

MMSU S&T Journal

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FOREWORD

Our Science and Technology (S&T) Journal is back. We resume after a brief lull with the resolve to sustain publishing from hereon. We are indeed propelled more than ever because it is a part of our mandate, our commitment to serve the public whose investment in us has to be reciprocated via knowledge creation, specifically in the form of research breakthroughs. Since we started publishing, we have vowed to be driven by principle that research is a public enterprise. Research breakthroughs then must be presented to the public not only to advance science and technology for its own sake but also if not more so, to provide options or solutions to the issues and problems of everyday life especially in our service areas. This is the commitment of research and so for MMSU through the S&T Journal.

The S&T Journal returns with this volume the promise of sustained and progressive publishing. We shall sustain by coming up with a quality issue on a regular basis. It is progressive for it will adhere and cope with the improving quality standards of publishing, nationally as prescribed by the Commission on Higher Education (CHED) and internationally according to global parameters, protocols, and norms. Beginning with this volume, the journal shall henceforth be a refereed publication. Part of the promise is the enlistment of high calibre external referees who pass acceptability measure on each article submitted for possible publication. We hope to have the international serial badge for the journal soon. In addition, we are now opening up the journal for contributors from outside of MMSU. Our S&T Journal shall henceforth become a publication for the whole research community without any restriction in terms of area, agency, and institutional bounds. Our S&T Journal embraces the norm of internationalization of research.

Seven of the several articles submitted for review have hurdled proverbial 'eye of the needle' and have been finally considered part of this volume. They represent a cross section of the disciplines, which include agriculture, food, forestry, service learning partnerships, and human resources. We look forward to a richer content and substance of the journal in the upcoming editions with the contributions of researchers from outside our university.

MIRIAM E. PASCUA
President, MMSU

High-Yielding and Acceptable Tugui (*Dioscorea esculenta*) Accessions for the Ilocos

Noralyn B. Legaspi and Beatriz S. Malab*

Abstract

Tugui (*Dioscorea esculenta*) is one of the more important species of yam and has been cultivated and used as subsistence food by rural folks since time immemorial. It thrives well in areas where the more important crops cannot be successfully grown and is considered as cash crop by the upland farmers in the Ilocos, being one of the few crops that can be grown in sloping and marginal areas that define their farmlands. However, productivity is limited to about 2.6 t ha⁻¹–3.3 t ha⁻¹ only, and one of the contributory factors of which is the absence of a recommended high-yielding variety.

To address this need, series of experiments were conducted with the hope of identifying promising accessions that could be recommended to farmers. After three years of evaluation both on-station and on-farm, six accessions (Accessions # 9, 3, 2, 1, 4, and 15) were identified promising, with mean yields ranging from 13.33 t ha⁻¹ - 14.54 t ha⁻¹, which is equivalent to an ROI of at least 1.63. These accessions are also highly acceptable to consumers.

With the promising accessions, planting of tugui can now become a more productive farming endeavor. With these, the marginal and/or idle lands can be made productive and be used to support the government's program on food security.

Keywords: *dioscorea esculenta, yam accessions, marginal*

Development of a Multiplication Technique for Virus-Free Garlic Planting Materials

*Miriam E. Pascua**, *Maura Luisa S. Gabriel*, *Araceli J. Badar*,
Menisa A. Antonio and Marissa I. Atis

Abstract

Garlic is vegetatively propagated by cloves; hence, it is exposed to virus infection and pests resulting to the accumulation of diseases in the planting materials through time. To address this problem, *in vitro* rapid multiplication techniques for shoot induction and bulblet formation were done at the Tissue Culture Laboratory. Specifically, this experimental study determined the effect of growth regulators on shoot induction on Ilocos white garlic variety; assessed the performance of Tan Bolters and Mindoro garlic using different culture media for *in vitro* bulblet formation; and evaluate the sucrose level that could enhance *in vitro* bulbing using Murashige and Skoog (MS) as base medium.

The protocol for a rapid multiplication technique was successfully developed both for *in vitro* and field conditions. For the *in vitro* techniques, procedures were done to induce shoots that form bulblets and to optimize bulblet formation. Garlic can be rapidly produced using the appropriate medium for shoot induction, which was MS + 0.3 mg/L IAA + 2 mg 2-ip + 3 % sucrose. For bulblet formation, the best bulbing media for both Tan Bolters and Mindoro I cultivars was MS + 12% sucrose. Based on the results, the bulblets produced *in vitro* can be multiplied in the field.

Keywords: *garlic, in vitro, tissue culture, multiplication, virus indexing, shoot induction, bulblet formation*

**Effects of Sanitation Cutting and Fertilizer Application
on the Rejuvenation of Old Kawayan Tinik
(*Bambusa blumeana* Schultes F.) Stands**

Joselito I. Rosario * and Charito L. Samsam

Abstract

The lack of concerted efforts to manage natural stands of kawayan tinik coupled with the increase in the demand for and prices of bamboo poles, the development of processing technologies and the increase in markets for bamboo products led to overcutting and overexploitation of bamboo stands. Thus, a study was conducted at the Mariano Marcos State University (MMSU) Forest Reserve in Sitio Lubot, Brgy. San Mateo, City of Batac, Ilocos Norte to determine cultural treatments that could revitalize the shoot and culm production of old kawayan tinik stands. Moreover, it assessed the effects of sanitation cutting and complete fertilizer application on the shoot and culm production of the clumps.

Sanitation cutting had marked effects on the number and height of shoots and culms, number, diameter, and length of matured culms. Generally, the clumps with sanitation cutting performed better than the clumps without sanitation cutting.

Moreover, fertilizer application significantly affected the number and height of shoots; number, diameter and height of culms; diameter and length of matured culms. Fertilized clumps produced more and bigger shoots and culms than the unfertilized clumps.

These results imply that sanitation cutting and complete fertilizer application would significantly increase shoot and culm production of old kawayan tinik clumps. In addition, it is apparent from the results that applying 2 kg 14-14-14 clumps⁻¹ year⁻¹ is sufficient to enhance the shoot and culm production of old kawayan tinik clumps.

Keywords: *cleaning/sanitation cutting, fertilizer application, kawayan tinik*

Root Growth Potential and Morphological Characteristics of *Jatropha curcas* L. Seedlings from Three Provenances

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and *Arturo SA. Castillo*

Abstract

The study was conducted at the Institute of Renewable Natural Resources Nursery, College of Forestry and Natural Resources, University of the Philippines Los Baños to evaluate the quality of *Jatropha curcas* seedlings raised from three local provenances (Laguna, Palawan and Surigao). Specifically, it assessed the variations in the root growth potential (RGP) of *J. curcas* seedlings from three provenances; differentiated their morphological attributes; and determined the degree of relationships between their RGP and morphological traits. The experiment was laid out in a randomized complete block design (RCBD) with four replicates. The parameters were RGP, height, root collar diameter (RCD), length of longest root, seedling biomass, root-shoot ratio, and seedling quality index (SQI).

Among the three provenances, Laguna provenance produced taller seedlings that had higher RGP than those from Palawan and Surigao, which indicates that those from Laguna could be genetically superior than the other two provenances. No provenance variations were observed on the RCD, length of longest roots, seedling biomass, shoot-root ratio, and SQI. In addition, all the seedlings, regardless of provenance, were top heavy and could be susceptible to moisture stress and desiccation when outplanted in drought prone areas.

Seedling height and RCD were correlated with all the morphological traits, except shoot-root ratio. This means that either height or RCD can be used to estimate the other morphological traits of *J. curcas* seedlings. Additionally, RGP is positively correlated with all the morphological traits, except shoot-root ratio; and a strong positive correlation was also observed between SQI and all the morphological attributes of the *J. curcas* seedlings.

Keywords: *root growth potential, seedling morphological traits, seed quality assessment, seedling quality index*

Growth and Yield Performance of Promising Napier Grass Accessions as Affected by the Frequency of Chicken Manure Application

***Roseminda R. Sair, Corazon Diana A. Pastor*
and Benito B. Balneg***

Abstract

The study compared the effect of single and split chicken manure (CM) application on the growth and yield of promising napier grass accessions, identified the high yielding napier grass accession, and compared the cost benefit ratio of producing napier grass. Three frequencies of chicken manure application - zero, single, and split - were used in fertilizing seven promising accessions of napier grass. The frequencies of fertilizer application were randomly distributed to three horizontal strips while the accessions were randomly distributed to seven vertical strips using the Strip-plot design. Each plot measured 3 m x 4 m.

Results showed that frequency of CM application significantly affected the number of days to shoot emergence, the number of tiller produced, height and dry herbage yield of napier grasses. Grasses with single or split CM application produced new shoots earlier and had more tillers than those with zero manure application. Grasses with split CM application were taller and produced higher total dry matter yield than those with single or zero application. In terms of dry matter yield, grasses applied with split manure application (10.13 t ha^{-1}) produced significantly ($P \leq 0.05$) higher dry matter herbage yield than those with single application (7.44 t ha^{-1}) during the wet season of the first year observation period. However, grasses with either single or split manure application produced comparable dry herbage yields with the unfertilized grasses during dry season. In the second year of observation period, grasses either single (6.98 t ha^{-1}) or split (6.35 t ha^{-1}) produced significantly more dry herbage yield than the unfertilized grasses (2.93 t ha^{-1}). Based on the mean yearly dry herbage yield, grasses with split manure application produced the highest total dry matter herbage yield per year of 12.11 t ha^{-1} while only 6.24 t ha^{-1} for the grasses with zero manure application.

In terms of napier grass accessions, no differences were observed on the number of days to shoot emergence and total dry herbage yield. However, Ex Indonesia produced the highest dry herbage yield and Miniero produced the lowest dry herbage yield.

The marginal benefit cost ratio 3.29. of split over single CM application, implies that the former is better than the latter. However, any of the accessions could be used because they have comparable herbage yield.

Keywords: *napier grass, accessions, chicken manure application*

**Capabilities and Employers' Assessment of the Current
Human Resources in Agriculture, Forestry
and Natural Resources in Region 1**

Marivic M. Alimbuyuguen* and Emerita D. Galiste

Abstract

The study provides a comprehensive picture of the current human resource capabilities of graduates in agriculture, forestry and natural resources (AFNR) programs of the Mariano Marcos State University (MMSU), Pangasinan State University (PSU), Ilocos Sur Polytechnic State College (ISPSC), and Don Mariano Marcos Memorial State University (DMMMSU). Using the descriptive research survey design, data from mailed responses of 597 proportionately-sampled AFNR graduates; and those from mailed questionnaires of and interviews with 166 employers of AFNR graduates selected through snowball sampling were gathered and analyzed.

Majority of the AFNR current human resources in Region 1 consisted of females, singles, rural area residents, and public secondary school graduates. They pursued an AFNR course because of the immediate employment prospects, affordability, and job opportunities. The graduate-respondents rated themselves to be good in terms of the specialized knowledge and skills in AFNR. They claimed that their AFNR curriculum was very relevant from which they gained their competencies. Most of the AFNR graduates were employed in private local firms/organizations in the rural areas as contractual workers.

Moreover, the employers of the AFNR graduates were very satisfied with their employees' understanding of their major and outside fields of study. They were also very satisfied on the general qualities, general skills, and specialized skills of their workers *vis-a-vis* their job requirements. On the whole, employers were very satisfied with the over-all preparation of their employees. Nevertheless, the employers suggested that speaking and communication skills, using new communication and information technologies, and maximizing team work be given emphasis in the AFNR curricular offerings. Additionally, they express their intention to hire AFNR graduates from the State Universities and Colleges (SUCs).

Keywords: *AFNR, current human resources, general qualities, general skills, specialized skills*

Discourses on Applied Ethics in a Service-Learning Partnership Project on Organic Agriculture

Frederick F. Rodrigo*

Abstract

This qualitative case study explored the constructs of applied ethics in a service learning partnership (SLP) project via social marketing and mobilization on organic agriculture. Applied ethics was unpacked based on the lived experiences of 21 project partners like concerned undergraduate and graduate students, faculty, and technology experts of the Mariano Marcos State University; administrators and staff of the Ilocos Agriculture and Resources Research and Development Consortium; clientele like the youth and farmers from Barangay Magnuang, City of Batac, Ilocos Norte; as well as subject matter specialists from the City and Provincial Agriculture Offices. Magnuang was the project site because the underground water of a relatively large portion of the barangay has been contaminated with nitrate due to the farmers' excessive use of inorganic commercial fertilizers.

Based on the transcripts of the documented activities, 34 ethical issues evolved, which served as bases for the in-depth interview guide. The interviews were documented and themes were drawn out from the transcripts. Among the more commonly-encountered dilemmas were conflicts involving one group of partners and others. The limited time for doing the project was the most commonly mentioned dilemma. Most of the ethical dilemmas were resolved through value- and purposive-rational actions, either strategic or communicative. Additionally, peer/collegial support and various groups' cooperation facilitated dilemma resolution. Meanwhile, time and resource constraints, personal limitations and biases, and power relations were among the impediments in resolving ethical dilemmas. The implications of the project partners' lived experiences in applied ethics were bases in recommending actions toward partnerships needed in sustainable organic agriculture.

Keywords: *applied ethics, service-learning partnership, social marketing and mobilization, ethical dilemmas, organic agriculture*