

**ABSTRACTS**  
**ISSAAS PHILIPPINES NATIONAL CONVENTION 2009**

**MICROBIAL TREATMENT OF JATROPHA PRESS CAKE AND FISH FEED  
NUTRITIONAL QUALITY EVALUATION**

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This study determined the possibility of using *Jatropha* press cake for feed production by allowing it to undergo anaerobic fermentation to improve its pH, crude protein content and total sugar content. Three separate experiments were conducted, each consisting of various treatments, and each treatment spanning a total of 21 days. The enrichment study evaluated the effects of using selected nutritional additives such as rice washings, sugar, salt and skim milk in fermenting *Jatropha* press cake in combination of up to 3% of the total *Jatropha* press cake by weight. No significant improvement (in terms of pH and sugar content reduction) was observed when using the additives separately as compared to using all the additives together in one sample. Using all the additives applied together resulted in lower pH and higher decrease in sugar content. Adding enrichment to *Jatropha* press cake prior to fermentation could improve crude protein content and other fermented feed properties. A mixed bacterial inoculant was developed based on the enrichment study and on pH and product smell. Using enrichment and mixed lactic acid bacterial inoculants together produced a feed with lower pH and greatly improved initial sugar content, resulting in better sugar consumption. Adding the mixed inoculant and enrichment to *Jatropha* press cake prior to fermentation significantly improved the fermented feed properties. The effects of adding non-protein nitrogen or urea (NPN) with mixed lactic acid bacterial inoculants was also evaluated. This treatment produced the lowest desirable pH and better crude protein levels. Overall, the treatment that produced the best results in terms of pH, decrease in sugar content, crude protein increase and smell was *Jatropha* press cake wetted with 3% rice washings and 3% mixed lactic acid bacterial inoculants.

**PANGASINAN STATE UNIVERSITY ORGANIC FERTILIZER PROJECT EXTENSION  
STRATEGIES AND INITIATIVES**

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Pangasinan State University has a critical role to play in countryside development, consistent with the university mission of “.. providing better service in the technical and professional training in the arts, sciences, humanities, and in the conduct of scientific research and technological studies and community service”. One of the banner projects is the Organic Fertilizer Production Project (OFPP) which aimed primarily to develop technologies and promote the utilization of organic fertilizer through different techno-transfer strategies and initiatives to attain sustainability in agriculture. The paper showcases the extension strategies and initiatives which has been generated for the last 9 years. The technology refers to the organic fertilizer which is promoted in collaboration with LGUs and other stakeholders for utilization and adoption among farmers and other interested individuals. It discusses the different components to effect desired development outcomes for the rural communities. These involved (1) capability building/training of farmer-clienteles; (2) establishment of organic fertilizer production plants and assistance to LGUs Material Recovery Facility (MRFs); (3) techno-demo to showcase the effect of PSU organic fertilizer through the university’s crop production activities; (4) techno-demo strategies, trainings and actual demonstrations were conducted and distribution of IEC materials in collaboration with cooperating agencies; and (5) monitoring and evaluation on trained farmer cooperatives were undertaken to ensure optimum production and

utilization of the technology. The dissemination, promotion and utilization of the PSU organic fertilizer production technology resulted in (1) farmers and other clientele equipped with the skills and knowledge on low-cost and adaptable organic fertilizer production technology; (2) organic fertilizer production plants established and LGUs assisting in the production of organic fertilizer using their acquired state-of-the-art equipments; (3) promotion of the utilization and adoption of the OFPT thru technology techno-demo and development, production and distribution of IEC materials; (4) increased number of farmers adopting the technology; and (5) linkages with other agencies were strengthened. It is therefore recommended to: (1) closely monitor and evaluate the performance of trained farmers; (2) intensify the conduct techno-demo at farmers' farms; and, 3) license the product.

### **SUPPLY CHAIN IMPROVEMENT FOR THE ABACA INDUSTRY IN THE BICOL REGION, PHASE 1: EVALUATION RESEARCH**

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This paper presents the analysis of the supply chain of abaca fiber and abaca-based products in the Bicol Region. Supply chain maps showing the key players and the flow of product, information and payments among them were illustrated. In addition, their roles and responsibilities, logistic issues and external influences faced were discussed. The efficiency, flexibility and overall responsiveness of supply chains and its players were also determined. Abaca fiber flows from the farmers to the end-users through a series of middlemen in a supply chain. The main problem of the industry is the low productivity of abaca farms, which hinders the supply chain players (i.e. farmers, traders, buying stations and GBEs) from meeting the abaca fiber requirement of their customers. This problem is caused by poor fiber quality, inadequate abaca replanting effort, declining area planted to abaca, non-adoption of recommended package of technology, limited value-adding and/or value-creating options at the farm level, and inclement weather. The persisting credit-market tie-up disables the farmers-and other traders to haggle for a better price for their abaca fiber and they are even charged with high shrinkage cost. It was also observed that there is a redundancy of functions performed by the supply chain players. Based on the identified issues, the following policy directions to improve the abaca supply chain with specific focus at the farm level are forwarded: (1) continuous training program on the various aspects of abaca production and post-harvest handling practices; (2) organization and/or strengthening of producers/marketing associations among farmers; (3) provision of alternative livelihood activities; (4) design, development and pilot testing of portable abaca stripping device; (5) rehabilitation of existing abaca areas in mainland Bicol using the recommended package of technologies (POT) and restoring shade cover, and (6) strengthening of information dissemination and extension support.

### **PRICE DYNAMICS AND COINTEGRATION IN THE MAJOR MARKETS OF AQUACULTURE SPECIES IN THE PHILIPPINES**

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This study explored the interdependencies of aquaculture markets in the Philippines by establishing price cointegration between wholesale and retail prices of three major species commonly farmed in the country, i.e., milkfish, tilapia and shrimp. The co-movements of wholesale prices between and among key markets for each species were also investigated. Moreover, exogeneity in prices was established using Granger-causation model to determine the existence of price leaders among these

markets. Such information are crucial in farm management decisions of producers and traders through better understanding of the efficiency in price formation across production and consumption centers which in turn defines the movements in prices and products among markets. Appropriate policies for the development of markets for the three aquaculture species were also identified. Such policies are expected to contribute towards the attainment of efficient pricing and distribution of benefits among market players and stakeholders. These benefits are expected to manifest through the system of grading standards for fish traded in local markets and in the choice of cost-effective technologies in grow-out and post-production practices.

#### **YIELD PERFORMANCE OF DIFFERENT SPECIAL PURPOSE VARIETIES OF RICE IN ABRA**

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The study determined the performance of PhilRice special purpose rice varieties in terms of yield in Abra under lowland ecosystem. The best varieties would be recommended to rice farmers for growing in the area. Specifically, the study was conducted at the ASIST Research area for two cropping seasons (2007 and 2008). Based on the findings, significant effects were noted on plant height at maturity, number of productive tillers, number of unfilled grains, length of panicle, weight of seeds, harvest index and yield. Moreover, all the varieties were found to be resistant to pest and diseases. NSIC Rc 13, NSIC Rc 17 and NSIC Rc 128 varieties gave the highest yields, which did not significantly differ from each other. These varieties were therefore recommended as planting materials.

#### **SURVEY AND DOCUMENTATION OF AGROFORESTRY SYSTEMS IN APAYAO**

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This study documented the existing agroforestry systems in Apayao. The farming systems in the province can be considered as varied in terms of tenure, unit of production, water availability, and topography. It can be generalized as: a) managed by the households, b) legally/not legally owned, c) with 3 to more than 18% slope, d) rolling to undulating topography, and e) irrigated to non-irrigated or rain-fed. These characteristics are common to upland farming systems. However, unlike other indigenous farming systems, production systems in Apayao are not only for subsistence but also for small to medium-scale production for commercial purposes. The variation can be observed in terms of output disposal, scale of operation, dominant crop and species diversity. These variables can be grouped as system components with their corresponding roles, interactions and distribution. Using these groupings, farming systems in the study area can be categorized as: a) mono crop plantation-based, b) multiple crop plantation-based (multistorey, relay cropping, mixed cropping), c) aqua-silvicultural-based, d) annual home garden, e) perennial home garden, and f) rice terracing. All the above cropping systems can be considered as multistorey, intensive and diversified. Even the mono-crop plantation-based system has at least three to five plant species with only one major crop. The farming system in the area is a product of: a) changing land-use pattern and vegetative-plant succession with time, b) migration and settlement pattern, c) technological innovation and adaptation pattern, d) market orientation, and d) socio-cultural pattern. The problems encountered by the farmers on production and practice of agroforestry were the occurrence of insect pests and diseases that resulted in low production output or even negative profit, lack of seminars or trainings for the technology to be used in the production system, and lack of fruit and forest tree seedlings to be planted, transportation for marketing and small land holdings.

**SELECTION INDEX OF TYPHOON-RESISTANT REFORESTRATION SPECIES AS ADAPTATION STRATEGY ON CLIMATE CHANGE**

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In the Philippines, one of the indicators of climate change is the increased occurrence of stronger typhoons. However, there is no screening method being used to choose the reforestation species suitable for typhoon-prone areas in the country. Four frequently used reforestation species were evaluated for typhoon resistance under field conditions in Bacacay, Albay, Philippines from January 2000 to December 2001. Agoho (*Casuarina equisetifolia*), mahogany (*Swietenia macrophylla*), river red gum (*Acacia auriculiformis*) and yemane (*Gmelina arborea*) were assessed in terms of five different damage categories as treatments, namely: defoliation, breaking of branches, breaking of stem, leaning, and uprooting. Plots were laid out on top of mountain ridges where the heaviest impact of typhoon was expected. Correlation analysis was used to compare linear associations of the damage categories, total height, basal diameter and species. Agoho was found resistant in all damage categories assessed. It could be recommended in reforesting exposed, high elevation, typhoon-prone areas due to its needle-like foliage, spherical canopy structure, high wood tensile strength and a deep root system. Mahogany was found moderately resistant to typhoon, while yemane and river red gum were non-resistant. Using the different damage categories assessed in the study, an index of species resistance to typhoon was developed. Reforestation species to be planted in typhoon-prone areas should conform to the resistance index to lessen damage and save on financial resources. This could be an adaptation strategy to climate change.

**THE POTENTIAL OF WEAVER ANTS (*OECOPHYLLA SMARAGDINA*) AS BIOLOGICAL CONTROL OF MANGO LEAF HOPPERS**

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The study evaluated the potential of weaver ants as biological control for mango leaf hoppers. Three treatments were used: Treatment A (untreated control), Treatment B (insecticides only) and Treatment C (weaver ants only). Results showed that the highest numbers of mango leaf hoppers before flower opening, during flower opening, and after flowering were noted in treatment A. The highest percentage of mango leaf hopper mortality was observed in Treatment B; The highest number of mango fruits developed at mango-size was observed in Treatment C. Treatment B produced the highest number of mango fruits at corn-size and the highest number of fruits harvested (134) followed by Treatment C (89), leaving no significant difference between the two treatments. Again, Treatment B had the heaviest production (13.79). Treatment A had the sweetest mangoes harvested with sugar content of 19.15, followed by Treatment B with sugar content of 18.34 and Treatment C having a sugar content of 18.22. However, a very slight difference on the percentage of fruit damaged was noted between Treatments B and C. Treatment C posted the highest net income with a return on investment of 224.39%.

**ASSESSMENT OF FISHING PRACTICES ON ENDEMIC FISH SPECIES IN KALINGA**

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The fishing and fish production practices on endemic fish species in Kalinga Province were assessed. The study was conducted in eight municipalities of Kalinga where major tributaries of fresh waters are located. Respondents were fisher folks engaged in fishing as their major source of income and also

those who treated it as one of their habits. A survey questionnaire was the major tool in gathering information, while instant interview of the fisher folks was done before the actual conduct of the study. Digital camera was also used to gather additional data relevant to the study. To ensure the veracity of the study, systematic random sampling among the fisher folks in each municipality was done. Kalinga is considered as one of the indigenous fishing communities in the Cordillera Administrative Region (CAR). Rivers connecting from the Chico River going down to the lower streams are very rich sources of indigenous fishes which fishermen usually harvest for their consumption. The traditional practices of using *banni-it*, *tabbokol*, etc. are observed in rivers and lakes of the province. However, employing the traditional methods is not enough to augment the fisher folk's food needs and income. This study is one giant step to come up with concrete plans to improve fish production in Kalinga; thus possibly improving their socio-economic condition.

#### **BIO- PHYSICAL AND CHEMICAL CHARACTERIZATION OF THE RIVER SYSTEM IN APAYAO PROVINCE**

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This study determined the bio-physical and chemical characteristics of the major river system and described the habitat of fish and shells in Apayao. Field survey and water analysis were conducted in 10 rivers found in Apayao, namely; Acutan, Nabuangan, Barren, Cabicungan, Laco, Karagawan, Nagan, Binuan, Zumigue and Ziwanan Rivers. Analysis of physico-chemical parameters of the river systems revealed that air and water temperatures range from 22 to 30oC, average water velocity 0.11 – 3.44 m/s, stoney to muddy bottom type, clear water, pH range of 7.32 to 7.97, average DO level and BOD of 6.11 and 2.96 mg/L, respectively. Moreover, these bio-physical and chemical parameters measured in the different rivers fall within the standards set by DENR for unpolluted rivers. The different rivers are inhabited by diverse fish and shell species. Activities within the rivers include fishing, bathing, swimming, washing, and transport of goods by the residents. The rivers provide an abundant water supply for irrigation as well as for domestic uses. There are Dipterocarp species grow in the area, while shrubs and grasses dominate the buffer zone of the rivers. To conserve these freshwater resources, the “Lapat” Sytem is implemented in Apayao.

#### **CLASSIFICATION OF DIFFERENT LAND UTILIZATION TYPES IN THE MULTIPLE USE ZONES OF MT. ISAROG NATURAL PARK, PHILIPPINES**

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The transect method of soil survey was used to study the floral species and the soil and land characteristics in the multiple use zones in Mt. Isarog. The observation sites, which were based from the map produced by CARE Philippines, are located in Sto Niño and Villaflorida, Ocampo, Camarines Sur; Payatan, Goa, Camarines Sur; Cawayan, Tinambac, Camarines Sur and in Panicuason, Naga City. The study determined the soil and other environmental characteristics at MINP multiple use zones; the existing floral species in the multiple use zones; land capability, soil fertility rating and soil suitability of the existing floral species, and generated land capability, soil fertility and soil suitability maps of MINP MUZs using the Geographic Information System (GIS). Most of the areas, particularly those located at the lower footslopes, are generally fairly good land and classified as Land Capability Class De. This class denotes a land that requires very careful management and intensive conservation practices for safe cultivation. However, a small portion of the area located on the lower footslope in Sto. Niño is classified as Class Ce, which is a moderately good land but also requires careful management and good conservation practices because it is moderately

eroded. The areas on the upper footslopes in the barangays of Payatan, and Villaflorida and Cawaynan are classified as Class M because of the steep slopes and moderate to severe erosion. These areas are limited to pasture or forest use, but also require careful management.

### **DISSEMINATING THE RESOURCE MANAGEMENT SYSTEM OF THE TINGGUIANS (LAPAT) THROUGH INSTRUCTIONAL MODULES**

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This study described the “Lapa”t system (Tingguian Resource Management System), documented its rituals and practices, analyzed its enabling factors and problems, and developed instructional materials from data gathered. Key informants were purposively identified from among the council of elders, “Lapat” officers, religious sector, ASIST Tingguian students, women, politicians, professionals, community folk, and government and non-government organizations. Data were gathered through interview schedule, focus group discussions (FGD) and informal meetings with key informants and FGD discussants. The collected data were further confirmed by participant observation, site visits and walk through. Results showed that the “Lapat” system protects and sustains the forest, fresh water resources, and environment for the present and future generations of Tingguians. The Council of Elders and “Lapat” officers manage all the activities of “Lapat” and enforce laws of the community by banning the harvest of dwindling forest products. The ban is lifted when forest products are replenished. The “Lapat system” is imbedded in the Tingguian culture. It involves prayer petitions (*bagawas*), information dissemination (*palek*), traditional oath (*sapata*) and fact finding ritual (*duo*). During the sealing of “Lapat” agreements, the whole community celebrates through traditional songs (*salidummay*), ethnic dance (*tadek*) and chants (*oggayam*), and a community luncheon highlights this events. Implementing the “Lapat” system entails problems such as smuggling of timber and non-timber products, population pressure, conflicting traditional and government laws on forestry and mining, kaingin, insurgency, boundary disputes, and weakening of cultural values. But generally, “Lapat” has enabling factors. It is indigenous and utilizes bottom-up and participative approaches with local communities, GO, NGO and religious groups, particularly the Roman Catholic Church, through its Apostolate on Integrity of Creation. It is also supported by the government through the IPRA law. With the gathered information, instructional modules have been developed for use in the social science subjects and have been integrated in the education, agriculture and forestry courses of Abra State Institute of Sciences and Technology (ASIST). ASIST provides a curriculum which is truly Filipino by developing modular instructional materials authored by a local author.

### **DIVERSITY OF NITROGEN-FIXING PLANTS IN AGRO-FORESTRY SYSTEM IN ABRA**

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The study was conducted to generate information on the diversity of nitrogen-fixing plants in agroforestry farms in 12 municipalities of Abra from 14 January to 30 April 2009. Respondents of the study were the owners and farmers of the agroforestry farms. The study made use of the descriptive design in benchmarking, characterization, documentation and evaluation of nitrogen-fixing plants. Descriptive statistics was employed. A structured interview schedule was used and supplemented by actual observation. Results showed that agroforestry farms in Abra contained diverse nitrogen-fixing plants. These plants included edible legumes, forage, medicinal plants and trees. These had definite characteristics, as well as ecological niche. The most common nitrogen-fixing plant found in the municipalities surveyed was kakawate or madre de cacao. Other plants grown were ipil-ipil and food legumes such as string beans, pigeon pea, mung bean, lima bean, hyacinth bean, wing bean, peanut and winged beans. Baguio beans, mani-mani, acapulco, tayum-tayum and sampaga were rarely

grown. Dolores, Luba and Tubo municipalities had the most number of nitrogen-fixing plants growing in agroforestry farms. Few nitrogen-fixing plants were seen in La Paz, San Isidro and Pennarrubia. Since these were lowland municipalities, fruit trees and field crops were usually grown in the agroforestry farms. Other crops cultivated included vegetables, plantation crops such as pineapple, fruit trees, grain crops, spices and forest trees.

### **EFFECTS OF SOIL AMENDMENTS ON THE GROWTH OF *JATROPHA CURCAS***

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An earlier study using copper contaminated soil from Mogpog, Marinduque was carried out to determine the effect of mycorrhizal amendment on the growth of *Jatropha curcas*. In addition, an experimental set-up carried out in Mogpog, Marinduque was done to study the effects of various soil amendments in *jatropha*. Since there was no work that looked into the effects of various soil amendments using garden soil that was previously treated with elevated levels of copper (0, 50, 100 and 500 ppm), a parallel potted experiment was carried out in the nursery area of the National Institute of Molecular Biology and Biotechnology, UPLB. Soil amendments were applied in fully established cuttings of *jatropha*. The treatments included not only mycorrhiza but complete fertilizer, compost and their combinations. Growth performance was assessed in terms of plant height and stem diameter (cm). The results showed that mycorrhizal application alone did not greatly improve the growth performance of the plant as compared with the control. In addition, compost amendment together with mycorrhiza showed better performance of *jatropha* than mycorrhiza alone. As expected the best growth performance was exhibited by all treatment combinations.

### **ENVIRONMENTAL SUSTAINABILITY AND CONSERVATION THROUGH INDIGENOUS NATURAL RESOURCE MANAGEMENT (INRM) IN THE CORDILLERAS: OPTIONS FOR PARTICIPATORY COMMUNICATION**

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Sustainable resource management is embedded in the tradition, culture and beliefs of the indigenous communities in the Cordilleras. The richness of natural resources in the region is coupled with Indigenous Natural Resource Management (INRM) strategies that help conserve and sustain their environment for decades. The paper presents the development and application of participatory approaches in the development of Information Exchange and Campaign (IEC) materials on INRM at the community level. IEC materials including posters, flyers, comics and radio spot were developed using a variety of participatory approaches such as Key Informant (KI) interview, Focus Group Discussion (FGD), community poster development, community folk story development and community translation. The Muyong or Pinugo is an indigenous forest management strategy in the Cordilleras recognized internationally. Various publications report that this INRM strategy does not only provide sources of food, fiber, fuel wood and construction materials to the communities but also helps minimize soil erosion and water runoff; maintains soil fertility, plant and animal biodiversity, and provides steady water source of the rice fields below for several generations. Another INRM strategy practiced by indigenous communities in the Cordilleras is the tapak-tapak system. Wild sunflower) is used as organic fertilizer. Foliar cuttings are applied either in the rice seedling beds or directly to the fields, and allowed to decompose before the start of the planting season. As an organic fertilizer, it helps maintain soil fertility, gives vigorous growth to rice and sustains rice yield. Participatory approaches are essential in acquiring first-hand information essential in the development of acceptable and effective forms of community IEC materials (e.g. community poster, flyers and story book) for environmental sustainability and conservation. With the tacit nature of indigenous

knowledge as in INRM strategies in the Cordilleras, effective transformation of such knowledge into community level communication tools is necessary.

### **FISH AND SHELL PRODUCTION PRACTICES IN APAYAO PROVINCE**

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This study determined the fish and shell production practices in Apayao. Specifically, it identified the native fish and shell species found in the province, and documented indigenous fishing and fish-shell production practices/methods of the fisherfolk. Field survey, interviews and photodocumentation were utilized in this study. There were various kinds of native fish and shell species are found in the freshwater habitats within the province. These included “gurami”, “palileng”, native “karpa”, “paltat”, “dalag”, “igat”, “kiwat”, “to' rit”, “agudung”, “dukian”, “bildat”, “balingasa”, “ahama”, native “kohol”, “udang” and “padaw”. There were also indigenous fishing gears and fish-shell practices employed by the fisher folks. They utilized “sidu”, “sarapa”, “sigay”, “tabukol”, “bukatot”, “sedeng”, “banni- it”, “pana”, fish pot, scoop net, “alat”, “pana” and “bubo” during fish and shell capture operations. Some still employed “karas”, while others used gill net, hook and line or trap nets. However, with the advent of modernization, some fisher folks had already adapted new methods and facilities in fish and shell production using concrete tanks, hapa net or earthen fishponds. There should be a program on preserving and improving of traditional fishing gears and practices as well as retaining the important fish- shell capture and production.

### **PAPEL BUHID: A PARADIGM FOR THE MANAGEMENT OF NATURAL RESOURCES AND SUSTAINABLE LIVELIHOOD AMONG THE INDIGENOUS PEOPLE IN OCCIDENTAL MINDORO, PHILIPPINES**

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The Poverty Alleviation Promotion thru Environmental and Livelihood Program for the Buhid Mangyans (PAPEL Buhid) is an extension program implemented by the Occidental Mindoro National College (OMNC) in partnership with the Buhid Mangyans and Barangay Council of Monteclaro in San Jose, Occidental Mindoro. It is a five-year program launched in December 2006 designed to help in the rehabilitation and conservation of upland resources and in the generation of sustainable livelihood of the Buhids. It specifically aims to improve agricultural production and health condition, promote adoption of appropriate upland technologies, and introduce sustainable livelihood using locally available resources. All projects implemented are designed to address the most pressing problems identified by the Buhids during the participatory appraisal such as poor health, low farm productivity and income, poor soil quality and land erosion. PAPEL Buhid has established a community nursery for forest and fruit-bearing trees and herbal plants, backyard vegetable garden, and mahogany and banana plantation. It has conducted livelihood trainings on handicraft, organic fertilizer production, seedling grafting, and practical cooking; seminar on health and nutrition, prevention of community diseases, parenting, and values orientation; and jingle making and singing contest. Observed effects of program include the planting of forest and fruit trees in the idle lands, practice of organic agriculture, adoption of environment-friendly technologies, generation of livelihood, increased awareness on environmental conservation, and building of greener and cleaner village.

### **NATURAL RESOURCE MANAGEMENT AND COMMUNITY-BASED LIVELIHOOD OPTIONS AS CROSS-CUTTING APPROACHES IN REACHING OUT TO THE INDIGENOUS PEOPLE OF OCCIDENTAL MINDORO**

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This paper argues that the use of ecosystems-based, community-centered, and holistic approaches bring out livelihood sustainability and natural resources conservation and management among the indigenous peoples of Occidental Mindoro, particularly those that belong to the five major tribes including Hanunuo, Buhid, Batangan (Tau-Buhid), Iraya, Ratagnon, and HaGuRa. The extension activities of Occidental Mindoro National College (OMNC) are implemented in partnership with the government, non-government and private organizations. This multisectoral partnership spearheaded the promotion of training and extension programs on Sloping Agriculture Land Technology (SALT), soil and water conservation, and biodiversity conservation; and community-based livelihood options like banana plantation, organic fertilizer production, food processing, and handicraft among the IP communities. This paper also highlights the distinct cultural and social traditions of the Mangyans in relation to the environment, which, when ignored may lead to failure of the interventions. The project experiences suggest that the success of any development program is dictated by realistic and need-driven programs. The participation of the communities, particularly the women groups is highly observed in the implementation of economically-viable projects such as production of high value crops and handicraft production.

### **GERMPLASM COLLECTION, IDENTIFICATION AND CHARACTERIZATION OF NATIVE RICE**

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This study dealt with the collection, characterization and evaluation of yield performance of 10 native upland rice varieties. The rice varieties were collected from different barangays within Apayao Province. These were planted with formulated homemade organic fertilizer in the rice terraces of the Apayao State College. Results showed that the native rice landraces were resistant to diseases and could withstand drought, although they differed in vegetative and grain characteristics. Calanasan had the highest mean yield per plot followed by Bolinaw and Sabadilla. There were significant differences among means of weight of 1000 rice grains of nine native upland rice landraces at 0.05 level of significance. LSD showed that means of Treatments 1 and 2 (Sinumay and Azucena), 4 and 5 (Sabadilla and Balatinaw), 6 and 7 (Tangtang and Calanasan) and 8 and 9 (Oskil and Biit) significantly differed, while those of treatments 2 and 3 (Azucena and Bolinaw), 3 and 4 (Bolinaw and Sabadilla), 5 and 6 (Balatinaw and Tangtang) and 7 and 8 (Calanasan and Oskil) did not. There were significant differences between the means of weight of grains from every plot of the nine upland native rice varieties compared to LSD at 0.05 level of significance. It showed that means of Treatments 3 and 4 (Bolinaw and Sabadilla) were not significantly different, while Treatments 1 and 2 (Sinumay and Azucena), 2 and 3 (Azucena and Bolinaw), 4 and 5 (Sabadilla and Balatinaw), 5 and 6 (Balatinaw and Tangtang), 6 and 7 (Tangtang and Calanasan), 7 and 8 (Calanasan and Oskil) and 8 and 9 (Oskil and Biit) were significantly different. Based on the results, Calanasan, Sabadilla and Bolinaw are recommended for adaptation to other rice fields and for propagation. It is recommended that further studies be conducted to identify the varieties of these native upland rice.

### **FLORAL INVENTORY IN RICE TERRACES AND ITS ENVIRON AT TANGLAGAN, CALANASAN, APAYAO**

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This study assessed the floral composition and the environment in the Tanglagan Rice Terraces, Calanasan, Apayao Province. Transect and quadrats/inventory plots were laid in the study site. There were 22 floral species inventoried within the rice terraces. Of these 22 plants, 10 were members of Family Poaceae (also known as Graminae), 4 species of Family Asteraceae and 1 species each of Families Amaranthaceae, Dennstaedtiaceae, Euphorbiaceae, Onagraceae, Pontederiaceae and Appiaceae. In the immediate environment of the rice terraces, 27 plants species were documented that included trees, shrubs, palms, vines, grasses and herbs. They belonged to Families Sterculaceae, Araceae, Lauraceae, Palmae, Leguminosae, Musaceae, Myrtaceae, Piperaceae, Sapotaceae, Rutaceae, Convolvulaceae, Euphorbiaceae, Moraceae, Mimosaceae, Fabaceae, Anacardiaceae, Caricaceae, Cucurbitaceae, Asteraceae and Poaceae. The plants in the immediate environment were commonly used as sources of food, beverages, fuel (firewood and charcoal), medicines and fibers. In terms of density and frequency within the rice terraces, *Oryza sativa* and *Paspalum conjajatum* registered the highest density, while the highest frequency and relative frequency were exhibited by *O. sativa*, *P. conjajatum*, *Fimbristylis miliaceae* and *Cyperus iria*.

### **FRY QUALITY OF PROMISING POTATO SELECTIONS GROWN FROM THREE LOCATIONS OF BENGUET**

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The study identified the location in Benguet that produced potato selections with the best fry quality; the potato entry with the best fry quality, and the effect of interaction between locations and potato entries on fry quality. The potato tubers harvested in Loo had the highest dry matter content and fry yield. In addition, the fries produced from these tubers were much liked by the sensory panelists. The fries produced from tubers harvested in Bonglo and Sagpat were moderately crispy, moderately perceptible, moderately oily, slightly firm, slightly brown and were moderately liked by the panelists. The potato entries CIP 2.21.6.2 and Igorota showed good fry quality based on high dry matter content and high fry yield. Both produced fries which were much liked much by the panelists. Growing CIP 2.21.6.2 and Igorota in Loo is recommended to produce production of tubers with good fry quality.

### **IDENTIFICATION AND CHARACTERIZATION OF DYE-YIELDING PLANTS IN APAYAO**

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The study identified natural dye-yielding plants in the upper municipalities of Apayao using the descriptive survey method. Findings revealed that *Coffea robusta*, a small tree 3-5 meters tall and with elongated leaves 15-20 cm long and 7-9 cm. wide, produced a brown dye from its bark and grain peel. "Pakak" or "antipolo" yielded an orange-brown dye from its bark. *Gmelina arborea* likewise produced a light brown dye from its bark. The narra tree also gave a yellow dye extracted from its bark. Anabiong tree, 10-15 meters tall, produced orange-brown dye from its bark, while bugnay, a tree growing to 6-8 meters high, yielded a light brown dye from its bark. Lubeg, a small tree which can grow anywhere and bears fruits that turn maroon when ripe, also produced red-violet dye.

### **INDIGENOUS KNOWLEDGE (IK'S) AND BIODIVERSITY CONSERVATION PRACTICES IN THE RICE TERRACES OF ABRA**

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The study documented indigenous knowledge and conservation practices in the rice terraces of Abra. It was conducted from 02 Dec. 2008-30 Apr. 2009 in 12 Abra municipalities where rice terraces were located and traditional varieties were planted. Respondents were the rice farmers growing traditional rice in the terraces. The study used the descriptive survey method of research, together with semi-structured interview and observation as instruments to collect data. Results showed that most of the traditional rice varieties cultivated by farmers had been used since time immemorial and passed on through generations. Moreover, farmers applied numerous indigenous knowledge and practices such as depositing pulled weeds in the bunds, sowing whole panicle in seedling production, “alluyo” system, “rakem” harvesting and flail threshing, utilization of farm wastes as organic fertilizer, and use of botanical pesticides. Farming practices, beliefs and attitudes were observed in conserving traditional rice varieties like observing dates for starting any field work, cooking native delicacies to offer in the farm area, harvesting beliefs and “ubaya”. Traditional rice varieties were conserved by fencing, crop rotation and continuous cropping; multiplying the number of species, storing the bundled sower seeds by hanging for the next planting season, applying botanical pesticides, and conserving the trees in the watershed for sustainable rice production. The declining number of farmers growing traditional rice was influenced by agronomic, socio-economic and cultural factors. There should be an effort to conserve traditional rice. Collaboration among concerned agencies to strengthen conservation measures for these rice varieties must be done.

#### **INDIGENOUS KNOWLEDGE AND BIODIVERSITY CONSERVATION PRACTICES IN APAYAO RICE TERRACES: A GENDER LENS PERSPECTIVE**

*Juana Angagan*

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This study identified and described the indigenous knowledge and conservation practices of indigenous people in the rice terraces of Apayao Province. On forest resources, some portions of the forest where the indigenous people obtain wild fruits and vegetables have been converted into swidden farms for planting rice, bananas, legumes and fruit trees. Of the 43 species of wild food plants eaten by the indigenous people, only 19 species have been identified by the researchers. There are 50 species of medicinal plants. Fibers from wild *Ananas comosus* (pineapple) in the forest are also extracted by the indigenous women as thread for sewing clothes. Fibers of white *Ficus minahassae* (Agimit) are sewn into panties, while these of *Abroma augusta* (Anabo) and *Musa textiles* (Abaca) are twined into ropes. In Kabugao and Calanasan, the barangay officials serve as the forest watchers. Any intruder is fined. In Conner municipality, a joint program on environmental protection is being implemented by the LGU, ASC and NGO. The members of the Save Apayao Peoples Organization are very vigilant in protesting against forest destroyers. There are 15 species of vegetables planted in between the 15 identified trees. These are fertilized with ashes from burned trees. Tributaries confluent flowing to the river are clean for indigenous people do not apply toxic chemicals in farming. These folks use trap net, hooks and fish cage in catching fish. Swidden farmers are prohibited from cutting trees within 100 meters of the watershed to protect the source of water. Indigenous farmers apply environment-friendly practices in farming such as green manuring to enrich the soil. The swidden farmers burn the forest for upland rice, bananas and legume plantations. They use the ashes as fertilizer. The common animals raised are carabaos, hogs, chicken and dogs. The indigenous people treat diseases by using plants and vinegar. Diverse medicinal plants have been used by old folks to cure illnesses. Four plants have been utilized as pesticides. Indigenous men and women help in conserving biodiversity in Apayao through the “Lapat” system.

#### **INSECT-PESTS MANAGEMENT FOR *JATROPHA CURCAS* L.**

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This study was conducted in two locations, Bamban and Capas in Tarlac, for three years using the seedling stage up to the second fruit-bearing cycles of *Jatropha curcas* L. to evolve management strategies for insect pests attacking the crop. Cultivation and other co-influencing factors were considered as criteria for the site selection. Three insect species namely: mealy bug, aphid and cutworm, were declared major pests as revealed by critical pest damage assessment, which registered considerable economic yield threshold reduction of 15.29% (mealy bug), 12.75 (aphid) and 18.99% (cutworm). Prey-predator feeding interactions showed appreciable reduction of host with efficiency ratings ranging from 47.5 – 50% in mealy bug, 40-50% in aphid to 50-70% in cutworm. The relationship between temperature and the rate of development particularly on cutworm eggmass hatchability contained good fit. It only took 1.5 days at 28.5°C for the first instar larval stage to emerge. Critical damage index among the tree major insect pests were within the range of 12.75 – 18.99%, which established the economic threshold level (ETL) - equivalent to 20 colonies/100 plants (mealy bug), 30 colonies/100 plants (aphid) and 5-6 larvae/50 plants (cutworm) - plant feeder-ratio as basis for action order forecast.

### **INVENTORY OF TEXTILE FIBER YIELDING PLANTS IN KALINGA**

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Fiber crops are industrial field crops grown for their fibers used in the manufacture of paper, cloth, rope and textiles. In the Philippines, the fiber crops industry is one of the major pillars of the economy, generating employment and foreign exchange. The Philippines has been the world's top producer of abaca: however, Ecuador's share in the world market has been increasing, threatening the Philippines' position. Aside from abaca, other natural fibers in the Philippines that may be tapped are ramie, jute, kenaf and minor fiber crops used by the pulp, paper and textile industries. This project identified potential natural fiber crops in several municipalities of Kalinga. The fiber crops were collected and their agroclimatic characterized. It was found out in the study that Pinukpuk municipality is populated with native banana or bowstring hemp based from the number of specie individual population followed with coir, pineapple, pita floja, rattan jute and cotton respectively. Tinglayan municipality is rich in term of true hemp or marijuana while Tabuk, Balbalan, Pasil and Rizal are good sources of abaca or manila hemp. Lubuagan municipality is the least source of abaca or manila hemp. The following species have the following scientific classification to wit: a). Cotton-common name; scientific name: *Gossypium*; vernacular name: Kapas; It has four species namely: *Gossypium barbadense*, *G. hirsutum*, *G. arboeum* and *G. herbaceum*. b). Jute/ *C. olitoruis* (for upland specie) Okra-common name; scientific name: *Corchorus capsularis olitoruis*; vernacular name: Okra or saluyot ; c). Abaca –Common Name: Manila hemp; Scientific name: *Musa textiles*; Vernacular name: Saba ti sunggo; 4. Agave–Common Name: Maguey; Scientific name: *Agave fourcroydes/ Agave cantala*; Vernacular name: Espa-espada; d). Pineapple-common name; scientific name: *Ananas comosus*; vernacular name: Pinya; e). Pita Floja -common name; scientific name: *Aechmea magdalenae*; vernacular name: Pinya-pinyahan; , f). Coir -common name; scientific name: *Cocus mucifera*; vernacular name: Bunot ti nyog; g). Broom root -common name; scientific name: *Muhlenbergia macroura*; vernacular name: ruot;

### **MACROFLORAL RESOURCES IN THE TANGLAGAN WATERSHED, CALANASAN, APAYAO**

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The study determined the macrofloral resources in Tanglagan Watershed, which supports the rice terraces in Calanasan, Apayao Province. It utilized the descriptive- survey method. Around 52

macrofloral species belonging to 16 families and 29 genera were documented from the sampling stations established in Tanglagan Watershed. The different families include Family Dipterocarpaceae, Moraceae, Euphorbiaceae, Lauraceae, Guttiferae, Meliaceae, Casuarinaceae, Combretaceae, Araliaceae, Sterculiaceae, Fabaceae, Fagaceae, Ebenaceae, Mimosaceae, Urticaceae and Celtidaceae. Majority of the species documented belonged to Families Dipterocarpaceae and Moraceae. Species distribution was as follows: 1) to Family Dipterocarpaceae of genera *Shorea*, *Dipterocarpus*, *Parashorea* and *Hopea*; 15 to Family Moraceae of genera *Ficus* and *Artrocarpus*; 10 to Family Euphorbiaceae of genera *Homalanthus*, *Macaranga*, *Bischofia*, *Margaritaria*, *Glochidion*, *Antidesma*, *Endospermum* and *Croton* and 1 to Family Celtidaceae of genus *Trema*, Family Lauraceae of genus *Litsea*, Family Guttiferae of genus *Garcinia*, Family Meliaceae of genus *Toona*, Family Casuarinaceae of genus *Casuarina*, Family Combretaceae of genus *Treminalia*, Family Araliaceae of genus *Polycias*, Family Sterculiaceae of genus *Abroma*, Family Fabaceae of genus *Erythrina*, Family Fagaceae of genus *Lithrocarpus*, Family Ebenaceae of genus *Diospyros* and Family Mimosaceae of genus *Albizia*. The genus *Ficus* has the most number of species identified.

### **MAXIMIZING AGRI – FISHERY INPUTS THRU SUSTAINABLE LAND USE IN AN ISLAND COLLEGE FARMING SYSTEM**

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Land use and agricultural production are important factors considered in an island based farming systems to sustain production. This paper presents multidisciplinary projects addressing consequences of the agri – fish production projects at the Catanduanes State Colleges with respect to ecology, environment and economy. Land use projects such as crop rice production, fishery production, fish breeding and nursery production, horticulture production, livestock and poultry production generated an 18.81 % of return on investments despite ecological stress such as heavy rainfall, flashfloods, typhoons and varying temperatures.

### **MORPHOLOGICAL DIVERSITY AND INDIGENOUS KNOWLEDGE ON RICE LANDRACES IN BENGUET, PHILIPPINES: TOWARDS SUSTAINABLE CONSERVATION AND UTILIZATION**

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Cognizant of the global concern to conserve indigenous rice genetic resources, this research was implemented to collect and characterize germplasm of rice landraces or indigenous rice varieties in Benguet; determine the morphological diversity and relationships among the collections; maintain a gene bank of the collected landraces, and identify indigenous knowledge associated with the landraces. Germplasm collection was done in the 12 municipalities of Benguet from July 2008 to March 2009. In-situ and ex-situ morphological characterization and diversity and cluster analysis were performed on the 157 indigenous rice varieties collected. Sabul and Tudoy had desirable characters such as long, wide and heavy grains. Pitkikil and Mayok exhibited long roots and many tillers. Low level of diversity was obtained, indicating homogeneity among the rice landraces. Most of the rice landraces were collected from the traditional rice growing municipalities and were associated with indigenous farmers' practices. These practices included *Kintoman* (dry season planting) and *Talon* (wet season planting); the use of the traditional instrument *rakem* in harvesting; the use of wooden mortar and pestle in threshing rice panicles, and the *soo* method or the traditional way of drying panicles. The different rice landraces are presently maintained ex-situ and morphological characters have been entered in a data base for future use. The information generated in this research will serve as bases for future studies on the improvement of grain quality, utilization

of rice landraces for various purposes and the identification of an heirloom rice variety for Benguet. In the future, the indigenous rice from Benguet may also find a niche in the global market. Relative to policy development, the results may serve as benchmark information to generate or improve policies on conservation, production and utilization of indigenous rice in the locality.

### **MULTIPLICATION RATE OF SELECTED POTATO ENTRIES TO RAPID MULTIPLICATION TECHNIQUE**

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Eight selected potato entries were evaluated for their performance in rapid multiplication technique. The entries 2.21.6.2, 380241.17 and the check variety Igorota had the most vigorous growth among the entries. Furthermore, Igorota gave the highest number of stem cuttings produced in three months with 152 stem cuttings/25 mother plants. It was followed by the entries 676070 and 380241.17 with 100 and 97 stem cuttings respectively. Other entries (2.21.6.2, 5.19.2.2, 573275, Granola and Ganza) produced stem cuttings from 45 to 86 stem. Significant differences were obtained on tuber yield of the different entries under greenhouse. The entries 5.19.2.2 and 676070 had the highest number of tubers with 30 and 27 per m<sup>2</sup> respectively. The lowest were from entries Igorota, 573275 and 2.21.6.2 with tubers ranging from 18 to 23 pieces per m<sup>2</sup>.

### **PERFORMANCE EVALUATION OF SWEET SORGHUM LINES FOR BIO-ETHANOL AND GRAINS UNDER PANGASINAN CONDITION (3 TRIALS)**

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The study sought to conduct evaluation trial of five (5) sweet sorghum lines under Pangasinan condition to determine their agronomic characteristics and identify and recommend varieties that are suitable for ethanol production. This paper highlighted the results of the three (3) trials conducted from October 2007 to February 2009. Analysis of variance in the 1st and 2nd trials showed that there were significant differences among varieties observed for plant height, stalk yield, stripped stalk yield, stalk juice volume, stalk juice yield, Brix, stillage yield, grain yield and seed size. In the 3rd trial, however, stalk yield and stripped stalk yield parameters showed that there were no significant differences among the varieties tested. The mean agronomic characteristics of the 5 varieties evaluated showed that ICSV 700 performed better in terms of plant height. Consequently, ICSV 700 and ICSV 93046 were the top performers in terms of stalk yield, stripped stalk yield, stalk juice volume, stalk juice yield, and \*Brix. The varieties SPV422 and NTJ2 performed better in terms of stillage yield in the 1st trial while SPV 422 obtained the best performance in the 2nd trial. However, for the 3rd trial, ICSV 93046 performed better as compared to the other varieties. On grain yield parameter for 1st and third trials, SPV422, ICSR93034 and NTJ2 were among the top yielders. Data on grain yield was not taken in the second trial due since it was attacked by the birds. Whereas, in terms of seed weight, ICSR 93034, performed better in the 1st and 2nd trials, while SPV 422 performed better in the 3rd trial.

### **CRYOPRESERVATION OF BOAR SEMEN BY PELLET FREEZING**

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This research was conducted to develop a simple cryopreservation protocol for boar spermatozoa without adverse effects on motility and fertilizing capacity; investigating the optimum glycerol concentration (1,3,5 & 7%), equilibration time (15, 30 & 60 min), and suitable volume (100, 300 & 500 ul) of boar semen for pellet freezing needed for post-thaw motility of boar spermatozoa. Morphological characteristics of the sperm were also considered as a factor affecting sperm motility and fertility. Further investigation was done on the penetrating capability of cryopreserved boar spermatozoa using in vitro matured porcine oocytes. Three percent level of glycerol added to the final dilution equilibrated at either 30 min or 60 min significantly resulted ( $P<0.01$ ) in an acceptable percentage of motility, while the three pellet sizes/volumes can be used to cryopreserved boar spermatozoa without adverse effects on its motility. Morphological evaluation of sperms revealed that frozen-thawed semen has much lesser ( $P<0.05$ ) normal sperms than the fresh semen of the same boar. Frozen-thawed semen attained a penetration rate of 36.15 percent.

#### **ADAPTABILITY TRIAL OF NEW PIGEON PEA ACCESSIONS IN ABRA**

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The study evaluated the performance of six new pigeon pea accessions (ICP 8863, ICPL 7091, ICPL 88093, ICPL85063, ICPL 7035 and farmers variety) suited in Abra to identify the best performing accessions in terms of growth and yield and recommended the best accessions for planting by legume farmers in Abra. Results showed that ICPL 7035 accession was the tallest at 24 days after planting. It also produced the highest number of marketable and non-marketable pods, the heaviest weight of fresh and dry seeds, the heaviest weight of green pods and highest yield in per plot and per hectare. On the other hand, accession ICPL 87091 produced the longest pod and the most number of seeds per pod. It was the earliest to produce flowers, set pods, filled seeds and mature pods. Based on the findings, accession ICPL 7035 and ICP 87091 could be grown by legume farmers in the upland areas of Abra.

#### **AGLIBUT SWEET TAMARIND**

*(The Commercialization of the Philippines 1<sup>st</sup> Sweet Tamarind Variety Registered Under NSIC-BPI)*

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The Pampanga Agricultural College developed the 'Aglibut sweet' tamarind and is now promoting its widespread planting not only in Central Luzon, but also in other parts of the country. 'Aglibut sweet' is the first sweet tamarind registered in the Philippines. The project was undertaken to extensively promote and commercialize 'Aglibut sweet'; monitor and evaluate the promotion and commercialization of 'Aglibut sweet'; identify problems encountered in the production, promotion and commercialization of 'Aglibut sweet'; recommend solutions to the identified problems of promoting and commercializing 'Aglibut sweet' and formulate more effective and efficient measures or strategies for the promotion and commercialization of 'Aglibut sweet' the project monitoring and evaluation results. To commercialize the Philippine sweet tamarind involved training of interested farmer-entrepreneurs, conduct of field days, establishment of demonstration farms, commercialization project proposal development and submission to external funding agencies, free technical consultation for walk-in buyers and previously-trained growers, credit assistance in the form of seedlings loan, technical backstopping necessary for the establishment and development of off-campus scion groves/nurseries at selected local government units (LGUs) and state colleges and universities (SCUs). Other promotional activities for the commercial production of 'Aglibut sweet' included the sale of seedlings; production of IEC materials; participation in technology commercialization forum;

trade fair and exhibits, and media advertisement. Despite the advantages and potentials of growing 'Aglibut sweet', however, the Philippines has yet to develop a strong industry for this commodity of great economic importance. The government should, therefore, promote the commercialization of this crop on a wider scale.

### **EFFECTIVENESS OF SUGAR MILL INDUSTRY WASTE AS RAWMATERIALS FOR CANE CHARCOAL BRIQUETTE**

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The study deals with the utilization of sugar mill industry waste particularly bagasse and sludge as raw materials for the production of charcoal briquette. The waste product from Sweet Crystal Integrated Sugar Mill Corporation in Planas, Porac, Pampanga was utilized in the study. Five treatments were used to determine the best combination of bagasse, starch and sludge in the production of cane charcoal briquette and this was tested using friability test and boiling test. The best formulation was then compared to the commercially available charcoal briquette. Results revealed that among the five treatments, T2 (75% starch and 25% sludge) gave the best result in terms of boiling test. Furthermore, it also revealed that in terms of dust, chip and unbroken charcoal, T2 ranks first as compared to the commercially available charcoal briquette (T6). Similarly, in terms of boiling test T2 can boil 3850.00 liters of water using 350 grams charcoal compared to T6 which can only boil 1725.00 liters. The amount of binder has significant effect on the strength and burning effectiveness of the cane charcoal.

### **FIELD EVALUATION OF SELECTED UBI (DIOSCOREA ALATA) ACCESSIONS IN ACID SOILS AND SALINE-PRONE AREAS**

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In the context of agricultural problem soils, Salinity and acidity are the dominant problems in agricultural land use. This study was conceptualized to determine the possibility of utilizing some problem soils into ubi production. Selected ubi accessions were assessed for their performance in acid soils and saline-prone areas. Accessions 5, 6, 8, 9, 10 and 12 were in a saline-prone area (Balongay clay in Sta. Teresita, Canaman, Camarines Sur), while Accessions 6, 10, 11, 12, 13 and 21 were raised in an acid soil (Caroyroyan clay loam at Pacol, Naga City). Results revealed that planting ubi both saline-prone areas and in acid soils, would be beneficial to farmers. Accessions 6 and 10 were both economically viable, as having the highest returns on investment among all the treatments.

### **FACTORS AFFECTING YIELD PERFORMANCE OF MANGO FARMS IN BATANGAS, PHILIPPINES**

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This paper determined the factors affecting yield performance of mango in Batangas, discussed the problems/constraints encountered by mango farmers, and provided policy directions to enhance the productivity of mango in the province. From 1990 to 2008, mango production in Batangas registered a positive annual growth of 4.22%, which could be attributed to increase in area at 5.07% and number of bearing trees at 4.53% per annum. Yields per hectare and per tree declined yearly by 0.92% and 0.37% respectively in the same period. In 2007, mango production reached 26,732 mt covering 11,970 hectares and 711,780 bearing trees. Yields attained were 2.23 mt/ha and 0.04 mt/tree. The Cobb-Douglas production function was estimated based on the primary data collected from 51 mango

farmers from Batangas City, Rosario and Bauan in 2008 using Ordinary Least Squares method. The determinants of mango yield per hectare included in the model were: nitrogen fertilizer, labor, number of bearing trees, flower inducer cost, chemical cost, soil type, presence of intercrops, planting distance and age of bearing trees. Fertilizer, labor and costs of flower inducer and chemicals significantly and positively influenced the yield performance of mango farms in the province. The right amount, frequency and timing of fertilizer, flower inducer and chemical applications were very critical in achieving better yield. Older bearing trees also required more material inputs than younger bearing trees. The sum of the production elasticities (0.68) denoted the decreasing returns to scale stage of mango production. This implies that a 10% increase in all inputs would result in yield improvement of mango by 6.8%. Mango farmers interviewed reported that high costs of material inputs, high pest and disease infestation, and limited access to credit constrained them from improving the productivity in mango farming. Given these problems, this paper provides the following policy recommendations: (1) promotion of Integrated Pest Management (IPM); (2) strengthening farmer's/industry's association to facilitate transfer of production technologies, and (3) better access to credit.

### **COCONUT YIELD RESPONSE ANALYSIS IN DAVAO PROVINCE, PHILIPPINES**

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This paper discusses the coconut yield response to various explanatory variables using multiple regression analysis on data from Davao Province for Crop Year 2007. The Cobb-Douglas production function was estimated using Maximum Likelihood Estimation (MLE) method. The explanatory variables included the total number of bearing trees per hectare, the amount of fertilizer applied per hectare, labor use per hectare, age of coconut bearing trees, variety and coconut intercropping. Results of the multiple regression analysis showed that the total number of bearing trees per hectare, amount of fertilizer applied per hectare, age of the coconut bearing trees, and practice of coconut intercropping significantly and positively affected coconut yield measured in nuts per hectare in the study area. The regression coefficient of fertilizer was also the production elasticity of fertilizer in a Cobb-Douglas production function. The production elasticity of fertilizer of 0.168 implied that a 1% increase in the amount of fertilizer applied would increase coconut yield by 0.168%, holding other factors constant. The coconut farmer-respondents applied inorganic and organic fertilizers. The sum of the production elasticities of all production inputs included in the model (0.689) was the returns to scale. Since the sum of the production elasticities was less than one, the production function exhibited decreasing returns to scale. This means that if all the production inputs included in the production function were increased by 1%, coconut yield would increase by 0.689%. The positive regression coefficient of coconut intercropping indicates that this farm practice increased coconut yield compared to coconut monocropping. This could be explained by the higher mean rate of fertilizer applied by coconut farmers who practiced intercropping (230.81 kg/ha) as compared to those who practiced coconut monocropping (192.88 kg/ha). Policy recommendations in this paper include the continuous promotion by the Philippine Coconut Authority of yield-augmenting technologies or farm practices such as coconut intercropping and fertilization of coconut trees using inorganic and low-cost organic fertilizers like NaCl or table salt.

### **EVALUATION OF DIFFERENT FRUIT ADDITIVES IN THE PREPARATION OF LEMONGRASS (*CYMBOPOGON CITRATUS*) BEVERAGE**

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This study was intended to make juice blends by combining lemongrass and fruit juices/plant extracts blend. It was conducted at the Apayao State College during the first semester of school year 2006-2007. The Complete Randomized Design with five treatments was used: T1 - pure lemongrass extract

(LE), T2 - LE + pandan extract, T3 - LE + citrus juice, T4 - LE + pineapple juice and T5 - LE + lubeg juice. Results revealed that T5 had the highest mean rating in taste, color and overall market acceptability and T4 for aroma as rated by 20 judges. ANOVA showed highly significant results in terms of taste, color, aroma and market acceptability. From the findings, it can be concluded that lemongrass extract used in the juice preparation can be improved by adding fruit juices/plant extracts. The following recommendations are forwarded: disseminate the results of this study to food processors, researchers and other interested stakeholders; disseminate to schools, offices and other institution the use of lemongrass as juice especially as the plant has been known for its curative potentials and has been used in tea production and other herbal products; determine the chemical composition and the shelf life of the prepared juice; undertake processing, packaging and marketing of the lemongrass + juice blends; conduct similar studies using other herbs and additives.

### **SUGARCANE YIELD RESPONSE ANALYSIS IN MAJOR SUGARCANE-PRODUCING PROVINCES IN THE PHILIPPINES**

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This paper discusses the sugarcane yield response to various explanatory variables using multiple regression analysis on 2006-07 farm survey data gathered from 105 sugarcane farmers in eight sugarcane-producing provinces in Luzon (Cagayan, Tarlac, Pampanga, Batangas, Bicol) and Mindanao (Bukidnon, Davao, Cotabato) or nine milling districts (Carsumco, Tarlac, Pampanga, Don Pedro, Balayan, Pensusil, Bukidnon, Davao, Cotabato). The Cobb-Douglas production function was estimated with tons cane per hectare as the dependent variable. The explanatory variables included the amount of nitrogen fertilizer applied per hectare, labor use per hectare, tractor use dummy variable, chemical cost per hectare, method of planting dummy (i.e., new planting vs. ratoon method), farm topography dummy variables and soil type dummy variables. The reference planting method was the ratoon method while the reference topography and soil type are flat topography and clay loam soil type. Results of the multiple regression analysis showed that labor use per hectare and chemical cost per hectare significantly and positively affected sugarcane yield. The regression coefficient of labor was also the production elasticity of labor in the Cobb-Douglas production function. The production elasticity of labor of 0.5369 implied that a one percent increase in labor use per hectare will increase sugarcane yield by 0.5369%, holding other factors constant. The positive and significant regression coefficient of the type of planting method indicated that higher sugarcane yields were obtained using new planting method compared to the ratoon method. The most ideal topography and soil type for sugarcane production are flat and clay loam, respectively. As expected, the regression coefficients for slightly rolling and rolling topography were negative and significant, indicating that higher sugarcane yields were obtained in farms with flat topography, other factors held constant. The regression coefficient for clay soil was likewise negative and significant, implying that sugarcane farms with clay loam soil type had a higher yield than those with clay soil type, other factors held constant.

### **EFFICACY TEST OF GROWTH PROMOTANTS ON THE YIELD OF HYBRID RICE IN KALINGA**

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The efficacy of growth promotants (Brasinollide, Planergy, GA3, Muriate of Potash, Crop Giant) on the yield of hybrid rice during the 2008 wet season in Taniok, Tabuk, Kalinga was assessed. Specifically, the study validated the efficacy of commercially distributed growth promotants and evaluated their effect on the yield of hybrid rice (M7 variety). It used the Randomized Complete Block Design with three replications in an area of 520 m<sup>2</sup>. Results showed no significant differences among the parameters height, panicle number, filled and unfilled grains, and weight of the grains.

However, differences between replications were noted, but these were attributed to other related factors and not on the growth promotants. The variation in the height of the plants, number of panicles, number of filled and unfilled grains, weight of the grains, and yield did not transform the effect of promotants into a significant result. Further analysis showed that the use of growth promotants could have initiated the occurrence of insect pests particularly rodents due to the effects on the physiology and morphology of the rice plants. Based on the results of the study, growth promotants are not necessary when planting the M7 variety. Growth promotants should be applied earlier, but further studies should be conducted to validate their effects.

#### **DEVELOPING A VIABLE MARKET FOR *JATROPHA* FEEDSTOCK PRODUCTION IN THE PHILIPPINES**

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The transport sector accounts for the highest consumption of energy at 80% of the total oil supply in 2007. Hence, there is pressure to pursue the blending mandates of the Biofuels Law. Among the potential energy crops, *Jatropha curcas* L. has been promoted as a feedstock for biodiesel production. Even with the dearth of information on the economic, socio-political, and technical aspects of *Jatropha*, many LGUs, private companies, as well as entrepreneurs, were emboldened to embark on *Jatropha* production which could help boost rural employment and income on the one hand, and a sustainable source of clean energy on the other. This study conducted an estimation and valuation of the economics of *Jatropha* feedstock production and a socio-economic impact analysis of *Jatropha* production, promotion and development both from the growers' and project implementers' perspectives. Investment analysis showed that *Jatropha* production is not a viable business investment at the current government-buying price of P4.50/kg of seeds. The total expenses in terms of labor operations and materials are greater than the expected revenues from the sale of seeds. Analysis of policies also showed that because of the prevalent view that biofuel feedstock production is a threat to food supply, market and non-market incentives are more pronounced for downstream investors like venture capitalist in processing plant than the upstream investors or the growers of *Jatropha*. In the light of these findings, the study has formulated several recommendations towards making a viable investment market for *Jatropha* seed production.

#### **EVALUATION OF SELECTED POTATO ENTRIES GROWN ACROSS LOCATION FOR ITS CHIPPING QUALITY**

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Five potato selections (573275, 676070, 380241.17, 2.21.6.2, 5.19.2.2) and three check varieties (Ganza, Granola, Igorota) from multilocational trials in Bonglo, Loo and Madaymen, Benguet were evaluated for dry matter content, chip recovery and sensory characteristics. The assessment was done at the NPRCRTC processing laboratory in March 2007. The potato selections showed differences in dry matter content, chip recovery, as well as sensory characteristics. Dry matter content was observed to be high (20-23%) in Igorota, 676070, 5.19.2.2, 573275 and 2.21.6.2 It was lowest in Granola and Ganza (16 – 19%). Highest chip recovery (32 – 35%) was observed in entries 5.19.2.2, 380241.17, 2.21.6.2 and Igorota. For the sensory characteristics, potato entries 380241.17, 5.19.2.2, 2.21.6.2, Ganza and Igorota had the best quality with slightly browning (1 – 2%) to no browning, slightly oily

and acceptable to highly acceptable chips. In contrast, the entries 676070, 573275 and the check variety Granola gave unacceptable chips characterized by excessive browning and oily chips.

### **FACTORS AFFECTING YIELD PERFORMANCE OF BANANA FARMS IN ORIENTAL MINDORO, PHILIPPINES**

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This paper presents the factors affecting yield performance of banana farms located in Oriental Mindoro, identifies the problems/constraints encountered by banana growers, and provide policy directions that would enhance the productivity of banana in the province. Banana production in Oriental Mindoro posted a positive growth of 3.50% per annum mainly due to expansion in area planted, which also grew at 4.10% per year from 1990 to 2008. Yields per hectare and per hill showed annual negative growth rates of 0.01% and 0.44%, respectively, in the same period. In 2007, banana production reached 163,729 mt covering 18,371 hectares and 7.43 million hills. Yields were registered at 8.91 mt/ha and 0.022 mt/hill. Based on survey data of 80 banana growers from the municipalities of Bansud, Socorro, Pinamalayan and Bacu in Oriental Mindoro in 2007, multiple regression analysis was done. The Cobb-Douglas production function was estimated using the Ordinary Least Squares (OLS) method. Explanatory variables included in the model on a per hectare basis were nitrogen fertilizer, labor, planting material cost, number of stalks, tenurial status, types of banana cultivars grown, presence of intercrops, topography, soil type, distance between hills, education, farming experience, age of farmer, gender, household size and distance of farm to residence. Increased fertilizer and labor usage, adoption of diversified banana farming, establishment of ideal farm characteristics (i.e., clay loam or sandy clay loam soil, distance between hills of  $\geq 20m^2$  and longer distance from farm to residence), and tenurial status in favor of owner operators significantly and positively affected banana yield in Oriental Mindoro. The sum of the production elasticities (0.76) was significantly different from one as revealed by the t-test results. The function coefficient of the OLS model implied increasing returns to scale where a 1% increase in all production inputs would raise banana yield by 0.76%. Problems and constraints cited by the banana grower-respondents in Oriental Mindoro included: limited supply of high-yielding and disease-free banana planting materials; high incidence of pests and diseases, and inadequate knowledge on proper production practices/technologies in banana farms. Hence, the following policy directions are recommended: provision of technical and budgetary support to the propagation and distribution of banana varieties which are better yielding and highly resistant to virus and other systemic diseases; adoption of site specific IPM and dissemination of information on control of banana pests and diseases; conduct of training on good agricultural practices (GAP), and formation of banana cluster to effectively forge strong linkages between banana growers and suppliers of quality planting materials and production technologies.

### **IMPROVING THE QUALITY OF NIPA ( *NYPHA FRUTICANS* L.) WINE**

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This study was aimed at improving the quality of nipa wine. Specifically, it determined what fruit juices could be added to nipa wine to improve its quality; compared the sample treatments in terms of taste, color and aroma; determined the cost of production of the different samples. The different treatments were: T0 - nipa wine (NW) control, T1 - NW + mulberry fruit extract, T2 - NW + pineapple, and T3 - NW + calamansi. The samples were evaluated by a panel of 30 judges in terms of taste, aroma and color. Data were analyzed using ranking and rank difference was further tested using the Friedman's rank test. Results revealed that T1 was the most preferred sample in terms of taste and

color and T2 on aroma. The least preferred treatment was the control. Rank differences showed highly significant result in taste, aroma and color. Hence, nipa wine could be further improved using fruit juice additives. The following recommendations are forwarded: undertake mass production of the improved nipa wine as part of the income-generating activities of the college; promote the improved nipa wine especially in trade fairs; determine the alcohol, sugar and other nutrient contents of nipa wine which are needed in the product label; design and develop packaging materials for added market value; conduct researches on other fruit additives; conduct similar studies on other wines of less economic value.

**TECHNICAL EFFICIENCY OF GENETICALLY IMPROVED FARMED TILAPIA CAGE CULTURE OPERATIONS IN THE LAKES OF LAGUNA AND BATANGAS, PHILIPPINES**

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In an earlier paper, a descriptive ex post study to assess the adoption and farm-level impacts of Genetically Improved Farmed Tilapia (GIFT) in the Philippines was conducted covering the top three producing regions: Region II (Isabela, Nueva Viscaya and Quirino); Region III (Nueva Ecija and Pampanga), and Region IV (Laguna and Batangas). This paper focuses on Region IV and takes a closer look and more in depth analysis of the tilapia cage culture operations in Lakes Sampaloc and Palakpakin in Laguna, and Laurel and Agoncillo in Taal Lake, Batangas. The technical efficiencies of the culture operations were estimated using translog stochastic frontier production function and the statistically significant factors affecting technical inefficiency were determined. Comparisons were made according to the four strain groups identified in the previous study: GIFT, GIFT-derived, non-GIFT and unspecified tilapia strains. In all four study areas, deviations from the frontier production functions were practically due to technical inefficiency. Thus, the strategy to improve their productivity is to address the factors that have been identified in their respective technical inefficiency functions.

**PROMOTION OF VEGETABLE ENRICHED FOOD PRODUCTS IN THE PHILIPPINES FOR FOOD SECURITY AND ENVIRONMENT CONSERVATION**

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The establishment of the Benguet Vegetable Processing Center (BVPC) in Benguet Province helps bring forth the government's food security and poverty alleviation programs to the grassroots by utilizing local resources into affordable and nutritious vegetable enriched food products. It was designed to strengthen and expand its capability to meet the challenges of the marketplace through development and improvement of food products and processes allowing the delivery of better products to the customers. It produces its own natural ingredients and infuses them in the end products with burst of health and wellness. It serves as an alternative market outlet for the farmers of their excess vegetable production, encourages contract growing and backyard organic farming, explores the use of edible indigenous vegetables, but strongly rejects crops with high pesticide residues. As a start, the Center processes 80 to 150 kg wheat flour based enriched with different vegetables and protein-rich foods on an 8 hour work with 18 hired graduates and unemployed mothers. Nutritive values of

these various products increased but varied depending on the ingredients and vegetables used. These products are being market-tested in partnership with local supermarket establishments and groceries, with income that sustains the operations of the Center. For a year of its existence and assessment, it has purchased 6,611 kilograms worth P88,883 of vegetables from farmers in the Cordillera Administrative Region, Regions 1 and 2. Vegetable and root crop contract growers are increasing from 1% to 5% a year, most of them experimenting on a year-round production system to back up the productivity plan of the Center. BVPC's establishment served as an eye opener to local government units that now started establishing their own processing plants for community livelihood. From November 2008 to August 2009, BVPC provided trainings to 400 participants from 19 municipalities as toll processors who will also produce veggie-enriched noodles to their respective regions.

#### **MANAGEMENT PRACTICES IN POTATO PRODUCTION OF THREE POTATO VARIETIES BY FARMERS IN BENGUET, PHILIPPINES**

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Farmers' management practices of growing potato varieties Igorota, Solibao and Raniag were documented. Information gathered came mainly from seven farmer-respondents selected based on their length of experience in growing the varieties and their willingness to share their knowledge and experience. Among the three varieties, Igorota was kept and maintained by farmers until the sixth cropping season. Solibao and Raniag were planted only once or for three cropping seasons. Solibao was less preferred in the market, while Raniag was a low yielder in high elevations (> 2000 masl). Farmers claimed that the yielding ability of Igorota could be maintained until the sixth cropping if seed tubers were sourced out from different farm locations and elevations every cropping season. Observations showed that the three varieties had higher yields during the October to February planting. Igorota and Solibao had robust vegetative growth but lower tuber yield during the wet season and resistance to late blight; hence farmers practiced longer fungicide spraying intervals. Farmers harvested Raniag as early as 75 to 90 days after planting, Igorota at 80-110 days, and Solibao at 90-120 days. Dehaulming one to two weeks before harvesting, curing by covering piled tubers in cement floor one month prior to transport, and spraying with a fungicide two weeks before harvesting were done to reduce bruises and feathering. Igorota was observed suitable for in-ground storage despite its 3-month dormancy period. The tubers of Igorota and Solibao turned green faster than Granola. Cropping pattern practices dictated the need for up to 6-month seed tuber storage. Hence, one farmer practiced one-level piling of the seeds in seedbed racks under diffused light storage in cooler temperature to prolong the dormancy of Igorota to more than three months. Further observation showed that the growing period was shortened when Igorota seed tubers were already shriveled.

#### **YIELD PERFORMANCE OF SELECTED LOWLAND RICE VARIETIES AS AFFECTED BY PHOSPHORUS AND POTASSIUM**

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This study evaluated the performance of selected lowland rice varieties as affected by the rates of inorganic fertilizer applied. It was laid out using the Randomized Complete Block Design in Factorial with 22 treatment combinations and 4 replications. Variety PJ7 was found to be taller than the other variety, M3, at maturity. There was no significant difference in the number of tillers per plant between the two varieties. M3 displayed longer panicle compared with PJ7. Yield per plot showed no significant effect on the variety used. No significant effects of fertilizer levels on height at maturity, length of panicle, number of tiller per plant and yield per plant were observed. The 22 treatment combinations did not differ significantly in all the measured plant characters. However, variety M3

fertilized with 120-80-80 kg per hectare gave the heaviest grain weight (6,908 kg per hectare). On the other hand, variety PJ7 (V2F2) yielded 6,266 kg per hectare. A higher ROI (P114.47) was noted in variety M3 fertilized with 120-80-80 kg of inorganic fertilizer per hectare.

#### **MULTI-LOCATION YIELD TRIAL OF POTATO ENTRIES GROWN ACROSS LOCATIONS AND SEASONS IN THE PHILIPPINE HIGHLANDS**

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The study evaluated the agronomic yield of and incidence of late blight and leafminer in selected potato entries across locations/zones and seasons. It also recommended to the National Seed Industry Council (NSIC) the entries for official variety release. Five potato entries grown and selected from preliminary yield trials were evaluated from 2006 to 2009 under different ecological zones/elevations: from low mountain zone (1350 masl), mid-mountain zone (below 2000 masl) and high mountain zone (2000 and above masl) for wet and dry seasons. Treatments were laid out following the Randomized Complete Block design (RCBD) with 40 tubers per replication in all locations and seasons.. Entries 380241.17, 2.21.6.2, 676070 and 5.19.2.2 were the best performers in terms of survival, vigor, canopy cover, and leafminer and late blight incidence. These four entries significantly out yielded the check varieties Igorota (processing type), Ganza (newly approved variety) and Granola (table type/ farmers variety). Dry matter content was found comparable with Igorota, the check variety. Based on the results entries 380241.17, 2.21.6.2, 676070 and 5.19.2.2 are highly recommended for potato production under low, mid and high mountain zones during wet and dry seasons. These are recommended for the National Seed Industry for variety release.

#### **MARKETING SYSTEM OF AGROFORESTRY PRODUCTS IN SELECTED SITES IN APAYAO**

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This study determined the marketing systems for agroforestry products in Apayao. A total of 100 farmer-respondents from Brgys. Tanglagan, Calanasan; Karikitan, Conner; Atok, Flora and Marag, Luna were selected in stratified random sampling. A structured interview schedule was used to elicit data. Simple descriptive statistics such as frequency counts, percentages, ranking, and means were used in the interpretation of data. Most of the respondents were male, belonged to the working age group (21–50), and with high literacy rate because all of them were able to enter schooling and most were high school graduates. Thirty-six percent of the respondents had an annual income ranging from P16, 000.00 to P36, 000.00. Most had farm sizes ranging from 0.5 to 1.5 hectares. About 18 respondents from Tanglagan and 12 from Marag practiced the improved fallow system of farming; 12 from Karikitan, intercropping and 10 from Atok, plot method. Upland rice was the main crop of the majority of the respondents from Tanglagan and Marag; fruit crops in Karikitan and banana in Atok. Gmelina was the tree grown by the majority of respondents in all study sites, while citrus, lanzones, rambutan, cacao, coffee, coconut and banana were the leading fruits grown. Majority (14) of the respondents in Tanglagan claimed rice as their promising product; fruit crops for 23 in Karikitan; banana for 22 in Atok, and rice and corn for 24 in Marag. In terms of marketing, fruit products in all the study sites were generally sold to middlemen going to the sites, who usually paid in cash. Production and marketing problems/constraints encountered were: occurrence of uncontrolled pests and diseases attacking their crops, resulting in low production output; high wastage due to the perishable nature of agroforestry products; lack of trading facilities, and low market value. Respondents also complained of the high production inputs, including the wages of workers. It is highly recommended that sustainable production of existing agroforestry products with market

potentials be undertaken and produce new products to sell through existing markets. Likewise, support services should be provided including the training and education of farmers on Integrated Pest Management (IPM); market facilities such as trading post; improved farm-to-market roads, etc; institutional services for farmers, such as cooperatives and credit system, efficient and effective market info system, etc. to strengthen their trading power as well as shorten the market channels, and appropriate price policies.

### **THE MUSCOVADO SUGAR CONSUMER MARKET IN THE PHILIPPINES: IMPLICATIONS FOR POLICY AND MARKET DEVELOPMENT**

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This paper provides an analysis of the consumer market for Muscovado Sugar in the Philippines using the Usage, Attitude and Image (UAI) marketing research tool. The findings provide the basis for formulating policy and market development initiatives to enhance the growth of the muscovado sugar industry. Based on UAI market surveys conducted among class ABC urban households, usage rate of muscovado sugar was low or only 23% of the respondents. This was due to low level of awareness about this sugar and existing brands and discontinued use among those who tried it. Majority of those who were aware of and used muscovado had favorable perceptions about it. Favorable comments were related to its applications ('ingredients for delicacies'), health benefits ('healthy and nutritious'), and wholesome quality ('natural/chemical-free'). Others had negative comments that included its 'coarse texture', 'dubious quality', and being 'expensive'. Users were motivated by factors related to the following: (1) health and environment, (2) altruism (desire to improve the socio-economic condition of farmers producing it), and (3) lifestyle (using it fits my lifestyle). Satisfaction rating for the MS brands currently used was generally high, with factors such as availability, taste, being certified and aroma as top-ranking. Non-trial of MS was due to current habits and beliefs ('not used to MS'), price ('expensive'), distaste for the product, its non-versatility, dislike for its color, and unavailability. The findings imply that a bigger market share for MS could be possible if awareness level could be raised and constraints to continuing use could be addressed. The industry must adopt a unified and collective action agenda to pursue specific measures and obtain the needed policy support from the government. The recommended measures relate to the muscovado sugar industry as a whole, the individual market players and the public/government sector.

### **POSTHARVEST LOSS ASSESSMENT OF POTATO ENTRIES GROWN ACROSS LOCATIONS IN THE PHILIPPINE HIGHLANDS**

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The study assessed the postharvest losses in potato entries, determined the effect of location on postharvest losses of potato entries, and determined the interaction between potato entries and location of production on postharvest loss. CIP 380241.17, Phil 2.21.6.2 and Phil 5.19.2.2 had the lowest yield loss from harvest to 18 weeks of storage. Moreover, potatoes harvested from Loo had the lowest yield loss immediately after harvesting and during storage. Both location and entry were important factors in selecting potatoes for low incidence of decay and weight loss. CIP 380241.17 and 5.19.2.2 could be stored when market price was low and sold there after based on their low weight loss after 18 weeks of storage. Careful harvesting and appropriate method for harvesting should be important considerations in reducing postharvest loss.

### **PRODUCTION PRACTICES, NEEDS ASSESSMENT AND TECHNOLOGY SYNTHESIS OF SELECTED VEGETABLES, LEGUMES AND ROOT (VELERO) CROPS IN ABRA**

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The research study documented the production practices, need assessment and technology synthesis of selected vegetable, legume and root crops (VELERO) in Abra. One hundred eighty five (185) VELERO growers from Bangued, Danglas, Dolores, Lagangilang, La Paz, Licuan, Pidigan and Tayum municipalities were selected as respondents. Results showed that 53% of the respondents practiced organic farming to increase their family income, but 92% did not undergo training related to organic farming. The farm size for VELERO production was 0.25 hectare and 92% had no soil analysis. Eggplant, tomato and bitter melon (ampalaya) were grown because of high demand in Abra. Majority of the respondents produced their own seeds. Intercropping was the most practiced system. One hundred three (103) respondents used native and hybrid varieties available in their locality. Most of them used animal manure to supply nutrients for their crops. The most common farm problems were marketing and high price of inputs. Technical information was obtained from fellow farmers and neighborhood. Lack of information about the project to be implemented, lack of demonstration farms and water supply were some of the problems in the community that hindered government project. About 98% did not avail of the services on organic farming for VELERO. Thus organic farming ranked first in the training course wanted by the respondents and to be demonstrated in the community.

#### **UTILIZATION OF PILI PULP FLOUR AND OIL FOR COOKERY**

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A study on pili pulp flour and oil revealed that these could be produced from fresh pili fruit. It was recommended that pili pulp flour and oil be used for home and small scale consumption and preparation of food products. Thus food products utilizing pili pulp flour and oil as ingredients were evaluated together with stabilizer, emulsifier, extender and food flavouring. A total of ten (10) recipes were developed, seven (7) of which utilized pili pulp flour while three (3) used pili pulp oil. The replications were prepared for each recipe, after which sensory evaluation was done using the score sheets. Out of the ten food products, pili choco drops, mayonnaise dressing and muffins were rated as "much liked". It was highly recommended that the above food products be verified and pilot tested for commercialization, the rest of the recipes be improved and shelf life and nutritive value of flour and oil be evaluated.

#### **COMPARATIVE PERFORMANCE OF BIOFERTILIZERS UNDER ANAEROBIC CONDITIONS**

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This study determined the comparative performance of biofertilizers under anaerobic conditions. Statistical analysis showed significant results on the average rice plant height per sample plant, fresh weight of grains (kg), and weight of filled grains. But significant results on the number of panicle per sample plant, number of filled grains per panicle, and number of unfilled grain per panicle were observed. Rice plants from T6 (Bio-N + ½ RR) produced the heaviest grains (181.33 kg/ha), while T1 and T4 both yielded the lightest grains (140.00). The following are recommended: 1. Planting of hybrid rice in Kalinga because of high yield and heavy grains. 2. Biofertilization under anaerobic condition for rice production using the recommended rates of Bio-N, Vital- N, Bio- Con, and Exquisite. 3. The use of T6 (Bio-N + ½ RR) based on its heaviest grains produced per sample plant (7253 kg/ha). 4. Conduct of follow-up studies under more cropping seasons.

## **ASSESSMENT OF FRESHWATER RESOURCES IN THE PROVINCE OF KALINGA**

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Aquatic resources in terms of (fish, shells and crustaceans) research and development in Kalinga has not been given much priority simply because aquaculture is not a major industry in the province compared to agriculture and forestry. However, with the dwindling land available for agriculture, pollution of aquatic ecosystems, increasing population and lack of protein food source, there is a need to develop the traditional culture systems for aquatic resources food production. Chico River is the major river traversing Kalinga with approximate length of 89.50 km. Its main tributary is the Pasil River which starts from Sadanga, Mt. Province then to Tomiangan, Pasil joining the Chico River with an approximate length of 40 km. Generally, these water bodies are acceptable for the culture of aquatic life. The study surveyed and documented the possible sources of edible fish and shell species in Kalinga with potential for aquaculture, and determined the ecology of freshwater fish and shell species in terms of the physical and chemical characteristics of their natural habitat as prerequisite to culturing them ex-situ. Results showed that samples from the eight major tributaries submitted on 18-19 February 2009 are classified as Class C waters based on DENR A.O. No. 34 (Series 1990) Revised Water Usage and Classification. They are therefore recommended for the propagation, treatment and growth of fish and other aquatic resources. Fresh waters can sustain livelihood activities and promote food security for its people. Culturing endemic and some endangered fish, shell and crustacean species is thus recommended.

## **INDIGENOUS KNOWLEDGE ON THE PRODUCTION AND PROCESSING OF ENDEMIC FIBERS IN APAYAO PROVINCE**

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The study determined the indigenous practices on the production and processing of endemic fibers in Apayao. The descriptive survey method was used. The indigenous fibers utilized in the province included anabo, agimit, apnit, pakak, kapok, abaka and apinyan. Agimit fibers are extracted from the bark by pounding the latter after stripping from the trunk. Then these are washed and dried in the sun. They are used by the old folks as underwear, headband and belt. Abaca fibers are extracted by slicing the fresh trunk, then inserting the latter in a manual fiber extractor and pulling the fibers afterwards. The fibers are woven into baskets, bags, and decorations, twisted into ropes. Anabo fibers are extracted from the plants by soaking the latter in water for 5-7 days. The fibers are washed thoroughly with water and dried in the sun to be made into ropes, bags and décors. Kapok fibers are also extracted from the fruit using a crude manual device - a stick formed like a cross, placed in a container half-filled with dried kapok fruits. The stick is turned or twisted to separate the seeds from the fibers, which are then used to stuff pillows, cushions and toys. Pakak fibers are extracted from the plants by pounding the bark to soften it. The fibers are washed, dried and made into head bands, underwear or rope. Apinyan fibers are extracted from the leaves by applying sharp materials such as sharpened bamboo on the upper part of the leaves until only the strands are left. The strands are used as thread or ropes. Lapnit fibers are extracted by soaking or splitting the trunk into four or five parts depending on the size. The outer layer is removed or discarded; the other layers are used as ropes, bags and decors.

## **AWARENESS, PERCEPTIONS AND ATTITUDES OF UPLAND FARMERS IN APAYAO TOWARDS AGROFORESTRY**

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This study was conducted in three selected areas in Lower Apayao to determine the awareness, perception and attitudes of upland farmers towards agroforestry. A total of 132 farmer-respondents were selected through systematic random sampling design. A structured interview schedule was designed to gather data on household characteristics, farming system and specifically on the awareness, perception, and attitude towards agroforestry. Descriptive statistics such as frequency counts, percentages, ranking, and mean were determined which and used in the final interpretation of data. The farmer-respondents were mostly male, middle-aged, married with low educational attainment and large household size. Most had low income from a small farm, owned their farmlands, and upland rice was the main crop planted and main source of income. Almost half of the respondents were not aware or had not heard of agroforestry as a farming system. However, those who were aware or had heard about agroforestry fully understood it. Majority were in favor of adopting forestry as a farming system and had plans of adopting it. Their general perception of certain agroforestry characteristics was neutral to positive. A little more information and explanation could help develop a positive perception towards agroforestry and eventually lead to its adoption. As to attitudes towards the adoption of agroforestry as a farming system, most of the farmer-respondents showed a positive attitude towards the idea. For those with negative and neutral attitudes towards agroforestry, many claimed that was something new, doubted its effectiveness and believed that it would be risky to adopt it. In general, the attitude towards agroforestry practices was neutral with a descriptive rating of 2.11. This suggests the need for more information and explanation to encourage a more favorable attitude towards agroforestry. Recommendations of this study include the need to conduct an intensive information, education and communication (IEC) campaign about agroforestry to increase the level of farmers' awareness; farmers training on agroforestry and integrated pest management (IPM); cross visits to successful agroforestry farms in places with similar bio-physical conditions; should be conducted to develop positive attitudes towards agroforestry; important conditions should be provided to farmers such as: provision of inputs to agriculture and forestry components and security of land tenure; provide assistance in marketing agroforestry products; provide on-farm post-technical and training assistance on Integrated Pest Management System (IPM). Another research which focuses on agroforestry adoption patterns should be conducted to develop a more powerful explanatory model of agroforestry adoption.

**ASSESSMENT OF HEALTH AND NUTRITIONAL KNOWLEDGE AND PRACTICES OF MOTHERS IN SELECTED BARANGAYS OF RIZAL, LAGUNA**

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The study was conducted to assess the knowledge and practices of mothers with 0-24 month's old children on health and nutrition in Barangay Tala, Talaga and Pook, Rizal, Laguna. Specifically, it aimed to determine the factors (e.g. age & educational level of mothers, family income) that affect mothers' Knowledge and Practices on breastfeeding, weaning, and care of children and to identify the relationship of nutritional status of children and knowledge and practices of mothers. Data was gathered through an interview using a questionnaire and anthropometric measurement of children and mothers. Mothers' anthropometric measurements such as weight and height were also considered as basis for determining children's nutritional status. Generally, the study revealed that there were only 10% underweight children aged 0-24 months old. More than one-third of the mothers was high school graduate and 19% did not finished high school. Almost half of mothers were in the age range of 22-29 years old. The age of mothers at first pregnancy was 19 years old. However, 45% of mothers experienced pregnancy once and 24% of them had been pregnant twice while 30% of mothers experienced pregnancy for three to nine times. Nevertheless, it did not mean that their children were equal to the number of pregnancy because some of them experienced miscarriage. Most of the

mothers were housewives and 41% belonged to above poverty threshold. Majority of the mothers were equipped and practiced proper care during and after pregnancy. Majority of the mothers were not equipped with knowledge and practices on breastfeeding. Likewise, giving the complementary foods to young children in the right time was not observed. However, mothers personally took care of their children and thereby giving the proper child care particularly when sick. Specific actions like intensive and appropriate designed nutrition counseling and seminar for malnourished families were still highly recommended to increase the knowledge and practices of mothers on breastfeeding and giving complementary foods. Further studies on evaluation of mothers' knowledge and practices on health and nutrition are essential for proper planning and implementation of nutrition intervention for prevention and eradication of malnutrition.

### **BASELINE DATA GENERATION OF AGROFORESTRY SYSTEMS IN ABRA**

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The study identified, described and evaluated the agro-forestry systems practiced in the province of Abra. Data gathering was done through personal interviews using a prepared interview schedule. Inputs provided by the key informants were supplemented by field visits and personal observations. Different farming systems and activities were documented through pictures and these were the basis of validating and evaluating the information gathered. The snowball sampling technique of data gathering was employed. Four distinct agro-forestry farming systems were practiced in the province: a) multi-storey, b) hedgerow cropping, c) live fence/boundary planting, and d) contour terracing systems. Two variants of the multi-storey system emerged: a) indigenous system wherein no orderly pattern of crop arrangement is practiced and this has evolved as a result of the long experience of the farming communities, and b) introduced systems which follows an orderly pattern of crop arrangement and has evolved as a result of research/experiment and can be adopted by others. These findings conform to the agroforestry classification proposed by Nair 1984, Getahun and Reshid 1988, and Lundgren and Raintree as cited by Lasco and Visco 2003. A modified hedgerow cropping was employed by the farmers. Strips of grass vegetation were used as hedgerow plants instead of woody perennials. In sloping grounds, contour terracing was practiced. Stones were piled at the base of the terrace forming stone walls and the agricultural crops were planted along the terrace. Live tree-boundary planting was commonly practiced to demarcate boundaries of land properties and to provide protection and privacy to valuable products. Others planted trees around their farms or home lots such as around the house, garden, cropland or orchard to protect their crops from strong winds and to demarcate areas where general access was discouraged.

### **CURRICULUM ENHANCEMENT TOWARDS INTEGRAL EDUCATION IN AGRICULTURE IN COLLABORATION WITH ORGANIZATION OF INDUSTRIAL, SPIRITUAL AND CULTURAL ADVANCEMENT (OISCA)**

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Abra was declared as one of the ten poorest provinces in the country. One approach explored was the establishment of domestic and foreign linkages like OISCA to generate employment and skills enhancement. A continuing training of ASIST graduates in agriculture to ensure employability was proposed. The program started its operation in Abra in 1984. ASIST was a grantee of Japan's program on Human Resource Development and Agriculture and Industrial Training for ASIST graduates to get further training along their fields of specialization in various agencies in Japan. It gave them the competitive edge in employment here and abroad, aside from the inter-cultural exposure. The advanced management styles and technologies being used in Japan bridged the gap between theory and practice, which is seen as the weakness of Philippine agricultural education.

ASIST is the only institution in Abra offering agriculture and agriculture-related courses interfaced with four functions. The linkage with OISCA has invigorated the employment prospect of agriculture graduate, as well as the enrollment of the College of Agriculture. It is sustained through a committed effort of the College to improve its instruction delivery program so that the quality of its graduates sent to OISCA can meet expectations. Since 2002 up to the present, OISCA and ASIST have been continuously working together to support this program. Constant dialogues are done to plan future activities as well as thresh out problems. The high regard and confidence earned by ASIST from OISCA should be sustained through continued bilateral talks. Furthermore, trainees coming back to our country after training in Japan are absorbed by sister companies based in the Philippines, assuring them of employment and serving as a showcase of viability of the program.

### **CLOSING THE GAP BETWEEN SCIENCE AND POLICY FOR ENHANCED ACTION ON CLIMATE CHANGE AMONG UPLAND COMMUNITIES**

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Climate change is considered the most serious, most pervasive environmental threat that the world faces today. The Philippines is not exempted from its impacts, more so being prone to natural and man-made disasters due to its location and geography. This calls for measures on how our society could reverse these adverse impacts or adapt to a new climate regime. As suggested by recent assessments, “the cost of inaction would be many time cost of action”. Central to these measures is the heightened interest for evidence-based policy underscoring that “policies that are informed by evidence help in the effective identification of needs and in the formulation of better strategies, as well as in helping reduce poverty and saving lives by lowering delivery costs and improving targeting” (Livny et al. 2006). Meanwhile, a review of natural resource policies by Lasco et al. (2008) revealed that climate change is yet to be mainstreamed into the Philippine development policy arena. Thus, this study explores how to effectively bridge the science and policy gap for enhanced action on climate change among upland communities in the Philippines. Forests are said to be critical ecosystems adversely affected by the change climate, and in them also reside the most vulnerable and the “poorest of the poor” people who are highly exposed to climate change risks. This sector is therefore a critical target for preparedness, adaptation and mitigation efforts for climate change. Information that will be generated from this study will give light on the status of climate change research, particularly with focus on upland communities, and what has been achieved in translating its results into policies and/or actions. Knowledge on this will help identify gaps that need further attention in responding to climate change risks or if current responses address the immediate needs of the upland communities.

### **COMMUNICATING CLIMATE CHANGE TO COMMUNITIES: A SURVEY ON CLIMATE CHANGE KNOWLEDGE AND PERCEPTION OF LOCAL DEVELOPMENT PLANNING COORDINATORS IN LAKESHORE CITIES AND MUNICIPALITIES OF LAGUNA, 2009**

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Climate has become an important concern at both regional and global levels. However, the challenge for the scientific community and the government is how to localize climate communication and engagement. This study hopes to generate findings that provide specific guidance to science communicators and government officials on how to best communicate knowledge about global climate change to local development practitioners. A survey study with the Local Planning and Development Coordinators of 19 lakeshore cities/municipalities of Laguna was carried out to assess

their knowledge and perceptions on climate change and to determine the actions taken by their local government in response to the climate issue. Results show that the respondents have a moderate level of knowledge about climate change. Aside from conferences and seminars, the main source of information on climate change is the media through newspapers and television. In general, the respondents have expressed a high level of concern on the potential effects of climate change to their city/municipality but due to other priorities, strategic actions to adapt or mitigate the effects of climate have not been done.

**COMMUNITY AWARENESS AND ACCEPTANCE OF THE KASC VISION MISSION,  
INSTITUTE GOAL AND BSA PROGRAM OBJECTIVES OF THE INSTITUTE OF  
AGRICULTURE AND FORESTRY**

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The Kalinga Apayao State College's vision mission, goals and objectives are essential to the community where it exists. Reinforcement can be better realized if the whole community as stakeholders fully understand and accept the mission vision, goals and objectives of the School. This survey used a simple descriptive research method. Respondents were composed of 77 professionals from the different agencies in the province of Kalinga. Most of them fell in the 31-40 age bracket, with Master's degrees, and were aware of the existence of KASC VMGO particularly the College Vision Mission unlike in the Institute of Agriculture and Forestry Program Goal and Objectives. The respondents' main source of information were leaflets/flyers and information bulletins distributed by the college. With regards to the understanding of the VMGO, the respondents rated all the items. The KASC Vision and Mission were rated the highest (very high understanding). The BSA Program objectives had the lowest degree of understanding, but still managed to obtain a "high" rating. Although the respondents showed high awareness and understanding of the VGMO, particularly the College Vision Mission and moderate awareness of the Institute of Agriculture and Forestry Program Objectives, efforts should be exerted to improve their awareness through enhanced information dissemination and campaign. There should be deeper discussions with the stakeholders for them not only to understand but also to retain the principles.

**HOUSING THE HOMELESS VICTIMS OF NATURAL DISASTER: THE  
RESETTLEMENT PRACTICES IN THE PHILIPPINES**

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The Philippines is very prone to natural disasters with an average of 20 typhoons. From 1995 to 1999, there were seven disastrous typhoons per year on the average. As a consequence, flooding is very common in both urban and rural areas. The National Mapping Resource and Information Agency said that one hundred and two areas or a total 181 towns will be most vulnerable with 2 meters sea level. Several thousands of families had lost their homes, properties and livelihood in the three provinces in the Philippines due to natural disasters that occurred in 1991, 2004 and 2006. The eruption of a dormant volcano, Mount Pinatubo in 1991 brought about recurrent lahars flows. Almost half a million families have to be resettled. In 2004, a super typhoon named Winnie buried the town of Infanta in Quezon province. In 2006, there were about 200,000 families from the surrounding municipalities in Mount Mayon, that suffered from flashfloods as an aftermath of typhoon Reming. The response of the Philippine government and non-government organizations to this urgent need is a long process of resettlement which usually takes an average of 2- 5 years. The paper further describes how the resettled families rebuild their lives through cooperation, solidarity and resiliency of the community members. Assistance of the NGOs was found to be indispensable because of their initiatives in providing sustainable livelihood to alleviate the widespread poverty in the resettlement

sites. The paper identified lessons that can be shared to other persons who will be in a similar situation and at the same time intervention strategies prior to typhoons and flooding; and volcanic eruption are suggested.

### **GENDER ROLES IN THE TEXTILE INDUSTRY IN APAYAO**

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This study examined the dynamics of the community, farms and households to understand the roles of men and women in the textile industry. Specifically, it determined the activities of men and women in the textile industry; determined the time spent by men and women allotted to their daily tasks, and analyzed the roles of men and women in the textile industry. The descriptive method of research was used with the gender analysis tool kit as the main data gathering tool. Purposive sampling was done in selecting the 30 respondents of the study. Results showed that women are heavily involved in textile-related activities especially weaving but men also share in the responsibility. Men assist in the production of textile products. But they devote much of their time to farming - their primary source of income. Based on the findings, women are the key players in the textile industry. They are the ones involved in most of the textile-related activities, particularly weaving. Men also share in the responsibility in the textile industry by assisting the women perform their work.

### **EFFECT OF NUTRITION EDUCATION AND COUNSELING ON THE BLOOD SUGAR OF DIABETES PATIENTS**

*Cynthia M. Custodio*

The incidence of Diabetes mellitus has been increasing among various population groups nationwide and worldwide as cited by national and international survey studies of the Food and Nutrition Research Institute in the Philippines and the World Health Organization as well. The population of the municipality of Los Banos was not spared from the menace of diabetes. Increasing number of patients from all walks of life seek medical attention to find cure for the disease. This study was made to explore the possibility of finding ways to alleviate, if not cure, the health concerns of individuals afflicted of diabetes. As a member of the medical team to answer the medical problem of diabetes patients, medical nutrition therapy was actively taking part in the healing process. In this study, nutrition education and counseling was conducted to a group of individual diabetes out-patients. The available medical charts and laboratory biochemical test results as ordered by the physicians were used as reference guide before the conduct of the nutrition education session. Nutrition profile form, illustration materials and nutrition guidelines were used to explain the therapy method to individual patients. Another group of individual out-patients were asked to answer the same nutrition profile form where the medical and socio-demographic information were indicated. They were given brief and quick advice regarding questions concerning nutrition and diabetes. The fasting blood sugar (FBS) tests were taken after one month. Results showed that ninety-three percent of the NIDDM out-patients studied who availed of nutrition medical therapy conducted by an RND were able to achieve normal blood sugar after different days of observation.

### **TECHNOLOGY ADOPTION OF ALTERNATIVE PLANTING MATERIALS AND PROCESSING VARIETIES IN THE PHILIPPINE HIGHLANDS**

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This study determined the level of technology adoption of rooted cuttings, generation zero seeds and true potato seeds as an alternative to clean seed tubers of locally developed potato varieties Igorota, Solibao and Raniag. A survey was conducted in the seven potato-producing municipalities of Benguet and Mountain Province, namely: Atok, Bakun, Bauko, Buguias, Mankayan, Kabayan and Kibungan. Results showed that rooted cuttings had the highest adoption level with 38% of the farmers having tried planting them at least once, followed by GO seeds (19%) and TPS (2%). Around 44% and 62% of the farmers were aware of rooted cuttings and GO seeds, respectively, but did not try planting principally because of lack of resources to grow seeds (clean area, cash and manpower). With respect to varieties, Igorota had high adoption level (82%), while Solibao and Raniag had low adoption levels (25 and 18%, respectively). High adoption level for Igorota was attributed to its high yield and tuber characteristics, which were acceptable in the market. Solibao has elongated tuber, while Raniag has low yield. Attendance to training and seminars, as well as membership in organizations, had higher influence on technology adoption levels than farm area and land ownership. Trainings contributed a lot to the increased awareness and adoption of rooted cuttings and Igorota variety.

### **SOCIAL NETWORK ANALYSIS OF RESEARCH COLLABORATION AMONG FILIPINO AGRICULTURAL SCIENTISTS**

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A social network is composed of people or groups called “actors”, each of which has some kind of connections called “ties” to some or all of the actors. In this study, we constructed a network of collaboration between Filipino agricultural scientists using computer archives of scientific papers in Philippine agriculture spanning the recent 4-year period from 2006 to 2009 involving 235 papers written by 645 authors. In this network, two scientists (actors) were considered connected (have ties) if they had coauthored one or more papers together. We found the following statistical properties of the network:

1. The Filipino agricultural scientists had written an average of 1.39 papers (maximum=13);
2. The scientific papers had an average of 3.81 authors (maximum=15); and
3. The Filipino agricultural scientists had collaborated with an average of 2.70 scientists (maximum=28).

To understand the pattern of connection and communication between scientists, we utilized computational techniques from statistical physics and the results were:

1. The maximum and average typical distances between scientists through the network were 12 and 4.89, respectively. Typical distance means the length of a “referral chain” of intermediate scientists through whom contact may be established. One needed to talk to an average of five scientists to get an audience with another, but needed to talk to at least 12 to guarantee an audience with any. The average value of 4.89 was smaller than the well-known six-degrees of separation among actors in networks exhibiting the small-world characteristics. This means that scientific information would not have to travel far through the network to reach those who could benefit from them.
2. The betweenness centrality of the network was 0.04, suggesting that 4% of the scientists were the most influential in the network acting as information hubs.

### **TAPPING THE POTENTIALS OF THE WEAVING INDUSTRY IN APAYAO**

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The province of Apayao is endowed with rich natural resources. Dubbed as the “Cordilleras’ last forest frontier”, Apayao continues to preserve its luscious natural beauty as well as its rich cultural diversity. The province’s main occupation is agriculture with rice and corn as the main crops produced. Other industries include furniture making, food processing, small-scale mining, blacksmithing and weaving. The weaving industry (basket, handicraft and loom weaving) is not only seen as a potential income generating activity, but also in upholding the province’s cultural identity. To tap the potentials of the weaving industry, an assessment was undertaken that included: documentation of the current situation of the industry; identification of the strengths, weaknesses, opportunities and threats to the industry (SWOT analysis) identification of science and technology gaps to generate interventions that would strengthen the industry. Results showed that the weaving industry is still in its formative years, untapped or not yet fully developed. The industry can harness the fiber and dyestuff sources in the province and enhance weaving. Present activities as part of enhancing the weaving industry include training on fiber processing, identifying and utilizing dye-yielding plants for coloring fabrics, and developing the ethnic weaving designs.

### **100 TECHNOLOGIES FROM UPLBCA**

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The UPLB College of Agriculture (CA), as the undisputed center of excellence in agriculture education and development, has already produced numerous technologies intended for the farmers and other stakeholders. For this particular paper, only 100 technologies developed by CA thru the century will be featured in consonance with the centennial celebration of UPLB. As early as 1915-1916, the then Department of Entomology witnessed the initial historic successes of biological control when some American entomologists visited Los Baños and discovered a parasitic wasp, *Scolla manilae* Ashmead. When introduced in Hawaii, this wasp led to the control of the white rub (*Anomala orientalis* Waterhouse). In the 1920s and 1930s, plant stocks and livestock, which were products of long years of breeding by researchers of the College, were made available to Filipino farmers. Among those stocks favorably received were Philamin cattle, Berkjala pig and Los Baños cantonese chicken. From then on, the College has been conducting research activities that served as important base for the development of agricultural science and scientific farm practice in the Philippines that also benefited other countries in Southeast Asia and the world. Other research milestones include high yielding crop varieties, improved/new varieties of ornamentals, flower inducers of mango and pineapple, biological control of pests, integrated pest management, postharvest technologies, plant and animal genetic resources, quality improvement and safety of wine and other ready to drink beverages, functional food from traditional and indigenous materials, high quality animal products, fertilizers, decomposers and soil enhancers, analytical techniques and packages and detection kits for plant, food, feed, and water pathogens. These technologies are anchored on sustainable development through utilization and management of locally generated resources, biodiversity conservation, participatory extension approaches, and strengthening of agricultural support systems.

### **PARTICIPATORY DEVELOPMENT BROADCASTING: AN EXTENSION SUPPORT STRATEGY FOR TECHNOLOGY PROMOTION TOWARDS AGRICULTURAL DEVELOPMENT**

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Even with the recent developments in information and communication technology, radio continues to be a most accessible and potent medium for sharing technical information and knowledge, and educating farming communities. This paper relates the experiences of putting up, test broadcasting, and piloting a participatory community radio program with local government units, research and development agencies, and the farmers themselves as partners, with the end in view of disseminating agricultural and development information relevant to the needs of the local communities and promoting modern agriculture as a viable enterprise. The process involved mentoring and training-workshops on: participatory program development; community- and agriculture-based radio program planning using participatory rapid rural appraisal to determine the information needs and listening preferences of the community; and program organization, planning, production, management, and monitoring and evaluation. The program is still evolving, a continuing learning experience for all partners, resulting in empowerment and capability building particularly in community-based participatory radio program production. An effective vehicle for technical/expert and resource sharing, it also created opportunities for increased networking and coordination among the different stakeholders. The program also paved the way for new linkages, future collaborative projects, and further agricultural extension researchable areas.

### **PROFILES OF ENDEMIC FRESHWATER ECOSYSTEMS IN ABRA**

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Abra is endowed with inland waters as habitats of freshwater endemic flora and fauna that are used as food. The Abra River has several tributaries that pass along the province and serve as the main source of livelihood of fisherfolks, and source of irrigation system of farmers. Baseline data on the profiles of fishing areas, endemic freshwater resources, and fisherfolks in Abra were gathered to promote and conserve environmental resources. The Abra River, creeks, streams, and rice fields teem with endemic freshwater resources. Thirty-eight fish species are present, of which the most common are “bunog”, “karpa”, “palilleng”, “igat” and “kampa”. The special endemic fish called ‘ludong’ is still common in the province. “Agurong”, “bennek”, “bisukol”, “leddeg” and “suso” are the common shells. “Kuros” and crabs are crustaceans, and “pakko” and “baktel” are the aquatic plants mostly used as food. Most of the fisherfolks have been permanently residing in their barangays for more than 30 years, married, with 1-5 members in their households, and have obtained basic education. They have been in fishing for 10-20 years, but farming is still their main source of income. However, those in fishing have higher income. Few have attended training on fish growing and marketing. Majority have joined associations and some are barangay officials. Their catch is used for home consumption, sold or bartered either as fresh or grilled. Selling is done right in the river, local public market or house-to-house, mostly by housewives and middlemen. Freshwater resources are threatened by human-induced activities such as pollution, mining and other activities, as well as by heavy siltation. Hence, the endemic aquatic species are now at the brink of extinction. There is, therefore, a pressing need to protect, sustain and conserve these resources in situ and ex situ for more sustainable aquaculture.

### **REPETITIVE HARVESTING: AN EFFICIENT METHOD FOR SEED TUBER PRODUCTION IN POTATO**

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Repetitive harvesting or staggered harvesting is a technique of enhancing potato to produce more tubers or force cultivars with poor tuber set to yield more tubers. This study determined the effect of repetitive harvesting method on G-zero tuber yield in the greenhouse and its subsequent yield in the field and the profitability of this method. Two trials were done where the potato plants were repeatedly harvested 2 to 4 times depending on the variety in between the growing period until it reached the senescence stage. The potato varieties 'Granola', 'Igorota', 'Solibao' and 'Raniag' were used. First harvesting of tubers was done after 5-8 weeks from planting. Duration of harvest depended on the maturity period of the variety. Succeeding harvests were done every after 2 weeks until the maturity stage. Storage performance and subsequent yield of tubers derived from repetitive harvesting was likewise compared with tuber yield from conventional method of harvesting (one-time harvesting at senescence period). Repetitive harvesting significantly influenced the number of tubers harvested but not on the weight of tuber per unit area. In the first trial, repeatedly harvested 'Igorota' and 'Granola' yielded an average of 367 and 410 tubers per m<sup>2</sup> against one time harvesting with 154 and 167 pieces, respectively. The same trend was observed in the second trial where repetitive harvesting in four varieties (Granola, Igorota, Solibao and Raniag) yielded more than twice the number of tubers than when harvested at one time. Furthermore, as harvesting increased from one to four times, the total number of tubers harvested also increased, consequently increasing net income by 17-30% inspite of additional labor cost incurred.

### **REVEALED WILLINGNESS TO PAY FOR SAFE DRINKING WATER IN LAGUNA WATER DISTRICT'S SERVICE AREA, 2008**

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Despite claims by the Laguna Water District (LWD) that piped water is safe for drinking, many households with piped water in Los Banos, Bay and Calauan municipalities in Laguna regularly buy and consume purified drinking water. This indicates that piped water quality is perceived to be poor and that households are willing to pay for safe drinking water. This study described the households' perception of the piped water, the reasons for these perceptions, and the measures that households employed to avert risks from drinking poor quality piped water. It also estimated the households' revealed willingness to pay (revealed WTP) for safe drinking water. Data came from a random sample of 392 households constituting 1.9% of all households with piped water in the three municipalities. Perceptions on piped water and the use of measures to improve water quality were analyzed using the descriptive method. The averting expenditure method was used to estimate the revealed WTP of households for safe drinking water. Results showed that 72% of sample households perceived piped water as not fit for drinking because of problems with its clarity, odor, taste and purity. This perception caused households to employ averting measures such as filtering, decanting, boiling, using a home water purifier, fetching water from a manually operated shallow tube well or hand pump, and purchasing bottled distilled water or commercial purified water, the last being the most common measure. The revealed WTP of sample households in all three towns totaled P14,117 per week or P734,094 per year, or at least P36 per week per sample household, on the average. Applying this value proportionately to the remaining population of households with piped water, total WTP amounted to almost P37,981,868 per year. The revealed WTP for safe drinking water was very high because piped water was clearly perceived by many to be unsafe for drinking.

### **ADAPTATION OF UPCOMING HYBRID RICE UNDER TABUK CONDITION**

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This study determined the adaptation of upcoming hybrid rice varieties under Tabuk condition in Kalinga Province. The Randomized Complete Block Design and the following treatments were used in the study: T1 - HLX1, T2 - HLX2, T3 - HLX3, T4 - HLX4, T5 - HLX5. Results showed that T3 produced the highest number of tillers and T4 the lowest. T3 produced the longest panicle at 22.64 and T2 the shortest at 21.97. T2 yielded the highest number of filled grains per panicle with a mean of 26.7 and T1 the lowest at 3.6. Unfilled grains per panicle were highest in T4 (136.25), but lowest in T2 (90.5). On the degree of spikelet opening, T5 showed the widest spikelet opening and T2 the closest. T2 had the heaviest grains and T5 the lightest. On the return of investment, T2 obtained the highest at 533.94% while T5 had the lowest at 25.50%. T2 has been recommended for planting in Kalinga during the wet season based on its performance – highest number of filled spikelets, heaviest grains and highest ROI (533.94%) compared to the other treatments. However, a similar study should be conducted during the dry season for verification purposes.

#### **ADAPTIVE MANAGEMENT TOWARDS INSTITUTIONALIZING RESOURCE EFFECTIVE (ADMIRE) *JATROPHA CURCAS* SEEDLING PRODUCTION**

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Globally with the inevitable pressures of climate change, humanity becomes conscientious in instilling an ecological everyday life. Recently, the trend is towards prospering a green economy. The Philippines has laid its significant contribution to the global mandate of preserving ecological stability. It has crafted the Biofuels Act of 2006, which makes mandatory the use of biofuel blends in the transport sector. Alternative energy sources are also being developed globally, to wit solar, wind, hydro and denrdothermal, among others. Meanwhile, one of the potential alternative energy sources which pro-actively caters to the mitigation and adaptation of climate change is the planting of biofuel species. The planting site for the said species is located at the marginal upland areas in the country - a vast area of at least 400,000 hectares. Such will require the supply of readily available quality planting stocks. Amongst the potentially promising biofuel species is *Jatropha curcas*. However, the production protocol for this biofuel is yet to be established in the country. The project, initiated by the Philippine National Oil Company-Alternative Fuels Corporation and the UPLB Foundation Inc. through the Institute of Renewable Natural Resources, established the production protocol that could serve as standard for the development of nursery customized to the Philippine condition particularly for *Jatropha curcas*. Through transdisciplinary approach and adaptive management, the project cost-effectively produced 5.3 million *Jatropha* seedlings. Silvical characterization showed that the asexually produced seedlings flowered earlier than the sexually produced seedlings. Moreover, the production module indicated that the 6-ha nursery area could economically raise the 5.3 million *Jatropha* seedlings.

#### **SUSTAINING THE SOCIO-CULTURAL AND NATURAL RESOURCE CONSERVATION OF THE ISNAGS THROUGH THE NARIHA SAY-AM FESTIVAL OF PUDTOL, APAYAO**

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The Narimag Highlanders Association (NARIHA) Say-Am Festival is celebrated every 18th of December by the Isnags of the upper barangays of Pudtol, Apayao. It is intended to promote the *Lapat* system as an indigenous conservation method of protecting natural resources and proliferating the Isnag's socio-cultural activities. Top government officials of the province join in the festival. Highlights of the occasion are the dancing of the “taddok the talip” and the exchange of discourse among the top provincial officials headed by the governor disclosing the meaning and significance of every event in the Say-am ceremony. Significantly, the event revives cultural traditions and unites the

people of Apayao (iYapayao) of different cultural orientations and background in protecting the twin rivers of Nagan and Maton, including the Agora Wildlife Sanctuary. The NARIHA Say-am is an effective tool of merging principles across cultural differences in Apayao. Likewise, it is also a helpful means of conserving the Agora Wildlife Sanctuary watershed supporting irrigations for farmlands and protecting both terrestrial and aquatic organisms for biodiversity conservation.

#### **PERFORMANCE OF SWEET SORGHUM ACCESSIONS UNDER ABRA CONDITION DURING WET SEASONS**

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Performance trial of five newly introduced accessions of sweet sorghum [*Sorghum bicolor* (L.) Moench], a dryland crop, under Abra condition was conducted at ASIST, Lagangilang, Abra. The study determined sweet sorghum's performance in wet season to ensure a year-round supply for bio-fuel production. It was also done to facilitate the transfer of technologies on sweet sorghum for mass production. There were no significant differences on the height of all accessions at maturity. However, ICSV 700 and NTJ2 accessions had the longest panicles. NTJ2 and ICSR93034 accessions had the best plant stand with significant differences. ICSV 700, SPV 422 and ICSR 94034 accessions flowered earlier with highly significant differences. NTJ2 accession was the most resistant to shoot fly damage, as well as stem borer damage, among the accessions, with significant differences. No significant differences in the lodging tendency were noted among the accessions. SPV422 and NTJ2 accessions showed the biggest stalks, with highly significant differences. NTJ2 accession had the highest stalked stripped yield, with highly significant differences. NTJ2, SPV422, and 93034 accessions gave the highest fresh weight, dried weight and weight of 100 seeds, which were highly significant differences. NTJ2, SPV422 and 93034 accessions were recommended for farmers' use to promote sweet sorghum bio-fuel production.

#### **STOCK ASSESSMENT OF *TRIPNUESTES GRATILLA* OF MALAUMAUN ISLAND, CASTILLA, SORSOGON**

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The stock status of the economically important sea urchin (*Tripnuestes gratilla*) of Malaumaun Island was assessed using the analytical length-based stock assessment through the FISAT-ICLARM Fish Stock Assessment Tool (version 1.2.2, Gayanilo et al., 1996). The Malaumaun stock is one of the only few remaining healthy stocks known in Bicol after the overexploitation in the 1990's of the Albay's east coast stock. Important growth and mortality parameters were extracted and used in determination of sustainable yield indices. A total of 3221 length measures or individuals, representing 10 months times series data were used in the analysis. The growth parameters computed for the species are  $L_{\infty} = 9.65$  cm and  $K = 1.02$ , indicative of fast growing tropical invertebrate species. Mortality parameters computed were total mortality ( $Z$ ) = 3.36, natural mortality ( $M$ ) = 2.52 and fishing mortality ( $F$ ) = 0.84. Exploitation rate was computed at  $E = 0.25$ . The exploitation level indices under exploitation as described by the conventional fish stock assessment exploitation standard which sustainable level ranges from 0.3 to 0.5 (Beddington and Cooke, 1983 and Guland, 1971). The computed length at first capture ( $L_{50}$ ) of 6.32 cm is bigger than the size at first maturity (6.0 cm), showing that the species had contributed to the spawning before the minimal harvesting. Recruitment pattern is year round with peak occurrence at second quarter of the year. The study recommends an increase in harvesting from  $E = 0.25$  to  $L_{0.50} = 0.406$ , which will result to an increase of 17% yield-per-recruitment, by harvesting 38.42% of the existing biomass. Harvestable individuals on per year basis shall not exceed 1229 at sizes bigger than 6.5 cm. Test culture of the organism, using the recommended harvestable

level can be tested to evaluate its potential as alternative livelihood to fishing communities. Further refinement of the bio-ecological bases of sea urchin management is also recommended.

**COMMUNITY RESOURCE –BASED ORGANIC FERTILIZER PRODUCTION:  
A SUSTAINABLE WASTE MANAGEMENT AND FARMING PRACTICE IN  
OCCIDENTAL MINDORO**

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The use of farm wastes as organic fertilizers is a practice that offers reduction in crop production costs, increasing yield and income and reduction of source of pollution. Its use is a promising strategy to achieve the universal goal for environmental preservation and conservation. This paper summarized the different experiments conducted on the utilization of farm wastes in improving crop production. These materials were composted and were tested to different crops by the Occidental Mindoro National College. Varying rates of mixtures and inoculants were tested in separate experiments. Likewise, the acceptance of farmers was assessed based on their responses as to the use of inoculated mixtures and their participation in related seminar-workshops. Results revealed that the use of composted farm waste materials like carbonized rice hull, rice straw, vegetable trimmings and different animal manure had significantly improved the yield of different crops. Its effect was found comparable to the use of inorganic fertilizer. Moreover, the use of isolated indigenous microorganisms and plant extracts were found comparable to the expensive and imported inoculants. As to diffusion, the compost and the technology of using compost enhancer were accepted by farmers at high level, indicated by the high attendance of farmers to extension activities and the increasing number of individuals and farmer organizations who are using self prepared inoculants. Many owners of commercial and backyard scale livestock farm are now transforming their waste into compost. Students of the OMNC had likewise found a source of income in collecting compost material.

**FOOD CONSUMPTION PATTERNS AND HOUSEHOLD FOOD SECURITY  
IN CALABARZON**

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The study determined the household food security in CALABARZON by assessing the calorie intake of the selected households. Secondary data covering 251 CALABARZON households were obtained from the 2003 Family Income and Expenditures Survey of the National Statistics Office and the 2003 Food Consumption Survey of the Food and Nutrition Research Institute. These were subjected to descriptive, Gini coefficient for inequality and multiple regression analyses. The average annual per capita income in CALABARZON was estimated at P36, 212, while the average food expenditure was P37.9 per person per day. The average food consumption was 923 grams per person per day and among the major food groups consumed were: cereal and cereal products (45%), fish, meat and poultry products (23%), and fruits (13%). The mean one-day per capita intake was 1,894 kilocalories, but the poor had an average of 1,572 and the non-poor households, 1,953 kilocalories per day. It was further revealed that 60% of the households in CALABARZON were food insecure, 74% of which came from poor households and 57% from non-poor families.

**UPLAND CROP PRODUCTION: OPPORTUNITIES FOR ORGANIC AGRICULTURE**

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This study described the crop production system in the uplands of Apayao; determined extent of chemical inputs in upland crop production system, and identified the doable interventions to develop organic agriculture in the area. Field survey was done to 42 upland dwellers in the municipalities of Luna, Pudtol, Flora and Sta. Marcela. Data were gathered using interview and observation coupled with photo documentation. Results showed that most upland farms planted traditional varieties of rice, legumes and vegetables. Production system was labor-intensive and did not rely much on chemical inputs. The use of pesticides was only done when there was severe pest and disease. In the light of the findings, the following recommendations are forwarded: conduct farm assessment to identify farms suitable for organic agriculture; establish market for organically produced crops in the area to encourage farmers to go organic; coordinate with LGU and other agencies to assist farmers for organic certification.; encourage farmers to go organic production; conduct RDE on organic crop production system to increase farm productivity of farmers.

### **MUSCOVADO SUGAR PRODUCTION AND MARKETING IN SELECTED AREAS OF THE PHILIPPINES: A VALUE CHAIN ANALYSIS**

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In the context of reducing poverty among sugar farmers, the production and marketing of muscovado sugar is considered an entry point for increasing farm income. The favorable retail price of the commodity in the domestic market creates a pull-up effect on the farmgate price that is beneficial to the farmers. In addition, the demand for the product is growing worldwide as the number of health foods consumers increases. This budding market niche presents an opportunity to the Philippine muscovado sugar farmers and other related industries. Despite the positive, supply has not caught up with the demand both in the domestic and world market. This study was conducted to analyze the production and marketing dynamics in Antique, Negros Occidental and Sultan Kudarat, the three largest suppliers of muscovado sugar in the country. The expected economic benefits from muscovado production are not equally shared among farmers within the selected study areas. Antique farmers have lower farm productivity and receive lower farm gate prices compared to farmers in Negros Occidental and Sultan Kudarat. Sugar processing continues to be a backyard operation where health, sanitation and air pollution is rarely addressed. Organic farming remains to be practiced only by a few sugarcane farmers. Because market niche already exists for muscovado sugar, farmers tend to continue using the conventional farming method over organic farming unless the whole market niche begin to clamour for organically produced sugarcane. Only exporters have become sensitive to the market for organically certified muscovado sugar because these are the segment of traders who are in touch with markets requiring organically grown products. Local traders, do not discriminate over organically grown sugar. The farm to market linkage is highly organized wherein each stakeholder has clearly defined functions and that market information flows freely. Vertical integration is more pronounced in Antique than in Negros and Sultan Kudarat. Although farm-market integration within a cluster is existent, intercluster linkaging is limited. Farm production costs differ among the three clusters included in the study which is indicative that farming methods vary among the clusters. The Philippines is less efficient in employing its resources to produce sugarcane than other selected muscovado-producing countries, namely, Brazil, Colombia, India, Indonesia and Thailand except for Mauritius. *Ceteris paribus*, production efficiency enables a country to sell its product at a lower cost and at the same time receive a normal profit.

### **EXPORT COMPETITIVENESS OF PHILIPPINE SEaweEDS BEFORE AND DURING THE IMPLEMENTATION OF AGRICULTURE AND FISHERIES MODERNIZATION ACT (AFMA), 1992-2006**

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This study determined the export competitiveness of Philippine seaweeds before and during the implementation of AFMA. The study used regression analysis to determine the effects of AFMA and other variables on the volume of exports of seaweeds. To measure the competitive advantage of Philippine seaweeds, the study used the revealed comparative advantage and cost competitiveness analysis. Domestic production of seaweeds increased from 1992 to 2006. The volume of exports of seaweeds and other algae used for food posted an increasing trend due to increasing imports of China. The volume of exports of seaweeds/other algae were positively related with AFMA and foreign exchange rate. Foreign exchange rate was positively related to the volume of exports of seaweeds and other algae used for food at ten percent while volume of exports of Indonesia was negatively related. For the periods considered, RCA values of Philippine seaweeds were all greater than one, signifying that it was still highly competitive in the global market. However, it posted a declining trend. The RCA value of Philippines seaweeds was significantly much higher at one percent probability level compared to the RCA value of Indonesian seaweeds. Although, the level of export competitiveness of Philippine seaweeds were higher than Indonesian seaweeds, its increasing level of export competitiveness poses a threat to the export of Philippine seaweeds. Philippine seaweeds have competitive advantage in production and trading based on the RCR values greater than one for both periods. The problems faced by the seaweed industry were increasing competition with other countries, continued smuggling of seedlings for planting and raw seaweeds for processing in the Asian neighbors, higher prices of raw dried seaweeds, shortage of supply as raw materials for local processors and deteriorating quality of local seaweeds. In order to enhance the export competitiveness of seaweeds industry, the following recommendations are suggested: (1) increase government support to enhance productivity of quality seaweeds; (2) reduction of smuggling of seaweeds through strict enforcement of the law; (3) increase the budget allocation for the five AFMA components to enhance the competitiveness of the Philippine seaweeds; and (4) strengthen small seaweed farmers/industry associations in the country.

#### **VALUE CHAIN ANALYSIS OF SEaweEDS IN ZAMBOANGA**

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Seaweed farming is an important source of livelihood for Zamboanga farmers. The Zamboanga peninsula is the third major seaweed-producing region in the Philippines, contributing 12 percent to the total national production and 20% of Mindanao produce. This paper assessed the value chain of seaweeds in Zamboanga City and Zamboanga Sibugay. Specifically, it identified the key players in the marketing chain, determined the factors affecting the farmer's choice of marketing outlet, evaluated the profitability of marketing seaweeds and the value added at the different stages of the marketing chain, and identified the key problems and constraints that affected the value chain activities. Zamboanga Peninsula had more than four key players in the seaweed industry. These included the farmers, traders (wholesalers, assembler-wholesalers, exporters) and processors. Two of the largest processing plants were located in Zamboanga City and were producing semi-refined carageenan. At least five companies were exporters of seaweeds in dried form. The logit analysis revealed that ethnicity and household income influenced the farmer's choice of marketing channel. Farmers preferred selling to fellow Chavacanos. Those with high household income were found to favor the exporters in Zamboanga and other regions outside the city. Dried seaweeds provided the farmers with high net return at P539,600. Among the traders, the exporters received the highest net return in spite of the high marketing cost incurred because of the high selling price they obtained. In terms of value addition, the exporters contributed the highest value added as they transformed

seaweeds into an exportable form. Compared to the other market players, the value added realized by exporters was about eight times higher than that generated by wholesalers, and twice that of the assembler-wholesalers. Among all product flows, the highest value addition was highest at P63.12/kg with the farmers selling to wholesalers and then to the exporters. For raw seaweeds, the flow from the farmers, wholesalers, assembler-wholesalers and exporters generated the highest value addition. The farmers, however, received the lowest share of the exporters' price. Poor quality control and the increase in transport cost adversely affected the marketing operation of seaweeds.

#### **STUDIES ON DETOXIFICATION OF *JATROPHA* PRESS CAKE AND PRELIMINARY FEED TESTING IN TILAPIA (*OREOCHROMIS NILOTICUS* L.)**

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*Jatropha curcas* meal has crude protein content of 53 to 58%. The press cake, however, has been found to be very toxic to fish, rats and chickens. In this study, *Jatropha* press cake was detoxified using heat treatment, solvent extraction and fermentation with mixed microbial inoculants for three weeks. Using tilapia fingerlings (*Oreochromis niloticus* L.), a two-week experiment was conducted to evaluate the toxicity and nutritional quality of the treated *Jatropha* press cake as fish feeds. Fingerlings were randomly distributed in eight treatment groups and fed the following diets: T1 (standard diet of commercial feed), T2 (fermented cake), T3 (50% commercial feed + 50% fermented cake), T4 (methanol-treated cake), T5 (50% commercial feed + 50% methanol-treated cake), T6 (heat-treated cake), T7 (50% commercial feed + 50% heat-treated cake), and T8 (raw *Jatropha* press cake). The body weight gain (BWG%) and specific growth rate (SGR%) in T1 and T3 were statistically similar, and both were significantly higher than those of the other groups. Feed intake with raw *Jatropha* meal in diet was significantly reduced for all treatments and fish experienced body weight loss. This was mainly attributed to the presence of phorbol esters, a toxin found in raw *Jatropha* press cake. Percent mortality based on tilapia test was used as the index of toxicity of treated and untreated press cake in this evaluation. Highest mortality of 46.67% was observed in those fed with raw press cake. T3 gave the results closest to that of T1 for all feeding parameters such as body weight gain, specific growth rate and daily food consumption. Fermentation with mixed bacterial inoculants seemed to be the best method for detoxifying *Jatropha* press cake for use as fish feed.

#### **BIO FERTILIZER PRODUCTION**

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The Kalinga-Apayao State College (KASC) is the only tertiary educational institution in Kalinga Province. It aims to provide quality education to the Kalinga youth to prepare them for future challenges. The college is also mandated to assist in the economic development of the province. This is the reason why the College continuously strengthens its agriculture curriculum, showcasing new and indigenous technologies to farmers that can help increase their productivity especially the marginalized ones. The project Bio-Organic Fertilizer Formulation aimed to develop a more scientific process of producing bio-organic fertilizer in KASC. By promoting the use of organic fertilizer, KASC aims to fully establish a fully operational organic fertilizer thus contributing to the other programs from the additional income. Four study areas were selected for compost making based on accessibility to supply of substrates and source of water: Agbannawag, Bulanao, San Juan and Isla. It was revealed that composting without any use of activator, but with proper management can be realized in 60 days on the average. The cost and return analysis indicated a high ROI, which means that bio-organic fertilizer is profitable as a business. However, the profit is very much dependent on the amount of fertilizer produced - the more number of bags produced, the greater is the

income. Moreover, the voluminous amounts of rice straw – either burned or left to rot in the field – harvested from two cropping seasons in a year can help ensure a steady supply of raw materials for bio-organic fertilizer production.

### **AGRICULTURE ON WHEELS**

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The College of Agriculture (CA), UPLB recently initiated the project titled “Agriculture on Wheels” in selected towns in Laguna to bring CA expertise to the field by sharing information and technical know-how to the farmers; inform the farmers of the facilities, services and programs that could cater to their needs; and provide an accessible professional consultation to the farmers and agriculture extension workers/technicians. The first phase of the project was conducted last September 14, 2009 in Bagumbayan, Sta. Cruz, Laguna where more or less 200 farmers from Calauan, Bay, Victoria, Pila, Lumban and Kalayaan, Laguna participated. In the second phase was held in Brgy. Bucal, Nagcarlan, Laguna, approximately 80 farmers from the towns of Rizal, Nagcarlan, Liliw and San Pablo City attended. The third and last phase of the project was held in Mabitac, Laguna where more or less 200 farmers from the towns of Sta. Maria, Siniloan, Pangil, Pakil, Famy, Mabitac joined. The farmers from the said districts raised varying problems affecting their crops and livestock. Most prominent of these include golden snail that attacks their rice plant, tomato virus disease, papaya ringspot disease, banana bunchy top virus, and beetle that eats the roots of some vegetables like tomato and pole sitao. Experts on crops, livestock and food processing from the College of Agriculture were in full force to answer the questions raised by the farmers. The farmers brought along with them specimens of their affected crops for the experts to diagnose and provide solutions to their problems. The “Agriculture on Wheels” is CA’s way of bringing back to the farmers the support they have given to CA in general through their taxes. Furthermore, the lessons learned from this project could eventually lead to a bigger “Agriculture on Wheels” in CALABARZON.

### **IMPLICIT ATTITUDES OF FORESTRY STUDENTS TOWARD THE FORESTRY PROFESSION**

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To determine the attitudes of an individual or a target group, researchers typically administer a self-report evaluation in the form of a survey questionnaire, which is an example of an explicit measure of attitude evaluation. However, the last two decades of attitude evaluation has made known that implicit measures of social and individual cognition such as the Implicit Association Test (IAT: Greenwald, McGhee, & Schwartz, 1998) can be as accurate, and compatibly used along with its explicit counterparts for more comprehensive attitudinal evaluations. This paper explores the applicability of using the IAT in measuring the implicit attitudes of UPLB Forestry Students toward the forestry profession. Results of the implicit and explicit tests will be reported and the extent of their implications in forestry will be explored.

### **RECEPTION OR RESISTANCE? A STUDY ON THE ACCEPTABILITY OF THE NEW WHO-CGS AMONG THE BARANGAY NUTRITION SCHOLARS OF CALAMBA CITY, LAGUNA**

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Improved health and nutritional (H/N) status of Filipinos specifically of children is always the optimum goal of H/N workers. Growth assessment of children involves measuring their weight and height/length and comparing these to growth standards. The Philippines initially used the Local Standards and in 2003, the International Reference Standards/National Center for Health Statistics (IRS/NCHS) was adopted. This required retooling of guidelines, growth tables and charts and trainings of the H/N workers. In 2006, the World Health Organization released a new Child Growth Standards. This study determined the acceptability of the new WHO-CGS among the BNSs; to identify factors for either reception or resistance to the use of the new standards; and to establish measures to facilitate ease, efficient and effective use of the new standards. An interview was conducted among 60 female BNSs from 46 barangays of Calamba City, using a developed self-administered survey questionnaire. Their main responsibilities are monthly weighing of children; survey for family profiles; H/N education classes; assist in both supplementary feeding programs and distribution of vitamins. Most of them have already served as BNSs for six to 10 years, as volunteers, receiving an honorarium of 500.00/month while 65% are receiving other benefits and incentives. Only 15% are recipients of H/N awards. Information on community profile were also gathered. Likewise, data on the availability of health center/ Rural Health Unit in their barangays, and the health/medical personnel present, the barangay budget allocation for H/N activities and H/N awards given to the barangay. Both their H/N knowledge and skills were obtained from Trainings/Seminars (T/S) attended. Only 27% had training on the Growth Reference/ Standards, while 52% had the IRS/NCHS training. Although only 50% agreed on the change of standards, it is still a reception among the BNSs. They have a positive attitude, considered it part of their job and are willing to study its use and application. They are however expecting that it will be easily understood and that a training will be provided. Overall, the BNSs showed that they are for the welfare of the Filipinos, for the development of the community from the improved process and system, for their improved knowledge and provision of services, and for the improved nutritional status of the children. It is recommended that the study be duplicated in other areas once the respondents have the training on the new WHO-CGS.

**IMPACT OF THE TECHNO-GABAY PROGRAM ON THE PRODUCTION OF CABBAGE  
IN CAMARINES SUR, PHILIPPINES**

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This paper focuses on the results of the impact assessment of the Techno Gabay Program (TGP) involving the Farmer Information and Technology Service (FITS) in Camarines Sur. The TGP is one of the banner programs of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) which was conceived and implemented because of the need to: provide information and technology services in Agriculture, Forestry, and Natural Resources (AFNR) sector via an effective mechanism; strengthen the link among technology generators, technology servers and technology adopters; and complement the efforts of local government units (LGUs) and Rural-Based Organizations (RBOs) in providing information delivery and technology services. The impact of the TGP on cabbage production was done by estimating time invariant stochastic production function and linear inefficiency effects model. Results showed that farmers had low awareness on TGP modalities. However, farmers who availed of TGP services had higher yield than before. Higher technical efficiency levels of the clients can be attributed to the TGP services provided by the FITS center. Technical efficiency was influenced significantly by higher quantity of

seeds and nitrogen used and low labor utilization as a result of reduced use of other farm inputs in the production system.

**EVALUATION OF THE COMMUNICATION MATERIALS PROMOTING NATIVE WILD SUNFLOWER (THITONIA DIVERSIFOLIA) AS ORGANIC FERTILIZER IN BANAUE, IFUGAO**

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The research is a formative evaluation of the communication materials promoting native wild sunflower (*Thitonia diversifolia*) as organic fertilizer. Case study design was used to evaluate the communication materials in terms of attractiveness, comprehensibility, acceptability, and intent to practice. The materials pretested (such as posters, leaflet, and storybook) were developed through a participatory communication materials development. The study was conducted using focus group discussion guide and self-administered questionnaires. Community leaders from different barangays of Banaue, Ifugao served as the respondents of the study. Data were analyzed using frequency counts and percentages. Results showed that the communication materials (particularly the posters) quickly catch the respondents' attention. High scores on knowledge tests indicated high comprehensibility among the respondents. Being products of a participatory communication materials development, the materials pretested were highly acceptable for the respondents. Various suggestions were also given by the respondents to further improve the materials.

**CAPTURING THE SOCIAL DIMENSION OF UPLAND VELERO CROP PRODUCTION IN KALINGA: A KEY INGREDIENT FOR RURAL DEVELOPMENT**

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Organic farming is becoming popular in Kalinga, but its adoption is very slow among the smaller farmers. Some farmers have mentioned that it is very expensive because they need to rehabilitate first their highly-stressed farms. This study documented the indigenous organic farming practices and continuous enhancement that could be easily adopted by small farmers because of affordability, besides being home-grown. Specifically, the researchers conducted survey and needs assessment of production practices for selected VELERO crops; synthesized indigenous organic production of selected vegetables, legumes and root crops; determined the post-harvest practices, marketing strategies and pricing trends for selected vegetables, legumes and root crops; determined the household dynamics and attitude of farmers toward organic vegetable, legume and root crop production; made a profitability analysis of organic VELERO. Based on the findings, upland farming system in Kalinga has great potential for organic agriculture although production is labor intensive but does not rely much on chemical inputs. Furthermore, seed materials are conserved for continuous production. The following recommendations are forwarded: conduct an extensive assessment to identify the farms suitable for organic agriculture; establish a market for organically produced crops in the area to encourage farmers to go organic, and coordinate with LGU and other agencies to assistance farmers in procuring organic certification.

**SOCIO- ECONOMIC PROFILE OF VELERO FARMERS IN THE UPPER MUNICIPALITIES OF APAYAO**

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The socio-economic profile of Vegetable, Legumes and Rootcrops (VELERO) farmers in the upper municipalities of Apayao, namely: Calanasan, Kabugao, and Conner, was determined. The descriptive survey method was used in the study. Results revealed that majority of the VELERO farmer-respondents had more than four children and attained elementary education. Aside from VELERO farming, they raised livestock such as pigs, ducks and chicken and planted rice and corn. VELERO farming was done in their backyards, ricefields and cornfields. Most of the VELERO planted were ingredients of “pinakbet” or “dinengdeng” delicacies including gabi, ube, kamoteng kahoy, beans and pechay. Majority of the farmers practiced organic VELERO production by using decomposed plants/leaves and animal manure, or if they could afford them, bought commercial organic fertilizers from authorized dealers. In terms of length of VELERO farming, farmers had been into VELERO production for more than 11 years. They utilized just a portion of their land for VELERO farming - about less than a square hectare both for family consumption and for sale to augment income.

**SURVEY AND IDENTIFICATION OF INSECT PESTS AND DISEASES OF ORGANICALLY GROWN VEGETABLES AND ASSESSMENT OF EXISTING PEST MANAGEMENT PRACTICE**

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A survey was carried out to gain a thorough understanding of the level of farmers' knowledge of insect pests and diseases; establish information on farmers' pest control methods, and identify knowledge gaps. One hundred and forty-two farmers were interviewed in three primary VELERO growing areas in Kalinga Province. Farmers acknowledged aphids and lady beetles to be the primary pre-harvest pests for legumes; for vegetable crops, lady beetles; for root crops, horn caterpillar during foliage stage and white grub during root crop development regardless of the cropping season. Aphids posed the most serious threat to rainy season crops, and were severe under warm, dry conditions and on late-planted crops. Pests remained largely uncontrolled due to lack of knowledge of appropriate control measures. Socio-economic constraints were also cited by both farmers and researchers. Among farmers applying pest control, chemical pesticides were the most common method used in the lowland. But in the upper areas, chemicals were not common and instead the respondents relied on locally available plant material extract, kitchen ash, drenching with water and hand picking. Knowledge of postharvest control practices was greater than of preharvest practices. Although ash and chemicals were the most common control methods, sun drying of plant materials and hanging for smoking were also used by some. There was a huge variation in the dosages used - these were usually either inadequate or excessive, and rarely as recommended. Based on the results of the survey, the researchers stress the urgent need to improve the existing but cheap, effective control measures both for pre- and post-harvest pests of VELERO crops. Furthermore, information on these cheap yet effective control measures should be disseminated extended to smallholder farmers as soon as it is available.

**WOMEN PARTICIPATION IN LIVELIHOOD PROJECTS IN THE SCIENCE CITY OF MUÑOZ, NUEVA ECIJA, 2009**

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The fundamental query is to identify factors related to women participation in livelihood projects and determine whether these livelihood projects have contributed to the wellbeing of women and the community, as perceived by the women themselves. Stratified random sampling using proportional allocation was used in selecting the respondents from three barangays of the Science City of Munoz. These barangays have the most number of livelihood programs implemented by the local government. Results showed that women's aspiration and level of participation tends to increase together. Other

factors that increase with level of participation are age, length of residence in the community, and access to information about the projects, while the number of children and household size of women hinders their participation to these livelihood programs. Satisfaction on the implementation of the programs and appreciation in terms of personal and community development through these livelihood programs also increase with the women's level of participation to the activities. Also, Perceived personal gains, community gains and satisfaction on livelihood programs of women involved and not involved in planning, implementation and monitoring are significantly different. Overall satisfaction of women who volunteered and those who were only requested/ encouraged to join are also significantly different. Findings of the study provide evidence useful to the Science City of Munoz leaders, planners and implementers for effective promotion of these livelihood programs with the fundamental goal of helping the community's rural poor through the women in the community.