the best parameter to judge the effect of H. sativum in wheat. Moreover, these results confirmed that the biochemical changes and the antioxidant defense activity depend on plant genotype and the mode of pathogen attract.

TRITICUM AESTIVUM; WHEATS; HELMINTHOSPORIUM; PEROXIDASES; SUPEROXIDE DISMUTASE; FUNGAL DISEASES; INOCULATION; ROOTS; LEAVES; SOIL; SPOTS; BLOTCHES; PATHOGENS

Genetic variability of Ralstonia solanacearum (E.F. Smith) Yabuuchi et al. isolated from soil planted to different solanaceous crops in the Philippines. **Waje, A.F.; Ardales, E.Y.; Dela Cueva, F.M.; Justo, V.P.** *Philippine Journal of Crop Science (Philippines) v 40 (1) p. 45-53 (Apr 2015).*

Ralstonia solanacearum (E. F. Smith) Yabuuchi et al. isolated from soil planted to different solanaceous crops were characterized based on traditional methods such as cultural characterization and pathogenicity test. Isolate were collected from different areas in Luzon, specifically in Beguet and areas in Mindanao (Misamis Oriental and Bukidnon) [Philippines]. Using the species-specific primers 759f/760r in multiplex-polymerase chain reaction, a 281-bp amplicon was generated from all the isolates which further confirm the identity of the bacterial isolates as R. solanacearum. Moreover, multiplex-PCR using phylotype-specific primers revealed that the Mindanao isolates belong to phylotype 1 while the Benguet isolates belong to phylotype 2. Assessment of the genetic diversity of the R. solanacearum isolates by repetitive element (rep)-PCR using REP and BOX

primers showed the separation of the Mindanao isolates from the Benguet isolates based on geographic origin. These characterization studies are vital for analyzing the difference between the isolates affecting the solanaceous crops in the 'vegetable baskets' of Luzon and Mindanao which can be used for studies related to disease management, host resistance and genetic relationships.

RALSTONIA SOLANACEARUM; GENETIC VARIATION; WILTS; PATHOGENS; PATHOGENICITY; DISEASE CONTROL; CROP MANAGEMENT; PHILIPPINES

Involvement of anamorph and teleomorph reproduction causing fungal leaf rot disease and twig blight disease of Mandarin in the Philippines. **Yago, J.I., Mangahas, J.A.V., Valdez, J.R.G., Gonzales, J.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 89-90 (Jul 2018).*

Citrus industry in the Philippines started in 1960s and the production in the local market dramatically flourished and has become economically important commodities in specific production areas in the country namely: Davao, Southern Tagalog, Kalinga and especially in Nueva Vizcaya. In spite of the occurrence of pests and diseases inflicted to citrus trees, citrus growing remains a profitable industry. Two major fungal diseases were dominant in Mandarin citrus plantation in the country such as Leaf Rot Disease (LRD) and Twig Blight Disease (TBD). Infected samples were collected on Mandarin cultivar of citrus. The causal agents were isolated and purified for identification. Detailed study on morphological characterization, pathogenesis and biological cycle were documented using compound microscope and scanning electron microscope. Involvement of both anamorph and teleomorph stage of LRD and TBD has long been an issue in the field of Mycology in the Philippines. It was explained by earlier mycologist that TBD can reproduced only by asexual means infecting twigs and branches while LRD invaded mostly on the leaves. This study provides clear information on the biological cycle and pathogenesis of the two modes of reproduction (anamorph or teleomorph). Scientific evidences derived from in-vitro and in-vivo investigation proved the involvement of two types of fungal reproduction in Mandarin citrus cultivars. Detailed study on the morphology, phylogeny and biology were also documented in the study. Thus, the results of the study is the basis of Philippine Mycologists to classify taxonomically the presence of anamorph and teleomorph stage infecting Mandarin cultivars in the Philippines. LRD and TBD are considered an endemic disease and this is the first evidence and report showing the detailed pathogenic reproduction in citrus.

MANDARINS; LEAVES; ROTS; BLIGHT; PARTHENOGENESIS; PHILIPPINES

Molecular screening of abaca (Musa textilis L. Nee) accessions using microsatellite markers associated with resistance to bunchy top virus. **Boguero, A.P.B.; Parducho, M.A.L.; Mendoza, M.R.D.; Abustan, M.A.M.; Lalusin, A.G.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 13-19 (Aug 2016).*

Fifty seven abaca accessions of the Institute of Plant Breeding [University of the Philippines] were assessed using 6 SSR markers associated with resistance to determine their genetic diversity, identity resistant and susceptible accessions for bunchy top virus, and establish a basis for construction of a genetic base pool in

breeding for resistance to bunchy top virus. Eighteen accessions were identified disease-free, 24 accessions showed mild resistance, 9 accessions were severely affected by bunchy top virus, and 6 accessions have no rating. All the accessions obtained from Palawan were observed healthy. The 57 accessions are highly diverse with Shannon-Weaver index of 0.92 and polymorphism information content value was 0.61. Accessions were grouped into 10 distinct groups with 41% Jaccard's similarity coefficient. Abuab Labo (resistant) and Maguindanao Pacol (resistant) have 56% and 45% similarity to Pacol, respectively, a source of resistance to bunchy top. Principal component analysis displayed a widely diverse set of population where each resistant accession is distributed throughout the four panels. The diversity of the accessions revealed that there would be other possible sources of resistance genes aside from Pacol which could be used for further improvement of abaca resistance.

MUSA TEXTILIS; ABACA; GENETIC MARKERS; BANANA BUNCHY TOP VIRUS; BIODIVERSITY; PETIOLES; DISEASE RESISTANCE

Phenotypically-desirable and PRSV-P tolerant papaya F sub 1 hybrids. **Magdalita, P.M., Signabon, F. B.** *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 75-83. (Apr 2017).*

The development of new papaya F sub 1 hybrids that are phenotypically-desirable and resistant to papaya ringspot virus-P (PRSV-P) is one of the important components of an integrated disease management strategy against the virus disease. While moderately tolerant varieties such as the Sinta provided some protection against the disease, new virus strains could evolve and overcome the resistance, hence new resistant varieties are necessary. Partial diallel crossing scheme was used to generate F sub 1 hybrids between diverse inbred lines. Eight F sub 1 papaya hybrids were evaluated for desirable horticultural traits and reaction to PRSV-P. Three hybrids were selected: hybrids 4, 7 and 5. F1 hybrid 4 is better than other hybrids in terms of horticultural traits and virus reaction. It is a semi-dwarf, had stout stem, thick flesh, higher TSS and edible portion than Sinta. It had a reduced symptom severity, delayed disease onset, slow disease progress and rate of disease development reduced symptom severity, low disease index and lower virus, tire than Solo, indicating a moderately tolerant reaction of PRSV-P. Hybrid 7 is semi-dwarf, had stouter stem, thicker flesh, higher TSS and had higher edible portion than Sinta. It had a delayed disease onset, slower disease progress, and virus tire lower than Solo, also indicating a moderately tolerant reaction to PRSV-P. Hybrid 5 is also semi-dwarf, had high TSS and an attractive bright red flesh. However, it had an early disease onset, faster disease progress and rate of disease development, making it moderately susceptible to PRSV-P.

CARICA PAPAYA; PAPAYAS; HYBRIDS; SPOTS; DISEASE RESISTANCE; BREEDING METHODS; AGRONOMIC CHARACTERS; SYMPTOMS

Screening for BBTV resistance and molecular characterization of gamma irradiated putative mutants of abaca using gene-specific markers. **Descalsota, G.I.L.; Lalusin, A.G.; Dela Viña, C.B.; Mendioro M.S.; Dizon, T.O.** *Philippine Journal of Crop Science (Philippines) v. 40 (1) p. 8-16 (Apr 2015).*

Screening for virus resistance and molecular characterization of 54 abaca lines generated from unirradiated and gamma-irradiated shoot tips of two abaca cultivars, Tinawagan Pula (TP) and Tangongon (TG) were

conducted. Phenotyping for bunchy top, bract mosaic and mosaic diseases and PCR-based diagnosis for bunchy top have identified 14 gamma-irradiated TP lines (2,5,6,7,10, 12, 17, 19, 20, 21, 24, 26, 28, and 29) and two gamma-irradiated TG lines (37 and 53) as potential virus-resistant lines. Simple Sequence Repeat (SSR) and Resistance Gene Analogue (RGA) markers were used for molecular characterization. Eight out of 10 SSR markers and one out of two RGA markers tested produced amplification products. A total of 23 alleles and 18 banding patterns were detected using the 9 markers. The number of alleles per marker ranged two to five. Two alleles and 7 banding patterns not found in unirradiated TP were found in the gamma-irradiated TP plants while alleles and 7 banding patterns not found in unurradiated TG plants were found in the gamma-irradiated TG plants. The average Polymorphism Information Content (PIC) of 0.48 was obtained in both the gamma-irradiated TP plants and the unirradiated TP plants. However, a higher PIC value (0.54) was observed in the gamma-irradiated TG plants as compared with a lower PIC value of unirradiated TG plants (0.41). The increase in the PIC value is indicative of the higher genetic variability in the gamma-irradiated abaca plants created by exposure of gamma irradiation.

MUSA TEXTILIS; ABACA; GAMMA IRRADIATION; PCR; DISEASE CONTROL; PLANT DISEASES; DISEASE RESISTANCE; SELECTION; GENES; GENETIC MARKERS

Validation of loop-mediated isothermal amplification (LAMP) assay for identifying Fusarium verticilloides infection in fast extracted corn DNA. **Santos, M.M., Rancho, K., Tumolva, J.A., Pascual, C.B., Ocampo, E.T.M.** 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. 118 (Jul-2018).*

One common problem in postharvest handling and storage of corn is the infection of Fusarium verticilloides, which greatly decreases yield quality and quantity by mycotoxin, is coded for by the FUM1 gene, which can be used as a marker in detecting early stages of Fusarium infection. The authors developed a loop-mediated isothermal amplification (LAMP) assay for FUM1 that provides a fast, easy and sensitive approach in identifying infection by providing products observable by the naked eye. To test for the possibility of using the developed LAMP protocol, a fast DNA extraction protocol for corn kernels was also developed. Kernels were ground in liquid nitrogen in extraction buffer composed of EDTA, Tris-HCI and KCI. After centrifugation, the supernatant was mixed with isopropanol for DNA precipitation, and resuspended in TE-RNAse solution. The amplification of FUM1 gene was done by mixing designed internal, outer and loop primer pairs, and Bst polymerase in a single LAMP cocktail, followed by incubation at 65 deg C. LAMP products were visualized by changes in solution color made possibly by the dyes hydroxynaphtol blue and SYBR Green 1 that were added before and after incubation respectively. The LAMP assay showed positive amplification with a detection level as low as 1.526 ng/muL DNA. These results show that LAMP can be utilized in developing and marketing an easy-to-use detection kit for fumonisin production corn kernels.

ZEA MAYS; DNA; FUSARIUM; INFECTION; EXTRACTION; GENES; MYCOTOXINS; BIOLOGICAL CONTAMINATION

Assessing response variation of selected rice genotypes under waterlogged condition. **Concepcion, J.S.; Desamero, N.V.** 8. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 72 (Jul 2018).*

Next to flash-flooding, stagnant water stress due to gradual increase in water level up to 80cm lasting for weeks or months has been a bottleneck in rice cultivation in submergence-prone areas. To address this concern, a genotype screening protocol and small scale facility was developed to assess the performance of rice genotypes under stagnant water condition. NSIC Rc222, PSB Rc68, IR242, IR46 and four mutant-lines were used as test genotypes and 1cum plastic water tanks with steel braces were used as screening facility. The 21-day old seedlings were planted in pots containing approximately 2kg of paddy soil. Stress was imposed 10 days after transplanting starting at 5cm from the base of the plant. Water level was raised by 5 cm at 2-day interval until it reaches 50cm, and maintained until harvest stage. Significant variation in maturity among genotypes observed, with IR64 and kawilan-IVC2011WS 324-6 maturing earliest with 105 DAS, and IR42 maturing the latest (123 DAS). Significant variation was observed in average in average internode distance, culm diameter, panicle number, and root length were identified as contributing traits explaining 78.84% of observed variation. A significant positive linear correlation in number of nodes with culm diameter, (r=0.9300) was generated. Axillary branch development was observed in IR42, PSB Rc68, PR41908-Tanggiling-IVC2010DS 6-2, and Kawilan-IVC2011WS 324-6 producing 1-2 branches from the main tiller, usually initiating at the 4th node from the base. All genotypes were observed to have aerenchyma formation in the root and stem as adaptive mechanism for anoxia due to waterlogged condition. Significant variation in response of rice genotypes under stagnant water condition was elucidated. To further establish and quantify the severity of stress, a second phase trial will be conducted comparing stress condition with non-stress condition.

ORYZA SATIVA; GENOTYPES; DROUGHT STRESS; WATERLOGGING; GROWTH; INTERNODES

Combining ability of quality protein maize inbred lines for seedling tolerance to drought stress. **Pfunde, C.N.; Mutengwa, C.S.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 1-12 (Aug 2016).*

Drought stress is a major constraint for maize seedlings in sub-Saharan Africa where temperatures can reach up to 40 deg C following planting. Failure of the plant to withstand drought stress at seedling stage implies that there is a reduced crop stand, which translates to reduced yield. The objectives of this study were to estimate general combining ability (GCA) and specific combining ability (SCA) effects and gene action for morpho-physiological traits of quality protein maize (QPM) inbred lines subjected to seedling drought stress. Twenty-one QPM inbred lines were crossed using a North Carolina mating design II. Forty-five hybrids which produced enough seed were evaluated under optimum and stressed conditions. Three control hybrids were included to make 48 treatments. The inbred lines and 48 hybrids were planted under simulated drought stress conditions in polyvinyl chloride pipes at 25% and 75% of field capacity over 21 d in a randomized complete block design replicated 3 times. General combining ability accounted for a greater percentage of the treatment sum of squares, suggesting that additive gene action was more important than non-additive gene

action for the expression of seedling traits under drought conditions. Inbred lines L2, L4, L16, and L18 were the best lines that exhibited high GCA effects, and were also parents to four of the five single crosses with the best SCA effects for most traits. As a result of their superior GCA and SCA effects under drought stress, these inbred lines are recommended for inclusion in QPM breeding programmes aimed at developing drought tolerant cultivars.

ZEA MAYS; MAIZE; HYBRIDS; INBRED LINES; GRAIN CROPS; DROUGHT STRESS; DROUGHT RESISTANCE; MALNUTRITION; PROTEIN DEFICIENCIES; SEEDLINGS; SEED PRODUCTION; COMBINING ABILITY

Developing next generation submergence tolerant rice breeding lines from single cross PSB Rc10 x NSIC Rc194 (IR64-Sub1). **Concepcion, J.S., Ticman, H.T., Bagarra, J.C., Buluran, R.J.D., Valida, G.D., Balmeo, K.R.P., Santiago, N.D., Ramos, A.V., Bandonill, E.H., Desamero, N.V.** 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. 104 (Jul-2018)*.

With the increasing threat in rice production due to climate change affecting flash flood-prone areas, there is a need to develop new submergence tolerant varieties with high grain yield, biotic stress tolerance, and good grain quality. A total of 160 F sub 1 plants were generated from PSB Rc10 and NSIC Rc194 single cross, wherein 1500 F sub 2 plants were established and subjected to submergence stress evaluation at seedling stage. Subsequent agronomic characterization, line selection, and uniformity evaluation from F sub 3-F sub 6 generations yielded 18 fixed recombinant inbred lines (RILs). Fixed RILs were subjected to comparative field performance under submergence stress at vegetative stage in 2017DS, and evaluated for grain quality and biotic stress resistance. RILs had comparable survival with NSIC Rc194 (98%) and FR13A (99%) ranging from 73% to 100% at 21 days after de-submergence. Yield potential under favorable condition ranged from 4.276 t/ha to 6.409 t/ha averaging to 5.631 t/ha wherein 4 (22%) RILs yielded higher by 12% to 83% compared with parental NSIC Rc194 (2.709 t/ha. A total of 17 (94%) RILs yielded higher 12% to 83% compared with parental NSIC Rc194 (2.709 t/ha). Seven (39%) RILs were identified to have resistance to Rice Blast, 13 (72%) with intermediate resistance to Bacterial Leaf Blight and 14 (78%) with resistance to Tungro under field condition. All RILs were scored as intermediate resistant to stem borer, brown plant hopper, and green leaf hopper. RILs had low to intermediate gelatinization temperature, wherein nine RILs (50%) had intermediate to low amylose content ranging from 16.9 to 21.2. A total of 8 elite RILs were selected based on survival, yield potential, biotic stress resistance, and grain quality and are possible nominees to National Cooperative Testing for submergence condition.

ORYZA SATIVA; INBRED LINES; CROP YIELD; AGRONOMIC CHARACTERS; CROP PERFORMANCE; TESTING; WATER TOLERANCE

Drought tolerance of selected Korean rice varieties under vegetative stage soil moisture deficits. **Jihyun, K.; Cruz, A.S.; Cabral, M.C.J.; Niones, J.M.; Suralta, R.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 70 (Jul 2018)*.

In the Philippines, high yielding Korean rice varieties received higher acceptable rating over that of local varieties in terms of grain and cooking qualities. Philippines has rainfed environments that are highly variable, breeding rice for drought-prone rainfed ecosystems requires genotypes that combine high yielding ability with good drought adaptation ability. Dry matter production under drought is a product between water use (WU) and water use efficiency (WUE). Thus, this study aimed to evaluate the relationship between dry matter with WU and WUE of five Korean rice varieties under drought stress. Five Korean varieties such as Dasanbyeo, Gayabyeo, Hanareum2, Milyang 23 and Saegyejinmi together with IR64 were grown in pots for 45 days and subjected to two water treatments: well-watered (WW) and progressive drought (PDR, 10% SMC). Under drought, 3 out of 5 Korean varieties such as Dasanbyeo, Hanareum2 and Saegyejinmi had significant increases in shoot dry weight (SDW) relative to WW while the rest had reductions. Total leaf area also showed similar pattern of response with that of SDW. WU was significantly different among the varieties and had significant relationship with the varietal differences in total root length. Correlation analyses showed that the varietal differences in SDW under drought had negative relationship with WU while it had positive relationship with WUE. Overall, initial results showed that some Korean varieties had the ability to maintain higher dry matter production under drought. Such ability for higher dry matter production was greatly contributed by their ability to maintain high WUE rather than WU. And thus, their drought tolerance ability was greatly contributed by shoot related traits rather than by root related straits. Further studies are being done to further characterize their root system developmental responses along the soil profile and photosynthetic efficiencies during drought stress.

ORYZA SATIVA; VARIETIES; DROUGHT RESISTANCE; DROUGHT STRESS; DROUGHT; SOIL WATER CONTENT; EFFICIENCY; WATER USE

Effect of different foliar sprays on biomass and yield of mungbean (Vigna radiata Wilczek) grown underwater deficit. **Reyes, J.A.O.; Macahilig, R.A.B.; Eliseo, M.A.M.; Ocampo, E.T.M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 69 (Jul 2018).*

Foliar spraying is a known technique in fertilizer application, it involves direct entry of the nutrients through the stomatal opening of the leaves. Recent studies suggest that its application also helps in adaptation of plants on certain environmental stresses. In this study, the different effects of foliar sprays on drought tolerance of mungbean (Vigna radiata Wilczek) was conducted at the Institute of Plant Breeding. CAFS, UPLB [College of Agriculture and Food Science, University of the Philippines Los Baños] under screenhouse and field conditions. Foliar sprays included abscisic acid (ABA), gibberellic acid (GA sub 3), glutathione (GSH), potassium nitrate (KNO sub 3), carrageenan (Car) and salicylic acid (SA). Applications were made using suggested concentrations from different drought related studies: ABA and GA sub 3(1mum), SA, GSH and KNO sub 3 (50mum) 1:10 v/v carrageenan: water; and were applied via spraying 3 days after the initiation of drought, 30 days after planting. The greenhouse experiment was laid out in randomized complete block design with split-plot (mainplot,water regime; subplot, variety and sub-sub-plot, foliar spray). Under greenhouse conditions, significant differences in root dry matter were observed across treatments. It was observed that 'drought'

plants treated with SA, GA sub 3 and KNO sub 3 had significantly higher root dry matter, however well-watered plants still showed the highest dry matter content. The field experiment was laid out in randomized complete block using 4 mungbean varieties (Pagasa 3, 7, 5 and 19) combined with water regime and foliar spray as one treatment. Under field conditions there was an increase in dry matter of 13-30% in 'drought' plants sprayed with GA sub 3, KNO sub 3 GSH and ABA. These same plants also had increased in seed yields under drought conditions. Results suggest that these foliar sprays have the potential to increase tolerance of mungbean plants to drought stress.

VIGNA RADIATA; CARRAGEENANS; FOLIAR APPLICATION; CROP YIELD; BIOMASS; DROUGHT STRESS

Germination and seedling growth of corn (Zea mays) and some weed species in response to treatment with common vetch (Vicia sativa) and rye (Secale cereal) extracts. **Mohammadi, G.R.; Noroozi, N.; Nosratti, I.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 83-87 (Dec 2016)*

Allelopathey is a biological process including interactions between two plants through the production of chemical compounds (allelochemicals) which can diminish weed problems. Both common vetch (Vicia sativa) and rye (Secale cereal) have shown strong allelopathic effects on many weed species. In order to assess the phytotoxic potential of rye and common vetch water extract on corn and some weed species, an experiment was conducted in the Seed Research Laboratory of Razi University, Kermanshah, Iran in 2012. Water extracts of common vetch and ryewere used as pure or mixed. Plant species under study consisted of corn and some weed species including green foxtail, redroot pigweed, lamb's quarters, barnyard grass and common cocklebur which are commonly dominant weeds of corn fields in the region. The results showed that the germination of weed species were completely inhibited by water extracts of rye and common vetch in pure or mixed treatment. Vetch extract did not significantly affect corn germination percentage, whereas, this trait was significantly influenced by rye and mixed treatments as compared with control.

ZEA MAYS; MAIZE; WEEDS;SPECIES; VICIA SATIVA;SECALE CEREALE; RYE; GERMINATION; ALLELOPATHY; PLANT RESPONSE

Improving the performance of tomato under waterlogged condition through potassium nitrate application. **Natividad, M.B.S., Agustin, A.M.L., Vizmonte, P.T.Jr.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 81-82 (Jul 2018)*.

LYCOPERSICON ESCULENTUM; CROP PERFORMANCE; GROWTH; SURVIVAL; WATERLOGGING; POTASSIUM NITRATE; APPLICATION METHODS

Flooding or waterlogging has been causing significant damage and losses in crop sub-sector. It is projected that there will be an increase in precipitation in the future due to increasing evapotranspiration brought by increasing temperature threatening crop productivity particularly vegetables. Potassium nitrate (KNO sub 3) has the potential to increase plant performance under waterlogged condition. The K sup + is well-known in improving plant performance under different biotic and abiotic stresses including waterlogging while NO sub

3 is involved in alternative pathway under anaerobic condition to increase ATP production. This study aimed to evaluate the effect of foliar application of KNO sub 3 on the survival and growth of tomato under waterlogged condition and compare the timing application. A pot experiment was laid-out in split-split plot design with water regime (normal and 24-hr waterlogged) as main-plot ; timing of application (before and after waterlogging) as sub-plot; and KNO sub 3 concentration (0%, 4%, 8%) as sub-sub plot following RCBD with three replications. Thirty-two day-old tomato plants were subjected to watterlogging and parameters were gathered weekly until 28 days. Results showed that 24-hr waterlogging in untreated plants significantly reduced almost all evaluated parameters (plant dry weight, survival, height, leaflet number, and leaf chloropyll content) except number of adventitious roots. KNO sub 3, on the other hand, improved plant survival and growth under normal and 24-hr waterlogging; however, with different trend. The trend under normal condition seems increasing with increasing KNO sub 3 concentration while decreasing from 4% to 8% under 24-hr waterlogged condition. Hence, better plant response was observed with lower KNO sub 3 concentration (4%)under waterlogged condition. Furthermore, in general, no significant difference was found in timing of application application suggesting the potential of KNO sub 3 application after waterlogging as this is more practical than application before waterlogging. The result indicates the potential of KNO sub 3 application even after waterlogging to reduce the damage of waterlogging to tomato plants.

Influence of high temperature on chlorophyll fluorescence and its varietal variation in rice**. Aung Kyaw Phyo, Nam-Jing Chung**. *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 59-68, Apr 2017*. 14 graphs; 1 table. Bibliography (58 ref). Received Feb 2019. UPLB Main Library, College, Laguna (Philippines)

This study was carried out to find varietal response to heat stress by chlorophyll fluorescence. Chlorophyll fluorescence is closely correlated with photosynthetic rate. Field-grown rice were dug up at the grain filling stage, and moved to the plant growth chamber, where the temperatures were set up one after another starting from low to high temperature (25 approx 45 deg C). Fo, Fm and Fvl Fm were measured after the first dark-adaptation, and OJIP transient was measured after the second dark-adaptation. Results showed that, in all cultivars, maximum quantum efficiency of PSII phytochemistry (FvlFm) and the area above the fluorescence transient decreased as temperature increased, and both dropped abruptly at 45 deg C indicating the damage occurred in the PSII center. Among rice cultivars, damages to photosynthetic apparatus as suggested by maximum quantum efficiency of PSII phytochemistry and OJIP transient curves, which imply the presence of varietal variation in heat tolerance of rice photosynthesis. 99\4

ORYZA SATIVA; RICE; VARIETIES; HEAT; FLUORESCENCE; CHLOROPHYLLS; HEAT TOLERANCE

Morphological and dry matter yield of rice genotypes in response to drought stress and rewatering at vegetative stage. **Faustino, G.P. ; Hernandez, J.E.; Desamero, N.V.; Cruz, R.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 72-73 (Jul 2018).*

Screening of drought-tolerant rice genotypes has focused on water use efficiency and maximizing grain yield under rainfed lowland condition. However, it is equally important to assess plant morphological responses

such as leaf rolling and leaf tip drying as they are practical drought stress indicators and also influence yield. This pot study in the screenhouse exposed 17 rice genotypes to drought stress at vegetative stage for 20 days (i.e., 15-35 days after transplanting or DAT), rewatering for 10 days (i.e, 36-46 DAT), and assessed soil water status, plant morphological changes, and aboveground dry matter yields. Each pot had a volume of 10 L and contained 8 kg of well-fertilized Maligaya clay soil. Soil moisture content and soil strength were assessed by gravimetric and penetrometer methods, respectively. Results showed that the 20-day drought treatment period was characterized by the decrease in average soil moisture content from 60.5 to 0.7% and increase in average soil strength from 0 to 3.0 MPa across the drought treatment pots. Out of 17 rice genotypes tested, only 8 genotypes namely: PSB Rc14, NSIC Rc416, GSR-21, RAELINE-10, NSIC Rc282, CT 9993-5-10-1-M, UPL Ri-5, and NSIC Rc160 survived after the vegetative drought stress and rewatering treatments. The performance of these genotypes could be attributed to slow progression of leaf rolling [i.e., scores of 1 to 4 for the 8 genotypes vs. 1 to 5 (tightly rolled) for the rest of the genotypes], leaf tip drying [i.e., scores of 1 to 4 vs. 1 to 5 (100% drying of leaf the lamina)], and lower reduction in aboveground dry matter yield based on the well-watered Control. Moderate or slow progression of leaf rolling and leaf tip drying could have contributed to relatively higher photosynthetic activity by maintaining photosynthetic leaf area thereby minimizing reduction in dry matter yield.

ORYZA SATIVA; GENOTYPES; DROUGHT RESISTANCE; DROUGHT STRESS; WATERING; LEAVES; BIOMASS

Optimizing the doses of Moringa (Moringa oliefera L.) leaf extract for salt tolerance in maize. **Ali, A.; Abbas, M.N.; Maqbool, M.M.; Arshad, M.I.; Jan, M.; Qayyum, A.; Lee, D.J.** *Philippine Journal of Crop Science (Philippines) v. 42 (1) p. 84-89 Apr 2017.*

Salinity is a major agricultural problem that adversely affects maize yield. Maize is a major fodder crop which necessitates the improvement of its vegetative performance under salt stress using different doses of moringa leaf extract (MLE). With the objective to tolerate the salt stress, 5 levels of moringa leaf extract concentrations [control, 5%, 10%, 15% and 20%] were foliarly sprayed on maize seedlings raised in saline (70 mM NaCl) and non-saline (0 mM NaCl) hydroponic Hoagland solutions. Plants were harvested 4 wk after applying salt stress and foliage spray of leaf extract. The following morphological characters (shoot length, root length, shoot fresh weight, root fresh weight, shoot dry weight, root dry weight, shoot root ratio) and biochemical parameters (sodium and potassium contents) were evaluated. The experiment was laid out in ARD in factorial arrangement with 5 replicates. The data collected was subject to statistical analysis at 1% probability level and DMR was used to separate the significant treatment means. The results showed that moringa leaf extract improved the shoot and root growth significantly. Moringa leaf extract proved to be helpful in reducing Na and increasing the K content of the leaf.

MORINGA OLEIFERA; ZEA MAYS; SALINITY; MAIZE; LEAVES; PLANT EXTRACTS; SEEDLINGS; SALT TOLERANCE; AGRONOMIC CHARACTER

Productivity of rice genotypes in response to flooding stress and crop management. **Peralta, L.C.; Desamero, N.V.; Cruz, R.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science

Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 75 (Jul 2018).*

Yields range from 1.0 to 2.0 t/ha flood-prone rainfed lowlands. Rice yields can be improved by using food-tolerant rice genotypes and appropriate crop management. This field study assessed the grain yields of three rice genotypes in response to flooding stress, seedling ages (i.e., 21 and 44 days), and post-flood N applications. Plants were subjected to 50cm floodwater depth for 14 days from 21 to 35 days after transplanting. Results showed that in the Control (2-3 cm flood water depth) and with no post-flood N application (NPFNA), grain yields of PSB Rc82 Cahireng Ag+ Sub1, and PR41543-B-14-2-1-2 ranged from 3.8 to 6.0 t/ha using 21-day old seedlings and from 3.9 to 6.5 t/ha using 44-day old seedlings. Based on the control yields of PSB Rc82 were reduced by 36.5% with NPFNA, 22% with N application at 2 days after de-flooding (DAD), and 25.9% with N at 7 DAD for 21-day old seedlings. With 44 day old seedlings, yields of PSB Rc82 were reduced by 40.4% with NPFNA, 31.3% with N at 2 DAD, and 16.7% with N at 7 DAD. Based on the Control, yields of Ciherang Ag+ Sub1 were reduced by 30.0% with NPFNA, 34.3% with N at 2 DAD, and 25.9% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of Ciherang Ag+ Sub1 were reduced by 61.5% with NPFNA, 49.12% with N at 2 DAD, and -13.16% with N at 7 DAD. Based on the Control, yields of PR41543-B-14-2-1-2 were reduced by 23.7% with NPFNA, 36.4% with N at 2 DAD, and 25.0% with N at 7 DAD for 21-day old seedlings. With 44-day old seedlings, yields of PR41543-B-14-2-1-2 were reduced by 18.0% with NPFNA, 41.86% with N at 2 DAD, and 25.0% with N at 7 DAD.

ORYZA SATIVA; GENOTYPES; PRODUCTIVITY; CROP MANAGEMENT; FLOODING; TOLERANCE; CROP YIELD

Response of wild and edible Musa spp. seedlings to limiting moisture stress. **Delfin, E.F.; Ocampo, E.T.M.; dela Cueva F.M.; Damasco, O.P.; Dela Cruz, F.; Dinglasan, E.G.; Gueco, L.S.; Herradura, L.E.; Molina, A.B.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 1-12 (Dec 2016)*.

Banana, one of the world's leading crops is predicted to be highly vulnerable to drought conditions brought about by climate change. Identification of drought tolerant cultivars is one of the long term strategies of addressing the effect of climate change. The National Plant Genetic Resources Laboratory and the Bureau of Plant Industry of the Philippine Department of Agriculture maintain germplasm collections of edible and wild Musa spp. From the Philippines, Southeast Asia and Papua New Guinea (SEA/PNG) that have not been assessed for drought tolerance. Thus, this study was conducted to assess the drought response of 29 Musa genotypes from the germplasm collections at seedling stage under greenhouse condition. Drought was imposed on 3 mo-old tissue culture-derived seedlings by withholding water for 2-3 wk, while control plants were watered regularly. Under drought condition, the genotypes differed significantly in terms of plant growth, number of leaf cigars formed, specific leaf area, biomass production and partitioning as well as water use efficiency across water treatment. Only 28% of the banana genotypes allocated more biomass to the roots. Total leaf area production was influenced by significant interaction between water treatment and genotype. Significant genotypic differences in terms of relative leaf folding (RLF) and stomatal conductance were observed, with increased RLF as soil moisture content decreased. Stomatal conductances were significantly affected by the interaction between genotype and time of sampling. The genotypes also differed significantly in their water use efficiency (WUE) with increases ranging 1-70% under drought. WUE was found

to be positively correlated with total plant dry weight, root volume, root dry weight and relative leaf folding. Based on the relative performance under drought cultivar, 'Gubao' (BBB) is the most drought tolerant based on total biomass production, root dry weight, root volume and WUE followed by 'P.K. Malaccacina' and 'Tindok'.

MUSA (BANANAS); VARIETIES; WILD PLANTS; MUSA BALBISIANA; DROUGHT; DROUGHT RESISTANCE; STOMATA; TRANSPIRATION; WATER USE; EFFICIENCY; GENOTYPES; GERMPLASM COLLECTIONS

Risk heat-stress induced spikelet sterility of irrigated lowland rice using RIDEV V2 Model simulations. **Punzalan, B.R., Alcantara, A.J., Vergara, D.K, Aunario, J.K.S., Shi, W., Ye, C., Kumar, U., Psco, R.M., Shreestha, S., Laza, R.C., DingKuhn, M.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 80. (Jul 2018).*

Studies show that daytime temperature above 35°C and night-time temperature above 25°C may significantly reduce rice yields by including spikelet sterility when they coincide with flowering, the sensitive stage of crop. Simulations to assess heat-induced spikelet sterility (Ster-Heat) of three popular Philippine rice varieties (IR64; NSIC Rc222; NSIC Rc238) and heat-tolerant aus variety Nagina 22 were conducted using RIDEV (Rice Development Model) V2, a model for rice phenology and sterility based on crop microclimate and panicle temperature. In-depth simulations to evaluate temporal patterns involved General Circulation Models-derived climate data of Los Baños, Laguna (1981-2000, 2010-2049) and Maligaya, Nueva Ecija (1978-1997, 2010-2029); 12 sowing dates representing each month of the year; and two anthesis times (Anth Time): 10.00 and 11.00 H. In both sites, the highest incidence of Sterheat is expected to coincide with the hottest month of the year. The difference in SterHeat between AnthTime 10.00 h and 11.00 h is considerable for Philippine cultivars. Regardless of anthesis time, advancing sowing in the dry season from January to December would reduce the incidence of SterHeat of Philippine cultivars. This strategy may also be considered during the wet season, but may be less crucial. Findings of this study may serve as decision-making tool for stakeholders to mitigate the effects of global warming, specifically SterHeat, by adjusting cropping calendar.

ORYZA SATIVA; VARIETIES; SPIKELETS; INFERTILITY; INFLORESCENCES; TEMPERATURE; PLANTING DATE; MODELS; CLIMATIC CHANGE; GREENHOUSE EFFECT

Root developmental response of selected rice varieties under progressive drought conditions. **Gaetos, G.C.S.; Divina, C.C.; Kalaw, S.P.; Reyes, R.G.; Mananghaya, T.E.; Niones, J.M.; Suralta, R.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 71 (Jul 2018).*

Drought stress can affect the plant physiology status, metabolic activities and other related processes concerning growth and development. This study aims to characterize the root cell structure and root developmental response in relation to dry matter production under progressive drought (PDR) stress using the

a root box system. NSIC Rc416, PSB Rc68 and IR64 rice varieties were subjected to PDR and non-stress conditions. The experiment was laid out in RCBD with three replications. The effect of water stress in the physiological and cellular structure of rice showed that significant changes in morphological, physiological and cellular development in response to PDR in relation to non-stress condition. It is notable that a significant reduction of shoot biomass (SDW) compared with the non-stress conditions. This significant SDW reduction was attributed to less root development and reduced cellular structure, which led to dry matter reduction.

ORYZA SATIVA; VARIETIES; ROOTS; PLANT PHYSIOLOGY; DROUGHT STRESS; WATER DEPRIVATION

Screening of rainfed rice lines under osmotic stress at seedling stage. **Malabanan-Bauan, K.B.; Magnaye, A.M.A.; Lalican, D.J**.; 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 70-71 (Jul 2018).*

Drought is a prevalent occurrence in rainfed rice areas, and developing varieties that can tolerate water deficit condition has been one of the major breeding objectives for rice. This is particularly important for the Philippines, where around 30% of rice lands are rainfed. Screening of breeding materials for drought tolerance as early as seedling stage is important especially for dry-seeded rice that is common in rainfed areas. This study evaluated the germination and seedling growth of UPLB-bred promising rice lines at varying levels of osmotic stress, and identified lines that exhibited water deficit tolerance at early seedling stage. Sixty-six promising rice lines including rainfed purification lines and wide hybridization-derived lines were tested at five water potential levels (control or 0, -0.25, 0-0.50, -0.75, and -1.0 MPa) imposed using varying strengths of polyethylene glycol (PEG 6000 MW) on filter paper. Highly significant differences among treatments were detected for germination percentage, root length and shoot length. Germination percentage was similar from treatment 0 to -0.50 MPa, but it dropped significantly by 30% at -0.75 MPa, while only 27% germinated at -1.0 MPa across rice lines. Shoot and root length were also significantly reduced with decreasing water potential of the growing media. Drastic reduction in shoot length (69%) was observed at -0.50 MPa, while roots were 44.31% shorter at -0.75 MPa relative to control. Out of 66 rice lines, 20 promising lines (19 purification lines and one WH-derived line) were selected to have relative drought tolerance based on seed germination, shoot and root growth.

ORYZA SATIVA; PROGENY; SEEDLINGS; TESTING; GERMINATION; DROUGHT RESISTANCE; SOIL WATER DEFICIT

Seedling vigor of rice genotypes under water stress condition. **Barroga, W.V., Rafael, A.B., Marcelo, P.N.M., Manangkil, O.E.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings, Legaspi City, Albay (Philippines), 2-7 Jul 2018.

Seedling vigor is important for uniform crop establishment, weed competition and normal seedling growth under a wide range of field conditions. Flooded seeds with low seedling vigor during germination stage resulted to poor crop establishment and later to yield penalty especially in direct seedling cultivation. Nineteen rice genotypes with good phenotype were evaluated for early seedling vigor under water stress conditions. Entries were laid out in RCBD [randomized complete block design] with three replicates and

flooded with 5 cm water level in steel tray for 21 days to identify vigorous genotype. Germination percentage, seedling length and seed vigor index (SVI) were measured 21 days after sowing. Genotypes were compared with Khao Hlan On, a landrace known with tolerance to flooding at germination and good seedling vigor. Germination percentage and seedling length showed significant correlations. Among genotypes evaluated, PR45297-42-2-1-1-3-1-B was the most vigorous which had germination of 48%, seedling length of 418 mm, and highest SVI of 20532. The line was statistically comparable with Khao Hlan On with 41% germination, seedling length of 462 mm, and SVI of 19142. PR45297-42-1-1-3-1-B had good seedling vigor under water stress conditions and with superior phenotype than the check variety. The line was selected for the development of variety for direct wet-seeding cultivation.

ORYZA SATIVA; GENOTYPES; SEEDLINGS; SEED CHARACTERISTICS; SEED; VIGOUR; DIRECT SOWING; DROUGHT STRESS

H60 Weeds and weed control

Adjuvant and airborne dust effect on Foramsulfuron+Iodosulfuron and Foramsulfuron activity on Johnson grass (Sorgrum halepense). **Shahbazi, T.; Saiedi, M.; Nosratti, I.; Honarmand, S.J.; Sarmast, M.R.** *Philippine Journal of Crop Science (Philippines) v. 39 (3) p. 51-55 (Dec 2014)*.

Johnson grass (Sorghum halepense L.) is a problematic weed in croplands of Iran whereby herbicides control varies under different environmental conditions. Therefore poor experiments were conducted in the campus of Paradise of Agricultural and Natural Resources, Razi University, Kermanshah, Iran during summer of 2013. Two rhizomes of Johnson grass were planted in a plastic pot. Treatments included foramsulfuron alone, foramsulfuron+iodosulforon (WG formulation), foramsulfuron+iodosulfuron (power formulation) in combination with adjuvants ammonium sulfate (AMS) and urea ammonium nitrate (UAN). Spray solution, with and without adjuvant, was applied to washed and none-washed Johnson grass foliage. Treatments were laid out in a completely randomized design in a factorial arrangement with four replications. In this study the number of experimental units was 169 pots (163 treated pots and six untreated pots) and a total of 338 Johnson grass plants. The results of this study indicated a decrease in efficiency of foramsulfuron and iodosulforun herbicides due to airborne dust accumulated on Johnson grass shoots. In general, applying adjuvants increased herbicide performance especially in dusty condition. Addition of AMS to the herbicide spray solution overcame the influence of airborne dust on the activity of herbicides better than UAN. WG formulation of Maister was more efficient in the presence of airborne dust.

SORGHUM HALEPENSE; GRASSES; SPECIES; WEEDS; ADJUVANTS; ENVIRONMENTAL FACTORS; SPRAYING; FOLIAGE; POT EXPERIMENTATION; HERBICIDES; WEED CONTROL

Effects of various organic emulsifiers on crop growth and weed control. **Jang, S.J.; Kim, K.R.; Yun, Y.B.; Kuk, Y.I.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 63-70 (Dec 2017).*

The research aims to determine the promotional effects of various organic emulsifies (sugar bubble, natural detergent, loess sulfur, brown rice vinegar, and powder soap) on lettuce, Chinese cabbage, radish, cucumber, and barley; investigate whether the increase in crop growth by the emulsifiers is related to photosynthetic

efficiency (quantum yield), chlorophyll and carotenoid contents; and to evaluate the herbicidal effects of the organic emulsifiers on common lambs quarters (Chenopodium album L.), curly dock (Rumex crispus L.), dandelion (Taraxacum officinale L.), and barnyard grass (Echinochloa crus-galli (L.) P. Beauv.). Plant height and shoot fresh weight in the radish, Chinese cabbage, and lettuce increased from 15-51 % using sugar bubble, 11-49% using brown rice vinegar, and 8-48% using natural detergent at 1, 3, 5, and 10% concentrations in the greenhouse. Plant height and shoot fresh weight of cucumber and barley did not increase with emulsifier treatment. The increase in crop growth by the emulsifiers was not related to photosynthetic efficiency (quantum yield), chlorophyll and carotenoid contents. Germination rate, shoot and root growth in cucumber and barley were 100% inhibited by brown rice vinegar, powder soap, and loess sulfur at 3% and 5% concentrations in Petri dish bioassays. Shoot and root growth in barley and cucumber were also 100% inhibited by brown rice vinegar at 3% and 10% concentrations, respectively, and loess sulfur at 10% and 5%, respectively in soil experiments. Shoot and root growth in common lambs quarters, curly dock, and dandelion were 100% inhibited by 3% concentrations of all emulsifiers tested (sugar bubble, brown rice vinegar, powder soap, and loess sulfur) in Petri dish bioassays. In a greenhouse study, curly dock was 28-30% and 47-100% controlled by foliar applications of brown rice vinegar and loess sulfur, respectively, at 3, 5, and 10% concentrations, and dandelion was 46-55% controlled by loess sulfur at 5% and 10% concentrations. The results of this study suggest that organic emulsifiers tested can be used to increase crop growth and provide in-row weed control for transplanted vegetable crops.

VEGETABLE CROPS; WEEDS; WEED CONTROL; EMULSIFIERS; ORGANIC AGRICULTURE; GROWTH; APPLICATION METHODS

Germination and seedling growth of corn (Zea mays) and some weed species in response to treatment with common vetch (Vicia sativa) and rye (Secale cereal) extracts. **Mohammadi, G.R.; Noroozi, N.; Nosratti, I.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 83-87 (Dec 2016)*

Allelopathey is a biological process including interactions between two plants through the production of chemical compounds (allelochemicals) which can diminish weed problems. Both common vetch (Vicia sativa) and rye (Secale cereal) have shown strong allelopathic effects on many weed species. In order to assess the phytotoxic potential of rye and common vetch water extract on corn and some weed species, an experiment was conducted in the Seed Research Laboratory of Razi University, Kermanshah, Iran in 2012. Water extracts of common vetch and ryewere used as pure or mixed. Plant species under study consisted of corn and some weed species including green foxtail, redroot pigweed, lamb's quarters, barnyard grass and common cocklebur which are commonly dominant weeds of corn fields in the region. The results showed that the germination of weed species were completely inhibited by water extracts of rye and common vetch in pure or mixed treatment. Vetch extract did not significantly affect corn germination percentage, whereas, this trait was significantly influenced by rye and mixed treatments as compared with control.

ZEA MAYS; MAIZE; WEEDS;SPECIES; VICIA SATIVA;SECALE CEREALE; RYE; GERMINATION; ALLELOPATHY; PLANT RESPONSE

Response of cotton to tillage and post-emergence herbicides in wheat-cotton system in Pakistan. **Usman, K.; Khan, N.; Yazdan, F.; Din, S.U.; Ayatullah.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 61-70 (Aug 2015).*

Conservation tillage with broad-spectrum herbicides may have the potential to control weeds and enhance cotton (Gossypium hirsutum L.) yield. Field experiment was conducted in 2010 and 2011 at Agriculture Research Institute, D.I. Khan, Pakistan to examine tillage and herbicide effects on weed control and cotton yield in wheat-cotton system. The experiment was arranged in split plot in RCBD with 4 replications. The main plot treatment comprised of three tillage systems, including zero (ZT), reduced (RT), and conventional tillage (CT), while the sub plot was weed control treatments namely, haloxyfop-R-menthyl 10.8 EC (108 g a.i./ha), lactofen 24 EC (168 g a.i./ha), haloxyfop + lactofen, hand weeding, and weedy check. Broad-spectrum herbicides (haloxyfop +lactofen) reduced weeds by 92 and 94%, and produced highest lint yield (1222 and 1515 kg/ha) in 2010 and 2011, respectively. Relative weed density was modified by tillage with lowest values recorded in CT. Howver, RT with broad-spectrum herbicides had then maximum weed reduction and lowest dry weed biomass (DWB). Reduced tillage with broad-spectrum herbicides produced maximum plant height, 100-seed weight, and lint yield. This combination is an optimum weed management strategy that contributes significantly to cotton production. However, if deep-rooted perennial weeds persist, CT with broad-spectrum herbicides may be occasionally required.

GOSSYPIUM HIRSUTUM; COTTON; HERBICIDES; CONSERVATION TILLAGE; YIELDS; WEED CONTROL; COTTON INDUSTRY; FIELD EXPERIMENTATION; PAKISTAN

Weed management practices and herbicide resistance in weeds in Florida citrus. **Ramirez, A.H.M.; Futch, S.H.; Jhala, A.J.; Abit, M.J.M.; Singh, M.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 1-8 (Apr 2018).*

Herbicide-resistant weeds have been confirmed in some crop production systems in Florida but not in citrus groves. A grower survey was conducted in 2012 to determine the current weed management practices in Florida citrus and to determine awareness of citrus growers about herbicide-resistant weeds. A questionnaire was sent to 60 randomly selected growers, of which 33 turned in their responses representing 20% of the citrus growing area in Florida. Most of the respondents (47%) indicated that weed problem and species in Florida citrus did not change over the years with the top 3 problematic weeds: Spanish needle (Bidens spp.), balsam apple (Momordica charantia L.), and panicums (Panicum spp.). Weed control in citrus grove is primarily with the use of herbicides applied alone, in tank-mixes, or applied sequentially in a year. Diuron, simazine, and indaziflam are the top 3 PRE herbicides while glyphosate, paraquat, and saflufenacil are the top 3 POST herbicides applied in Florida citrus. Glyphosate is the most commonly applied herbicide in the vast majority of citrus groves and as frequently as 3-5 times in a year. Citrus growers in Florida are aware of herbicide resistant weeds and their negative impact on citrus production. Although, there are no confirmed herbicide resistant weeds in Florida citrus, few weeds including Spanish needle, ragweed parthenium (Parthenium hysterophorus L.), and nightshade (Solanum spp.)

CITRUS; VARIETIES; WEEDS; WEED CONTROL; GLYPHOSATE; HERBICIDES; PESTICIDE RESISTANCE

J- POSTHARVEST TECHNOLOGY

J11 Handling, transport, storage and protection of plant products

Ambient storage in mid-elevation environment maintains seed viability and seedling vigor of TGMS hybrid parental**. Salazar, B.T. Guittap, L.V., Masajo, T.M.** 8. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 114 (Jul 2018)*.

Low-temperature environment is critical in seed production of TGMS female parent line. The study was conducted from Sept 2017 to March 2018 to determine if mid-elevation environment can also be effective in keeping seed viability and seedling vigor of TGMS hybrid parental lines. A 3 x 2 x 2 factorial experiment was laid out in split-split plot design with storage environment (ambient storage room, cold storage room, and mid-elevation storage room) as main plot, storage container (woven polypropylene bag, and woven polypropylene bag with polyethylene plastic as liner) as subplot, and hybrid TGMS parental line (M20 female parent and M20 male parent) as sub-subplot. Seed testing commenced before storage and every two weeks thereafter until 24 weeks after storage (WAS). Seed viability was assessed using filter paper method, while seedling vigor was evaluated using seedling length and biomass parameters. Comparable seed viability and seedling vigor were observed across treatments until 14 WAS. Germination percentage (GP) of seeds stored in the ambient room significantly declined to 84% at 14 WAS, and further to 63% at 24 WAS. Interestingly, mid-elevation storage registered high GP comparable to that in cold storage (greater than equal to 90%) until 16 WAS. Results also showed that, regardless of storage environment, woven polypropylene bag with plastic liner was 10% more effective in maintaining GP compared to container without liner. Storage treatments were also found to extend high GP up to 10 and 18 WAS in M20 female and M20 male parentals, respectively.

ORYZA SATIVA; RICE; SEEDS; VIABILITY; SEEDLINGS; VIGOUR; SEED STORAGE; ALTITUDE

Effect of gamma radiation on the shelf life, physiological and nutritional value of onion (Allium cepa L.) **Munir, N.; Hameed, N.; Haq, R.; Naz, S.** *Philippine Journal of Crop Science (Philippines) v. 42 (2) p. 61-65 (Aug 2017).*

Onion is one of the most important and perhaps one of the oldest cultivated vegetable crop in all continents. In Pakistan, it is grown in different volumes and harvesting periods. Based on the latest United Nation's report, Pakistan ranks as the 8th country that produces the most onion. Onion is widely used for culinary purposes particularly in savory dishes to improve the gastronomic properties of most recipes. Apart from its culinary characteristics, onion has a remarkable medicinal powers and antifungal, antibacterial, antihypertensive, anti-inflammatory, and antioxidant properties. However, post-harvest losses reduce these benefits. Post-harvest losses occur due to mishandling, rotting sprouting, and dehydration. Reduction of these post-harvest losses would maintain and enhance onion quality. Thus, this study aimed to enhance the shelf life and the removal of micro flora without affecting the nutritional value of onion through gamma irradiation. The onion sample used during the experiment was collected from a wholesale market in Lahore, Pakistan. The main objective for treating harvested onions with different doses of gamma radiation was to prevent the physiological processes

leading to sprouting during extended storage. The samples were sent to Pakistan Radiation Services (PARAS) Lahore for irradiation at doses of 0.05 kGy, 0.10 kGy, and 0.15 kGy then these were stored at room temperatures. Various physiological and nutritional parameters were assessed during the various storage time. The parameters include the percent of weight loss, ash content, moisture content, fat, crude fiber, crude protein, and carbohydrates. By measuring these parameters, before and after gamma irradiation, it was concluded that the dose of 0.10n kGy is optimum for enhancing onion shelf life without any significant change in its physiological as well as nutritional value.

ALLIUM CEPA; ONIONS; GAMMA IRRADIATION; KEEPING QUALITY; CHEMICOPHYSICAL PROPERTIES; PROXIMATE COMPOSITION; NUTRITIVE VALUE; STORAGE

Physiological and physicochemical changes in guava (Psidium guajava L. cv. Queso de Bola) fruit stored at different temperatures. **Rodeo, A.J.D.; Gonzales, D.C.H. Esguerra, E.B.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 19-28 (Apr 2018)*

The effect of storage temperature on the physiology, physicochemical attributes ans shelf life of guava (Psidium guajava L. cv. Queso de Bola) fruits stored at 15 deg C, 20 deg C and ambient temperatures (32+- 2 deg C) was studied. Low temperature slowed down the respiratory activity of the fruit. 'Queso de Bola'guava did not exhibit a typical climacteric pattern of respiration and produced only a small amount of ethylene. Total soluble solids content of the fruit was low and did not increase much while titratable acidity remained constant during storage. Ascorbic acid content decreased during storage, but degradation was slow under low temperature. Fruit had a storage life of 7, 11 and 19 d under ambient temperatures, 20 deg C and 15 deg C, respectively. Storage at 15 deg C for 2 wk maintained the sensory quality, slowed down ascorbic acid degradation, reduced the weight loss, prevented shriveling and delayed the development of diseases. Shriveling and early onset of diseases caused a short shelf life for fruit kept at ambient conditions and at 20 deg C. Moderate peel browning was observed after 2 wk of storage at 15 deg C and following transfer to ambient conditions. Peel browning at 15 deg C cannot be solely attributed to chilling injury because slight browning was observed even at ambient temperatures.

PSIDIUM GUAJAVA; GUAVAS; CHEMICOPHYSICAL PROPERTIES; STORAGE; TEMPERATURE; POSTHARVEST PHYSIOLOGY; KEEPING QUALITY; PEELING

K- FORESTRY

K10 Forestry production

Community-based forest management for resilience through agroforestry. **Lalican, D.J.; Visco, R.G.; Gascon, A.F.; Castillo, A.S.A.; Florece, L.M.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 19-29 (Dec 2017).*

The study generally aimed to assess the agroforestry systems of Community-Based Forest Management (CBFM) sites to formulate policy recommendations for the implementation of agroforestry practices in the study areas and other agroforestry sites. The practices of agroforestry, where woody perennials are deliberately used on the same land management unit as agricultural crops and/or animals, were characterized

based on structure. The structural basis for classification refers to the composition and temporal arrangement of the different components such as annual crops, pasture/animals and trees/shrubs. The socio-economic and demographic characteristics of farmers were obtained using survey sampling from 122 households. Quadrant method was employed in acquiring agrobiodiversity. The method determined species diversity by counting the number of tree species and number of individuals under each species in quadrants for each farm. The soil properties and erodibility were determined through soil sampling, using modified erosion bar, and direct on-site measurements and laboratory analysis, respectively. Results revealed that farmers practiced shelterbelts/windbreaks-cum live trellis system in Liliw [Laguna, Philippines] and multilayer tree gardens in Sta. Maria [Laguna, Philippines]. The agrobiodivesity of agroforestry systems in both sites were moderately diverse from CBFM members while low diverse for non-CBFM members. Agrobiodiversity indices of agroforestry systems for CBFM members and non-CBFM in Liliw are 2.58 and 1.98, respectively while CBFM members and non-CBFM members in Sta. Maria are 2.72 and 0.78, respectively. Farms in both sites had low soil bulk density and erosion rates with high organic matter, nitrogen, phosphorous, and potassium contents. Regardless of the kind of agroforestry system practiced in the CBFM sites, it has been observed that agroforestry is indeed beneficial for both study sites.

FOREST MANAGEMENT; COMMUNAL FORESTS; FORESTRY; AGROFORESTRY; SOIL CHEMICOPHYSICAL PROPERTIES; SOIL DENSITY; BIODIVERSITY

L- ANIMAL SCIENCE, PRODUCTION AND PROTECTION

L01 Animal husbandry

People simply love the native lechon. **Sarian, Z.B.** *Agriculture (Philippines) v. 23 (1) p.60-61 (Jan 2019)*

SWINE; INDIGENOUS ORGANISMS; FOOD TECHNOLOGY; PROCESSING; FOODS; ANIMAL HUSBANDRY; SUPPLY BALANCE; PROFIT

Rabbit industry in the rise. **Veneracion, A.M.** *Agriculture (Philippines) v. 22 (10) p. 56-60 (Oct 2018)*

RABBITS; PRODUCTION; TECHNOLOGY; INDUSTRY; PROCESSING; FARMERS; RURAL AREAS; TOURISM; LAPIN (ORYCTOLAGUS); PRODUCTION

L73 Animal diseases

New technology detects early mortality syndrome is shrimps. **Anon**. *Agriculture (Philippines) v. 23 (1) p.55 (Jan 2019)*

PRAWNS AND SHRIMPS; MORTALITY; VIBRIO PARAHAEMOLYTICUS; HEPATOPANCREAS; NECROSIS; DIAGNOSIS

M- FISHERIES AND AQUACULTURE

M11 Fisheries production

New research findings in agriculture and fisheries. **Guerrero, R.D.III.** *Agriculture (Philippines). v. 22 (10) p. 30-31 (Oct 2018)*

AGRICULTURE; FISHERIES; RESEARCH; TECHNOLOGY; TECHNOLOGY TRANSFER; AGRICULTURE; PECHES

M12 Aquaculture production

What is happening to our farmed Tilapia industry. **Guerrero, R.D.III.** *Agriculture (Philippines) v. 23 (1) p. 28-29 (Jan 2019)*.

TILAPIA; FISHERY RESOURCES; FISH INDUSTRY; FISHERY PRODUCTION; FISHERY MANAGEMENT; FISH FARMS; FISH PONDS; PRODUCTION; PRODUCTION COSTS; CAPITAL

N-AGRICULTURAL MACHINERY AND ENGINEERING

N20 Agricultural machinery and equipment

Fertigroe N,P and K nanofertilizers towards better yield in corn [sic, rice]. **Lorenzo, J.C.A., Villegas, G.M., Gauna, G.B., Lalap, A.A**. 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 88 (Jul 2018)*.

To help reduce costs and improve production and postproduction efficiencies, appropriate mechanization and postharvest technologies must be developed, promoted, and eventually be adopted by farmers and seed production from planting to drying of seeds. Three seedling establishment methods, using mechanical transplanters, precision seeder and manual transplanting of NSIC Rc160 (FS) were used in DS and WS 2017. Each method of crop establishment was replicated thrice in the field using 0.25 ha paddy per replicate. Two rotavations, 2 harrowings, 1 levelling and 1 final levelling was done for land preparation. Field inspection was conducted 20DAT; maximum tillering; the on-set flowering; and two weeks before harvest by PhilRice SeedTech staff and designated seed analysts from BPI-NSQCS [Bureau of Plant Industry-National Seed Quality Control Services]. At final inspection both in DS and WS 2017 field purity was observed high in all treatments. At final inspection both in DS and WS 2017 field purity was observed high in all treatments. Seed viability, vigor and seedling emergence tests of seeds established using transplanters and those planted manually resulted in high seed quality. Expenses incurred were slightly higher in manually transplanted, owing to the higher seed yield obtained in using transplanters, net income was considerably higher also. The trials made on mechanical transplanting in both PhilRice-CES and Negros in WS2017 confirmed the great potential of using mechanical transplanting in inbred seed production. Mechanization, or the use of machines in farming, can bring down the cost of labor particularly for labor-intensive crops like rice. However, further trials must be considered in the improvement of the procedures for direct-seeding using Korean precision seeder.

ORYZA SATIVA; RICE; PLANT ESTABLISHMENT; SEED PRODUCTION; TRANSPLANTING; EQUIPMENT

Income rise with mechanized rice: higher yield and quality through mechanized inbred rice seed production. **Ferriol, A.G.S., Ramos, R.C., Brena, S.R.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, , Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 90 (Jul 2018)*.

To help reduce costs and improve production and postproduction efficiencies, appropriate mechanization and postharvest technologies must be developed, promoted, and eventually be adopted by farmers and seed producers. Hence, it is necessary to develop a standard protocol of mechanized seed production from planting to drying of seeds. Three seedling establishment methods, using mechanical transplanter, precision seeder and manual transplanting of NSIC Rc160 (FS) were used in DS and WS 2017. Each method of crop establishment was replicated thrice in the field using 0.25 ha paddy per replicate. Two rotavations, 2 harrowings, 1 levelling and 1 final levelling was done for land preparation. Field inspection was conducted 20DAT; maximum tillering; the on-set of flowering; and two weeks before harvest by PhilRice SeedTech staff and designated seed analysts from BPI-NSQCS [Bureau of Plant Industry-National Seed Quality Control Services]. At final inspection both in DS and WS 2017 field purity was observed high in all treatments. At final inspection both in DS and WS 2017 field purity was observed high all treatments. Seed viability, vigor and seedling emergence tests of seeds established using transplanters and those planted manually resulted in high seed quality. Expenses incurred was slightly higher in manually transplanted, owing to the higher seed yield obtained in using transplanter, net income was considerably higher also. The trials made on mechanical transplanting in both PhilRice-CES [Central Experiment Station] and Negros in WS2017 confirmed the great potential of using mechanical transplanting in inbred seed production. Mechanization, or the use of machines in farming, can bring down the cost of labor particularly for labor-intensive crops like rice. However, further trials must be considered in the improvement of the procedures for direct-seeding using Korean precision seeder.

ORYZA SATIVA; RICE; SEED PRODUCTION; QUALITY; SEED; MECHANIZATION; PLANT ESTABLISHMENT

Yield in on-farm trials using multi-purpose seeder under rainfed rice growing environments. **Basuel, E.E., Suralta, R.R., Santos, R.C., Cerales, A.M., Gageliona, E.C., Abon, J.E.D., Bautista, E.G., Bueno, C., Banayo, N.P.M., Martin, E.C., Kato, Y.** 5. UP REPS Inc. Annual Scientific Conference and 9. General Assembly Meeting Shercon Resort and Ecology Park, Batangas (Philippines), Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 82 (Jul 2018)*.

Dry seeding technology (i.e., seeding dry seeds directly onto dry soil) is a promising option for coping with unreliable rainfall patterns in rainfed rice production. Dry Seeding of rice can prevent crop failure even if there is little rainfall for transplanting. Currently, a multipurpose seeder (MPS) is developed to make mechanized seeding more affordable while increasing the efficiency and productivity in rainfed areas. This study aimed to evaluate the yield of rainfed farmer's fields using MPS and this was conducted during 2017 wet season in Tarlac (Paniqui and Victoria) and Pangasinan (San Quintin and Umingan) [Philippines]. Treatment were: Farmers' variety (FV) + Farmer's practice (FP); FV + MPS and; Sahod ulan11 (SU11) + MPS. Farmers' varieties used were NSIC Rc222, NSIC Rc160 and PSB Rc9. Farmers' practice for dry seeding was either broadcasting or

manual seeding. Sahod ulan11 (NSIC Rc346) is a rainfed lowland rice variety. The seeding rate used in FP was 100 to 180 kg/ha while in MPS was 60 kg/ha. Results showed that there was significant interaction between site and treatments on yield in all sites although the increase was significant only in Umingan. The SU used may not be the most adaptable in the test sites and/or the intensity of drought conditions during the growing season was not severe to effect varietal differences. Further analyses of the prevailing weather conditions in each site are still being conducted including the characterization of yield contributing components in each site. Overall, the results showed that the use of MPS contribute to the increase in yield rainfed areas relative to the existing farmer practices in dry seeding. Since the seeding rate used in MPS was lesser than in FPs, ROI using MPS is expectedly increased.

RICE; ORYZA SATIVA; SOWING; EQUIPMENT; RAINFED FARMING; ON-FARM RESEARCH; DROUGHT

P- NATURAL RESOURCES AND ENVIRONMENT

P01 Nature conservation and land resources

On-farm conservation and management of crop diversity in barangay [village] Magahis, Tuy, Batangas [Philippines]. **Aguilar, C.H.; Antesco, D.K.; Barrera, W.; Biguelme, M.; Borines, N.O.; Descalsoto, G.I.; Madrid, I.J.; Malunes, L.J.; Saracanlao, R.J.; Borromeo, T.; Altoveros, N.; Dayo, M.H.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 79.*

The continuous cultivation and management of a diverse set of crop population is essential for a farming community's sustainable development. Though conservation approaches for plant genetic resources in years ahead are already in place, economic pressures and preferences by the farmers continues to challenge agro-biodiversity and traditional farming system. This study was conducted to: 1)assess crop diversity maintained by farmers in Brgy. [village] Magahis, Tuy, Batangas, [Philippines], 2)Know the farm conservation and management practices of crop diversity by the farmers, 3)determine the socio-economic factors that influence farmers' crop conservation practices, and 4)determine possible solutions to address arising concerns about on-farm conservation in the said community. Fifteen farmers of various age were gathered for a focus-group discussion, followed by one-on-one interview, and then by resource mapping of the site. There is considerable crop diversity in Brgy. Magahis, Tuy, Batangas that is being maintained through the years. The farmers practice different seed supply systems with majority of them having their own supply every season. This diversity, however, is vulnerable to loss due to economic disadvantages, selection, and changes in agricultural practices. There is a need to devise a strategy to convince and involve the farmers in the national plant diversity conservation efforts. Narrowing the gap between formal and informal seed supply systems is also important. The development of market niches for traditional varieties and on-farm conservation awareness campaign should also be conducted.

CROPS; BIODIVERSITY; FARMS; RESOURCE CONSERVATION; FARMERS; FARMING SYSTEMS; PHILIPPINES

Climate change-ready technologies teaching styles and preferences: the case of 12 TecVoc high schools in the Philippines. **Manalo, J.A., Bautista, A.M.F., Hallares, R.T., Berto, J.C., Paulino, T.C., Saludez, F.M., Villaflor-Mesa, J., Maramara, R.M.** 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. 40 (Jul-2018).*

PhilRice, DA-BAR [Department of Agriculture-Bureau of Agricultural Research], and the Department of Education are working on a project to create climate change ready schools. Among its key components is to document the best styles and preferences in teaching climate change-ready technologies. Teaching climate change-related topics remains an uncharted territory despite its relevance and urgency especially in relation to climate change adaption. In this Project, participating teachers from 12 Technical-Vocational high schools nationwide were trained on the intersections between climate change and rice production at the PhilRice Central Experiment Station Nueva Ecija [Philippines]. After their training, they were then asked to integrate the lessons in their respective classes. In this paper, the teachers delivered teaching demonstrations on topics of their choice under the climate change and rice production domain. They designed the whole teaching demonstration from choosing the topics to be discussed, teaching styles, and other elements of teaching. Participant observation during the teaching demonstration proved useful in documenting the responses of the students on the lecture delivered by the teachers. In-depth interviews with the participating teachers were conducted to reflect on the choices they made. Focus group discussions with the teachers and school officials who came to the demonstration as well as with some students were also conducted. Results show that localization and edutainment approaches appear to be the most preferred teaching styles. It was learned that the student learn best if the topics are fitted to the conditions in their community. Hands-on activities, on the other hand facilitate understanding of some complex topics such as the Minus-One Element Technique. This paper forwards several critical reflections on the methods that best convey lessons on climate change-ready technologies.

CLIMATIC CHANGE; EDUCATIONAL INSTITUTIONS; EXTENSION ACTIVITIES; DIFFUSION OF INFORMATION; PHILIPPINES

Digital tools for sustainable water management. **Evangelista, G.K.; Auxillos, J.; Aquino, E.; Cabangon R.; Yadav, S.; de Dios, J.; Pascual, K.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 36 (Jul 2018)*.

Globally, agriculture use approx 70% of freshwater and of which, 40% is used for rice cultivation. The alternate wetting and drying (AWD) is one of such water management techniques which can save water up to 30%. However, its adoption has been slow because of many challenges like (a) water is managed by farmers' association, (b) the technology cannot be extrapolated to command area, and (c) it is knowledge, labor and time intensive. IRRI and PhilRice have developed decision tool called AutoMon sup PH that will automatically

inform the farmer, water-user association leader, or irrigation water resources technician on the schedule of irrigation based on the threshold level of 'Safe AWD'. The study looked into using multiple sensor principles (capacitive, ultrasonic, infrared, resistive) and testing the sensors under varying water conditions (constant and variable head, saline and turbid water) to assess accuracy of water level. It was determined that ultrasonic and capacitance principles exhibited a +/- accuracy of 0.2 to 0.4 cm from actual measured water level values. Different modes of data transmission (Wi-Fi, Sub-Ghz, and GSM) were tested and all from were found to be useful based on the criteria used for AWD, improvement in site selection practices by shifting to remote based criterion using an unmanned aerial system to assess field topography was explored. This entails drone mapping and assessing elevation to identify field variations, which is difficult to conduct at point based method where selection is done at ground level only. Results from this study will establish baseline information and decision logic for the use of the technology in actual farmers' fields. Scaling up of this technology is expected to improve access to information, foster effective coordination among stakeholders, and promote transparency in water governance thereby catalyzing the adoption water saving technologies.

ORYZA SATIVA; WATER MANAGEMENT; WATER USE; EFFICIENCY; MONITORING; DECISION SUPPORT

New water facility benefits evacuation site. **Yap, J.P., Jr.** *Agriculture (Philippines) v. 22 (10) p. 48-49 (Oct 2018).*

WATER SUPPLY; WATER AVAILABILITY; GROUNDWATER; DRINKING WATER; SOLAR ENERGY

Sustainable irrigation water management using ICT tools for monitoring and reporting of water demand on rice irrigation system. **Cabangon, R.J.; Pascual, K.S.; Yadav, S.; Auxillos, J.; Regalado, M.J.C.; Aquino, E.; de Dios, J. ; Evangelista, G.K.; Rafael M.; Martin, R.M.S.; Burac, M.A.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 36-37 (Jul 2018)*.

In irrigated areas, the alternate wetting and drying (AWD) technique saves water up to 30% without yield penalty and has many benefits, including reductions of methane emissions. AWD is a mature technology where the field is allowed to dry except at (1)seedling recovery phase until 2-4 weeks after transplanting until weeds are controlled and (2)during flowering stage. Irrigation is applied when the water level in the field is 15cm below the soil surface. Although AWD has been tested and validated in many countries, its adoption has been relatively slow because of the many challenges faced by farmers. The major challenges are (a) water governance--water is managed by an irrigators'/farmers' association instead of individual farmers (b) decision platform: the technology at this stage is field specific and can't be extrapolated to the turnout catchment area; the approach lacks the interface for converting data into information for other stakeholders in the irrigation system heirarchy; (c)knowledge-intensive--this technique requires good understanding and measurement of water depth; (d)labor-intensive--the frequent monitoring flooding and drying of paddy fields increase costs; and (e)time-intensive--the new technique requires more management oversight and puts higher demands on farmers' time. To overcome these challenges IRRI and DA-PhilRice have developed an ICT tool called AutoMon sup PH for catalyzing the adoption of water saving technologies by improving access to the information, effective coordination among different decision makers, and transparency in water governance. The decision

tool was demonstrated in Regions 2 [Cagayan Valley], Region 3 [Central Luzon] and Region 6 [Western Visayas] to evaluate the performance in terms of accuracy and sending of data. Results showed very high correlation between AutoMon sup PH readings and manual readings (R sup 2 approx 0.99). An interface is being developed to analyze the data at different scales and send information to different stakeholders depending on their role in water governance.

ORYZA SATIVA; WATER MANAGEMENT; TECHNOLOGY; IRRIGATION WATER; WATER CONSERVATION; RESOURCE MANAGEMENT; WATER SUPPLY; INFORMATION TECHNOLOGY; MONITORING

P34 Soil biology

Characterization of plant growth-promoting diazotrops from salt-affected areas in the Philippines. **Ong, J.D.P.; Lantican, N.B.; Cruz, W.T.; Diaz, Ma.G.Q.; Paterno, E.S.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 56-68 (Apr 2018).*

Soil salinity is an important factor limiting plant productivity worldwide. Studies have shown that plant growth-promoting bacteria can help plants tolerate salt stress. This study focused on the isolation and characterization of diazotrophs present in saline soils. Diazotrophs were isolated from the soil, plant rhizosphere and plant root samples obtained from Pampanga, Batangas, Iloilo, and Palawan in the Philippines. The 147 isolates were screened for 1-aminocyclopropane-1 carboxylic acid (ACC) deaminase activity, indole acetic acid (IAA) and siderophore production, and for phosphate solubilization. Ten isolates which tested positive for all of most of the plant growth-promoting traits were selected for further studies. BLAST analysis of the 16S rDNA showed that the microbial isolates were highly similar to members of Enterobacter sp., Serratia sp., Pseudomonas sp., Haererehalobacter sp., Salinicola sp., and Mangroveibacter sp. The nifH gene was detected in eight out of the 10 isolates. Under gnotobiotic condition, rhizosphere isolates AS10.2GPR and BPRP18.1 significantly increased the shoot dry weight of corn, cv IPB var 11 Magenta jars supplied with nutrient solution amended with 150 mM NaCl (15 dS/m), by 71.78% and 69.59%, respectively, relative to the uninoculated, nitrogen-free control. AS10.2GPR and BPRP 18.1 were highly similar to Serratia sp. NH10 (100%) and Enterobacter sacchari strain HX148S (99%), respectively.

NITROGEN FIXING BACTERIA; SOIL SALINITY; PLANT PRODUCTION; OSMOTIC STRESS; RHIZOSPHERE; NITROGEN FIXATION; PLANT GROWTH SUBSTANCES

Development of rapid and efficient DNA extraction protocol for lowland rice paddy soils using powdered broken glass. **Fulleros, Ma.C.; Ocampo, E.T.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. *Philippine Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 67 (Jul 2018).*

Different farm practices of lowland rice production affect the soil microbial profile. Understanding the occurrence and diversity of microbes which help in localization of atmospheric nitrogen provides an insight in the soil quality which greatly affects yield. Isolation of microbial DNA from paddy soil is difficult without the aid of commercial kits since cell lysis buffer cannot penetrate the micropores of clay where the anaerobes are

found. In this study, a rapid and efficient extraction protocol. Using the GF-1 extraction kit (Vivantis TM, Malaysia), CTAB method and freeze-thawing protocols. Using the GF-1 kit yielded quality DNA but is not cost effective when dealing with large amount of samples. The CTAB method was not able to extract DNA while the freeze-thawing protocol has low contaminated yield. The developed method which use broken borosilicate-based laboratory glass and SDS was able to successfully isolate DNA. The optimized SDS concentration destabilized the cellular proteins which made cell lysis possible by grinding with the glass powder. To check the quality of the isolated DNA for downstream processing, the 16S ribosomal DNA region will be amplified. BLAST search of 16S amplicons shows the identities of the microbes present and reveals their biological interactions. With the help of associated bioinformatics pipelines and Canonical correspondence analysis (CCA) to ordinate the special compositions of the bacterial community to the measured soil parameters, this would contribute to the investigation of the functional capacity of the present microbial community in the paddy soil. Results may suggest how microorganisms affect crop productivity directly by modifications of their genetic material indirectly by enhancing the physico-chemical properties of the soil.

SOIL MICROORGANISMS; SOIL CHEMICOPHYSICAL PROPERTIES; DNA; EXTRACTION; ISOLATION; ANALYTICAL METHODS; PADDY SOIL

Effect of endophytic bacterial inoculation on banana, Musa acuminata cv.Lakatan. **Benzon, H.R.L.; Mendoza, D.M.; Cosico, W.C.; Torreta, N.K.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 12-21 (Aug 2014).*

Banana is one of the most popular fruit in the world and is a top export commodity in the Philippines. This study aimed to assess the response of banana to endophytic bacterial inoculation (EBI) and to develop a simple technology that farmers can easily adopt. EBI presents multiple positive potential benefits to crops like banana, including increase in plant growth and nitrogen fixing capabilities, and may serve as an alternative to intensive fertilizer use. The first of the two experiments was done to test the effects of EBI on Musa acuminata cv. Lakatan. Of the treatments used, the plants treated with the isolate MUCp 12 were significantly greater in plant height and pseudostem diameter, which was comparable to those treated with inorganic fertilizer treatment. The root dry weight and total dry matter yield were also enhanced significantly, as well as in the phosphorous and total potassium content of inoculated plants. EBI also significantly increased phosphorous uptake. A second experiment, designed to test the combined effects of EBI and inorganic fertilizer applications, was shown to considerably but not significantly enhance plant height. A significant increase in pseudostem diameter was seen most in the treatment with combined 60-60-60 fertilizer and MUCp 14 treatment. However, the effect of this treatment was not significantly different from inoculation with isolate MUCp 12 alone and inoculation combined with a lower rate of inorganic fertilizer application. This suggests that inoculation alone can increase pseudostem diameter. Even though isolates MUCp 12 and MUCp 14 increased the shoot dry weight, total dry matter yield, and P content of banana, when combined with either 30-30-30 or 60-60-50 fertilizer treatments, the effect seemed to be unfavorable. The same observation was seen in the N content when isolate MUCp 12 was used. The improved growth and development of the inoculated plants could be attributed to the production of growth promoting substances by the endophytic bacteria. It is recommended that inoculation with bacterial endophytes should be done during nursery stage for seedling establishment. Proper identification and characterization of the bacterial endophytes and growth

promoting substance are highly advised. Further research involving field trials using modified inoculation methods are recommended.

MUSA ACUMINATA; MUSA (BANANAS); VARIETIES; GROWTH; ENDOPHYTES; INOCULATION; BACTERIA; FERTILIZER APPLICATION

Identification of endophytic bacteria isolated in talahib (Saccharium spontaneum L.) (sic) roots. **Jardinero, K.J.J., Cruz, J.A., Suralta, R.R., Ordonio, R.L**. 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. 64 (Jul-2018)*.

Endophytic bacteria are endosymbiotic microorganisms prevalent among plants that colonize its intracellular spaces and do not cause plant disease or significant morphological changes. Wild grasses such as talahib (Saccharium spontaneum L.) are under explored as source of growth promoting endophytic bacteria for commercial application to crops. The beneficial endophytic bacteria isolated in talahib roots were in-vitro screened for its plant growth promoting activities and the promising isolates were identified using Biolog OmniLog Identification System. The Burk's medium, a nitrogen-free medium was used in isolating the potential endophytes. A total of 19 isolates from talahib roots obtained from Science City of Muñoz and San Jose City, Nueva Ecija [Philippines]were tested for the production of growth-promoting compounds. These compounds include indoleacetic acid (IAA) production, phosphate solubilization and starch hydrolysis. Out of 19 isolates, four produced IAA in culture. One of the most important mechanisms involved in plant-growth promotion is the bacterial excretion of phytohormones, such as IAA. Nine isolates showed positive in phosphorus stabilization by the formation of clearing zone around the isolates grown in Pikovskaya's medium. Among the 19 isolates evaluated, two possessed the capability to utilize stach. Three out of 19 isolates were selected based on their performance on the in-vitro screening. In this paper, two endophytic bacteria namely, Burkholderia plantarii and Acinetobacter baumanni were biochemically identified. These endophytes associated with talahib roots produced growth-promoting compounds that may stimulate plant growth. Present findings conclude that talahib roots can be a good source for isolating beneficial microbes. However, several in-vitro assay tests and evaluation of the selected isolates under screen house conditions is highly recommended to further determine its efficacy as plant-growth enhancer.

SACCHARUM SPONTANEUM; ROOTS; ENDOPHYTES; BACTERIA; PLANT GROWTH STIMULANTS; IAA; STARCH; HYDROLYSIS

Rainfall indices for a weather index-based crop insurance for rice. **Capistrano, A.O.V.; Quilang, E.J.P.** *Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 9-18 (Apr 2018)*

This paper analyzed the applicability of two sets of rainfall indices for a weather index-based crop insurance (WIBCI) for rice against low rainfall cover in Dumangas, Iloilo, [Philippines] WS2013. WIBCI is a new type of risk-transfer-mechanism (RTM) being tested in the Philippine that operates on the principle of having pre-agreed indices set per weather variable between the insurer and insured. Claims happen when these indices are considered 'breached' or are not met in the case of low rainfall cover for a particular period. Operation-

wise, the WIBCI product is revolutionary and could be a potentially quick-responsive climate change adaption measure. However, new as it is, questions on the applicability of the product, particularly the indices, have to be evaluated and scrutinized. Validation points used in this study were breach assessments via the WIBCI product's procedure and its consistency with actual drought incident reports. Average yields of the community relative to WIBCI farmers' individual yields were also used to validate consistency of breaches or no breaches among enrollees. Results of yield analysis relative to each community's average yield showed 95.7% of enrollees have low yields. When matched with the breaches assessed using the existing indices, only 52 enrollees breached the indices. Overall validity of the existing index via consistency of breached indices with low yields was only 70% but the 30% mismatch was still significant from an insurance business standpoint hence, a postulated set of indices specific to the location were developed for comparison. With the postulated indices, only 20 enrollees breached the indices which were much lower in number and more acceptable considering the absence of PAGASA's [Philippine Atmospheric, Geophysical and Astronomical Services Administration] official drought incident reports. However, consistency analysis revealed that a much higher basis risk was incurred when using the postulated index which was mostly due to the mismatch of 'no breaches' and low actual grain yields.

ORYZA SATIVA; RICE; CLIMATIC CHANGE; DROUGHT; CROP YIELD; CROP INSURANCE; RAIN GAUGES; RAIN; ENVIRONMENTAL IMPACT ASSESSMENT; SOIL WATER DEFICIT; WEATHER REPORTS

P40 Meteorology and climatology

Carbon sequestration in organic and conventional corn production system. **Aquino, A.L.; Sta. Cruz, P.C.; Zamora, O.B.; Aguilar, E.A.; Lasco, R.D.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 11-18 (Dec 2017).* Summary (En).

Global warming brought about by increasing concentration of green house gases (GHG) in the atmosphere, particularly that of CO sub 2, is a major concern due to its impact on climate change. The intensity and frequency of typhoons, drought and flooding increased due to the change in climate and these have a negative impact on crop productivity and food security. Alternative farming practices that can potentially reduce CO sub 2 emission and optimize the efficiency of plant and soil carbon sequestration is therefore necessary. Thus, this experiment was conducted to determine and compare the potential contribution of organic and conventional corn production systems on carbon sequestration based on plant biomass and soil organic carbon accumulation. The field experiment was conducted at the Central Experiment Station, Pili Drive, UP Los Baños, College Laguna [Philippines] from June to September 2012 for the wet season experiment, and from February to May 2013 for the dry season experiment. Four fertilizer treatments and two corn cultivars served as mainplot and subplot, respectively, and were laid out in split-plot in RCBD with three replications. The cultivars evaluated were USM Var 10, a high yielding open-pollinated variety and Crystal, a farmer-selected open-pollinated cultivar. Fertilizer treatments were control, inorganic fertilizer (138 kg N from urea), and organic fertilizer in the form of vermicompost. The rate of vermicompost used during the wet season was 8 t/ha while during the dry season 8 and 10 t/ha was used. Data on root and shoot biomass and organic carbon content, soil organic carbon, and bulk density were monitored at 30 and 60 days after sowing during the wet season and until 90 days after sowing during the dry season. Plant carbon (C) sequestration

was calculated based on root and shoot biomass and on the carbon content of plant tissues. Soil C sequestration was calculated based on soil organic carbon content, soil depth and bulk density. For both wet and dry season experiments, the use of inorganic fertilizer contributed to highest total plant C sequestration. Between the two cultivars, USM Var, a 10 high yielding open-pollinated variety, contributed more to C sequestration. Soil C sequestration was likewise highest using inorganic fertilizer, but values did not differ during the wet and dry season. The total carbon sequestration using inorganic fertilizer was undeniably much greater than using vermicompost. However, considering the adverse environmental impacts of inorganic fertilizer, (i.e. CO2 emission during its manufacture, transport, and use; deterioration of soil and water quality; and impact on human) this may reduce its C sequestration potential.

ZEA MAYS; MAIZE; VARIETIES; CARBON; CLIMATIC CHANGE; SEQUENTIAL CROPPING; ORGANIC FERTILIZERS; GREENHOUSE EFFECT; PLANT PRODUCTION; INORGANIC FERTILIZERS

Knowledge, attitude, perception and willingness-to-pay survey for imposing carbon tax in the Philippines. **Eleazar, P.J.M.; Demafelis, R.B.; Matanguihan, A.E.D.; Tongko-Magadia, B.D.; Gatdula, K.M.; Predo, C.D.** *Philippine Journal of Crop Science (Philippines) v. 42 (3) p. 1-10 (Dec 2017)*.

The global movement to curb carbon dioxide emissions to mitigate climate change has led to the development of several technologies and researches that use renewable energy to reduce fossil fuel consumption and consequently, reduce harmful emissions. This paper aims to share information that will help develop a carbon tax policy in the Philippines. A face-to-face dichotomous choice, contingent valuation was conducted to elicit the willingness-to-pay of the respondents from 544 households in two localities namely Antipolo and Isabela, [Philippines] representing the urban and rural areas, respectively. Also, their knowledge, attitude, and practices towards climate change were surveyed. The information gathered is a primary step in identifying factors to consider in developing the carbon tax rate that will be acceptable to the Filipino consumers. The data gathered in this study is limited to the imposition of carbon tax on the electricity and transportation sector-the two sectors which contribute more than 50% of the Philippines' total carbon dioxide emission. The result of the survey showed a very low affirmation on the willingness-to-pay a carbon tax, not exceeding 50% of the total respondents, which may be attributed to the current social status of the Filipino people when most have yet to satisfy their basic needs. The respondents' expenditure for the subject commodities sums to about 50% of their total monthly household' expenses (Antipolo: 13.06% of MHE is for electricity, 32.39% for fuel, and 10.37% for fare; Isabela: 13.60% of MHE is for electricity; 23.01% for fuel, and 9.24% for fare).

CARBON; TAXES; CLIMATIC CHANGE; VALUATION; HOUSEHOLDS; CONSUMER EXPENDITURE; HUMAN BEHAVIOUR; PHILIPPINES

Q- PROCESSING OF AGRICULTURAL PRODUCTS

Q02 Food processing and preservation

Malvar's [Batangas, Philippines] jack (fruit) of all trades. **Hernandez, J.M.** Agriculture (Philippines) v. 22 (10) p. 41 (Oct 2018)

ARTOCARPUS; SPECIES; FRUITS; PROCESSING; PROCESSED PLANT PRODUCTS; FOOD SAFETY; FOOD HYGIENE;

Quality evaluation and utilization of tapuy (Philippine rice wine) lees flour. **Manaois, R.V.; Morales, A.V.** Philippine Journal of Crop Science (Philippines) v. 43 (1) p. 29-37 (Apr 2018).

This study was conducted to evaluate the tapuy lees, or the residue of Philippine rice wine (tapuy) processing, as a food ingredient. Tapuy lees from different rice varieties were prepared into flour (TLF) and assessed for their physicochemical properties and storage properties. TLF was then substituted to wheat flour in butterscotch at different levels, namely, 0 15, 30, 45, and 60% (wt/wt) and the products were evaluated for their sensory and nutritional quality. Results showed that regardless of rice variety, TLF contained levels of crude protein (CP) and dietary fiber (DF) at 44.1-57.0% and 10.2-16.5%, respectively. TLF could last up to 5 mo when stored at ambient condition (26±1 deg C) in 0.03 or 0.07 mm polyethylene (PE) packaging and greater or equal to 7 mo when stored at low temperatures (4±1 deg C). When used to substitute for wheat flour in butterscotch, increasing the levels of TLF resulted in products with higher moisture content, but water activity remained at 0.67. The degree of sweetness and caramel taste, stickiness, denseness, and moistness were not affected by TLF substitution. Use of at least 45% TLF resulted in more grainy/gritty butterscotch with significantly perceptible lees-like/fermented off-taste and off-flavor. With the optimum formulation of 30% TLF substitution, significant improvement in CP content from 4.6 to 7.3 g 100/g and DF from 1.0 to 2.3 g 100/g were observed. Results indicated the potential of a major by-product of rice wine manufacture in the development of a high-protein and high-fiber food ingredient.

RICE; WINES; FLOURS; USES; INGREDIENTS; DIETARY FIBRES; PROXIMATE COMPOSITION; PROTEIN CONTENT; KEEPING QUALITY; BYPRODUCTS; WINEMAKING

Researchers develop low-salt mussel sauce. **Anon**. *Agriculture (Philippines) v. 23 (1) p.57 (Jan 2019)*.

MUSSELS; FOOD TECHNOLOGY; PROXIMATE COMPOSITION; FERMENTED PRODUCTS; INGREDIENTS; CONDIMENTS

Veggie flour for better nutrition. **Sarian, Z.B**. *Agriculture (Philippines) v. 22 (10) p. 52-53 (Oct 2018).*

SWEET POTATOES; CASSAVA; MUNG BEANS; MORINGA OLEIFERA; FOOD TECHNOLOGY; PRODUCTS; PROCESSED PLANT PRODUCTS; NUTRITIVE VALUE

Q04 Food composition

Assessment of Philippine maize variety CGUARD N39 for high starch as an alternative to rice-corn blend. **Purificacion, M.V., Beltran, A.K.M., Ching, J.M.I., Ledesma, J.M. E.S., Sumaoi, J.D.F., Ardales, G.Y. Jr., Laude, T.P**. 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. 63 (Jul-2018)*.

The Cereals Section of the Institute of Plant Breeding promoted the rice-corn blend which has potential to solve the problem on rice sufficiency in the country. This restitution of technology will also give more

opportunities for farmers to increase their corn production and income. For the consumers, cheaper and healthier staple food can be addressed with rice-corn blend. To equate the demand for food, broadening the maize genetic base and breeding for high nutritive value must take place. A farmer's collected variety, CGUARD N39, was analyzed and found to contain high starch and thus underwent genetic improvement. The cooked blend of the rice-improved variety (70:30) was analyzed based on proximate composition. It was compared to the rice-corn (70:30) blends of the original population (C0), IPB Var 6 and pure rice. The analysis showed high significant differences (Pr0.01) in total carbohydrates a starch, amylopectin, and energy value. Pure rice had the highest total carbohydrates (87.31%), starch (65.70%) and amylopectin (49.55%). This signifies the direct relationship between amylopectin and flavor of rice. Rice-IPB Var 6 had the highest amylose (20.64%), thus the variety helps to increase the amylose content of the blend. The rice-improved variety had the highest energy value with 429.22 kCal. The cycle 0 and improved CGUARD N39 gave a moderate glycemic index of 61.94% and 62.27% respectively. For a regular diet, the rice-corn blend of the improved CGUARD N39 gave a moderate glycemic index of 61.94% and 62.27% respectively. For a regular diet, the rice-corn blend of the improved CGUARD N39 is recommended because of its higher energy value and lower amylopectin content compared to pure rice. While having a moderate glycemic index, it can be used as a maintenance food. Overall, CGUARD N39 can be a possible substitute for the rice-corn blend and further research to guarantee that the variety can be an alternative healthy food staple than rice.

ZEA MAYS; MAIZE; RICE; VARIETIES; PROXIMATE COMPOSITION; STARCH; HEALTH FOODS

Bignay [Antidesma bunius] and duhat [Syzygium cumini] extracts are good for human health. **Anon**. *Agriculture (Philippines) v. 23 (1) p.61 (Jan 2019).*

FRUITS; PLANT EXTRACTS; ANTHOCYANINS; ANTIOXIDANTS; ENZYME INHIBITORS; HEALTH; ANTIDESMA BUNIUS; FRUITS

Encapsulation of black rice bran anthocyanin-rich extract: optimization and characterization. **Bulatao, R.M., Samin, J.P.A., Eugenio, P.J.G. Salazar, J.R., Monserate, J.J.** 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. 115 (Jul-2018).*

Anthocyanins are recognized for their health-promoting properties that could help reduce the risk of acquiring lifestyle-related diseases. Ranging from purple to blue, anthocyanins are considered to be an excellent source of natural colorants for food and pharmaceutical products. However, its utilization is restrained due to unstable properties upon exposure to light, high pH, and temperature. In this study, anthocyanins from black rice bran was encapsulated in chitosan-alginate through polyelectrolyte complex formation. Screening of factors and optimization were done using full-factorial design and Box-behnken design, respectively. The process of encapsulation involved ionic pre-gelation of calcium chloride (CaCl sub 2) with alginate followed by complexation with chitosan at different pH values. The encapsulated anthocyanins were further characterized for their encapsulation efficiency (EE), chemical properties, surface morphology, and particle size. Result showed that the optimum conditions for the encapsulation of anthocyanins were obtained by using 6.30 mg/mL chitosan and 36 mM CaCl sub 2 solutions at pH 5.5. This process had the highest EE of 51.2% among

the combinations generated by response surface methodology. Furthermore, the developed capsules had high phenolic content (3.87 mg gallic acid eq./g) and strong antioxidant activity (5.69 mg Trolox eq./g). It also had smooth and round irregularly-shaped particles with 118.8 nm mean size. Therefore, it can be concluded that the encapsulated anthocyanins from black bran rice is a very promising material that could be used for food and pharmaceutical industries.

RICE; BRAN; ANTHOCYANINS; CHEMICOPHYSICAL PROPERTIES; JELLIFICATION; FOOD COLOURANTS; ENCAPSULATION

Grain quality and antioxidant profiling of the top two most preferred traditional rice varieties per region in the Philippines. **Romero, M.V., Mamucod, H.F., Corpuz, G.A., Huliganga, R.C., Anies, A.J.P., Corpuz, H.M.** 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. 115-116 (Jul-2018).*

The Philippines is fortunate to have vast array of traditional rice varieties (TRVs) including pigmented and aromatic rice, with high demand in the domestic and international market. Recognized for their premium rice grains with excellent eating quality, most of the TRVs command higher prices compared to regular milled rice. The two most preferred TRVs in 15 regions were identified based on the Department of Agriculture's Upland Rice Development Program: Dumalengan and Mimis (CAR), 75 Days and Balatinaw (Region 1), Pinilisa and Balatinaw (Region 2), Galo and Binernal (Region 3), Inipot-ibon and Pinalawan (Region I4-A), Milagrosa and Tipak (Region 4-B), Black Rice and Red Blondie (Region 5), Malido Red and Palawan (Region V6), Kanukot and Tumindog (Region 7), Kalinayan and Baysilanon (Region 8), Ismagol and Kalingkit (Region 9), Dinorado and Speaker (Region 10), Remolitis and Perya (Region 11), Azucena and Dinorado (Region 12), Kalingkit (Black) and Gabay (ARMM). Grain quality evaluation showed that most of the preferred TRVs had good milling recoveries with intermediate amylose content (19.39-21.84%) which demonstrates good eating quality. Based on the alkali-spreading value, majority of the TRVs had intermediate gelatinization temperature (70-74 deg C), indicating shorter cooking time. For both the unpolished and polished forms, Gabay (ARMM) had the highest crude protein content while Balatinaw (Region 2) had the highest total anthocyanin content. Dinorado (Region 12) and Balatinaw (Region 2) had the highest total antioxidant activity in unpolished (9.08 Teq/g) and polished (3.33 Teq/g) form, respectively. Total phenolic content ranged from 0.39-5.54 (unpolished) and 0.14-2.7 mg gallic acid equivalent/g (polished). This study demonstrates that traditional rice varieties can be marketed at premium price due to their excellent grain quality traits and health promoting properties. With the increasing awareness on health and nutrition, these findings can also provide important inputs in the development of healthier rice.

ORYZA SATIVA; RICE; INDIGENOUS ORGANISMS; GRAIN; QUALITY; ANTIOXIDANTS; PROXIMATE COMPOSITION; ANTHOCYANINS; PHENOLIC CONTENT; PHILIPPINES

Morphological and physico-chemical characteristics of 'Red Creole' Allium cepa L. in three production areas in the Philippines. **Del Carmen, DR.; Espigol, A.M.D.; Nuevo, P.A.; Masilungan, G.D.** *Philippine Journal of Crop Science (Philippines) v. 41 (3) p. 13-19 (Dec 2016)*.

A survey was conducted in the three major onion growing areas in the Philippines, namely, Mindoro Occidental, Nueva Ecija, and Pangasinan to augment and update the limited available data on the local 'Red Creole' variety. This was followed by laboratory determination of the morphological and physico-chemical characteristics of bulb onions that affect the taste, flavor and postharvest behaviour of the produce. Correlation between these characteristics was also investigated. These are deemed important as basis in developing effective interventions and/or strategies in the produce quality and marketing systems improvement. Results showed that onions obtained from Nueva Ecija are superior in terms of size and compressive strength while onions obtained from Mindoro have the highest pungency values. Onions from Pangasinan are small with the lowest weight value but have the thickest leaf sheath. Bulb weight is positively related to compressive strength, but is negatively related to total soluble solids. Bulb height also shows positive correlation with compressive strength and negative correlation with total solids. The bulb's equatorial diameter and firmness are also negatively correlated. Lastly, onion's outer leaf sheath thickness is also positively correlated with pungency.

ALLIUM CEPA; ONIONS; VARIETIES; CHEMICOPHYSICAL PROPERTIES; SEED WEIGHT; PETIOLES; PHILIPPINES

Nutritional value, functional components and acceptability of sweet potato (Ipomoea batatas L.) and corn (Zea mays L.) blends as instant complementary food. N**guyen-Orca, M.F.R.; Hurtada, W.A.; Dizon, E.I.** *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 20-26 (Dec 2014).*

Infants and young children are most affected by household food, thus there is a need for complementary foods that are safe and in expensive. The study was set out for the purpose of developing an instant complementary food from sweet potato and corn. Corn (IPB variety 6) and for cultivars of sweet potato namely, cream-fleshed (CFSP), yellow-fleshed (YFSP), orange fleshed (OFSP) and purple-fleshed (PFSP) were mixed in eight different proportions. Blends with the highest dispensability, 55:45 (sweet potato-corn), were analyzed for nutritional value and functional components and subjected to sensory evaluation. The nutrient content per 100 g of sample ranged from, 3.13-2.81 g protien, 1.7-1.6 g fat; 361-367 kcal total energy; 28.6-765.5 mug, Beta-carotine ; 1.5-3.7 mg iron; 0.5-1.3 mg zinc ; while functional components ranged from, 216.5-beta-carotene; 1.5-3.7 mg iron; 0.5-1.3 mg zinc; while functional components ranged from, 216.5-283.3 mg catechin equivalents for total phenols; 12.2-28.0 mg gallic acid equivalents for flavonoid; 0.1-0.2 mg catechin equivalents for tannins; 11.5-22.6 mg catechin equivalents for anthocyanin; and 43.3 - 59.4% antioxidant activity. Generally, blends were acceptable in terms of aroma, mouth and taste. Purple-fleshed sweet potato-corn was superior in terms of nutrient composition and functional components. The results showed that the blends are potential complementary foods for improvement of nutritional status of children.

IPOMOEA BATATAS; SWEET POTATOES; ZEA MAYS; MAIZE; VARIETIES; INFANTS; NUTRITIVE VALUE; ANTHOCYANINS; ANTIOXIDANTS; FLAVONOIDS; PROXIMATE COMPOSITION; ORGANOLEPTIC ANALYSIS; ORGANOLEPTIC PROPERTIES; NUTRITIONAL STATUS

Phytochemical screening and assessment of health-related bioactivities of phenolic compounds from yacon [Smallanthus sonchifolius (Poepp. and Endl.) H. Robinson] leaves and tubers. **Reyes, C.T.; Villagen, R.C.P.; Rodriguez, E.B.** *Philippine Journal of Crop Science (Philippines) v 39 (2) p. 1-11 (Aug 2014)*.

Yacon [Smallanthus sonchifollius (Poeppig and Endlicher) H. Robinson], a tuber crop originally cultivated in the Andean region of South America, has been used as food and in traditional medicine by the native inhabitants for centuries. This study determined the nutritional value of yacon grown in Nueva Ecija [Philippines], characterized the phenolic constituents and evaluated their health-related bioactivities. By proximate analysis, a 100-gram sample of freeze-dried yacon tuber was found to contain low levels to protien (2.43 g), moderate level of fiber (4.47 g) and high level of carbohydrates (73.8 g). A 100 g sample of dried yacon leaves contained high level of protein (15.24 g) and fiber (5.67 g), and moderate level of lipids (2.81 g). Potassium comprised more than 50% of the total mineral content of yacon leaves and tuber, as determined by ICP-OES. Phytochemical screening showed the presence of phenolics, alkaloids, sesquiterpene lactones, terpenoids and triterpenoids; and absence of cyanogenic glysides, saponins and glucosinolates in yacon leaves and tubers. The total phenolic contents of the tuber and leaf extracts, as estimated by the Folin-Ciocalteu method (in terms of mg GAE per 100 g sample and mg QE per 100 g sample) were : tuber methanol extract (164.2 ± 16.9 and 167.5 +- 15.0), leaf decoction extract (3,489.4 +- 129.9 and 3,484.7 +- 142.1) and leaf methanol extract (529.2+-52.4 and 214.8 +- 46.1). Descending two-dimensional paper chromatography, TLC and RP-HPLC analyses of the phenolic extracts and their products from acid- and base-hydrolysis showed that caffeic and its esters and derivatives were the major phenolic components. Quantification by RP-HPLC showed high levels (in terms of mg per 100 g sample) of a caffeic acid ester in the tuber extract (155.32 ± 0.67) and leaf decoction (186.72 ± 4.55), caffeic acid in the based-hydrolyzed leaf decoction (395.3 +- 0.7) and ferulic acid in the acid-hydrolyzed leaf decoction (43.32 +- 7.00). Results from chromatographic analyses corroborated by the isolation and identification of the following compounds by silica gel open column chromatography. Sup 1 H-NMR spectroscopy and melting point determination; caffeic acid from leaf decoction based-hyrolysed extract, and ferulic acid from leaf decoction acid-hydrolyzed extract. The phenolic extracts were found to have significant DPPH radical scavenging activity. Furthermore, the phenolic extracts exhibited significant anti-lipoperoxidative activity on rat liver microsomes comparable to a commercial supplement containing silymarin extract, which is recommended for hepatoprotection. Using duck embryo CAM vascular irritation assay, the phenolic extracts were found to possess an anti-inflammatory activity comparable to hydrocortisome.

POLYMNIA SONCHIFOLIA; SPECIES; LEAVES; TUBERS; ANTIOXIDANTS; PHENOLIC COMPOUNDS; MEDICINAL PROPERTIES; PROXIMATE COMPOSITION

Q70 Processing of agricultural wastes

Development of coir coloring filler and peat-based handicraft. **Lumata, R.L., Peñamora, L.J., Baya. L.J.B., Tagactac, C.M., Lumata, A.L.** 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. 117 (Jul-2018).*

Currently, stocks of coir are utilized mainly for geotextile and a few handicrafts whereas cocopeat is used as base material for fertilizer development for vegetables. Moreover, coir and peat are produced from coconut husks using the the PCA's fabricated 12HP mobile decorticating machine which has been distributed to several regions in the country as part of KEDP program. In this on going research, novel products are developed for art and crafts which is intended to be tested by the K-12 program in their art classes. The parameters involved for

coir coloring fillers are coir size, color concentration, and toxicity analyses of dyes. The coloring art fillers were used for making several portraits which can substitute commercial fillers which are either made of egg shell and other non-organic materials. Cocopeat has been tested as a substitute for plaster of paris in making figurines using white glue as binder; however, several other types of binders are being studied. Plaster of paris, also known as dehydrated gypsum, comes from a nonrenewable resource whereas cocopeat is composed of 60%-70% of the total weight of coconut husks which can be collected thousands of tons each year as Philippines is the second largest coconut producer in the world. This product development from coconut aims to develop high value products which come from a highly sustainable waste resource from coconut (husks) which are just normally burned in copra processing.

COCONUTS; COIR; HUSKS; PROCESSING; HUSKING; PRODUCT DEVELOPMENT; TECHNOLOGY; PEAT; HANDICRAFTS

S- HUMAN NUTRITION

S01 Human nutrition - General aspects

Differences in satiating effects of white rice and brown rice in selected Filipino adults. **Golloso-Gubat, M.J.; Magtibay, E.V.J.; Nacis, J.S.; Udarbe, M.A.; Santos, N.L.C.; Timoteo, V.J.A.** *Philippine Journal of Crop Science (Philippines) v. 41 (2) p. 55-60 (Aug 2016)*.

Previous studies reported health and economic benefits of increased brown rice consumption, but scientific data on differential effects on satiety of brown and white rice are largely limited. This study investigated the difference in satiating effects of brown rice and white rice. Study participants (n=34) completed a 6-wk randomized crossover study. In the first 2 wks, study participants were randomly assigned to fully consume breakfast test meals with either brown rice (n=17) or white rice (n=17). A 2-wk washout period followed and a crossover in rice assignments in the last 2 wks. Test meals were matched in weight, energy (approx 500 kcal) and macronutrient content. Hunger ratings of study participants were measured in 100-mm visual analog scale (VAS) at 0, 15, 30, 45, 50, 90, 120, 150, 180 and 240 min to obtain temporal profile of hunger. Mean satiety quotient (SQ) was calculated by dividing the difference between mean hunger ratings at 0 min and 240 min postprandial over the energy content of the test meals. Reported feelings of hunger were significantly lower with intake of brown rice and white rice in the late postprandial phase (150, 180 and 240 min postprandial). Mean satiety quotient (SQ) of brown rice test meals (3.12 +-6.17 mm/kcal) was significantly higher (p=.045) than mean SQ of white rice test meals (1.58 +-4.11 mm/kcal). The present data suggest that brown rice have stronger short-term satiety signal capacity than white rice.

ORYZA SATIVA; RICE; VARIETIES; FOOD INTAKE; FOOD CONSUMPTION; APPETITE; ADULTS; PHILIPPINES

T - POLLUTION

T01 Pollution

Mercury, lead, and cadmium content on aquatic kangkong (Ipomoea aquatica, Forsk) from selected areas in the Philippines. **Nuevo, P.A.; Maunahan, M.V.; Marquez, K.L.D.; Oliveros, R.R.B.** 48. Crop Science Society of the Philippines Scientific Conference : Proceedings; Crop Science Innovations : express path towards countryside development, Legaspi City, Albay (Philippines), 2-7 Jul 2018. Philippine *Journal of Crop Science (Philippines) v.43 (Supplement no. 1) p. 34 (Jul 2018).*

IPOMOEA AQUATICA; MERCURY; LEAD; CADMIUM; POLLUTION; PHILIPPINES

Kangkong (Ipomoea aquatica Forsk.) is a leafy vegetable popular among children and commonly used in Philippine cuisine. It is known to be nutritious but heavy metal contamination is an issue since the plant has the capability to sequester heavy metals found in water effluents from domestic and industrial waste. This study aimed to determine mercury (Hg), lead (Pb) and cadmium (Cd) uptake of kangkong grown in Laguna Lake (Calamba City, Laguna; Tanay, Rizal; and Pasig City, Metro Manila); Angat River in Pulilan Bulacan; and a swamp in Cavite, the major sources of supply in Metro Manila and suburbs. The heavy metal concentrations at the top, middle and bottom portions of I.aquatica were determined at different locations and periods from Pasig City (2013), Rizal, (2013), Cavite (2013), Laguna (2014-16) and Bulacan (2016). In 2013, the concentrations were highest, on the average, in market samples from Pasig City (16.9ppb Hg and 0.22ppm Cd) and Rizal (6ppm Pb). The heavy metal levels were higher in the plant samples (0.98-24.91ppb Hg; 0.11-0.66ppm Pb; 0.009-0.017ppm Cd) than the water where these grown (0.98-24.91ppb Hg;0.11-0.66ppm Pb; 0.009-0.017ppm Cd) than the water where these were grown (0.1-0.54ppb Hg; 0.015-0.023ppm Pb; 0,002-0.003ppm Cd) in Laguna and Bulacan. The calculated values to reach the provisional tolerable weekly intake (PTWI) of mercury and provisional tolerable monthly intake (PTMI) of cadmium of samples from Bulacan and Laguna are far beyond the normal eating capacity of a 60-kg person but may pose a high risk to individuals of lesser weight including children.

U- METHODOLOGY

U10 Mathematical and statistical methods

Improved rice yield monitoring using remote sensing and crop simulation model. **Alosnos, E., Radam, E.D., Quicho, E., Setiyono, T., Romuga, G., de Rios, J., Quilang, E.J., Mabalay, M.R., Arocena, A., Maloom, J., Raviz, S., Laborte, A., Barbieri, M.** 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. 119-120.*

>Development of rice yield monitoring system is very important for scientific researchers, agricultural planners and policymakers, particularly in areas where ground observations are sparse and inconsistent. An objective, accurate, cheaper, and faster method of monitoring rice yield is needed for more effective formulation and implementation of agricultural services, technologies, and policies that would contribute to the country's rice

self-sufficiency and food security. The study was conducted to investigate the potential of integrating Synthetic Aperture Radar (SAR) - based remote sensing and crop simulation model ORYZA for large-scale operational monitoring of rice yield. Result of rice yield simulations conducted during dry season (DS) and wet season (WS) of 2016-2017 showed the good performance of the integrated SAR-ORYZA yield estimation system in terms of the level of agreement with actual yields. The agreement between simulated and actual yields substantially improved with increasing spatial aggregation (i.e from provincial to regional-level). The aggregated Root Mean Squared Error (RMSE) and index of Agreement (IOA) at provincial-level were 0.57 t/ha and 0.84, respectively; whereas at regional-level the RMSE and IOA were 0.46 t/ha and 0.89, respectively. In terms of yield performance, highest average yield were recorded in Nueva Ecija for both DS (6.39 t/ha) yield performance, highest average yields were recorded the highest average yields in both DS (5.73 t/ha) and WS (4.46 t/ha). Quantile regression analysis of simulated yields revealed that provincial-level yield gaps between maximum attainable yield and average farm yield were relatively higher DS (0.52-3.27 t/ha) than WS (0.64-2.36 t/ha). Information on yield gaps is very important for spatial targeting of interventions and prioritization of research and development (R and D) recommendations that have higher impacts. The study demonstrated that application of remote sensing and crop modeling techniques could further enhance rice yield monitoring in the Philippines.

ORYZA SATIVA; CROP YIELD; MONITORING; REMOTE SENSING; RADAR; CROP PERFORMANCE; MODELS

U40 Surveying methods

Development of a GIS [Geographic Information System]-based model for predicting rice yield**. Maloom, J.M.; Saludes, R.B.; Dorado, M.A.; Sta. Cruz, P.C.** *Philippine Journal of Crop Science (Philippines) v 39 (3) p. 8-19 (Dec 2014)*.

Monitoring the growth of rice and forecasting its yield before harvest season is important for crop and food management. Remote sensing images are capable of identifying crop health as well as in predicting its yield. This study was conducted to develop a functional model for predicting rice yield from remotely sensed data. The Normalized Difference Vegetation Index (NDVI) calculated from remote sensing images have been widely-used to monitor crop growth and relate it to crop yield. This study used 16-d composite Terra MODIS NDVI data from December 2008 to April 2009 to predict rice yield in Dingras, Ilocos Norte, Philippines. Nine yield prediction models were developed through linear regression analysis (stepwise method) between NDVI and observed yield, among which Model 3 had the highest potential. It can predict yield way ahead before harvesting. The r2 value of the models ranged 0.36-0.75, which means that about 36-75% of the yield variability could be explained by the models. The variability between predicted and actual yields are due to factors not considered in the model such as type of soil, varieties planted, weather and other cultural management practices, such as water, nutrient and pest management used on the standing crop studied.

ORYZA SATIVA; RICE; YIELDS; GEOGRAPHICAL INFORMATION SYSTEMS; CROP MONITORING; REMOTE SENSING; CROP MANAGEMENT; CROP YIELD; MODELS