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***Building Resilient Communities through Agriculture***

**ABSTRACTS OF PAPERS AND POSTERS**

**APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) ON THE  
VULNERABILITY ASSESSMENT OF WATERSHEDS AS A TOOL IN REDUCING  
CLIMATE CHANGE IMPACTS ON AGRICULTURAL PRODUCTION, BIODIVERSITY  
CONSERVATION AND ENVIRONMENTAL HAZARD AVOIDANCE: THE CASE OF  
YABO NAGA WATERSHED, CAMARINES SUR**

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Due to climate change, natural phenomena and man-made disasters have become more frequent and devastating, threatening agricultural production systems and the livelihood of many people. The vulnerability of Yabo-Naga watershed in terms of natural and human induced risks and its impact to agricultural production were assessed following the Integrated Ecosystem Management Approach or “ridge to reef” policy of the DENR. The vulnerability of the Yabo Naga watershed was analyzed using Geographic Information System (GIS). Spatial maps and overlaying surface components of combined factors were generated to validate the relative contribution of various attributes to the occurrence of hazards. Consequently, less hazard prone areas most suitable for development; areas where further evaluation are required; and areas where mitigating measures should be prioritized were defined. Biophysical and socio-economic parameters were determined and reflected in thematic maps that serve as primary inputs in determining hazards and degrees of vulnerability.

Final output consisted of vulnerability maps indicating the degrees of susceptibility to flooding, soil erosion, biodiversity loss, water pollution and grassland fire. These vulnerabilities were analyzed in terms of impact to agricultural production. The watershed vulnerability to flooding, landslides and soil erosion, biodiversity loss, grassland fire, and water pollution ranges from moderate, high to very high, adversely affecting agricultural production both in upland and lowland areas. Due to their incapacity and lack of understanding of such hazards and vulnerabilities, the people and the communities are at risk. The empirical data and information generated by the study contribute insights and understanding to address the roots of vulnerabilities and reduce losses of lives, further degradation of resources and environment due to natural and human induced hazards. The outputs of the study also help in designing effective and efficient strategies and approaches to manage and reduce risks, and hence the occurrence and magnitude of disasters.

**INDICATIVE SPATIAL SOIL FERTILITY MAPPING  
OF LAND MANAGEMENT UNITS (LMU’S) FOR RICE USING QUANTUM GIS**

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The application of fertilizers is one important intervention in raising crop yield such as in rice. Generally, soil test and/or plant tissue analyses are used as basis to determine appropriate rate of fertilizer to apply on individual crop. Unfortunately, data on soil analysis especially at the Land Management Unit (LMU) level are often unavailable. If ever they are obtainable, many farmers do not

know how to use soil and/or tissue test results. Indicator-based mapping can generate maps that can be made easy for both ordinary farmer and technicians to use. The Geographic Information System (GIS) is one valuable tool that can help generate databases of soil properties at the same time present the spatial data into simple maps. This study utilizes Free and Open Source Software for Geomatics (FOSS4G) tools such as Quantum GIS and Open Office to develop soil databases and LMU-based indicative spatial soil fertility maps. The study utilized soil survey reports to gather basic soil information. Meanwhile, provincial production data were obtained from the Bureau of Agricultural Statistics to match rice performance record with soil data. Random key informant interviews were conducted to gather additional data (e.g. farmer profiles, rice varieties, and yield). In order to update soil information, soil samples were collected from each representative LMUs which were qualitatively analyzed for NPK and salinity level using the ASC-UPLB Soil Test Kit (STK). Nutrient Manager (NM) was utilized to find out what and how much fertilizer must be added for rice varieties planted in the sampled farms. Overall, the LMU's with clayey soil texture has high potential to supply essential nutrients to rice crop as indicated by the  $>24$  cmol kg<sup>-1</sup> CEC values and the medium base saturation ( $>20\%$ ) level. However, it was noted that several farms have very low (1-2%) organic carbon. This means N is generally limiting in most rice fields included in the study and therefore would require regular application of N fertilizer in order to maintain high and sustainable yield level. Further, the observed variability of fertilizer recommendations based on NM for different rice variety and under different LMUs would suggest that blanket fertilizer recommendations are not advisable to improve rice yield. It will not also help increase fertilizer use efficiency.

**HOW VULNERABLE ARE THE UPLAND COMMUNITIES TO CLIMATE CHANGE?  
A SYNTHESIS OF COMMUNITY-BASED FOREST MANAGEMENT (CBFM)  
CASE STUDIES AND POLICY ANALYSIS**

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CBFM as a strategy refers to all organized efforts of the government to work with local communities in and adjacent to public forestlands. It underscores the principles of social equity, sustainability and community participation in forest management and biodiversity conservation. Through the CBFM strategy, the government empowers and allocates to local communities portions of the forestlands for development, protection, management, conservation and further grants them access to utilize forest resources. Thus, CBFM is seen as a key forestry program that can meet the challenges associated with climate change. The various CBFM activities including natural forests management, degraded lands rehabilitation and agroforestry are supportive of the objectives of promoting ecological stability and promoting livelihood opportunities for upland communities. This study assessed the readiness of the CBFM program to meet the challenges of climate change by doing a content analysis of its various policy issuances and by looking into the actual bio-physical and socio-economic accomplishments of CBFM program. Different sets of criteria and indicators were formulated and tested to determine its contribution in reducing the impacts of climate change and whether the CBFM program adds to the resiliency of the forests and forest communities to adapt to climate change. Content analysis showed that climate change concerns are not mainstreamed in the various CBFM policy issuances, as these concerns are not explicitly mentioned in the policies. Despite this, CBFM policies are directed towards forest conservation, sustainable resource management and the enhancement of socioeconomic welfare of forest-dependent communities that have the potential to reduce current vulnerability of forests and upland communities. Review and analysis of the accomplishments of CBFM on ground revealed that: (1) current CBFM programs and projects help improve forest condition in a number of places; (2) CBFM may not have significantly reduced current vulnerability of communities to climate-related and other socioeconomic stressors considering the limited livelihood opportunities developed by the project.

**DEVELOPING SITE-SPECIFIC SPATIAL AND SYSTEMS MODEL OF LANDSLIDE SUSCEPTIBILITY INDEX (LSI): THE CASE OF GEN. NAKAR-INFANTA, QUEZON**

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Landslides are responsible for the considerable loss of agricultural production, infrastructure and lives in the entire world aggravated by increased urban development, landuse change and abnormal weather (rainfall). Successive typhoons hit Infanta-Gen. Nakar area from November 13, 2004 to December 03, 2004 causing floods and landslides. This study attempted to develop a site-specific landslide susceptibility index (LSI) model using Geographic Information System (GIS) for spatial analysis and STELLA for dynamic systems modeling. Landslide prone areas were sampled and analyzed for soil texture, atterberg limits and Cation Exchange Capacity (CEC). Random household survey and key informant interviews were also conducted to solicit first-hand information on the experiences and the possible causes of landslide in the area. Landuse maps were generated from 2002 and 2008 TerraLook satellite images. Modeling was done thru GIS and STELLA. Result of the soil survey and analysis showed that the soil in the study area is generally deep to very deep (>1m), red clayey soils, low-medium clay activity (CEC=16-45 cmol(+)/kg) and increasing plasticity index (PI) with increasing clay. In the span of six years (2002-2008) drastic change in landuse of the case study site was observed resulting in 52.27% reduction in forest cover, increase in annual crops, coconut mixed with crops and shrubs and built-up areas, respectively. The spatial landslide susceptibility model showed that as 24-hr total rainfall reaches 150mm, susceptible and highly susceptible areas increased by 37% and 110%, respectively. The site-specific LSI systems model also reveals that changes in vegetation accompanied by unusually high 24-hr total rainfall had high susceptibilities. Susceptibility to landslides is greatly affected by vegetation, geophysical characteristics and climatic conditions. On the other hand, human activities (e.g. charcoal making) indirectly affect landslide susceptibility thru removal and change in vegetation cover.

**ASSESSMENTS OF THE HANUNUO WOMENS' UPLAND FARMING SYSTEM AND IMPLICATION TO CLIMATE CHANGE ADAPTATION**

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This paper aimed to analyze the sustainability of the upland farming system of the Hanunuo Mangyan women in Occidental Mindoro and find out its bearing on the present condition of the environment. This further intended to either enrich or debunk the theory within the mainstream society that the Mangyans have been a party to the unabated destruction of the forest resources due to their economic activities. This also determined the Hanunuo women's socio-economic and psychological characteristics, farming practices, and perceptions regarding natural resource management. The women are young with basic education and are actively involved in community organizations. They are small landholders with swidden farming and charcoal making as the major sources of living. The Mangyans aspire for a better life. They believe these are possible through hard work, patience, perseverance, and faith in their capability, and strong government support. Their greatest fear is getting sick and having a fatal accident. The women's problems are low productivity and income, proliferation of vices in the community, and deliberate deterioration of their children's values. The ecological problems experienced include land deterioration and erosion, emergence of crop pests and diseases, natural calamities, and climate change. Some of the women's farming practices are not environment-friendly. The lack of viable economic options forced them to abandon other traditional ecological practices. Similarly, modern agriculture not appropriate to their upland conditions has slowly penetrated their farming system. The women are aware that some of their economic undertakings are detrimental to the environment. But the thought of environmental degradation is not a concrete motivation for them to stop engaging in those activities because of their greater cash need for food and children's education. The upland farming system is traditional and

subsistence agriculture. The women are in the quandary being deliberate wayward stewards of the environment as they are confronted with intertwined social, cultural, economic, environmental, and political problems and issues.

**SAGIP-LUPA: SOIL CONSERVATION TECHNOLOGY AND WEED MANAGEMENT**

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Sagip-Lupa (GSL) Soil Conservation Technology and Weed Management is a study that advocates for the technology that shall address the concerns of preventing soil erosion through sustainable agriculture. GSL also seeks to determine the best option that is environmentally friendly, safe to users, cost effective and practical to use in light of sustainable agriculture. The project started in February 2005 to end this year 2010. The five (5) study sites are Quezon (corn-corn-corn) with slope topography of 12%, Batangas (upland rice-corn-upland rice) – topography of 10%, Benguet (potato-cabbage-potato) – topography of 30%, Isabela (corn-corn-corn) – topography of 15-20% and Nueva Ecija (lowland rice) – flat topography. There were two treatments in the study. The use of non-selective, contact and post emergent herbicide (NSH) at the rate of 2-3 li-prod/ha versus the conventional farmer's practice (FP) of weed management. The results showed significant soil erosion reduction in all GSL sites as compared to FP. GSL percent soil erosion reduction over FP in Quezon, over a period of five (5) years was 62.90%, 56.31% in Batangas, 55.05% in Benguet and 52.10% in Isabela. Another advantage of the GSL technology is economic benefits. Reduced input costs were found to all GSL sites. Cost savings over FP was 37.96% in Quezon (corn); 20.61% (upland rice) and 26.38% (corn) in Batangas; 58.85% (cabbage) and 61.86% (potato) in Benguet; 35.12% in Isabela (corn) and 44.7% cost savings in Nueva Ecija (rice). Five-year period in the GSL treatments and sites showed significant trends of yield increase over FP. Over-all, the GSL technology on its 5<sup>th</sup> year proved to be an effective alternative remedy in minimizing soil erosion, while providing high yield and excellent weed control in sloppy areas.

**SHOWCASING INTEGRATED FARMING (CROP-LIVESTOCK) TECHNOLOGIES AS COPING MECHANISMS FOR LOWLAND AND UPLAND TYPHOON DEVASTATED COCO BASED FARMS: A REHABILITATION STRATEGY**

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With the onslaught of Super Typhoon Reming in Albay in 2006, the coconut farms were devastated. It was estimated that it would take about four to five years for the coconut to fully recover. The challenge therefore is to encourage these farmers to rise up by giving an alternative source of income while waiting for the coconut to recover. Thus the focus of the intervention was to showcase adaptive agricultural technologies that would encourage farmers to fast track rehabilitation. This research aimed to showcase technologies that would address rehabilitation of both upland and lowland cocobased farms. The two set-ups differ on its implementation strategy but basically adopted the Science and Technology Based Farm (STBF) approach of PCARRD under the Techno Gabay program. The first set-up in a hilly land farm followed the standard STBF modality with only the Magsasakang Siyentista involved in the establishment of the Techno-demonstration in Malabnig, Guinobatan, Albay. The upland farm had now fully recovered with well established contours and cash crops including the native chicken and goats. Coping strategies such as establishment of contour hedgerows to prevent soil erosion, practice of minimum tillage to avoid over exposure of the soil to

extremes of temperature and use of indigenous or native varieties adaptive to changing climate were the good agricultural practices showcased. The overall total income of the farm manifested a positive trend with a remarkable ROI. The second set up was a techno demo farm which was established in a lowland cocobased location at Paulog, Ligao City. Overall attaining a 65% ROI for the total crops grown in the site, the potential therefore of the technologies showcased cannot be overlooked. As part of the project output, a simple tunnel type structure dubbed as “Teknolohiyang Maogma asin Kayang Kaya” was developed. The structure was modified to suit the financial capability of local farmers and suitability to local conditions, is the first of its kind in the area. The structure was tested to withstand the strong winds, heavy downpour and severe heat of the sun. Thus, its acceptability to the farmer was unquestionable. The farmer members have now adopted the technologies introduced in their farms and have a common leased farm growing sweet corn and vegetables. Integration with native chicken has the potential of elevating the ROI. The native chicken was the source of income of the farmer during the El Nino from February to June 2010. Two groups of farmers underwent the season long training with a techno demo farm and adapted the technologies. With these experiences, the rehabilitation of these agricultural farms can be ensured. With emphasis on agribusiness ventures, the opportunity for contributing to agriculture resiliency can be sustained as an adaptive strategy to address climate change impact and can be a venue for replicability for other areas in the country.

**REGIONAL BOTANICAL GARDEN: A MODEL FOR CONSERVING RAINFOREST AS A CLIMATE MITIGATION MEASURE IN THE PROVINCE OF APAYAO**

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Dubbed as the “Last Forest Frontier in the North,” the province of Apayao is endowed with rich forest resource covering almost 70% of its total land area. Threatened with the increasing number of upland dwellers, the Apayao State College, Local Government Unit of Luna, and the Department of Environment and Natural Resources came together for a common goal of establishing the Regional Botanical Garden, as model for forest protection. The Regional Botanical Garden (RBG) is situated at Marag Valley, once the haven of the New People’s Army during the 80’s, and now habituated by various indigenous people such as Isnags, Ibanags, Igorots and others. The RBG has a total land area of 1,025 hectares. Impact of the project includes biodiversity conservation, a climate change mitigation measure to reduce risk of drought and other natural disaster, and increase awareness of communities on forest conservation.

**MANAGING WATER RESOURCES: CLIMATE CHANGE MITIGATION LESSON FROM THE INDIGENOUS PEOPLE OF APAYAO**

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The Nagan and Maton River, located at Pudtol, Apayao are the main river tributaries of the mighty Apayao River. The Apayao River supports irrigation to thousands hectares of farmland in the municipalities of Pudtol, Luna and some parts of Abulug. To conserve and protect the river systems and their watershed ( the Agora Wildlife sanctuary), the Isnags headed by Mayor Batara Laoat organized the NARIMAG ( Nagan River Management System). NARIMAG utilizes indigenous knowledge and practice (IKP) in protecting Nagan and Maton River including Agora Wildlife sanctuary. The IKP is interfaced with government laws on water management. The impact of NARIMAG to climate change mitigation includes: reduction of drought incidence; provision of haven to flora and fauna species (aquatic and terrestrial); lessening the threat to loss of biodiversity; reduction of expenditures especially on imports of major food crops (rice and corn); and strengthening social capital to sustain IK climate change mitigation measures.

**PROMOTING AGROBIODIVERSITY: STRATEGY FOR CLIMATE VARIABILITY  
ADAPTATION IN THE UPLANDS OF APAYAO**

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Conventional farming system in the uplands of Apayao follows monocropping system usually rice. Decline in the productivity of rice production system has been experienced by upland farmers for the last two years due to erratic weather patterns and other environmental factors. Addressing this concern, this project has been conceptualized. This paper focuses on the promotion of agrobiodiversity as a strategy for enhancing adaptive capacity of upland farming communities in the province of Apayao. It utilizes various modalities for promoting diversified farming system models which could withstand the erratic weather condition of the province. Agrobiodiversity system utilizes various crop combination models to newly established plantations and enhances existing agroforestry farms.

**THE DISASTER PREPAREDNESS MEASURES IN THE HIGH-RISKS BARANGAYS OF  
THE PROVINCE OF ALBAY**

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This paper looks into the preparedness of the different identified high-risk barangays in the Province of Albay. Specifically dealt with in this paper are the status of the disaster management program, and the level of preparedness of the province along the different phases of the disaster management cycle. The phases of the cycle are prevention, mitigation, response, recovery and rehabilitation. Finally, this looks into the policies that may be suggested to further enhance the practices mandated and done at the grassroots level. The crunch and release model is used as the prime theory for this study, duly supported by the AGIL Scheme of Talcott Parsons and the normative theory on comprehensive disaster management. This utilized the survey for the 115 barangay captains/Barangay Disaster Coordinating Council Heads of the listed high-risk communities in the Province. The findings of the study revealed that (1) there is an existing organizational structure within the province from its level down to the barangay level that responds to disaster. The resources that are existing and functioning very well in the society are barangay officials (manpower), tricycles (transportation), barangay halls (infrastructure support) and megaphones (equipments). Department of Social Welfare and Development is the one with whom the barangays has the greatest linkage and majority of the barangays do not have linkage with private entities. (2) The province is adequately prepared when it comes to prevention, moderately prepared in mitigation; response, and; recovery and rehabilitation. (3) The problems related to disaster preparedness: dredging canals (prevention), lack of proper coordination (mitigation), delayed distribution of relief goods (response) and, lack of funds (recovery and rehabilitation). (4) Among the policies identified for formulation are forced evacuation, availability of training programs, proper information dissemination, conduct of barangay assembly during times of disaster, funding for medicines and, strict implementation of building codes. The different municipal/city disaster coordinating councils and the province share the same vision, mission and goals when it comes to disaster management but this still needs to be formulated, agreed upon and worked on by all the municipalities and cities. The level of capability of the province along the different phases of disaster management is varying. Finally, the paper also presents various recommendations to several local government units.

**COCONUT-BASED FARMING SYSTEMS IN RIZAL, OCCIDENTAL MINDORO AND ITS  
RELATION TO SELECTED FARMERS' CHARACTERISTICS**

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Characteristics of coconut farmers in Rizal, Occidental Mindoro and their adopted farming systems are not yet documented. Aware of this, a total of 54 coconut farmers were purposively selected and interviewed. Using the descriptive-correlational design, a researcher-constructed interview schedule was used in the data gathering. Coconut farmers had a mean of 33.06 years of experience in coconut farming. Majority were high school graduates, owners of coconut farms measuring on the average 1.48 hectares. Households were composed of three members, who also contributed labor for the different activities in the farm. As to communication, they had relatively low exposure to sources of information, indicating that they failed to avail the different relevant information about coconut farming that was offered by these sources or media. Monoculture was still practiced by coconut farmers. However, there are those who adopted intercropping of vegetables, fruit trees and forest trees to the coconut trees. Raising of poultry, goats, swine and cattle were likewise adopted. The primary purpose was to have a better living by having a diversified source of income and readily-available food. Likewise, these were intended to increase the productivity of their coconut farms. Correlation analysis found out that the variable farm size and exposure to media were significantly and moderately related to the adoption of coconut-based farming systems. Other profile variables were not significant correlates. It is recommended that relevant information should be relayed to the coconut farmers to make them equipped with new knowledge and skills. Various communication media must be tried. Likewise, focus group discussion (FGD) and key informant interview (KII) are recommended. Further related studies should also be conducted.

### **CAPABILITY AND VULNERABILITY TO FLOOD OF THE MUNICIPALITY OF MILAOR, CAMARINES SUR**

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Milaor's geographical location determines a significant weight on the social and economic structures of its neighboring the towns and city. It is characterized as flat to gently sloping with 0 – 3 percent slope. The area particularly the western barangays being situated in the low-lying portion of the Bicol River basin area and is 0.2 meter below sea level makes a large portion of the municipality susceptible to frequent flooding. Further, it has two types of soil texture, namely clay and clay loam, and is being traversed by the Bicol River and specifically passes along seven barangays. The study was conducted to look into the capability and vulnerability to flood of the Municipality of Milaor, Camarines Sur. Results of the study revealed that the elements at risks to flood of the Municipality of Milaor are its population - 26,452 (NSO 2007), lifelines (water system, power supply and communication facilities), social structures (educational institutions, parish church and the formation center), infrastructures (municipal offices, provincial and barangay bridges and concrete road) and sources of livelihood (farming and agri-related income-generating activities). Population most at risk during flood is 45.89% (12,138 persons or 2467 families) (MSWO 2008). The capability of the community is manifested through the resiliency of the households and by equipping themselves with "salbabida", boats and life vests, strong family ties, existence of 13 formal education institutions and 5 evacuation centers.

While the vulnerability is its geographical location (0.2 m. below sea level), the high poverty level on the eastern part, and majority of the houses are single-storey and made of wood. The Municipality of Milaor focuses its efforts on preparedness in terms of response. It reinforces the community's capacity by providing trainings for Basic Life Support, Watermanship and other relevant disaster response trainings. The recommendations are: creation of the Milaor Disaster Management Office and Barangay Disaster Management Offices; capability building/enhancement; trainings/education of household members; advocacy and aggressive information dissemination; and mitigation and intervention strategies such as formulation of local policy and sanction on sanitary solid waste management; installation of creek floodgates; and relocation of perennial flood victims.

**THE ECONOMIC POTENTIAL AND ECOLOGICAL VULNERABILITIES OF THE FISHERY RESOURCE OF BACON DISTRICT, SORSOGON, PHILIPPINES**

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Ecological safeguarding is essential in the face of the aggressive stance of the government to promote development along various areas. This is crucial in as much as economic development attained at the expense of the fragile environment is meaningless and unsustainable. The Rapid Resource and Social Assessment of Bacon District by the City Government of Sorsogon is a bold step to address scarcity of research-based inquiries regarding the status of fishery resources at least for the Bacon sector only, and the first comprehensive account of a coastal part of Albay gulf. The research undertaking made use of participatory resource assessment. The principal coastal habitats of a typical tropical marine ecosystem are found in Bacon District: coral reefs, extensive seagrass and seaweeds and mangroves. Their presence in sound states in Bacon district is a competitive advantage of the place against the impacts of many environmental challenges. Overall, the three habitats are in sound state, except to some signs of disturbances especially to corals inside Sogod Bay, which were reduced to rubbles due to blast fishing in the past. Siltation is also high in Sogod Bay and also a threat to a good coral assemblage off Sto. Nino and Osiao due to erosion of immediate upland periphery. The capture fisheries of Bacon District is a multigear type which harvests various species of mainly coastal and oceanic pelagics and hard bottom demersal fishes. Peak fishing operations happens from February, when the northeast monsoon weakened, up to June, prior to the onset of the southwest monsoon. Bulk of the fishing trips and 64% of the municipal fisheries production of the district is generated during this period. The fishing gears have diversified from 20 types in 1998 to 33 at the present time, a signal of increasing fishing intensity and scarcer resources. The coastal waters of Bacon District, Sorsogon City characteristically supports more production of the marine organisms because of the diverse plankton community and good water physical characteristics. Salinity, pH, temperature, turbidity and conductivity complied to DAO-34 standards set by DENR-EMB. The fisherfolks of Bacon District are original Bacongnons, mostly Catholic, have an average residency of 23 years and majority are elementary and high school graduates. The mean household size is 6.45 members. They have been fishing on an average of 24.17 years, and presently exert fishing intensities of 10.15 months per year, 3.19 weeks per month, 4.93 days per week and 1.43 times per day. Illegal fishing perpetrators are claimed to be people from outside of the repondents' barangay. The local government unit is viewed as the one responsible in stopping illegal fishing through its FARMC and law enforcement authorities.

**ECOFEMINISM: WOMEN'S WORK ON ENVIRONMENTAL CONSERVATION IN THE PROVINCE OF SORSOGON**

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This paper describes the perspectives of ecofeminism and the roles of women in environmental protection and conservation. Likewise, this paper delineates the interrelatedness between the oppression of the women and the degradation of the environment. The discussion is based on the issues such as women's perspectives of the environment; the nature of their participation in environmental protection and conservation; the challenges they encountered and the approaches they adapted in relation to the challenges; the roles played in the environmental protection and conservation; and their views on the connection between women and environment. This paper further argues that women are directly affected by the state of environment because of the traditional roles imposed by the patriarchal system of the society to the women like providing and preparing food; cleaning of the house; washing of the clothes and dishes; gathering of fuel wood; fetching water; and taking care of the children. The special links between women and the environment underscore the

following concerns: the position of women, the origins of women's victimization within the ecological crises and the solutions offered to save the environment and empower women.

**GENDER-BASED ROLES, MANAGEMENT PRACTICES AND NEEDS OF WOMEN FARMERS IN OCCIDENTAL MINDORO**

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Women do not only contribute to the agricultural labor force but also perform as agricultural managers and decision makers. They are involved in the production of food for the household and business but as to how much they have contributed, labor force statistics does not emphasize. Hence, development programs fail to address their specific needs. This paper describes the personal, family, and socio-economic characteristics of women farmers of Occidental Mindoro, Philippines. Their farm management practices and needs are also determined to identify interventions appropriate to their specific needs. They are small landholders who practice multi-cropping and are engaged in small-scale animal production. They are not affiliated to any organization and have not attended trainings especially those related to agriculture and farm business management. They have not received any technical and financial assistance from government and non-government organizations. The women do occasional farm record keeping but is not up-to-date which they use for planning and decision making. They do not seem to appreciate the importance of preparing project proposal. Sourcing of funds is the women's foremost consideration. The women farmers wish they could improve agricultural productivity and income so that they also attain better life. Study results show that development programs have not yet really served women probably because planners and policy makers still think that women nowadays are confined to traditional home management and child rearing roles. If there are any programs available in the communities, these have not benefited most women because these are designed for the men or for those who belong to organizations. Most women do not think of farming as a business but only a source for family subsistence so that they are not focused on other farming strategies or mechanisms that may give them higher return on investments.

**COPING MECHANISMS OF THE NEGRITOS OF LUNA, APAYAO**

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The Negritos are one of the deprived or perhaps the most deprived cultural minorities in the country. These tribal people do not give importance to formal education or school-based learning. Their opposition to school-based learning may be due to racial prejudice and their nomadic character. In spite of being poor and nomadic, they were able to cope up with the change in time amidst technological advancement. It is then important to look into the Negritos way of life able to cope up with changes in their environment. This paper deals with the coping mechanisms of the Negritos which has been a lesson for many generations of their existence against various disasters that came along their way.

**RESILIENCE IN FARM LEVEL FOOD SECURITY: LESSONS FROM THE ISNAGS OF APAYAO**

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The Isnags are the dominant ethnic groups in the province of Apayao. They were of malay-type ancestry who used to establish houses along bodies of water. Over the years, they have developed techniques to cope with farm stresses resulting to fluctuating yields of major crops. Some of their techniques are part of their cultural traditions which is handed down to generations. This paper

discusses the strategies of the Isnags in securing food over major disasters such as typhoons, floods and drought that contributed to the development of their resilience capacity.

**WEAVING MEANING TO THE PROCESS OF ENDING HUNGER AND  
POVERTY WHILE CARING FOR MT. MASARAGA WATERSHED**

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Conventional development approach looks at economic growth and maintaining ecological stability of the environment as incompatible goals. The Extension Service efforts of Bicol University College of Agriculture and Forestry since 2003 to present, has sought to end hunger and poverty while taking care of the environment. This paper presents the interventions to put to ground the attainment of the above mentioned goal. The search for meaning of a well grounded process of ending hunger and poverty while caring for Mt. Masaraga Watershed started in 2003 to 2006 via the implementation of the Program on Sustainable Agriculture and Biodiversity Conservation and Management as approaches. While initiatives undertaken yielded positive results, yet it fell short of realization of goal. In 2009, taking lessons from PSARD and addressing climate change impacts, the Values-Based Development Alternative for the Welfare of the Needy in Mt. Masaraga Project was conceptualized, funded and implemented. Strategies to implement the above mentioned goal are: (a) Self Help Group Formation, Stabilization and Empowerment, (b) Capacity Building, (c) Adaptive Research, (e) Community Managed Biodiversity Conservation and Management, (f) Community Managed Sustainable Nature-Based Enterprises, (g) Community Managed Disaster Risk Reduction and Management, (h) Participatory Domiciliary Nutrition Rehabilitation, (i) Participatory Project Self-Review and Planning, (j) Livestock-Based Agroforestry Farming Systems Development and Management and, (k) Local Environmental Governance.

**IMPACTS AND INFLUENCES OF SMALLHOLDER UPLAND DEVELOPMENT PROJECT  
IN ALLEVIATING POVERTY IN THE PHILIPPINE UPLANDS**

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For more than ten years, the Philippines has adopted the Community-Based Forest Management (CBFM) Program as a forest restoration strategy and for poverty alleviation in the uplands. The pattern of upland development since the adoption of the CBFM in 1995 has involved the provision of the following: a) security of long-term tenure to forestlands; b) assistance by the government to forest plantations, livelihood activities, and infrastructure and other support services; and c) involvement of government and NGOs in strengthening and empowering communities to implement such projects. The concept of CBFM departs radically from the traditional notion that considers forest occupants as the culprits of forest degradation. CBFM directly involves upland communities in developing, rehabilitating and protecting the forests. The implementation of CBFM assures the generation of employment opportunities in the uplands through seedling production; plantation establishment; forest protection and conservation activities; harvesting; processing; transporting and marketing of CBFM products. This paper documents and evaluates the impacts and influences of the CBFM program on the human well-being of the upland communities following the Millennium Ecosystem Assessment (MA) framework. This framework postulates that people are integral parts of the ecosystem and that dynamic interaction exists between them. This study showed that the CBFM participants had attained improvement in their well-being – i.e. marked increase in income over the benchmark income before they were awarded a CBFM project; and acquisition of several household and farm assets which were before uncommon to forest-dependent communities. There appeared to be inequitable access and enjoyment of resources, opportunities and eventually

material benefits generated by the CBFM Project. This study had identified several issues and concerns as well as policy recommendations toward this end.

**EMPOWERING COMMUNITIES FOR CLIMATE CHANGE ADAPATION THROUGH SUSTAINABLE AGRICULTURAL DEVELOPMENT EXTENSION PROGRAM (SADEP) IN OCCIDENTAL MINDORO**

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The Sustainable Agricultural Development Extension Program (SADEP) is now on the ninth-year of actively promoting environmental education and sustainable livelihood in the uplands and farming communities of Occidental Mindoro. This program aims to promote the use of ecologically sound farming practices; generate income through proper utilization of locally available resources; train farm households to increase their productivity; and increase community awareness on environmental conservation. The College forged partnerships and collaborations with organizations, and private individuals in the implementation of projects in agriculture, environment, livelihood, and education. Observed impacts include: (1) adoption of ecologically sound farming practices, (2) generation of sustainable livelihood, (3) increased farm productivity and income, (4) creating healthier, cleaner and greener communities, (5) improved farmers' access to information, technology, and service institution, (6) forging of partnerships among development organizations and agencies, and (7) enhanced decision-making capability. The program can be a very effective instrument in bringing development to the countryside. It has achieved the following: enabled the generation of sustainable livelihood among farming families; enhanced community awareness on environmental conservation and protection; rekindled aspirations of the people to attain better lives; and helped strengthen the Institution's working relationships with other organizations. The collaborations formed reinforced the projects of SADEP and opened many socio-economic opportunities to the communities. It is recommended that partnership with the community and other local organizations must be institutionalized to help monitor, evaluate, and sustain the different extension projects. Existing linkages must be strengthened and other organizations with similar undertakings must be invited to improve delivery of services. Continuing capability building of communities especially in natural resource management and entrepreneurship is necessary. An impact study should be conducted to find out the projects' contribution to the quality of life in the rural communities.

**ENHANCING PRODUCTIVITY OF BICOL RICE FARMERS THROUGH INTEGRATED FARMING SYSTEM: THE PALAYAMANAN MODEL**

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Palayamanan, a project coined from the two words "palay" – a Filipino term for rice at any stage prior to husking and "yaman" – also a Filipino term which means wealth was introduced. The Palayamanan Models are composed of well-integrated components harness and maximize use of farm resources and highlights the interconnectivity between each resource and by-products in the various farming systems. Productivity of many small farmers remains low because of declining productivity of growing monocrop rice. With the increasing cost of lands and inputs and yields of inbred rice varieties reaching a plateau, the income of the farmers has increased tremendously. The income derived from growing a hectare of rice is below the poverty threshold and makes it difficult to meet the tool requirements for the farm family. There is therefore a need to promote diversified and integrated farming system to generate more income. Diversified rice-based farming systems by

integrating crop production, pomology, aquaculture and waste recycling resulted in higher productivity and income that assures food security, reduced production risks and economic stability and sustainability of the farm system. The Community-based Palayamanan Model Farms were piloted in seven sites nationwide representing the upland, and saline-prone areas nationwide. Each community-based Model composed of a core group of 10-15 farmers, who conduct the participatory technology development. One Palayamanan Model Farm was also established in each community which served as community seed bank for planting materials and animal stocks and as learning center. A core group of 5-10 farmers attended the farmers' field school and other capacity enhancement activities. The number of farmers increased exponentially over time. Each community-based model was provided Php 100,000 for the acquisition of farm inputs that were loaned to the farmers. The proceeds from the loan were funneled back to the project. Partnership and complementation with 565 ECB Philippine Army, Department of Trade and Industry, Department of Environment and Natural Resources, Department of Agrarian Reform, Ginintuang Masaganang Ani Programs and various LGUs enhanced the pooling of technical knowledge and financial and physical resources in delivering services and development mechanisms to sustain gains in Palayamanan.

### **EMPOWERING RURAL COMMUNITIES THROUGH VALUES ENHANCEMENT AND LIVELIHOOD PROGRAMS**

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This research cum extension program jointly undertaken by Sorsogon State College and Energy Development Corporation (EDC) aimed at empowering rural communities through values enhancement trainings and livelihood projects. Using survey questionnaire, interview, observation, and focus group discussion in data gathering, the 577 respondents of the nine barangays of Sorsogon City and Manito, Albay claimed to possess positive attitude toward improving their skills and supporting the development projects in their communities. Justice and peace, faith, and love of God are their common values. They hope for a progressive community, aspire for unity and cooperation and believe that they can still improve their social, spiritual and economic status in life. Majority preferred to have more trainings on agriculture/fishery, baking rice products, and meat/fish processing. The extension program, *Advocacy for Livelihood Intervention and Values Enhancement (ALIVE)* was implemented in the nine barangays benefiting 1,353 members. The following were undertaken: (1) organized the residents into various sectors and cooperative; (2) undertook self-awareness and values enhancement trainings; (3) conducted trainings on various livelihood projects along the four sectors; and (4) established livelihood programs for the members such as aqua-silviculture, lambaklad, fish corral and fish net loan assistance for fishing sector; rice production, agricultural loan assistance and food processing for lowland agriculture; production of high-value vegetables and coco coir production for upland sector; and labor contracting like welding, riprapping, and other construction-related work for the labor sector. Most respondents have positive perceived values. Thus, it is recommended that a continuous training on values be conducted among the residents. Nevertheless, the trainings on self-awareness have enhanced the level of awareness of their capabilities, confidence and commitment to improve themselves. The livelihood programs have increased family income and made them more self-reliant, productive and empowered to manage some livelihood enterprises in their communities.

**SOCIO-ECONOMIC PROFILE AND PRACTICES OF RICE TERRACES FARMERS IN  
UPPER APAYAO**

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This study was conducted to determine the socio-economic profile and practices of rice terraces farmers in Conner, Calanasan and Kabugao, Apayao. Descriptive survey method was employed in the study. Most of the respondents are male, age 31-40 years old, married, have attained elementary level, with 5 and more children studying in public schools. The primary source of income is farming, and in order to augment income they do livestock raising, vegetable and root crop gardening. Most of the respondents owned a house and lot but in semi-concrete, bungalow type. The respondents are members of farmer's association and have attended trainings on farming. Some of the cultural practices includes pisit, bunyag, tadog, say-am, atang, mangatugangan, mogahupag, magdewas, pasalip and ragragsak. The farmer-respondents cultivate both native and commercial hybrid varieties within the rice terraces in Conner, Calanasan and Kabugao, Apayao. Organic farming is employed by farmers. There is a need to strengthen indigenous practices in the conservation of rice terraces and management practices to increase rice yield and maximize income of farmers, conduct further study to correlate the relationship of the social and economic status, and cultural practices in the conservation of rice terraces; and conduct information dissemination on the advantages of using traditional varieties of rice.

**ENHANCING THE EMPLOYABILITY OF AFNR GRADUATES IN THE BICOL REGION**

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The Colleges of Agriculture in the Philippines are facing some major challenges requiring new educational strategies, innovative leadership and institutional reforms that take into account the current trends and factors that influence agricultural and rural development. Due to the declining opportunities of agricultural graduates, student demand on agricultural education has been decreasing rapidly in the recent years as evidenced by the dwindling student enrollment suffered by all agricultural colleges in the Philippines. The changing nature of agriculture in the Philippines provides both "push" and "pull" dynamics for agriculture graduates to engage in entrepreneurial activities. For agriculture and potential new entrants into agriculture to capitalize on opportunities in the business environment, a shift in focus from *agricultural producer* to *agricultural entrepreneur* is imperative. The project aims to enhance the employability and entrepreneurial abilities of AFNR graduates in the Bicol Region. The project trained 150 AFNR graduates from six SUCs. Training modules on entrepreneurial personality, enterprise planning, marketing, bookkeeping, and financial management were used. The training included the employability enhancement, job fair, internship, business plan preparation and presentation. The entry level of entrepreneurial competencies of trainees reveals weakness on risk-taking which is very important in entrepreneurship. However, after the training this became very satisfactory. Both male and female trainees were only satisfactory in demand for quality and efficiency and risk taking. These became very satisfactory after the training. Post-test showed improvement in the trainees' knowledge on the principles and concepts of entrepreneurship. After six months of completion of the training, the post-evaluation reveal that 70 trainees (47%) have established their own business enterprise. Out of this number, 58 trainees (39%) availed loan financing from the project and 12 trainees (8%) used their own money to establish their business. There were 56 trainees (37%) who were presently employed in various agribusiness firms.

**AFNR CURRICULAR PROGRAM ENHANCEMENT THROUGH THE INTEGRATION OF  
ENTREPRENEURSHIP IN TECHNICAL COURSES**

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Traditionally, agricultural education in general is geared towards the acquisition of necessary knowledge, skills and capacities related to the specific technical or scientific field for employment. The objective is very seldom to enter into business or to create a new venture, although it might be a final outcome. It is this fundamental difference in context that necessitates a re-look at the applicability of current entrepreneurship education models to the Philippine agricultural context. The project aimed to enhance the AFNR curricula through entrepreneurial skills integration for AFNR students. The curricula for all AFNR courses in the seven SUCs in the Bicol Region were subjected to review for purposes of looking into the feasibility of integrating entrepreneurship into these courses. Implementing guidelines/mechanics for this purpose was formulated in a workshop. The students together with their parents were given orientation regarding the integration in their courses. The faculty-mentors who were trained by the project in the integration carried out the following activities: (1) enhanced their teaching syllabi by including topics on the principles and concepts of entrepreneurship; (2) conducted lecture-discussion on the topics included; (3) supervised the preparation of business plan of students; and (4) supervised and monitored the implementation of the planned enterprise projects of the students. After the two semesters of integration, the following were the results: (1) Parents appreciated the integration of entrepreneurship; (2) Students expressed their appreciation and acceptance of the integration; (3) faculty-mentors recognized that the integration equipped the students with the knowledge and skills they need in case they decide to engage in business after graduation. They also accepted the challenges of their additional tasks; and (4) Post-test showed improvement in the students' knowledge on the principles and concepts of entrepreneurship.

**LEVEL OF AWARENESS AND PRACTICES ON SOLID WASTE MANAGEMENT OF  
STUDENTS OF ASIST LAGANGILANG**

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This study aimed to determine the solid waste management awareness and practices and exposure of students of Abra State Institute of Sciences and Technology. It also looked into the relationship between the profile of the respondents and their level of awareness, practices and exposure to different sources of information on solid waste management. There were 238 student respondents. This study used the descriptive analytical method of research. A questionnaire adopted from the study of Fontanilla (2003) was used as the main instrument in gathering data. The student respondents showed a moderate level of awareness on solid waste management and the level of practice showed that items on the different components of solid waste management are sometimes practiced by them. Results further reveal that the level of awareness and the course and year level of the students have no significant relationship. But there was a significant relationship between level of awareness and occupation of parents. On the other hand, there was no significant relationship existing between the level of practice and the course and year level. And there was a significant relationship between the level of practice and occupation of parents. Likewise, there was a significant relationship between the level of exposure and the occupation of father particularly on mass media.

**THE LAPAT SYSTEM: AN INDIGENOUS NATURAL RESOURCE MANAGEMENT SYSTEM OF THE ISNAGS IN APAYAO**

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The study documented and validated the *Lapat* System in the Municipalities of Conner, Kabugao, Pudtol and Calanasan, Apayao as a way of conserving natural resources. Being the youngest province of Cordillera, Apayao is endowed with rich cultural and natural resources known to be the last frontier of forest cover and one of the provinces covering the watershed cradle of the North. Such a potential feature is attributed to the indigenous peoples (IP) culture-bound initiatives in conserving their natural resources. The practice of *lapat* by the Isnags has in it the unique characteristics of providing a wealth of knowledge in environmental management. Today, *lapat* is still practiced by the elders to declare a body of water, plantations, forests and residential lots as sacred in honor of a dead member of the family. These areas are preserved by the bereaved family within a year or two by imposing penalties to intruders, thus making the area untouched within the prescribed period. Lifting of the *lapat* is commenced through they say- am or a grand festivity with many rituals usually help within 3-5 days to a maximum of one week celebrated by all members. By application and through consistent practice by the Isnags, *lapat* has contributed significantly in preserving and conserving the natural resources in the province.

**LESSONS FOR THE ROAD: THE APOSTOLIC VICARIATE OF SAN JOSE LIVELIHOOD MOVEMENT, INC. EXPERIENCE IN MANAGING THE INTEGRATED PEST MANAGEMENT (IPM) PROGRAM IN OCCIDENTAL MINDORO**

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The Apostolic Vicariate of San Jose Livelihood Movement, Inc. or LM is a church-based intermediary non-government organization (NGO) picked by the National Agriculture and Fishery Council (NAFC) to lead the implementation of the IPM program in Occidental Mindoro. This case study aimed to find out the experiences of the NGO in managing such government program particularly how it worked with other government organizations. Specifically, this aimed to describe the strategies employed and the problems encountered in managing the project, and determine the impact of IPM program in the farming communities. This was a response to the felt need of its farmer beneficiaries who had difficulty in paying back production loans due to poor harvest. To effectively implement the project, LM forged partnership with other organizations; targeted farmers' organizations and cooperatives; conducted continuing education and training for IPM workers; collaborated with educational institutions; utilized multi-media to promote IPM, and established linkage mechanisms with partner agencies. The problems encountered were weak local government support, delayed release of LGU funds, poor work ethics of LGU staff, and lack of sincerity of other partners. Lack of transparency and managerial leadership crisis within the lead agency had also resulted in the disintegration of people directly involved in the project. Initial performance evaluation conducted by the lead agency a year after the implementation revealed an almost 100% decrease in pesticide use among farmers, 20% reduction of production cost, and an increase of net income by at least Php3000 per hectare. In 2009, an impact study result showed that those farmers still had high knowledge about and positive attitude towards ecologically sound farming practices but the practice of technologies relative to IPM was very low. The study revealed that the main root of the problem was attitudinal in nature especially among the field personnel. Participatory management style must be enforced where everyone is involved in planning, implementing, and evaluating of the project. There is also a need for transparency especially in terms of money and sharing of risks benefits among partners.

**PROMOTING CACAO PRODUCTION: AN AGROFORESTRY APPROACH FOR FOOD SECURITY AND ENVIRONMENTAL CONSERVATION IN APAYAO**

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Cacao, *Theobroma cacao*, is a source of chocolate. Aside from cocoa, there are many other by-products that can be derived from cacao. These are livestock feed from cocoa pod husks, the mucilage which contains 11 % glucose for wines, alcoholic drinks and crystallized glucose for the use of pharmaceutical industries, fish food from powdered fruit husks for juvenile tilapias, soap making from cocoa butter fat and fertilizer from cocoa /pod husk ash. Cacao grows well in the tropics. It can be integrated with other crops in a multistorey cropping system. It starts to bear fruits after 18 months of planting. Because of its potentials, the college in collaboration with the Techno Gabay program of PCARRD through the Highland Agriculture and Resources Research and Development Consortium (HARRDEC) promoted the production of cacao as a major component of agroforestry farms. Activities undertaken as part of the promotion include documentation of Magsasaka Siyentista Ortega (MS best practices) cacao production technology, germplasm collection, establishment of cacao bud wood garden, establishment of demo farm and nurseries, and conduct of training to farmers and food processors.

**THE EXTENT OF IMPLEMENTATION OF ENVIRONMENT PROTECTION PROJECTS IN THE SELECTED BARANGAYS OF NABUA, CAMARINES SUR**

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Camarines Sur Polytechnic Colleges conducted this study to formulate a program that will improve the implementation of programs on environment protection. More specifically it sought to determine the existing projects being implemented by the Municipality of Nabua on Environment Protection, the level of awareness of the respondents on the projects being implemented, the extent of project implementation, and propose a program to improve the implementation of the Environment Protection project in the community. Majority of the respondents affirmatively believed that there are programs and projects on environment protection awareness campaign implemented in the barangay but only very few household were aware on how these programs were implemented. It is therefore concluded that awareness on the programs is still missing. Thus, it is recommended that massive information dissemination and trainings on how environment protection will be fully practiced in every household must be done in every barangay.

**AWARENESS ON THE ECOLOGICAL AND ECONOMIC BENEFITS OF ESTUARIES IN MAGSAYSAY, OCCIDENTAL MINDORO**

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This study was conducted to determine the level of awareness of respondents on the ecological and economic benefits of estuaries in Magsaysay, Occidental Mindoro. Employing the descriptive method of research, specifically the correlation design, the randomly selected residents of Magsaysay, Occidental Mindoro were interviewed using the researcher constructed interview schedule. Results revealed that most of the respondents reached elementary school, (74.5 percent); at the age range of 30 to 39, and had been residing in Magsaysay estuaries. The households' size was more than 6 members, and any few (32.4 percents) are member of organization. Majority is engage in farming and fishing generating an income as P4000 to P6000 As to their level of awareness, the respondents were aware at a moderate extent of the economics benefits (mean=3.28), and benefits (mean=3.30).

Statistical tests had revealed that the profiles are not significantly related to the level of the ecological, economic and conservation benefits.

**VICARIOUS EXPERIENCES ON THE OTHER SIDE OF AGRICULTURAL SCIENCES  
RESEARCH: BASES FOR PREVENTIVE MEASURES**

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This study sought to determine some agricultural technologies claimed to be of negative effects, analyze them, and on the basis of such information, formulate and forward approaches that could serve as bases for precautionary measures to future agricultural technology researchers, developers and extension workers. It made use of documentary survey (existing data search) and evaluation (critical analysis). Findings show the following agricultural technologies are alleged to be damaging or to have caused negative effects: biofuels, pesticides, biotechnology and GM crops, and “confined (intensive) livestock operations”. The negative side of *biofuels* was highlighted by the unregulated tearing down of forests, threatening an ecological disaster, and the conversion of edible crops into fuels despite the fact that billions of people have almost nothing to eat. The use of *pesticides* has polluted and is polluting arable lands and usable waters, it has also developed strong resistance among pests. *Genetically modified crops* endanger the ecosystem and the consumers’ health. *Intensive livestock operation* causes the growth of antibiotic resistant bacteria and makes the workers sick. On the basis of these findings, the approaches that may be forwarded to “prevent” the downside of these technologies are: the conduct of preventive agricultural technology impact assessments that predict both positive and negative outcomes of technologies, a critical analysis of the technologies’ environmental and social costs, damage to farms and fisheries, pollution of groundwater and surface water by animal wastes and pesticides, and increased health risks from these pollutants compared to the benefits they bring- abundant food (to those who can afford), convenience, and economic contribution from growers to harvesters to processors to sellers, and the formulation of agricultural R&D policies and protocols to address these issues.

**SCALING UP COASTAL RESOURCE MANAGEMENT  
IN AN AGRARIAN REFORM COMMUNITY**

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Over the years, the coastal ecosystem in and all over the country is under stress from the combined impacts of human overexploitation, physical disturbance, pollution, sedimentation and general neglect. Results of which include the continuing decline of fish catch of marginalized fishing communities which is often coupled with the vicious cycle of the lack of access to various basic services from the government and other livelihood opportunities. To answer this diversified problem and the increasing need for conservation, protection and sustainable management of coastal and terrestrial resources, the Deagan Island Coastal Resources Management Project (DICOEMAP) was implemented in Dimasalang, Masbate. The DICOEMAP initiative is an academe-interagency-municipal partnership in an attempt to address the interrelated political, institutional, socioeconomic, and environmental concerns plaguing a common agri-fisheries ecosystem. This paper brings into the forefront the undertaken activities emanating from the Comprehensive Agrarian Reform Program by utilizing the Agrarian Reform Community concept. Such resulted to a holistic convergence of services offering a spatial framework for community and beneficiaries development. This initiative of convergence primarily focusing on the prospects and opportunities in an island which is part of the MAMIA Agrarian Reform Community in Dimasalang, Masbate, has been a collaborative effort of the Department of Agrarian Reform Masbate Provincial Office and Bicol University in Legazpi City towards achieving institutional and governance on ecosystem resources management.

**BIOASSESSMENT OF THE WATER QUALITY OF THREE SELECTED RIVERS OF ABRA**

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The study determined the water quality of three selected rivers of Abra namely: Lingas- Baay, Tineg and Sagnit Rivers from September 2008 and January 2009. Bioassessment on the water quality was based on parameters of Species Diversity Indices, Ephemeroptera, Plecoptera, Trichoptera (EPT) Index and Biological Indicators of macrobenthic invertebrates. The physical factors (water velocity, depth and width of the river, air, surface and under water temperatures and substrate composition) as well as chemical factors (Dissolved Oxygen and pH) were also determined. Three riffles were selected from each river system and were divided into three sampling stations. Physical and chemical parameters were determined *in situ*, while macrobenthic invertebrates were collected, identified and classified. Diversity indices such as Shannon-Weiner, Simpson and Margalef's indices and EPT Index as well as the presence and absence of biological indicators were used in the data collected for bioassessment. There were no significant differences in water velocity. The water depth was significantly higher (0.48 m) in Sagnit River, while the width of Tineg river was significantly higher. Moreover, surface and under water temperatures registered higher at Tineg River. Sand and gravel were the common substrates in the three rivers. Dissolved Oxygen was highest at 6.16 mg/L in Lingas-Baay River. The pH in the 3 rivers was slightly alkaline. Fourteen different species of macrobenthic invertebrate were collected, taxonomically identified and described in the 3 rivers. The Index of Similarity showed a high degree of similarity among the macrobenthic species. These could be attributed to some physical (velocity, substrate) and chemical (slightly alkaline pH) characteristics, which were common to the 3 rivers. Lingas-Baay ranked first in terms of Diversity Indices and EPT Index, and 2<sup>nd</sup> for biological indicators, while Tineg River ranked first for Biological Indicators, 2<sup>nd</sup> and 3<sup>rd</sup> for EPT index and diversity indices, respectively. Sagnit river ranked 2<sup>nd</sup> for the diversity indices and both 3<sup>rd</sup> for EPT Index and biological indicators. On the basis of these indices on bioassessment, Lingas-Baay over-all ranked first which indicates that of the 3 rivers, it had the best water quality, followed next by Tineg river which was moderately clean. Sagnit river had the least water quality.

**COMPARATIVE ANALYSIS OF GEMELINA PLANT GROWTH IN A GENTLE AND STEEPER SLOPE SOIL: THE SIXTH-MONTH SITUATION**

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The main objective of this study is to describe the gemelina (*Gmelina Arborea*) plants six months after they were planted in two lots of different slopes. The plantation sites were part of the two adjoining lots of almost equal areas and of the same soil type. They differ on ground formation since one is a gentle slope while the other is steeper. The soil water content, climatic condition, temperature, wind speed and precipitation were observed. The plants were propagated by seeds and were transplanted at a height of 20-45 cm. To attain straight body growth, young branches were cut and removed. Weeding was conducted regularly. After six months, a total of three hundred three (303) gemelina trees are growing in the two areas. The average height of the plants in gentle slope soil is 59.8 cm. while the average body diameter is 0.46 cm. The average height in the steeper slope is 113.86 cm. and the average body diameter is 0.57 cm. The tallest height attained in the gentle slope is 210 cm., and the shortest is 20 cm. The tallest height attained in the steeper slope is 410 cm. while the shortest is 20 cm. The two sites are appropriate for gemelina plants to grow. The climatic condition is suited to attain normal growth. After six months of cultivation, the plants grow at remarkable performance. However, the species in the steeper slope soil show better growth performance than in the gentle slope soil.

**IDENTIFICATION AND GERMPLASM COLLECTION  
OF DYE YIELDING PLANTS IN APAYAO**

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This study was conducted to identify, collect and maintain germplasms of potential dye yielding plants in Apayao. The survey method of research was used coupled with investigation and experimentation. Plants that possess dye potentials were extracted by beating and boiling. Yarn was dyed in dye bath metamordanted with salt. Results of the study show that the researcher collected 30 potential dye yielding plants. The collected dye yielding plants were maintained at ASC Luna campus. From the results of the study, it can be said that abundant dye-yielding plants are present in the province. In the light of the findings, the following are recommended: explore other sources of natural dyes; investigate local mordants suitable for each dyestuff; expand germplasms collection area; mass propagate the identified potential dye yielding plants.

**BIOMASS PRODUCTION OF MALATAYUM (*Indigofera tinctoria*)  
AS AFFECTED BY PLANTING DISTANCE**

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The study was conducted at ASIST Experimental Area of the Research Department from April 2009 to April 2010 to determine the effect of planting distance of best rate of carbonated rice hull on Malatayum and to find out the interaction effect between planting distance and CRH application on biomass production. Based on the findings of the study, the different distance of planting evaluated had significant effects on the final height, canopy of the plants, number of branches, yield per plot and the computed yield per plot. Malatayum plants spaced at 1.0 m x 1.5 m registered the widest canopy, produced more number of branches, obtained the highest yield per plot and the computed yield/ha. With regards to the rate of Carbonated rice hull applied to the plants, the application of 25 tons/ha of carbonated rice hull manifested the tallest height, widest canopy, produce more number of branches, highest yield per plot and the computed yield/ha. There was a significant interaction effect between the distance of planting and CRH application on the yield per plot.

**DYE AND YIELD OF MALATAYUM MIXED WITH DIFFERENT MORDANTS  
APPLIED IN COTTON YARN**

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This study was primarily conducted to compare the Fresh and Fermented Malatayum Leaves Dyestuff Using Indigenous Mordants on Cotton Yarn. It aimed to determine the yield of the dyestuff as affected by the fresh and fermented Malatayum leaves using five different indigenous mordants; compare the absorptive capacity of the cotton fabric as affected by the fresh and fermented Malatayum leaves dye extracts; and compare the colorfastness of the cotton yarn as affected by the fresh and fermented Malatayum leaves dye extracts. Malatayum leaves were collected and prepared for eight weeks fermentation and extraction. Indigenous mordants such as vinegar, rust, gabi extract, ash and salt were selected and prepared to mix to the dyestuff produced in both fresh and fermented leaves. CRD was the experimental design used in this study. The dye yielding performance of fresh and fermented malatayum was significantly different. Fermented malatayum leaves produced more crude extract than fresh malatayum leaves. Among the mordants used salt showed the greatest dye yielding performance of both the fresh and fermented malatayum leaves. Nonetheless, native vinegar, gabi extract and salt has no significant difference with the crude extract produced as compared to rust and ash. Fermented dyestuff was significantly different from fresh malatayum dyestuff in terms of the absorptive capacity of the cotton yarn. The effect of mordant to the cotton yarn was highly significant

to vinegar, ash and salt as compared to gabi extract and rust. The colorfastness of fermented malatayum dyestuff mixed with following mordants brought out the army green color (vinegar); battleship gray (rust); dim gray (gabi extract); chamoisse (ash) and (ecru salt) colors to the cotton yarn. Likewise, the fresh malatayum dyestuff gave desert sand and tan (vinegar); seal brown, follow and khaki (rust), fawn and tan (gabi extract), ecru and follow (ash) grollu and follow (salt).

**PERFORMANCE OF MALATAYUM LEAVES DYE PROPERTIES ON SILK FABRIC  
EXTRACTED AT DIFFERENT PLANT TERMINALS AND MONTHS AFTER  
TRANSPLANTING**

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The study was conducted to determine which plant terminals of malatayum leaves and the best months after transplanting (MAT) in harvesting the leaves for dye extract that give the best color effect for silk fabric. The study was conducted at the ASIST Research Laboratory from January 2009 to April 2010. Three Plant Terminals (D) as factor A: D<sub>1</sub> – mixture of top and base leaves (leaves harvested 15 cm from the top), D<sub>2</sub>- top leaves (leaves harvested 7.5 cm from the top and D<sub>3</sub>- base leaves (half of those leaves harvested 15 cm using the lower portion) and Factor B: A<sub>1</sub>- 4 month's after transplanting, A<sub>2</sub>- 5 months after transplanting A<sub>3</sub>- 6 months after transplanting, A<sub>4</sub>- 7 months after transplanting and A<sub>5</sub>- 8 months after transplanting. Base on the findings, different colors were obtained. The best colors identified were indigo (Web), Persian Indigo, Liver, Medium purple color. These were the best color identified because these were the nearest colors of indigo that malatayum plants yielded. Indigo (Web) color was obtained from the mixture of top and base leaves extract of malatayum harvested at 5 months after transplanting when dyed to silk fabric. The five months after transplanting was the peak of blooming stage of the malatayum plants which contributed to the color yielded. Liver color was identified from the base leaves extract harvested at 5 months after transplanting. Persian Indigo (Dark blue) was obtained from top leaves extract harvested at 8 months after transplanting when dyed to silk fabric. This may be due to some matured pods that were included that added the color. This was also the ripening stage and pods are also sources of color. Indigo (Web), Persian Indigo and liver color were the best color identified for silk fabric using harvested leaves at different months after planting.

**INDIGENOUS FERMENTED PLANT JUICE (IFPJ) AS NUTRIENT  
SUPPLEMENTS OF MALATAYUM PRODUCTION**

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The study was conducted to determine which among the Indigenous Fermented Plants Juice (IFPJ) application will give high biomass of Malatayum production. The study was conducted at ASIST from October 2008 to September 2009. Five IFPJ were used: F<sub>1</sub>- Control, F<sub>2</sub>- Shiny bush "Pansit-pansitan" *Peperomia pelucida*, F<sub>3</sub> -Malabar nightshade "Alugbati" (*Basellarubia*), F<sub>4</sub>- Spiny Amaranth "Kalunay" (*Amaranthus spinosus*) and F<sub>5</sub>- Pigweed "Ngalog" (*Portulaca oleracea*). Based on the results, plants sprayed with fermented Pigweed juice gave the highest growth increment, plant canopy and biomass. The four treatments do not differ significantly on their increment and plant canopy. Plants applied with fermented pigweed and spiny amaranth juices were significantly different over the control plants. Plants sprayed with fermented pigweed juice responded the widest plant canopy which was highly significant. But the different treatments were not significantly different from each other because more or less their phosphorus content analysis was the same. And they were significantly different from the untreated plants. This shows that phosphorus had promoted rapid and vigorous growth of the malatayum plants from the fermented plant juice applied to the plants during their vegetative growth. Plants applied with fermented pigweed juice registered the most leaves biomass of malatayum. The different treatments were significantly different from each other. Plants

without application IFPJ produced the lowest biomass per plant with a mean weight of 3.42 kg compared to 4.89 kg from that plant applied with pigweed fermented plant juice. Therefore Pigweed as Indigenous Fermented Plant Juice as fertilizer supplement for Biomass of malatayum production is recommended.

#### **ADAPTABILITY TRIAL OF LOWLAND RICE VARIETIES UNDER ABRA CONDITIONS**

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The study was conducted for two growing season at the Research Experimental Area on rice, at the Abra State Institute of Sciences and Technology Lagangilang, Abra to determine the adaptability and yield performance of six (6) lowland rice varieties selected. Result of the study revealed that there were significant differences in the height of seedlings at transplanting and at maturity, number of grains per panicle, number of filled grains, number of unfilled grains, length of panicle, harvest index, weight of 1000 seeds and yield per hectare of the different lowland varieties. Result of the study indicates that the varieties tested showed highly significant differences in the parameters studied except in percentage survival and production of tillers. PSB Rc 18 outranked the other varieties in yield probably because it had produced the highest number of tillers per hill, grains (filled and unfilled) per panicle, high harvest index and yield per hectare of 5.2 tons. PSB Rc 82 were the tallest at transplanting time hence were the tallest at maturity, had high percentage survival and the longest panicle. NSIC Rc 112 produced the highest number of productive tillers and the heaviest weight of 1000 seeds. PSB Rc 28 produced the least yield because of low production of tillers, number of grains produced, low harvest index and short panicles. The yield of all the varieties exceeded the average national production of lowland rice, which is 3.4 t/ha (Agriculture Magazine, 2000). PSB Rc 18, 82, NSIC 110 and 112 and IR 64 could be grown by rice farmers in lowland condition in Abra because they exceeded the average national yield and found acceptable by consumers.

#### **ASSESSMENT OF LOWLAND RICE (NSIC 112) GROWN IN COCONUT OIL MILL EFFLUENT-AFFECTED AREAS**

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An experiment was conducted at Balatas Anayan, Pili, Camarines Sur in order to assess the growth and yield performance of lowland rice (NSIC 112) as influenced by Coconut Oil Mill (COM) effluent at varying distances, to characterize the physical and chemical properties of the soil and water before the experiment, and to compare the return on investment of rice production as influenced by COM effluent as irrigation water on the affected areas in the municipality of Pili, Camarines Sur. A total of 30 plastic pots filled with ten kilograms soil were taken from the affected areas and one from the unaffected area which served as control. The Completely Randomized Design was used involving five treatments replicated six times. The following were the treatments: control (unaffected area), 1.0 km, 2.0 km, 3.0 km and 4.0 km downstream from COM effluent affected areas. The chemical characteristics of water samples were within the range of unpolluted water limits. The soils were slightly acidic and with adequate level of CEC. The percent base saturation was deficient in the unaffected area while adequate in the affected areas. The chloride level at 1.0 km and 3.0 km were low and the rest of the treatments medium. There were no significant differences among treatments in terms of number of days to flowering, number of unproductive tillers and grain weight. However, there were significant differences among treatments in terms of plant height, number of tillers, grain yield, and number of filled grains per panicle, percent unfilled grains per panicle, panicle number and harvest index. The correlation analysis between distance and yield was found to be highly significant. The farther the distance from the oil mill industry the lower was the yield. The highest return on investment (ROI) was obtained in the coconut oil mill effluent unaffected area.

**BASELINE SURVEY ON THE RICE TERRACES AND INDIGENOUS RICE PRODUCTION  
IN ABRA**

*Milandro B. Edwin*

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The study was conducted to document the rice terraces in Abra and the cultural management practices employed by the farmers in such areas that will serve as baseline sources of data. The key respondents are the rice terraces farmers from eight upland and three lowland municipalities. Data were gathered by using a semi-structured interview, by observation, and documented with the use of camera. Results showed that there are rice terraces in Abra which are mostly found in the upland municipalities and that farmers still grow traditional rice varieties, so it follows that they apply indigenous practices in the cultivation of these varieties. Some of which are the conventional method of land preparation, incubation method of seedling production, use of the wet seed bed, randomized transplanting, hand weeding, use of organic fertilizer through basal application, use of botanicals to control crop pests and diseases, yatab harvesting, manual threshing and winnowing, sun drying, storing bundled rice, storing harvested crops in a primitive warehouse locally known as "Agamang" and primitive milling.

**PRODUCTION PRACTICES AND NEED ASSESSMENT OF SELECTED VELERO CROPS  
IN APAYAO**

*Isabel B. Angway and Jaybee B. Omaweng*

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The study was conducted to identify vegetables, legumes and rootcrops (VELERO) production practices in Apayao. The study made use of the survey method of research with questionnaire as the main data gathering tool. Interview with VELERO farmers and observation of VELERO farms were conducted to gather additional data. The respondents produce vegetables, legumes and rootcrops (VELERO) as ingredients for pinakbet and dinendeng. Their primary source of income is farming. VELERO producers have been using organic fertilizers for many years but some shifted to the use of commercial fertilizers, without considering the bad effect of these chemically manufactured fertilizers. Organic VELERO producers produce their own organic fertilizers from decomposed plants, manure of animals and other biodegradable materials. Practically VELERO production is for family consumption and for sale to augment their income. Selling their VELERO products can be done individually by carrying their basket of VELERO going from house to house. Others may just sell theirs in the local market. Producers of selected VELERO just utilize a little portion of their land area in the backyard or in the mountain sides with approximately less than a hectare.

**MARKETING PRACTICES FOR SELECTED VELERO CROPS IN APAYAO**

*Isabel B. Angway and Jay Bee B. Omaweng*

Apayao State College

This study was conducted to determine the marketing practices for selected VELERO crops in Apayao. Descriptive survey method was used in the study. The results of the study disclose that most of the respondents prefer to sell their own VELERO production individually. VELERO or vegetables, legumes and root crops sold are those of ingredients for pinakbet and dinendeng, Filipino delicacies. Sellers are the ones who set the price of their VELERO products. Local markets and talipapa served as VELERO outlet. In terms of packaging, VELERO are disposed by bundles rather than by sacks. Organic and non-organic VELERO have the same price in the market. There should be a strong information dissemination on the advantages of eating organic VELERO, seminars about the production of organic VELERO especially addressed to the farmer-sellers, trading post or markets outlets should be established by local officials.

## **EVALUATION OF POTATO ENTRIES FOR ORGANIC PRODUCTION IN BENGUET**

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The study was conducted to evaluate the growth and yield of organically grown potato entries and determine the profitability of growing potato entries for organic production at Balili, La Trinidad and Loo, Buguias, Benguet. Ganza had high percent survival, high vigor, wide canopy, heaviest weight of marketable and non-marketable tubers, and had the highest return on cash expense (ROCE) in both locations. Ganza was also resistant to late blight and leaf miner incidence. Among the MLUSA entries grown in Balili, La Trinidad and Loo, Buguias, MLUSA 8 had wide canopy, plant height, and higher number and weight of marketable and non-marketable tubers leading to relatively high ROCE.

## **PRODUCTIVITY, NUTRIENT USE EFFICIENCY AND ENERGY UTILIZATION OF YAM BEAN [*Pachyrhizus erosus* (L.) Urban] GENOTYPES IN ILOCOS NORTE, PHILIPPINES**

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The study was conducted in three sites of varying climatic and edaphic characteristics in Ilocos Norte from April 2008 to April 2009 to determine the productivity, nutrient use efficiency, cost and return analysis, and energy cost of producing yield of five yam bean genotypes grown under four fertilizer treatments namely: unfertilized/control, dried chicken manure (DCM), 50% dried chicken manure (DCM) + 50% inorganic fertilizer (IF), and inorganic fertilizer (IF). The performance of the five yam bean genotypes under different fertilizer treatments in each site were evaluated based on the following parameters: shoot growth, root growth, dry matter production, dry matter partitioning to the economic yield, yield, nutrient uptake and conversion efficiency of absorbed nutrient to produce dry matter yield, net income, return on investment, and energy utilization in the production of economic yield. Based on the combination of experimental variables, such as fertilizer treatments and genotypes grown in three sites with varying edaphic and climatic characteristics, the application of 50% DCM + 50% IF produced the highest yam bean yield in Sarrat and Dingras, which have a relatively good soil characteristics and climatic conditions. The application of DCM in Bangui, which is characterized by sandy texture, uneven rainfall, windy condition or in general drought prone area, produced the highest yield. None of the test genotypes had consistent performance (yield) across sites. Plants applied with DCM were efficient in converting absorbed N, P and K into yield. Among the genotypes, Genotype 5 was the most efficient in converting absorbed N, P and K. The ROI across sites is constantly highest in unfertilized plants, which reflects low cost of production under low yield levels. The application of IF is the most energy consuming in producing yam bean, as reflected in the highest LDOE. The lowest LDOE was obtained in the unfertilized yam bean crop.

## **GROWTH AND YIELD PERFORMANCE OF DIFFERENT VEGETABLES APPLIED WITH ORGANIC FERTILIZERS**

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The study was conducted to determine the effects of organic fertilizers on the growth of different vegetables and to find out which among the different vegetables will give the best yield when applied with organic fertilizers. The study was conducted from October 2009 to February 2010 at ASIST, Main Campus, Lagangilang, Abra. The experiment was laid out following a Randomized Complete Block Design. The five different vegetables were tomato, mungbean, cowpea, pepper and eggplant set in each treatment with three blocks. The different treatments are as follows: T1- Farmers Practice T2- Organic fertilizer T3- Fermented Plant Juice (*Spiny amaranthus*). Based on the result obtained in the study, no significant result was observed among the different fertilizers in terms of initial height, plant

height at flowering and number of days to harvest on tomato, mungbean, cowpea, pepper and eggplant. However, statistical analysis showed highly significant result on the number of days to fruit setting of pepper applied with fermented plant juice compared to the other treatments. There was no significant effect of the different fertilizers on the number of marketable fruits and weight of marketable fruits on tomato, mungbean, cowpea and pepper except on eggplant which showed that those plants applied with fermented plant juice produced the greatest number and heaviest weight of marketable fruits. In terms of the computed yield per hectare, statistical analysis showed insignificant result on the yield obtained per hectare on tomato, mungbean and pepper; however, highly significant result was noted on the yield per hectare of cowpea and eggplant applied with fermented plant juice. The result of the study is supported with the findings of other researchers that fermented plant juice contains rich nutrients which can be easily absorbed by plants and bioactive substances that stimulate plant growth. Thus, cowpea and eggplant applied with fermented plant juice of *Spiny amaranthus* produced the greatest number of fruits and heaviest weight of marketable fruits that resulted in higher yield obtained per hectare.

**GROWTH AND YIELD RESPONSE OF ONION (*Allium cepa*) 'RED PINOY' VAR.ON  
VARYING BLENDS OF LIQUID TRICHODERMA AND SEAWEED (*Euchema sp.*)  
EXTRACT**

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This experiment following the Analysis of Variance in Randomized Complete Block design was conducted to determine the effects of varying blends of liquid trichoderma on the growth and yield of onion. This field experiment was conducted in OMSC, Murtha, San Jose, Occidental Mindoro from December 15, 2009 to March, 15, 2010. Three hundred sixty seedlings of onion were used in the study. Twenty seedlings (20) were randomly distributed for each treatment of 20 plants per replication. All the plants were subjected to same care and management except for the varying blends of liquid trichoderma and seaweed extract. Two hundred fifty (250 mL) of the blends were sprayed to onion one month after transplanting and every one month thereafter for a period of three months. Treatment 1, complete fertilizer; Treatment 2, 75 % liquid trichoderma and 25 % seaweed extract; Treatment 3, 50% liquid trichoderma and 50 % seaweed extract; Treatment 4, 25% liquid trichoderma and 75% seaweed extract; Treatment 5, 100% liquid trichoderma, and Treatment 6 100% seaweed extract. Based on the findings, plants treated with 50:50 blended liquid trichoderma and seaweed extract produced the highest yield performance of the plant in terms of the fresh and dry weight of bulb. Mean fresh weight of 54.66 grams and mean dry weight of 53.85 were registered by plants treated with 50 % Liquid trichoderma and 50% seaweed extract. It is therefore recommended that 50:50 mixtures of liquid trichoderma and seaweed extract be used in order to attain higher yield performance comparable to conventional way of growing onion. Onion growers can now make use of this farm input which is less expensive and is not harmful to man and the environment.

**THE EFFECT OF MAGNETISM ON THE GERMINATION AND GROWTH OF  
EGGPLANT SEEDLINGS**

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The study was conducted to determine the effect of magnetism on the germination and growth of eggplant seedlings, specifically aimed to determine the effect of the four magnetic treatment orientation if it enhances the germination and growth of eggplant seedlings, and to find out the effect of the four (4) magnetic treatment if there are significant result on plant height, leaf length and diameter, shoot and root length, shoot and root biomass, total biomass and root-shoot ratio. Randomized Complete Block Design (RCBD) was used in the study. There were 3 blocks of soil placed on a polyethylene plastic divided into 5 treatments as follows: T<sub>0</sub> – Control, T<sub>1</sub> – North / South,

T<sub>2</sub> – East / West, T<sub>3</sub> – Northwest / Southeast, T<sub>4</sub> – Northeast / Southwest. Result revealed the following findings: as to seed germination, significant effect was observed at 6 and 7 days after sowing (DAS) in favor of the seeds treated with magnets while not significant differences was observed at 8,9 and 10 days after sowing. As to the plant height no significant differences among the treatment mean at 11, 18, and 25 days after sowing. Significant result was revealed to the 1<sup>st</sup> (first) true leaf diameter at 11 DAS while no significant result at 18 and 25 DAS. Significant effect was noted on the 1<sup>st</sup> leaf length at 25 DAS. There was a significant increase on the second true length and diameter. Significant differences was noted on the shoot length, average shoot weight, root biomass and total oven-dry biomass while insignificant on root-shoot ratio. Based on the findings T<sub>2</sub> with East West orientation of magnets found out to be the best treatment followed by T<sub>3</sub> with Northwest Southeast orientation and T<sub>4</sub> with a Northeast / Southwest and T<sub>1</sub> North / South.

**YIELD RESPONSE OF TOMATO (*Lycopersicon esculentum*) ‘Diamante’ var. ON  
FERMENTED GOLDEN APPLE SNAIL**

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This experiment following the Analysis of Variance in Randomized Complete Block Design was conducted to determine the effects of varying amounts of fermented golden apple snail on tomato. This field experiment was conducted in OMSC – Murtha, Murtha, San Jose, and Occidental Mindoro from December 2009 - January 2010. Seventy two (72) plants of tomato were used in the study. Tomato seedlings were randomly distributed for each treatment of 4 plants per replication. All the plants were subjected to same care and management except for the kinds and amount of fertilizer used. These are as follows: Treatment 1, Control no fertilizer was applied. Treatment 2, RR of complete fertilizer, 1 L per hectare, 2 L per hectare, 3 L per hectare and 4 L per hectare of fermented golden apple snail was used for Treatment 3, 4, 5 and 6, respectively. Based on the findings, fermented golden apple snail has a significant effect on the yield of tomato as revealed by the increase in number and weight of fruits as compared to the use of chemical fertilizer. The application of 30 L per hectare of the experimental liquid fertilizer gives highest yield of tomato.

**TILLAGE SYSTEM AND NITROGEN MANAGEMENT EFFECTS ON GROWTH  
AND YIELD OF SOYBEAN (*Glycine max* (L) Merrill) GROWN IN RAINFED  
LOWLAND SOILS**

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A dry-season field experiment was conducted to assess the effect of tillage system and nitrogen management on the growth and yield performance of soybean (UPL Sy 2) in Ligao clay loam and Guinobatan sandy loam types of rainfed lowland soil. The experiment was laid-out in split plot in Randomized Complete Block Design with three replications. Tillage systems namely: plowing + harrowing (P+H) and conventional tillage (C) are assigned in the mainplot and nitrogen management: all of the recommended nitrogen was applied evenly by hand at planting (N<sub>1</sub>), 2/3 of the recommended N was applied basally at planting and the remaining 1/3 was sidedressed at flowering stage (N<sub>2</sub>), 2/3 of the recommended N was applied basally at planting and the remaining 1/3 was sidedressed at pod formation stage (N<sub>3</sub>), 2/3 of the recommended N was applied basally at planting and the remaining 1/3 was applied foliarly at flowering stage (N<sub>4</sub>), 2/3 of the recommended N was applied basally at planting and the remaining 1/3 was applied foliarly at pod formation stage (N<sub>5</sub>), and 2/3 of the recommended N was applied basally at planting and the remaining 1/3 was applied foliarly in equal doses at flowering and pod formation stages, respectively (N<sub>6</sub>). Drought condition prevailed during the conduct of the preliminary experiments. Total amount of rainfall recorded from sowing to 10 weeks after planting (WAP) was only 133.4 mm. Foliar N application when used as supplement and not as substitute for standard soil fertilization was beneficial for soybean production. Combining

early soil application and foliar application of N at flowering was effective in increasing yield in both soil types. Yield increase was attributed to higher number of pods per plant mainstem and branch yield.

**TILLAGE SYSTEM AND ROW SPACING EFFECTS ON SOIL MOISTURE AND ON GROWTH AND YIELD OF SOYBEAN (*Glycine max* (L) Merrill) GROWN IN RAINFED LOWLAND SOILS**

*Luis O. Amano and Viola L. Amano*

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A field experiment was conducted to determine the effect of tillage system and row spacing on soil moisture content and on growth and yield performance of soybean (UPL Sy 2) in Ligao clay loam and Guinobatan sandy loam types of rainfed lowland soil. The experiment was laid-out in split plot in Randomized Complete Block Design with three replications. Tillage systems namely: furrowing (F), plowing + harrowing (P+H), plowing + rotoovation (P+R), and conventional tillage (C) are assigned in the mainplot and row spacing (25 and 50 cm) were assigned in the subplot. Drought condition prevailed during the conduct of the experiment. Total amount of rainfall recorded from sowing to 10 weeks after planting (WAP) was only 133.4 mm. In both soil types, soil moisture content showed the same trend of result in the order of F>P+H>P+R>C as far as tillage system is concerned. Soybean response to tillage system was similar in both soil types but greater effects of tillage were observed in Guinobatan sandy loam than in Ligao clay loam type of rainfed lowland soil. The relative yield advantage of less-tilled soils (F and P+H tillage systems) over the highly tilled soils (P+R and C tillage systems) in terms of moisture conservation in both soil types was associated to the significantly higher dry matter yield, higher proportion of three- and two-seeded pods, and greater number of pods per plant. The 25-cm row spacing showed no significant yield advantage over the 50-cm row spacing in both soil types under below normal precipitation.

**ESTABLISHMENT OF A SUSTAINABLE PAPAYA BASED CROPPING SYSTEM**

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The study basically aimed to come up with the a sustainable cropping system for papaya through the development of a cost effective strategy with the intent of establishing a benchmark information on production practices, fertilizer management, best variety combined with appropriate fertilizer management scheme and cropping system that could withstand the incidence of the ring spot virus diseases as it is grown in an infested area. The premise is to be able to showcase a good agricultural practice on papaya growing that would improve the usual farmer's practice since they would not give up papaya growing despite the viral disease infestation in the area. Research efforts had been towards the development of a variety that is either resistant or tolerant to papaya ring spot virus disease. The Participatory Technology Development Approach was used in this study with some modifications. The aim was to be able to fast track the transfer of technology to other farmers at the same time expose them to the conduct of doing an actual field research. It can be concluded that Red Lady Papaya (hybrid) variety grows best when grown as a single crop and with fertilizer applied following the recommendation based on soil analysis. It also yields longest and heaviest and biggest fruit. The disease incidence is also lesser as compared to the native variety. The Native variety tends to perform better when planted in a multicrop system and fertilizer applied following recommendation based on soil analysis thus producing taller trees, producing more fruits and the incidence of PRV is lower. It is therefore recommended that similar studies should be undertaken to further verify the results of these tests. Research such as this must be conducted in campus because of difficulty in monitoring the crop. Participatory technology development approach must not be with a single farmer cooperator but must be a farmers' group activity. The choice of the cooperator must include leadership skills and

good interpersonal relation in the area. Farm research must be more on showcasing technologies and good agricultural practice for replication by other farmers.

### **MODIFIED FRUIT BAGGING TECHNIQUES FOR MANGO**

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Mango is one of the commercially important fruit crops in the Philippines. Mango is prone to attacks of insect pests and diseases in all stages of development. One management practice which can help address these problems is fruit bagging because it is another way of preventing contact between the host and insects/diseases as well as minimize mechanical injuries thus improving quality. The project aimed to determine which of the bagging materials and forms gave the best quality of fruits; determine the effect of the bagging materials and forms on pest incidence, and find out which of the bagging materials and forms gave the highest yield and net income. The project was conducted at the Integrated Sustainable Agri Techno Demo Farm of the Pangasinan State University, Sta. Maria Campus, Sta. Maria, Pangasinan: Study 1- Bagging materials (White plastic bag, Black polyethylene bag, Brown paper bag, Glossy paper bag and Newspaper bag); and Study 2- Bag forms (Triangular/Marsman style, Flat form/Cebu technology, Modified square form, and Conical form). There were 16 experimental trees split into four blocks, in each block there were four trees and in each tree all the treatments were present in each study. Fruits were bagged at 46 days from the last spraying of KNO<sup>3</sup>. Each treatment had 10 sample fruits bagged. Sampling was randomly done. Brown paper bag, white plastic bag and glossy paper bags and triangular/Marsman style, flat/Cebu technology and modified square as bag forms securely protected the mango fruits against pest incidence. Fruit bagging with brown paper bag and triangular bag/Marsman style exhibited the highest ROI. However, a verification study along this line for a more conclusive result is recommended.

### **PERFORMANCE EVALUATION OF SIX SWEET SORGHUM LINES FOR BIO-ETHANOL AND GRAINS UNDER PANGASINAN CONDITION**

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The study sought to conduct evaluation trial of six sweet sorghum lines under Pangasinan condition. Specifically, it aims to determine their agronomic characteristics and incidence of pests and diseases and recommend lines that are suitable for stalk, grain and bio-ethanol production. There were significant differences observed for plant height, plant appearance score, lodging score, days to 50% flowering, stalk diameter, stalk juice volume, seed size, \*Brix values, stalk yield, stripped stalk yield, stalk diameter, stillage yield, stalk juice yield, panicle weight, grain weight and yield. The mean agronomic characteristics of the lines evaluated showed that, in terms of plant height, stalk yield, stripped stalk yield, stalk juice yield, stalk juice volume, and stalk diameter, the ICSV 700 and ICSV 93046 lines have produced the greatest yields. On seed and grains characteristics, the NTJ 2 and SPV 422 lines have produced the greatest yields. In terms of grain weight, the ICSV 700 and ICSV 93046 lines have the heaviest grains. The ICSV 93046 and ICSV700 lines have the least resistance to lodging, lower plant stand, and longest days to attain 50% flowering. ICSV 93046 and ICSV 700 are good planting materials for stalk and stalk by-product purposes. The NTJ 2, SPV 422, and IS 2331 lines produce greater grains. NTJ 2 and SPV 422 are the most resistant to sweet sorghum pests and diseases.

**ARBUSCULAR MYCORRHIZAL FUNGI: BIOLOGICAL CONTROL AGAINST STRIGA  
(STRIGA HERMONTHICA), A PARASITIC WEED**

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Bicol University, College of Agriculture and Forestry, Guinobatan, Albay

Conventional agriculture is identified as a major contributor of pollutants and greenhouse gasses resulting in the degradation of soil and water quality and increasing atmospheric temperature. Natural and organic farming is seen as the best alternative in mitigating the effects of agriculture in environmental degradation and climate change. In Africa, a parasitic weed known as *Striga* is causing tremendous devastation in croplands. Sorghum, a major cereal crop in Africa is a host plant. The germination, growth and proliferation of *Striga* are triggered by the root exudates of its host plants. As *Striga* germinates it attaches itself to the roots of its host causing the latter to be stunted and eventually die. Since the point of attachment and parasitic activity is at the root system of the plant, control was made at the same point by encouraging mycorrhizal activity in the root zone. Arbuscular Mycorrhizal (AM) fungi, first proven in many scientific studies to help plants absorb phosphorus and micronutrients from the soil were used in this study. A pot experiment using sorghum as host plant treated with arbuscular mycorrhizal fungi was studied in a tropical glasshouse at Wageningen University, The Netherlands to study how these fungi would suppress the germination and growth of *Striga*. Results showed that where there were mycorrhizal fungi, the germination of *Striga* was significantly lower. This result was validated in a laboratory experiment by means of root exudates from the test sorghum plants used in the pot experiment. The root exudates were collected by soaking the root system of the test plants in water overnight. Seeds of *Striga* were treated with the root exudates of the test plants. Validation test results showed significantly lower percentage of germination of *Striga* treated by exudates collected from sorghum plants with mycorrhizal fungi. It was concluded that Arbuscular Mycorrhizal fungi are indeed potent biological control against *Striga*. Similar experiments with AM fungi can be conducted to study its effect on parasitic weeds and pests and diseases attacking root systems of plants in the Philippines.

**PSU MUSHROOM RESEARCH, DEVELOPMENT AND EXTENSION  
INITIATIVES IN ILOCOS REGION**

*Cesar G. Della and Elisa S. Della*

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Ilocos region is a potential mushroom growing region in the Philippines due to its favorable agro-climatic conditions and availability of agro-industrial and forest wastes from rice, other cereals and wood shavings for spawn and growing mushrooms. The paper showcases the mushroom research, development and extension initiatives of PSU-MRDC in Ilocos region. It discusses the best practices developed and disseminated in the different PHEIs, municipalities and cities in Ilocos region. There were six major strategies used in the development and promotion of the technologies. These involved (1) technology generation where technologies were developed for spawn and mushroom production for *Volvariella volvacea*, *Pleurotus spp.* and *Auricularia polytricha* are results of findings from scientific researches; (2) capability building for the stakeholders to equip them with knowledge and skills on mushroom production technologies; (3) techno-demo was undertaken to showcase the technologies; (4) development, production and distribution of IEC materials; (5) forging of memoranda of agreements with partner agencies; and (6) mushroom production included as subject for BSA. The results of the technology generation and promotion of the mushroom production technologies in Ilocos region conducted from CY 2000-2010 show (1) new technologies on spawn and mushroom production using indigenous materials; (2) promotion of the adoption of mushroom production technologies; (3) increased number of farmers adopting the technologies; and (4) strengthened partnerships/linkages. It is therefore recommended to have: 1) continuous conduct of capability building and updating of the technologies to ensure optimum production and utilization; 2) integration of the technologies not only in the BSA curriculum but in the other courses as well.

**GROWTH PERFORMANCE OF CACAO (*Theobroma cacao* Linn.) SEEDLINGS  
USING VERMICOMPOST**

*Maria Christina N. Zarate-Manicad*

Apayao State College, San Isidro Sur, Luna, Apayao

The study sought to determine the growth performance of cacao seedlings in decomposed agricultural waste through vermicomposting. Specifically, the study aimed to find out if there is a significant difference in the growth performance of cacao when grown in different potting media using vermicompost in terms of height increment, root collar diameter increment, root length, oven-dry root biomass, oven-dry shoot biomass and oven-dry total biomass; and determine the best potting medium that enhances better growth and survival of Cacao seedlings in the nursery. The experiment was laid-out in CRD with three replications per treatment. The growth of cacao seedlings was affected by using pure vermicompost and its combination as potting media. Height increment, root collar diameter increment, oven-dry root biomass, oven-dry shoot biomass, and total oven-dry biomass have significant effect. Root length showed insignificant result. Growing cacao seedlings in vermicompost in different proportions caused significant effect on the growth of cacao seedlings within five (5) months. Pure vermicompost and combinations of sand and vermicompost at 2:1 ratio showed the best growth response. Seedlings grown in pure vermicompost (T1) has the highest height increment and root collar diameter increment, while those grown in combination of sand and vermicompost at 2:1 ratio obtained the heaviest oven-dry root and shoot biomass, and total oven-dry biomass. Hence, pure vermicompost and combination of sand and vermicompost at 2:1 ratio are best for growing cacao seedlings in the nursery. It is recommended that a follow-up study be conducted prolonging time of observation to at least 8 months for nursery experiment using the same potting media to verify the result; future studies of this kind should be encouraged for cacao seedlings and other agro-forestry species in order that agricultural wastes will be subjected to vermicomposting and will be utilized properly; field trials using similar potting media should be used; and promotion on the result of the study should be made.

**INOCULATED COMPOST PRODUCTION FROM *Jatropha* PRESS CAKE AND  
COMPOST TESTING IN *Jatropha* PLANTS**

*Bayani M. Espiritu, Mannix S. Pedro, Lovely B. Willauer and Carmena Nimfa G. Cayabyab*

Soil and Agro-Ecological Resources Division, Agricultural Systems Cluster, College of Agriculture,  
and National Institute of Molecular Biology and Biotechnology (BIOTECH),  
University of the Philippines, Los Baños, College, Laguna

Pot experiments were set up to test the effects of inoculated *Jatropha* press cake compost on the growth of *Jatropha* plant. Inoculated compost application induced marked increases over the control in basal stem diameter (6-37%) during the first few months of growth after germination in the screen-house. The plants that were held in the screen-house were out-planted in the field in July 2008. Flower initiation commenced 6 months after out-planting with initial harvest being conducted in February to June 2009. Continued flowering and bearing of fruits were observed during the period. The highest fruiting was observed in the months of April and May. Averages of 1.0-1.5 kg dried seeds were harvested monthly (total of all 21 plants) from trees that received applied fertilizer as chemical or organic form during early stage of development. One year after transplanting, a marked increase of 16-41% in basal stem diameter over the control in plants treated with organic fertilizer or chemical fertilizer was observed. Flowering and fruit development declined in July 2009. However, the trees flowered again after this period but no fruits were collected in the succeeding months due to the heavy rains that caused serious fruit fall-off as young and mature nuts. Yield comparisons among treatments were therefore not conducted during the year. Further observation and monitoring are still in progress to verify the quantitative increases in nut yield as effected by the application of inoculated press cake compost and/or chemical fertilizers.

**MICROBIAL INOCULANTS FOR *JATROPHA* A PRESS CAKE COMPOST PRODUCTION**

*Bayani M. Espiritu, Mannix S. Pedro, Lovely B. Willauer and Carmena Nimfa G. Cayabyab*

Soil and Agro-Ecological Resources Division, Agricultural Systems Cluster, College of Agriculture, and National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños, Laguna

Composting heaps were prepared for the purpose of determining the effects of microbial inoculation on *Jatropha* press-cake compost production. The different treatments were: T1, control; T2, enriched *Jatropha* press cake extract; T3, + 2% (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>; T4, + *Trichoderma* and *Azotobacter*; and T5, + mixture of 12 microorganisms from *Jatropha* press cake. Heap dimension was 2.0 m x 1.20 m x 0.5 m and contained 250 kg *Jatropha* press cake. The physical and chemical properties and microbial load of press cake in the course of composting were determined. The pH of all treatments increased from 5.0 to 8.5 that could have caused the decrease in nitrogen content of the compost. The initial total nitrogen content of press cake ranged from 3.06% to 3.51%. After 56 days of composting, a decrease in total N was observed which ranged from 2.24% to 2.91%. The highest decrease in total N was observed in the control heap (2.24%, total N) that was a decrease of 32.33% compared to that with ammonium sulfate. On the other hand, an increase in phosphorus content was observed. The highest increase in total phosphorus was recorded in heap enriched with *Jatropha* press cake extract, 0.75% (increase over control of 20.97%) followed by the heap inoculated with mixed microbial strains 0.73% (increase over control of 19.67%). Total carbon content generally decreased in all treatments. The results showed the different qualities of compost that can be prepared from *Jatropha* press cake using some defined protocols with or without microbial inoculation.

**POTTING MEDIA FOR PHYSIC NUT (*Jatropha curcas*) SEEDLINGS GROWN UNDER OPEN AND GREENHOUSE CONDITIONS**

*Fe B. Perlas and Rhueta R. Alejo*

Central Bicol State University of Agriculture, Pili, Camarines Sur

The study was conducted to determine the effects of the potting medium on the growth of *Jatropha* seedlings, determine the relationship between the chemical properties of the potting media and the growth parameters of *Jatropha* and compare effect of two light intensities on the growth of *Jatropha* seedlings. The Completely Randomized Design (CRD) was used with six (6) treatments replicated five times. The treatments were: T1 = (Control) garden soil, T2 = (1:1) garden soil, sawdust, T3 = (1:1) garden soil, coco peat, T4 = (1:1) garden soil, sand, T5 = (1:1:1) garden soil, sand, mudpress, and T6 = (1:1:1) garden soil, sand, sawdust. The different potting media did not significantly affect the plant height of *Jatropha* seedlings under open conditions at 14 and 42 days after transplanting. Significant difference in plant height was observed. The different potting media significantly affected the plant girth of *Jatropha* seedlings only at 28 and 70 days after transplanting. The highest plant girth was observed in the garden soil + sand + sawdust treatment. Significant differences were observed in the leaf area in the open condition. Significant differences in plant height under green house condition were observed after transplanting. The garden soil + sand + mudpress treatment was observed to have the tallest seedlings, biggest plant girth and leaf area under green house conditions. Plant girth was significantly affected and was bigger under open conditions. The leaf area of *Jatropha* seedlings was significantly affected by the two light intensities with bigger leaf area under green house conditions. Under open conditions, plant girth was significantly affected by organic matter content, total calcium and total magnesium, while leaf area was significantly affected by the total phosphorus content. The correlation coefficients between total calcium and total magnesium as well as between total phosphorus and leaf area were positive. The growth parameters such as plant girth, plant height and leaf area were not significantly affected by the chemical properties of the potting media under green house condition. A negative correlation coefficient was observed between organic matter content and the growth parameters.

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**GERMINATION MEDIA FOR PHYSIC NUT (*Jatropha curcas*) SEEDNUTS**

*Fe B. Perlas and Floramae V. Baloro*

Central Bicol State University of Agriculture, Pili, Camarines Sur

This study was conducted to determine the chemical properties of the germination media and determine the effect of the germination medium on physic nut germination. The Completely Randomized Design (CRD) was used in the study with twelve (12) treatments replicated three times. In each treatment, 15 tuba seed nuts were sown. The garden soil + mudpress had the highest pH reading of 6.87. The garden soil + coco peat had the highest percent water holding capacity with 90.08%. The soil + sand treatment (T7) had the lowest water holding capacity with 34.45%. The garden soil + compost had the highest organic matter content with 15.20%. The soil + sand treatment (T7) had the lowest with 3.33%. The garden soil + mudpress) got the highest total phosphorous content of 1.14%, The garden soil + coco peat) got the highest total potassium content of 0.146%, the soil + sand treatment (T7) had the lowest total potassium content of 0.052%. The garden soil had the highest total calcium with 1.32%, the lowest total calcium was observed in the garden soil + coco peat treatment (T5). The garden soil + sawdust) and T8 (garden soil + sand + compost) got the highest total magnesium content of 0.25%, the lowest was observed in the treatments with garden soil + sawdust (T4) and garden soil + coco peat (T5). The garden soil + sand + mudpress had the highest percent germination and percent germination energy and the longest length of germination while the lowest was in the garden soil + sand + rice hull medium. The shortest pre-germination period was observed in the garden soil + rice hull which was significantly different with the rest of the treatments. Correlation analysis showed that the chemical characteristics of the growing media did not significantly affect the germination of tuba.

**SURVIVAL OF PHYSIC NUT (*Jatropha curcas*) AS INFLUENCED BY PLANTING METHOD**

*Fe B. Perlas and Steven A. Ibarbia*

Central Bicol State University of Agriculture, Pili, Camarines Sur

The study was conducted in San Jose, Pili, Camarines Sur covering a total area of 550 square meters. The area was previously planted with vegetables and corn for 10 years and now abandoned with vegetation dominated by cogon (*Imperata cylindrica*). The randomized complete block design (RCBD) was used with three treatments replicated three times. The treatments were the following: T1- Direct-Seeding, T2- Bareroot Seedling and T3- Potted seedling. The percentage survival of *Jatropha* was highly significant as influenced by planting methods. The potted seedlings had the highest average percentage survival from 14 DAP until the end of the experiment. Apparently, there is a declining trend on the rate of percentage survival in all methods due to the El Nino phenomenon.

**THE FOOD STATUS SURVEY OF SAPAT AT TALIFUGO, CONNER, APAYAO**

*Zacarias A. Baluscang, Hannie T. Martin, Satur Bangyad and Marcelo Canipas*

Apayao State College, Malama, Conner, Apayao

This study assessed the food security condition of SAPAT PROJECT “Sapat at Masustansyang Pagkain sa Bawat Tahanan” (Sufficient Nutritious Food in Every Household), funded by the United Nation Development Program thru the National Anti-Poverty Commission recipients in Barangay Talifugo, Conner, Apayao. The survey revealed that most of the respondents were 36- 45 years old and active in farming activities. The mean number of children per family is six and annual income was PhP 5,410.06. About 80% of the respondents had sufficient food on their table and 62% never had cut size meals. However, only 36% can afford to eat a balanced diet containing carbohydrates, protein, vitamins and minerals. All respondents eat rice during breakfast, lunch and dinner. To cope with the scarcity of rice especially during rainy season, 92% of the respondents substitute rice with root crops. Protein sources include chicken, pork, beef, fish and eggs. Most of the respondents eat their viand in combination with vegetables with some meat and fish. There are 23 commonly consumed vegetables in Talifugo, Conner, Apayao. The respondents usually consumed leaves, shoots and fruits of the vegetables. Most of these are planted in backyard/farms or bought from market for barter. Seventy percent of the respondents grow vegetables for family consumption and only 36% had enough vegetables for family consumption. Majority did not meet the availability of food in a quantity and quality sufficient to satisfy the dietary needs. The most common diseases are fever, headache, cough, colds, asthma and malaria. The less serious cases are referred to local parademic health workers in the barangay.

**EVALUATION OF VEGETABLE, ROOT, AND TUBER (VRT) CONSUMPTION PROMOTION AMONG CHILDREN**

*Betty T. Gayao and Dalen T. Meldoz*

Northern Philippines Root Crops Research and Training Center  
Benguet State University, La Trinidad, Benguet

Promotion interventions to improve the consumption of vegetables, roots, and tubers among children were conducted in six municipalities of the Cordillera region. Vegetables, roots, and tubers (VRT) consumption, quality of diet and nutritional status before and after promotion interventions were compared, and the relevance, effectiveness, efficiency and sustainability of the interventions were evaluated. The vegetables, roots, and tubers promotion interventions were relevant in terms of attaining the Philippine government goals of increased per capita intake of vegetables and reduced micronutrient deficiencies. The interventions were partially effective as it increased to 38% the percentage of children eating vegetables, roots and tubers; increased to 98% the adequacy of their vegetables, roots, and tubers intake; and improved diet quality of children in terms of protein, calcium

and vitamin C, including water content. Despite the limited resources, the interventions were efficiently implemented by the participating barangays and schools. However, sustainability of intensified vegetables, roots, and tubers consumption promotion is questionable or dependent on political will.

#### **DEVELOPMENT OF PROCESSING TECHNOLOGIES FOR PANDAN AND LEMON GRASS**

*Arnulfo P. Malinis, Ma. Merlie R. Arbo, Leonora S. Lanuzo and Violeta S. Ronda*  
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Bicol Region is the second economically depressed region of the country. Albay is one of its six provinces with high percentage of unemployment rate. This project basically aimed to develop products and by-products of pandan and lemongrass which both generate new technologies and provide income sources for Bicolanos, thereby respond to this major unemployment problem. Pandan and lemongrass are locally abundant in Region V. Production of these plants could generate an estimated gross income of ₱270,000.00 per harvest if sold at ₱5.00 per kilogram of lemongrass stalks, and 108,000 kilograms of pandan if sold at ₱3.00 per kilogram could generate an estimated income of ₱324,000.00 per harvest. Moreover, pandan and lemongrass contains medicinal properties. They are both used as diuretic. Pandan is an anti-diabetic plant and leaves can treat skin diseases. Lemongrass is also a stimulant, promotes digestion, reduces fever and relieves menstrual pain and nausea. It is on these social, economic, and health considerations that the researchers conducted this research. An experimental and descriptive-developmental methods of research was employed. Matured pandan and lemongrass were subjected to juice extraction producing a sixty-two percent (62%) juice recovery for pandan samples and seventy-two percent (72%) for lemongrass. The extracted juices were processed into a ready-to-drink and granulated herbal drinks. The meal waste was made into powdered food seasoning and flavorings. Several recipes were prepared seasoned and/or flavored with pandan, lemongrass and its combination such as chicken braised with lemon grass, hamonadong pata flavored with pandan and lemon grass juice extract, puto and cookies flavored with pandan juice extract, Italian pork chop and chicken liver seasoned with pandan and lemon grass combo juice extract and others. Results showed that the produced ready-to-drink and granulated herbal drinks from pandan, lemon grass and its combination, and the different prepared recipes were highly acceptable.

#### **MINDORO BANNER FOOD PRODUCT DEVELOPMENT: ACCEPTABILITY OF COOKIES MADE FROM VARYING PROPORTIONS OF WILD YAM (*Dioscorea villosa*) FLOUR**

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Occidental Mindoro State College-Murtha Campus, San Jose, Occidental Mindoro

As an initial endeavor to develop a Mindoro banner product, “nami” or wild yam (*Dioscorea villosa*) was used. This crop is a staple food of the Mangyans of Mindoro. The study was conducted to determine the acceptability of cookies with varying proportions of “Nami” flour. Treatment levels were T<sub>0</sub> (control, 100% wheat flour), T<sub>1</sub> (75% wheat flour + 25% “Nami” flour); T<sub>2</sub> (50% wheat flour + 50% “Nami” flour), T<sub>3</sub> (75% wheat flour + 25% “Nami” flour) and T<sub>4</sub> (100% “Nami” flour). Products were rated by 75 evaluators as to taste, color, aroma, and texture using Hedonic Rating Scale. Weighted mean, standard deviation, ANOVA and LSD were used. Comparable acceptability was found between “nami” cookies and the commercial product. However, the use of 100% “nami” flour got significantly low taste. The use of 50% and 100% “nami” significantly reduced color acceptability. There was no significant effect on aroma, but texture was significantly reduced. “Nami” flour can be used in the preparation of cookies but other ingredients should be added to improve texture and taste. The use of quality indicators that would not rely on sensory evaluation was recommended for more reliable results. Nutritional and chemical content must also be evaluated.

**CONSUMPTION OF FISH-SHELL PRODUCTS IN APAYAO**  
*Jaybee Omaweng, Reymalyn Aman and Maria Christina Z. Manicad*  
Apayao State College, Malama, Conner, Apayao

Fish plays a very important role in the daily life of many Iyapayaos, particularly the poor. It is the main source of animal protein in their diet. The study was conducted to determine consumption of fish-shell in Apayao. Descriptive survey involving a total of 115 respondents was used with questionnaire and interviews as data gathering tools. Fresh fish is the type of fish products usually sold to market and is most preferred by the consumers. In terms of the methods of preservation, majority used the sun dried method. Fish products were usually sold in the market and housewives were the majority involved in the house to house selling of fish-shell products. Tilapia is the most preferred kind of aquatic products frequently preferred for home consumption and the consumer respondents greatly consider the freshness and quality and even the price in buying fish-shell products. Sinursur is the most preferred indigenous cook of fish; fresh form and sun dried fishes are the best selling products. To protect the freshwater resources of the province particularly the fish-shell species, there should be a stronger program and advocacy on sustainable use of resources

**DEVELOPMENT OF KATMON FRUIT (*Dellenia philippinensis*) AS BASE SEASONING MIX**  
*Fely A. Habla, Mateo Luis G. Janer, Jeffrey P. Estrada, Prudivic Bigata and Aldrin P. Magracia*  
Sorsogon State College, Sorsogon City

This research is focused on the development and acceptability of Katmon fruit (*Dellenia philippinensis*) as base seasoning mix. Experimental method was used in deseeding the katmon fruits. Katmon powder was produced through drying, deseeding, milling and packing/storing in a foil packaging material. For every 2500 grams of fresh Katmon fruits, an average of 255 g. or 10.2 g. or 10.4 % of dried flour was generated. A moisture loss of 2240.4 g. or 89.6 % was observed. The Katmon powder recovered a light brown fine fibrous and has been mixed with other ingredients to produce seasoning mix. Of the three replications conducted the base seasoning mix with ingredients of 45g of Katmon powder, 3g iodized salt, 1.45 sugar, 0.5 msg and 0.05 citric acid were rated as extremely as like to taste. Based on acceptability level, trial 1 was rated as extremely like as to flavor and much like as to texture, odor and color, respectively. Sensory evaluation was done by the panelist using standard score sheets. Acceptability factors such as taste, texture, odor and color were included among the choices. Results were obtained across prepared viands which is "sinigang na baboy" in Katmon mix indicating the evident taste and odor of the katmon base seasoning mix. The researchers observed correct cooking methods/ techniques in the addition of the developed seasoning mix in the prepared viands. The accepted ones were then standardized. The researchers concluded that katmon fruit are potential for the preparation of base seasoning mix and accepted among consumers and as per laboratory test conducted by the FNRI 2009 and DOST 2010. The shelf-life is highly recommended for the developed product to compete with the other commercial base seasoning mixes. Further research is still needed to address other gaps revealed by the research.

**DEVELOPMENT AND ACCEPTABILITY OF AN ENRICHED LUBI -LUBI (*FICUS PSEUDOPALMA*) NOODLES**

*Fely A. Habla, Concepcion J. Cambaliza, Tarcela F. Detera,*  
*Mateo Luis G. Janer and Geraldine De Jesus*  
Sorsogon State College, Sorsogon Campus, Sorsogon City

This research is focused on the development and acceptability of an enriched lubi-lubi (*Ficus pseudopalma*) noodles utilizing its puree as indigenous ingredients. Noodles were developed and enriched using lubi lubi leaves. The level of acceptability was determined to find out the degree of acceptance of the noodles among consumers. Experimental method was used by extracting the puree of lubi lubi leaves and used as flavor and packed/stored in polyethylene bag. Of the three trials conducted,

the enriched lubi-lubi noodles with ingredients of 250 g of Lubi lubi leaves puree, 325 g APF, 10 g salt, 150 g eggs and 2 g vegetable oil, 187.5 water was rated much acceptable. Based on acceptability level, trial 2 was rated as much acceptable as to taste and color and acceptable as to texture and odor. Sensory evaluation was done by the panelist using standard score sheets. Acceptability factors such as color, texture, flavor and odor were included among the choices. Results were obtained across prepared products, indicating the evident taste and aroma of lubi-lubi leaves through varied degree depending upon the quantity of puree used. The researchers observed correct mixing methods or techniques used flavorings and other materials that nicely blended with lubi-lubi puree as suggested by evaluators; the accepted ones were then standardized. The researchers concluded that lubi-lubi leaves are potential flavoring in the preparation of enriched lubi-lubi noodles and accepted among consumers. The proximate analysis of the developed enriched noodles in terms of moisture content, ash content, fiber content, protein content, fat content, carbohydrate content and shelf-life is highly recommended for the developed product to compete with the other commercial veggie noodles. Further research is still needed to address other gaps revealed by the research.

#### **DIFFERENT LEVELS OF FRUIT EXTRACT IN JAMBOLAN WINE MAKING**

*Ma. Digna T. Bose and Estrelita M. Vasquez*

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This study aimed to determine the alcohol content of jambolan wine with different levels of fruit extract. There were four treatments prepared in this study, each replicated three times. All the mixtures were fermented for two weeks. After fermentation, the mixtures were pasteurized. Samples from each pasteurized mixtures were placed in sterilized bottles and were brought to DOST for analysis. Based on the DOST analysis, T<sub>1</sub> has an alcohol content of 6.46%, T<sub>2</sub> - 5.035%, T<sub>3</sub> - 4.84% and T<sub>4</sub> - 3.81 %. The researchers concluded that the greater the level of fruit extract, the lesser is the alcohol content of the wine. And as the amount of extract increases, the alcohol content decreases. The best mixture in making jambolan wine is 2liter fruit extract + 2 cups brown sugar + 2 teaspoon yeast. The researchers come up with the recommendation that a sensory test should be made to confirm the findings of this study.

#### **FISH AND SHELL POSTHARVEST PRODUCTION IN APAYAO**

*Leilani A. Parugrug and Normalina P. Usita*

Apayao State College

The study was conducted to determine the indigenous processing of fish and shell in Apayao. It was also conducted to produce fish and shell food products. Results showed that the most common dishes for freshwater fish and shell fishes include *abraw*, *sinursuran* and *sagket*. The natives costumarily cook fish and shell fishes with added hot chili. This reflects the Apayao's inclination to hot and spicy foods. *Abraw* is a combination of grated coconut flesh with added *agatol*/crablets and *agurong*. All three are made to ferment overnight and cooked the following day with coconut milk and hot chili. *Sinursuran* refers to fishes cooked in bamboo internodes with salt and hot pepper. The content is crushed using a "*sursur*" or a long stick. *Sagket* making can be applied to meat or fishes which employs the practice of allowing the fish or meat's flesh to develop a rotten odor and is later cooked with salt and hot pepper. Moreover, it was found that all freshwater and shell fishes available in Apayao can be made into fish- and shell-based flakes, noodles, burgers, sauces, soups, breads and crackers, fish bone soups, kropek, canned/bottled/tetra packed fish and shells, and other nutritious fish and shell food products. However, it is recommended that more studies be made to establish the process flow of making these products without compromising the quality of the output. It is recommended that further studies should be made regarding the indigenous processing of freshwater and shell fishes to include shelf-life analysis and nutritional content evaluation on the products. More experiments on other products should be conducted to explore the potentials of the food products.

**BUROLICIOUS PROJECT: ITS PROCESSING, PACKAGING, COMMERCIALIZATION  
AND PROJECT IMPLEMENTATION**

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This study aimed to (1) standardize the process and formula of fermented rice-fish (dalag) mixture; (2) analyze the nutrients, sensory test, shelf life, microbial properties for food safety and (3) improve the socio-economic status of the buro producers. This study is designed to make the product retain its delicious taste however eliminating the undesirable odor. The improved processing of buro revealed that ginisang burong dalag packed in 8 oz. glass jar with a maximum net weight of 240 grams has a minimum processing time at 100°C for 44 minutes starting from thermal processing temperature at 37.8°C. The improved burong dalag has 24-26% salt content lower than original and 18-21 days of fermentation. The commercial sterility test resulted in negative traces of harmful aerobic and anaerobic bacteria, when cultured in malt extract and acid product test broth. It has low mold and yeast count as compared to other fermented manufactured goods. The improved product is delicious, nutritious and with pleasant odor. It has passed the 365 days shelf life test. In its entirety, burong dalag is acceptable and has export quality. Market pilot test disclosed that standard preparation of 3 kilos has 36.26% return of investment for cooked buro and 48.26% if raw. It also increased employment of 3-4 laborers per producer. At present the researchers trained 23 female producers in three barangays and one model cooperator. The processed burong dalag has potential innovation into a large profitable industry. The burolicious project implementation have social impact on (1) high quality of food safety, (2) amplified sales; (3) improved socio-economic status of buro makers; (4) boosted the morale of women (5) increased employment rate; (6) revival of the old culture on buro making which originated from the town; and (7) increased the revenue of the town.

**EFFECT OF VACUUM PACKAGING ON KEEPING QUALITY OF SMOKED FISH**

*Myrna C. Bigueja<sup>1</sup> and Christine C. Bigueja<sup>2</sup>*  
Partido State University<sup>1</sup>, Bicol University<sup>2</sup>

Smoked fish are almost as perishable as fresh fish. To preserve smoked fish for a longer time, it should be kept at 0°C. The experiment was conducted to improve the keeping quality of smoked fish. The study aimed to determine the effect of vacuum packaging material on some selected fillet and whole and gutted smoke fish, such as: milk fish bangus (*Chanos chanos*), round scad (*Sardinella longiceps*), tilapia (*Oreochromis niloticus*), and stored at room temperature and cold storage at  $4 \pm 0^{\circ}\text{C}$  for 12 weeks. Packaging materials increases storage period, however, the shelf life of whole and gutted smoked fish is shorter than filleted fish. Products that were kept in cold storage had stable quality up to 24 weeks. Furthermore, sensorial analysis showed no significance difference up to 15 days for under-vacuum packaging conditions at cold storage temperature. On the other hand, fillet tuna and tilapia has longer storage life than fillet milk fish bangus and round scad. In conclusion, vacuum packaging materials could improve some quality aspects and increase the shelf-life. Hence, it is recommended that smoked products should be packed in vacuum packaging materials.

**PHYSICAL, CHEMICAL AND RETURN OF INVESTMENT ANALYSIS OF BOTTLED  
TILAPIA (*Oreochromis niloticus*) IN COCONUT (*Cocos nucifera*) SAUCE**

*Myrna C. Bigueja<sup>1</sup> and Christine C. Bigueja<sup>2</sup>*  
Partido State University<sup>1</sup>, Bicol University<sup>2</sup>

An experiment was conducted to evaluate the physical, chemical attributes of bottled tilapia (*Oreochromis niloticus*) in coconut sauce. Likewise, return of investment was calculated to determine the profitability and viability of the product. Result of the sensory evaluation showed that the best proportion of the ingredients in making the Bottled Tilapia n Coconut Sauce were 160 grams tilapia fish, 1 cup coconut milk, 1 tsp ginger (sliced), ½ tsp garlic (chopped), 1 stalk lemon grass, ¼ tsp salt,

¼ tsp kalamansi juice, 3-4 whole black pepper. The product has proximate chemical content of 95.97 ash; 43.23 carbohydrate; 16.50 fats; 27.5 moisture and 12.77 protein. Furthermore, the product also met the requirements for commercial sterility, for not having any growth of organism under various condition of the test. For the undiscounted measures of profitability, the project showed a high return of investment of 194% and a short payback of 1 months. The Benefit Cost Ratio of the project was greater than 1 at a computed B/C ration of 2.7 indicating that the project is viable. It is recommended that Bottled Tilapia in Coconut Sauce recipe may be improved and may be developed with different variations. Shelf life of the product may also be determined in the future investigation. Laboratory analysis may be conducted on the peroxide value of the product.

### **TAXONOMY OF FRESHWATER FISHES AND MOLLUSKS IN THE PROVINCE OF ABRA**

*Mary Joan T. Guzman*

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Fishes and shells are widely distributed in the freshwater bodies of the province of Abra. This study covers the taxonomy of freshwater fishes and shells in the province of Abra. It is aimed at furnishing information on the identification, nomenclature, characteristics and etymology, growth and development and ecological status and importance of fishes and shells found in the province of Abra. Collection of different species of fishes and shells was done in all the tributaries of the Abra rivers system. Fishes and shells were transferred to the laboratory for further identification, classification and characterization. Sixteen (16) species of fishes and seven (7) species of shells belonging to 21 genera were classified and identified namely; Fishes - *Clarias batrachus linn*, *Oreochromis sp.*, *Anguilla marmorata*, *Cyprinus carpio*, *Zenarchopterus dispar*, *Cestreaus plicatilis*, *Opicephalus striatus*, *Glossogobius giuris*, *Awaousgrammepomus*, *Awaousocellaris*, *Bunakapinguis*, *Sicyopterus micrurus*, *Anguillidae sp.*, *Rhyacichthys aspro*, *Gambusia affinis*, *Anguillidae sp.* and Shells - *Pyganodon sp.*, *Glochidium sp.*, *Melanoides sp.*, *Melanoides sp.*, *Physa sp.*, *Viviparus sp.*, *Pomacea canaliculata*. Etymology of the nomenclature was derived from their taxonomic morphology. Although there were similar morphological characters observed among fishes and shells collected, variation on the external and internal morphological characteristics, size and coloration was also reflected. Growth and development was done during wet and dry seasons. Some are all year round. Longevity ranges from 1-47 years. Most of these species were found in riffles and pools of the rivers and found to be ecologically threatened. These species are economically important as human food.

### **MAPPING OF POTENTIAL FISH AND SHELL PRODUCTION AREAS IN APAYAO**

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This study was conducted to identify and map out the habitats of the different endemic fish and shell species in various rivers in the province of Apayao. Specifically, it aimed to describe the specific habitat of fish-shell of the freshwater ecosystem in the province and identify the production areas of fish-shell. Field survey in the different rivers in Apayao were conducted and maps of existing habitats of the different endemic fish and shell species in various rivers in Apayao were generated using Autocad. The four (4) major watersheds of Apayao Province; namely, Apayao-Abulug Watershed, Zumigue-Ziwanan Watershed, Nabuangan-Barren Watershed, and Cabcungan Watershed, show that Apayao Province is rich in water resources. Biophysical and chemical parameters measured in the 18 sampling stations established in upstream, midstream and downstream locations fall within the standard set by DENR for unpolluted rivers. Endemic fish and shell species abound in the rivers in Apayao. The data collected from the sampling stations were summarized in ten (10) geographical maps and overlay maps for clarity. Other maps show the location of the sampling stations in relation to the barangays in the different municipalities of Apayao. The information generated from the study provided insight on the location of fisher folk, fish and shell resources available and fishing practices.

**PROBIOTICS AS CONTROL FOR LUMINESCENT VIBRIOSIS IN MUD CRAB  
(*Scylla serrata* Forsskal, 1775) LARVAL REARING**

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Luminescent vibriosis caused by *Vibrio harveyi* is a common disease problem in mud crab (*Scylla serrata*) larval rearing. The use of antibiotics to treat vibriosis in mud crab larvae is not apparently viable due to drug resistant vibrios. The use of commercial probiotics to control luminescent vibriosis has been identified as a promising approach. Three experiments were individually carried out to determine the survival rate of mud crab larvae treated with three different commercial probiotics that were inoculated in the rearing water used to rear mud crab larvae. To determine the effect of commercial probiotics on heterotrophic count, presumptive *vibrio* count, yellow colony-forming *Vibrio* count, green colony-forming *Vibrio* count and luminous *Vibrio* count, rearing water and mud crab larvae samples were collected, spread-plated and counted on nutrient agar plates with 1.5% NaCl and thiosulfate-citrate bile salt agar plates, respectively. Water quality parameters were also monitored to determine the effects of probiotics on the level of salinity, temperature, dissolved oxygen, pH, ammonia and nitrite. Further, the survival rate of probiotic treated and untreated mud crab zoea larvae were determined through immersion challenge with *V. harveyi*. Addition of commercial probiotics in the rearing water did not significantly reduce LVC in the rearing water and mud crab larvae compared with the control. However, these probiotics significantly improved water quality as indicated by marked reduction in ammonia and nitrite levels. In addition, probiotic treated mud crab larvae challenged with *V. harveyi*, resulted in higher survival rates indicating that application of commercial probiotics during mud crab larval rearing is a strategy to control unwarranted outbreaks of luminescent vibriosis in mud crab larval rearing.

**SPECIES DIVERSITY OF TWO SELECTED FRESHWATER ECOSYSTEMS OF ABRA**

Mary Joan T. Guzman

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The study was conducted to determine the species diversity of two selected freshwater ecosystems of Abra in terms of; presence of macroflora and macrofauna found in Lagayan and Lagangilang River ecosystems; occurrence and distribution of macrospecies present in Lagayan and Lagangilang River ecosystems; compare the species diversity indices of the Lagayan and Lagangilang River ecosystems; assess the quality of water of the rivers ecosystems based on the presence of biological indicators; identify the relationship of the fishing activities of fishermen to the observed data. The researcher collected the macroflora and macrofauna of the two freshwater ecosystems along the banks of the river by using mosquito nets. The species were identified and classified according to the Linnanean system of classification. Frequency and relative frequency were used to determine the occurrence and species diversity of the two sites. Different diversity indices (Shannon-Weiner, Simpson, Margalef's) were used to compare the species diversity of the two freshwater ecosystems. The water quality of the ecosystems was determined by the presence or absence of the different biological indicators. Chi square was used to show the relationship of the fishing activities of fishermen and the observed data of the researcher.

**BEHAVIORS OF “IGON” NATIVE CHICKEN (*Gallus gallus domesticus*) RAISED IN CONFINEMENT**

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The traditional raising of native chicken is familiar and most commonly practiced in rural backyards in the Bicol Region. The native chickens are just loosely free to roam around and trees served as their perches at night. This backyard production yield low volume of products and results in the inconsistency of the product output in the market (Chang, FAO 2002). Igon is the type of native chicken found in the 2nd and 3rd district of Albay. It is very popular in the locality especially to fighting cock aficionados due to its strength and hardiness. Other management systems such as confinements must be tried in order to increase its production; hence, this study was conducted to analyze the behavioral activities of “Igon” native chicken raised in confinement such as feeding and drinking, mating and laying, sitting/nesting and mothering ability and other behavior encountered of “Igon” native chicken raised in confinement. The behavioral results that were gathered showed that superiority among the rooster and hens was observed during eating, drinking, and mating by means of pecking. Igon rooster and hens eat (65-95g)/day and (45-75g)/day more amount of feeds during rainy days and drink less amount of water (130-350ml) and (50-90ml)/day, respectively. Nine to nineteen days after mating hens were observed to look for nest. Two hens tried to share the same nest at the same time during laying and nesting. Laying time was 1-2 minutes when eggs popped out the cloacae of the hen. Sitting hens left their nest 1 to 3 times a day to eat, drink and dust bath. Hatching time of eggs set was after 20-22 days. The temperature of nest varies from 35.8oC, 38.2oC and 40oC for flat, curve and slightly deep, fit and deep curve, with 60%, 94%, and 70% hatchability, respectively. Mothering ability was observed by driving away their chicks in one corner of the pens by way of opening their wings to cover their chicks and fight approaching chickens near them. Social or range behavior was usually observed while eating, drinking, pecking of grasses in the roaming area and relaxing while cleaning their feathers and dust bathing. Other behavior observed was cannibalism of hens for chicks fallen from the nest to the ground.

**GERMPLASM COLLECTION OF FORAGE CROPS FOR SMALL RUMINANT PRODUCTION**

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Apayao State College

The study was conducted to establish germplasms collection area of forage crops for small ruminant production. Specifically, it was intended to collect germplasm of forage crops in small ruminant production; maintain germplasm of forage crops for conservation purposes. Four types of forage crops collected: grasses, legumes, trees and other crops. These were planted in the experimental area at DA- ROS, Luna, Apayao. Germplasm collection was established at ASC, Luna Campus. The collected germplasms were maintained *ex situ*. A total of 26 forage crops were collected for the establishment of small ranch production under Agroforestry project. The germplasms were collected from variety of sources and donors. In the light of the findings, the following are forwarded as recommendation: Collect other germplasms of forage crops for the small ruminants production; explore other potential legume, grass and tree forage for small ruminant production considering the wide ecological and biodiverse species of crops in the province.

**Poster Presentation**

**CLIMATE CHANGE ADAPTIVE CULTURE TECHNOLOGY  
FOR LETTUCE PRODUCTION**

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In response with the pertinent provisions of the 2009 Climate Change Act of the Philippines (R.A. No. 929) an experimental research relevant to climate change had been conducted using lettuce as the experimental unit. The technology involved a process by means of constructing the experimental set ups and cultivating of lettuce. The first set up involved construction of a bed-like structure made of bamboos. The other set up was a garden plot with the same dimensions as that of the bed-like structure. Lettuce were grown on both experimental set ups using organic fertilizers and urea as treatments. A completely randomized design was followed in this experiment replicated three times. In the first experimental set up, lettuce seedlings were planted in polyethelene bags each bag planted with one seedling. The plot as the other set up was also planted with lettuce seedlings. Results showed that lettuce grown in polyethelene bags grew faster and healthier as compared with lettuce grown in plot. Lettuce in polyethelene bags were also produced year round.

**UTILIZATION OF CHICKEN CROP AS SAUSAGE CASING**

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Sausage or “longganisa”, an excellent source of proteins and vitamins, is a convenient food made from different kinds of meat which may be packed in natural or artificial casings. To add value to waste products particularly the internal organ - crop in chicken dressing plants and develop a unique product in support to the commercialization of the native chicken industry in the Bicol region, the use of crops as casing was explored and the sensory quality and acceptability of the chicken crop as casing for chicken sausage was determined. The study conducted from February 10- March 5, 2010 at the Institute of Graduate Studies, Central Luzon State University, Munoz, Nueva Ecija used the Completely randomized design with dried crop and frozen crop as treatments replicated three times. The attributes appearance, odor, flavor, tenderness and general acceptability were evaluated by ten panelists. Significant differences ( $P \leq 0.05$ ) were noted in the appearance, odor, flavor and general acceptability with the frozen crop having a better score. After one week storage in the refrigerator, odor and flavor were significantly different ( $P \leq 0.05$ ) with those stuffed in frozen crops having a higher score. Both products were comparable in terms of appearance and general acceptability. Cost of production of one piece of crop sausage was P8.73. Freezing the crops is recommended than drying due to the increase in time and labor spent in drying. Use of crop as casing would be very suitable for specialty products using native chicken meat in place of broilers. The author recommends further study on crops as casing material using other poultry species and the development of specialty products (native chicken or rabbit meat as raw material) with crops as casing material.

**DEVELOPING THE MINIMUM REQUIREMENTS OF PRODUCTION FUNCTION FOR  
OPTIMUM PRODUCTIVITY OF BICOL UNIVERSITY**

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This study was conducted to develop the minimum requirements of production function for optimum productivity of Bicol University. Selected colleges of Bicol University include the Bicol University College of Agriculture and Forestry; Bicol University Polangui Campus and Bicol University College of Industrial Technology. The study focused on the production projects funded by the University that generated funds intended to supplement institutional maintenance and operating

expenses. To generate the data needed, the researcher utilized the normative descriptive survey using questionnaire with self-rating scale, checklists, and interview. Data were analyzed using range, averages, percentages, cross-tabulation, and graphical presentation. For the study of congruency and validation of relationships, the Kruskal-Wallis *H*-test was used. Based from the findings of this study, the following conclusions include: (1) All the respondents considered the internal productivity factors to contribute to the production function of Bicol University although the level of contribution vary from moderate to much contribution; (2) The degree of controllability of the productivity factors likewise vary from least controllable to moderately controllable; (3) Among the problematic factors, people was the most problematic for top management, plant and equipment for middle management and students with addition of organization and systems for students; (4) The differences in the perceptions of the respondents and colleges to the internal productivity factors' level of contribution, degree of controllability and as problem areas were all significant; and, (5) The Kurosawa model based on structure of work hours can be used to determine workers' efficiency and productivity. The following recommendations are presented: (1) Adoption by Bicol University of the proposed minimum requirements of production function for optimum productivity developed from this study; (2) The existing production projects must not be treated as support only to instruction, research and extension but rather as full scale commercial enterprise; (3) Small-scale projects should be expanded to a medium-scale enterprise; (4) Bicol University must undertake an innovative measure to initiate a comprehensive development plan specific for production function; (5) Bicol University must institutionalize the implementing rules and regulations governing production function, and lastly, (6) Bicol University must make an effort and representation to appropriate institutions/entities and/or government development agencies for the creation of Regular Fund classification specific for production function which should be included in the General Appropriations Act (GAA).

#### **HEALTH REMEDIATION AND THE USE OF MEDICINAL FLORA BY DEAGANONS OF DIMASALANG, MASBATE, PHILIPPINES: A DOCUMENTARY**

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Deagan Island is one island component of Barangay Mancaraguit, Dimasalang, Masbate. It is a 257 hectare island, occupied by fishing and farming community, with tenurial rights granted under the Comprehensive Agrarian Reform Program (CARP) (ARC Development Plan). Fishing is the frontline livelihood of the growing communities of Deagan and the adjoining islands. Traditional knowledge on health in Deagan Island is very rich. Selected household members of the island disclosed some fertility-related and health care issues affecting most of the households. There is no available Health Center in the island so medical and health needs are rarely attended to, except for those who can afford to go to the health center in the town proper for check-ups. Absence of health workers and the geographical isolation of the island make sanitation monitoring and transport of emergency cases difficult and childbirth risky. Propagation of medicinal plants for health remediation is basically observed in every household. The use of medicinal plants is common in first aid remedies for common illnesses, like colds, fever and flu. Among the common herbs which some of the residents propagate are *lakadbulan*, *artamesa*, *oregano*, *herba buena*, *labnog* and *noni* plants. *Hilots* are local means in which the community depend from whenever somebody is ill. These are the six (6) quack doctors whom the locals call as *parahoyop* who are always ready to administer their craft to those who are infirmed. Their rituals ranged from the use of various leaves, bark of trees, eggs and essential oils accompanied by the prayers or *oracion* which the *parahoyop* does. Although, most of them do not accept any payment for their services, the residents sometimes give them donations in the form of small cash or in kind. Majority of the ones being brought to them for treatment are those who suffer from muscle pains, sprains, constipation, gas pain, headaches, fever and flu and the headache due to the so-called usog or sibang. Some of them also undertake circumcision of the male youth using a sharp *labaha* as implement with rubbing alcohol and guava leaves as antiseptic.

**BURIRING (FAMILY *Tetraodontidae*) FISHERIES: PROSPECTS FOR ALTERNATIVE TOURISM OF DIMASALANG, MASBATE, PHILIPPINES**

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Buriring is a unique fisheries of Bicol, particularly of Dimasalang, Masbate. *Buriring* is a local name of juveniles of distinct species of a pufferfish, belonging to Family *Tetraodontidae*. The duration of its occurrence in the Naro Bay is very short (four to five weeks only); however, the capture of juveniles is in large quantity. Three distinct species are observable based on distinct physical markings; however, there is a need to establish the taxonomy of these species. It is important however to stress that the three variants are traditionally eaten by most people of Dimasalang as exotic food. The 2006 season had an approximate production of 2,200 metric tones with a conservative economic value of P44 million pesos. A Buriring fishery in Dimasalang is rich in traditional knowledge. A variety of menu can be prepared out of *buriring*. The very popular is soup (in Cebu) and a variety of menu for buriring's liver and flesh known locally as *linabog* (in Dimasalang). The presence of *buriring* is not a good phenomenon to some. Some fishers were annoyed by *buriring*, since it severely reduces their income during its season. It was noted from the accounts of people that some severely affected sectors resort to rituals to drive-away *buriring*. This was reportedly done by wrapping some *burirings* in a black cloth and burry this in a local cemetery through a simple ritual. It was claimed to be effective, because for sometime, *buriring* disappeared for almost five years not too long ago. With such unique fishery in Dimasalang, the trend of holding festivals as promotional strategy of local government units, *buriring* can be a good material. It could introduce Dimasalang to the world as haven of *buriring*. Capitalizing on the unique characters and limits of *buriring*, a local festivity can be conducted annually, especially during season of the fish. In the essence, the festival would result to more detailed understanding of the fish and its ecology. At times when the supply is scarce, as an expected dynamics of any fish population under exploitation, the activity can be channeled to resource limit awareness and environmental management advocacies.

**PREVALENCE OF *Paragonimus* sp. METACERCARIAE INFECTION IN FRESHWATER CRAB, *Sundathelpusa philippina*, FOUND ALONG BRGY. PUTING SAPA CREEK IN SORSOGON, PHILIPPINES**

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Freshwater crabs, *Sundathelpusa philippina*, the second intermediate host of the lung fluke, *Paragonimus* sp. were collected from a creek in Barangay Puting Sapa, Juban, Sorsogon, and were examined microscopically for the presence of metacercariae in the gills, pericardial tissues, gonadal tissues, and leg muscles. There were 61 crabs examined: 31 males and 30 females, and 26 juveniles and 35 adults. Male crabs had significantly higher metacercarial load (mean 92) compared to females (mean: 80). Mature adult crabs had significantly higher level of infection (mean: 105) compared to the juveniles (mean: 68). Comparative mean metacercarial load distribution in different body tissues showed the highest in gills at mean of 58.9, and followed by pericardial tissues with 15.9, gonadal tissues with 12.8, and leg muscles with 1.4. Using the ANOVA and validated by Duncan's and Tukey Kramer's tests, a significant difference ( $p=0.05$ ) in the metacercarial load in gills and in leg muscle metacercarial load between adult crabs and juvenile crabs was noted; while insignificantly different between the genders. In the pericardial tissues and gonadal tissues, the metacercarial load showed no remarkable difference between adults and juveniles as well as sexes.

**DISTRIBUTION AND ABUNDANCE OF FRESH WATER CRAB (*SUNDATHELPUSA PHILIPPINA*) INHABITING A CREEK IN BARANGAY PUTING SAPA, JUBAN SORSOGON**

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<sup>1</sup>College of Science, Bicol University, Legazpi City, 2009,

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The study was conducted to determine the distribution and species abundance of the freshwater crabs in the locality of Brgy. Puting Sapa Juban, Sorsogon. The 239 crabs collected from two sampling stations, Ilawod and Iraya covering an area of 250 square meters per station were all identified as *Sundathelpusa philippina*. The crabs pooled from the two stations consisted of 115 females and 124 males with a relative density of 0.460 and 0.496, respectively. Male juveniles (n=51) had higher relative density (0.204) compared to 29 female juveniles (0.116). Adult and juvenile sex ratios were 1:1 and 1:2 (male vs. females), respectively. In both stations, though differences in weight and body length between sexes in both adult and juveniles were insignificant, this was significant between stages of development/growth. Biomass difference between the two stations (Ilawod: n=136 & 0.087g; Iraya: n=103 & 0.086g) is insignificant.

**THE ECOLOGICAL VULNERABILITY OF BIO-PHYSICAL QUALITY OF THE COASTAL WATERS OF BACON DISTRICT, SORSOGON CITY, PHILIPPINES**

*Ida F. H. Revale and Arnelyn D. Doloiras*

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The coastal waters of Bacon District, Sorsogon City characteristically supports more production of the marine organisms because of the diverse plankton community and good water physical characteristics. There were twenty-one different species of phytoplanktons and eight species of zooplanktons identified and taxonomically classified. The phytoplanktons identified belonged to six phyla – Bacillariophyta, Ochrophyta, Ciliophora, Dinophyceae, Prasinophyta and Cyanobacteria. *Amphisolenia bidentata* is the most abundant of the phytoplankton species and *Acanthocyclops robustus* is the most abundant zooplankton. San Juan has the most diverse plankton community, and the abundance of phytoplanktons in the area supports more production of marine organisms, since planktons are indicators of a healthy and productive sea. The physical characteristics of the sea water surrounding Bacon District such as salinity, pH, temperature, turbidity and conductivity complied with the standards set by DENR-EMB in DAO-34. Normal growth of aquatic biosystems are observed and is likewise favored by the water quality, however, this marine habitat is so fragile that any alterations to this aquatic environment including the observed optimum condition of such environment will render them unfavorable for both aquatic organism and to the inhabitants residing the island. There is a need to sustain the management of the marine sanctuary in the area so that the richness of the marine resources is maintained. While there is the presence of mariculture in the area, there should be constant counter monitoring of the water quality for environmental safeguarding.

**THE COASTAL FISHERIES PRODUCTION OF BACON DISTRICT, SORSOGON CITY, PHILIPPINES**

*Ronnel R. Dioneda Sr., Arnelyn D. Doloiras and Arnel L. Noli*

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The capture fisheries of Bacon District is a multigear type which harvests various species of mainly coastal and oceanic pelagics and hard bottom demersal fishes. Fishing dynamics is strongly affected by the interplay of northeast and southwest monsoon. Peak fishing operations happen in February, when the northeast monsoon weakened, up to June, prior to the onset of the southwest monsoon. Bulk of the fishing trips and 64% of the municipal fisheries production of the district is

generated during this period. The fishing gears have diversified from 20 types in 1998 to 33 at the present time. The increase in gear types and units signal increasing fishing intensity and scarcer resources, hence fishers modify their gears to enhance catching efficiency. Fishers disclose that they devote longer fishing times and generate smaller catch during the present time. Decrease of catch rate was noted to range from 20-65% using rough baselines in 1998. Species shift from big oceanic pelagics to smaller coastal pelagics and demersals and shortened fish availability (season) were also evidently noted. The fishing gears are mostly simple and municipal types, dominated by handlines of several variants. Seven units of commercial fishing gear (ring net) are present and contribute 19% to the coastal fisheries production of the district. Fifty three percent of the 2156.8 mt total fisheries production estimate for 2009 is contributed by handlines. More than 80% of this total production is contributed by Sto. Nino, San Juan, Caricaran and Poblacion. The remaining are shared by the other 14 barangays, having Bato (3.5%) and Buenavista (3.8%) leading the pack of minor contributors. The approximately 1200 fishers are unevenly distributed along the 32.48 kilometer coastline, with an average density of 34.73 fishers per kilometer coastline. The total annual fisheries production they generate, conservatively estimated at P130 million (Php) surprisingly exceeded the total economic revenue generated by the 1400 hectares of irrigated and unirrigated rice farmlands. With this information at hand, investments to wider interventions for fisheries development and management would have stronger economic and social justification.

**THE ECOLOGICAL HABITATS OF BACON DISTRICT, SORSOGON CITY,  
PHILIPPINES**

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The ecological habitats of the coastal area of Bacon District, Sorsogon City were assessed of their status. Standard sampling techniques were used to generate data that were needed to come up with comprehensive statements regarding the present state of the identified habitats. Line intercept method was used to survey the existing coral reefs. Line quadrat method was used to assess the seagrass/seaweed beds while line plot method was used to evaluate the community structure of the mangrove habitat. Fish visual census was employed to assess the diversity and biomass of coral reef fishes. Corals were found to be thriving along the entire coastal zone of the district but noted to very extensive in barangays Osiao, Sto. Niño, San Juan, Caricaran, Sawanga and Buenavista. The status of the coral reefs in the said areas ranged from poor to good live coral cover. Overall mean percentage live coral cover was 40.28% in the whole sampling area indicating a fair live coral cover condition. The reduction in live coral condition can be attributed to both anthropogenic and natural causes. Thirty six species of coral reef fishes were identified in the coral reef stations with varying biomass estimates of 112 to 308 kg/hectare. Nine species of seagrasses and four species of seaweeds were identified and they were observed to be extensively thriving in the sampling areas. The species *Syringodium isoetifolium* appeared to be the dominant species of seagrass. This was followed by *Thalassia hemprichii* with *Halophila minor* as the least. Among the seaweeds the species *Halimeda cylindracea* was dominant. Ten species of mangrove species were identified alongside with another three associated species. *Avicennia marina* was present in all the sampling sites. Cutting of mangrove trees was observed in most of the sampling stations. Level of perturbation was estimated at level three. The different ecological habitats evaluated were important life support systems for the existing fishery in the area especially for the gleaning of macro-invertebrates.

**SOCIO-ECONOMICS OF BACON DISTRICT COASTAL COMMUNITIES, BACON DISTRICT, SORSOGON CITY, PHILIPPINES**

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An assessment of the socio-economics of the coastal communities was undertaken as component of the Rapid Resource and Social Assessment of Bacon District. It intended to provide detailed update of the status of the social and economic well-being of the district coastal dwellers for CRM and other interventions for the district's fisheries development and management. The fisherfolks of Bacon District are original Bacongnons, mostly catholics, have an average residency of 23 years and majority are elementary and high school graduates. The mean household size is 6.45 members. They have been fishing on an average of 24.17 years, and presently exert fishing intensities of 10.15 months per year, 3.19 weeks/month, 4.93 days/week and 1.43 times/day. Many households commonly owned manual or motorized banca. Mesh sizes of nets are suited for the target species. Hooks used by fishers are homemade. Most of these municipal fishing gears are assembled locally using locally-available materials. Most of smaller fishes were caught by fish nets and the fish corral. Per catch, the volume ranged from 3-5 kilograms per fishing trip (one trip per day). Marketable sizes costs PhP 70.00 per kilogram, however, 80% of the catch is allotted for domestic consumption, 10% is shared with companions and/or relatives and the remaining quantity is sold. Fisher folks are aware of the existence of illegal fishing practices in the coastal waters of Bacon District with illegal fishing perpetrators are people from outside of their barangay and rely on the local government unit (LGU) as the one responsible in stopping illegal fishing. Women play crucial role in both community development at Bacon District or in the fishing activities. Women's activities in the barangay are focused much on socio-civic and livelihood activities and involvements include marketing of fish catch and fish processing. The coastline along the Bacon District has been naturally and ecologically contoured and is considered a recreational and ecotourism area due to the quality beaches.. Bacon District fisher folks have positive perceptions of conservation of coastal resources. They are open to the realities for a need towards better future direction of conservation and management of coastal resources. Fishing is their way of life and the same needs to be nurtured.

**UTILIZATION OF VERMICOMPOST IN LAHAR-LADEN AREAS AROUND MAYON VOLCANO**

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Agriculture is one of the major economic activities in Albay. However, different calamities occur resulting to ecological changes. On November 30, 2006, severe rainfall associated with the passing of super-typhoon Reming triggered lahar flows, landslides and flash floods on the southeastern quadrant of Mayon Volcano. Vast agricultural land had been damaged and deemed one of the worst problems of the residents whose economic life depends on agriculture. A study was conducted to assess the growth and development of bell-shaped pepper (*Capsicum annum* L.) on lahar soil to varying levels of vermicompost. The lahar utilized was collected from lahar-laden area near the 6-kilometer danger zone of Mayon Volcano. Observed values from the study shows that lahar-laden areas can be made productive for agriculture given proper management and appropriate technologies by using organic fertilizer such as vermicompost. Vermicompost is a product of processing organic waste by earthworms. It has dramatic effects on the availability of nutrients, plant germination, growth, flowering, fruiting, and yield of crops. With these, the farmers could use the land destroyed by the lahars in low-lying areas of the volcano while at the same time rehabilitating the immediate surroundings and mitigating also the negative impacts of climate change.

**DISASTER RISK REDUCTION THROUGH LAND USE PLANNING IN LAHAR-DEVASTATED FOOTSLOPES OF MAYON VOLCANO IN ALBAY**

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Mayon Volcano's lahar deposition continually being pried and loosened by typhoons' heavy rains is constantly altering the landscape in the foot slopes of the volcano. Such a precarious condition necessitates a dynamic land use plan to cope up with the hazards of future events of high intensity typhoons and volcanic eruptions. This study was conducted in Lidong, Sto. Domingo, Albay to formulate an appropriate land use development framework plan for lahar-devastated areas brought about by Typhoon Reming in 2006. The land use development framework planning involved the following activities: A. Environmental assessment of the study site: Spatial extent and physical delineation of the study area; Identification of major land use systems; Ecological profiling (biophysical and socioeconomic), and Integrative analysis. B. Consultative process: Community consultation; and, validation with the community and other stakeholders. Future events of high intensity typhoons and volcanic activities will pose hazards to Lidong and other areas at the footslopes of Mayon Volcano. The land use development framework plan will provide the general guidelines to help mitigate the risks of disaster and maximize the potential use of the land and natural resources.

**PEARL FARMING SCIENCE AND TECHNOLOGY PROGRAM OF CASTILLA, SORSOGON, PHILIPPINES**

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The research capitalized on the presence of at least three species of pearl producing oysters, one of which is *Pinctada maxima*, popular for its potential to yield south sea pearls. There is the potential of exploring spat collection as possible support activity to the pearl farming program being developed in the area. The 18 species of spats fell under 2 phyla (Mollusca and Arthropoda), distributed to three classes, 10 orders, 10 families and 14 genera. The dominance of several economically important mollusks, specially the pearl producing oysters, namely, *P. maxima*, *P. margaritifera* and *Pteria penguin* and *P. colymbus* were indicators of the potential of exploring spat collection as input to nursery technology to support fresh supply of pearl oysters for commercial pearl farming. A promising development of locally-adaptable technology of pearl oyster relaxation was tested in the experimental implantation of round nucleus right in the gonad of recipient oyster. The relaxation protocol utilized locally available plants as relaxant. When compared to the local practice of wedging, PORIT was much simpler and effective. There was 100% survival rate with PORIT while 0% survival rate with the wedging method (experience by local farm practice in Cogon). Also, there were no rejections of the nuclei implanted in PORIT while the owner-technician of the local farm employing the wedging method reported recovery of pearl beads. Pearl farming, as an ecologically-friendly aquaculture practice would sit well with the protection and management of coastal assets of Castilla. The location of the present experimental station, at the eastern periphery of the Malaumauan Island Fish Sanctuary and Marine Reserve (FISAMAR) could be a tool to further enhance the protection and management afforded to the reserve and sanctuary. This an inviting opportunity for local managers to carry-out CRM while integrating eco-friendly aquaculture and FISAMAR management. The ecotourism potential of the pearl farming project in a scenic uninhabited Malaumauan Island, near the FISAMAR is obvious. Several times, the project and the pearl farm venture were featured in broadcast and print media.

**FUEL EFFICIENT CHARCOAL STOVE (PATENT NO. 02-2009-000005)**

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The research study was primarily aimed to design, construct and evaluate the performance of the Fuel Efficient Charcoal Stove. Patent application to protect the rights of the maker and researcher was also form part of the study. Igneous stones from emitted by Mayon Volcano was selected and used as the secondary materials and used in prolonging heat temperature. The locally available charcoal stove was used to compare the performance of the Fuel Efficient Charcoal Stove. The prototype is patented and awarded by IP Philippines Intellectual property rights and is protected for 7 years. The stove consumes charcoal at the rate of 400 grams for 2 hours; and 3) Heat temperature holds for a while through its secondary materials even charcoals are turned into ashes. The design of Fuel Efficient Charcoal Stove is patentable. Small holes as part of the design with a rectangular shape opening at the lower part helped good circulation to produce more intense heat. About 400 grams of coco charcoal is enough to last for 2 hours to cook food for the family.