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What's inside . . .

Off the Press June 2004

Editorial

God's Creation: A Theology of the Environment

Christianity is often seen in opposition to ecology. In many intellectual circles, Christianity is equated with capitalism, industrialism, Westernism, consumerism, imperialism, and even militarism. In reality, Christianity should be at the forefront of protest against these destructive attitudes and practices.

Christians are not known for leading out in environmental education, or conservation projects. Most environmental programs and advocacy groups are not affiliated with Christian churches.

We are faced with many global issues today, but some of the most pressing involve our environment. Environmental issues are not just the concerns of a few; they are the concerns of many. And everyone is affected.

When it comes to ecology, the Christian's responsibility is even greater than that of the non-Christian. It is vital that as Christians we be concerned with the welfare of the individual, but we often overlook the environment in which the individual lives. What happens when he/she gets sick from eating fish from contaminated lakes or seas, or from extreme pollution? Where should Christians stand on such issues?

Looking at the past—how man has taken advantage of God's creation and exploited what it has to offer—we have wreaked havoc on Planet Earth for generations still to come. Advances in science and technology and galloping population increases have placed enormous pressure on our natural resources.

We have been overtaken by devastating environmental crises like the ever-widening "hole" in the ozone layer, the unstoppable loss of our biodiversity and disastrous climate changes. As such, there should arouse the need to revive the theology concerned with God's creation as well as His redemption.

We Christians need to develop a biblically-grounded attitude toward God's creation. We believe God created the world as indicated in Psalm 24:1, "the earth is the Lord's and the fullness thereof." He cares for it and He wants us to

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A survey report: Second of two parts

Biodiversity: CI readers' No. 2 most clamored topics

Gloria R. Diokno

One of the notable findings of the readers' survey is that the subscriber-respondents do keep abreast with the times in terms of the topics/subjects they would like to see published in the CI. **Environment** and **biodiversity** are the emerging issues worldwide and these are the two topics/subjects which readers/users would like to read in the CI. These two big areas of concern are the "in" things to cope with. Accordingly, this suggests the need to intensify R and D efforts along **environment** and **biodiversity**.

Suggestions on how to improve the CANOPY *International*

Topics/subjects respondents would like to see published in the CANOPY *International* (CI). Respondents were asked to suggest as many topics/subjects as they could which they would like to see published in the CI. Consistently, among the local and the foreign respondents, environment and biodiversity appeared to be the number-one and number-two favorite topics/subjects, respectively, preferred by the great majority.

Moreover, there were a number of topics/subjects which only the local respondents would like to see published in the CI. Solid waste management was the most frequently mentioned topic/subject by a large number of readers/users.

Respondents' suggested measures of improving the CI. The respondents were asked to suggest as many measures of improving the CI as they could. The most frequently cited measure was "More information about current research projects" by both local and foreign respondents. This was indicated by the great majority of both local and foreign respondents.

Second and third most commonly suggested measures of improving the CI were "More recent issues on environment/Philippine ecosystems" and "More photographs". These were consistently mentioned by respondents, both local and foreign.

Concluding statements

In light of the findings in the study, the following conclusions may be drawn:

- On the whole, both males and females have access to the CI although this was conversely shown in the two groups, local and foreign subscribers: more women readers/users among the former but more men readers/users among the latter.
- Reading/use of the CI is prevalent among married subscribers, 30-49 years of age and high-salaried.
- Reading of the CI prevails among the highly educated (from college graduates up to those with doctorate) and those engaged in research and teaching/education.
- Usage/reading of the CI is predominant among the 6-10-year subscribers who get their copies through the mail and those who read bimonthly, picking out information that are interesting and useful in their respective jobs.
- Reading/use of the CI is prevalent among the subscribers who look for and read articles directly related to their jobs, interests, or needs.
- Information in the CI are described by the predominant subscriber-respondents as completely relevant to their respective fields/jobs and the content of the articles are described as "just right".
- Relevance/usefulness of the research findings published in the CI to their respective jobs is the predominant benefit that the respondents derive from reading/using the publication.
- After reading/using the CI, the subscriber-respondents file their copies for future reference.
- Environment and biodiversity which are the emerging issues or needs worldwide are the two areas of concern the subscriber-respondents want the CI to publish.
- Correspondingly, the suggested measures for improving the CI prevalent among the readers/users deal on more information about current research projects and more recent issues on environment/Philippine ecosystems.

Implications and recommendations

The findings of this study yield some implications and warrant certain recommendations worth considering by those who have something to do with the composition and production of the CI.

Since the CI is accessible to both males and females, it is imperative, then, that the publication should be gender-sensitive. That is, it should cater to the needs of both gender in terms of appropriate research-based information. Moreover, the publication should be responsive enough to address the needs and interests of women in relation to their jobs. But this should be done in the context of environment and biodiversity which are the respondents' preferred topics/subjects they would like to read in the CI.

As repeatedly reflected in the responses of the readers/users, in terms of content or the kind of information needed, current research findings within their respective areas of concern are in great demand. As such, this calls for an intensified conscious and deliberate effort on the part of the researchers at the ERDB to impart research results to the subscribers and other end users.

Moreover, it is extremely necessary that the ERDB management exert a more vigorous effort to require the researchers throughout the technical divisions to package the results of their studies/research projects for publication.

It goes without saying, then, that relevance of research-based information

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Response of gugo to different potting media

Lucas L. Gonzales, Marcos J. Quimio Jr., and Rogelio M. Calinawan

One of the most commercially-valuable forest vines identified by the National Commodity Teams on Nontimber Forest Products and on Agroforestry and Multipurpose Tree Species (of the Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development) is gugo (*Entada phaseoloides*).

This is a very large, woody climber (liana) found throughout the Philippines, in forests at low and medium altitudes. It is pantropic in distribution. Its stem is as thick as the human arm, angled, and much twisted. The bark is dark brown and rough. The seeds are hard and circular, with their sides flattened about 5 cm across and chocolate-brown. Gugo can be propagated by seed.

Gugo is used extensively in the Philippines and in other oriental countries for washing hair. When the bark is soaked in water and rubbed, gugo produces a lather, which cleanses the scalp very effectively. In the market, it is used as an ingredient for hair tonics.

A project on testing the response of gugo to different potting media was conducted at the Jamboree Site of the Los Baños Experiment Station. This project serves as a demonstration area to highlight technologies on forest vine production and management geared toward more raw materials.

Table 1. Percentage germination of gugo seeds under different potting media.

Potting Media	No. of Seeds	Germination	Percentage Germination (%)
Pure soil	30	5	16.6
Pure soil + coconut coir dust	30	17	56.6
Pure soil + sawdust	30	16	53.3
Pure sand + sawdust	30	20	66.6
Pure sand + pure soil	30	20	66.6
Pure sand + coconut coir dust	30	20	66.6
Pure coconut coir dust	30	18	60.0
Pure sand	30	19	63.3
Pure sawdust	30	25	83.3

Propagation trials

Propagation methods, both by seeds and by stem cuttings, were tried.

Planting materials (stem cuttings) used in the trials included the following:

- base portion
- middle portion
- top portion

Right after seed treatment with fungicide (Captan WP), the seeds were sown on jute sack with pure sawdust (as seen in the photo). After 15 days from sowing and the radicle (1.0 cm) emerged from the seed, these were potted directly in plastic bags with pure sawdust as substrate. After one month, data on percentage germination were recorded.

Parameters such as survival, growth, and development and other nursery practices were assessed. Periodic measurements and data gathering were undertaken.

Results

Results showed that gugo could be propagated best by sexual means. Seed germination is hastened by scraping the seed hilum, including the portion of testa, and soaking the seeds in tap water for 24 hours. This procedure gives a seed germination percentage of about 98% before potting, thus, confirming the study of Quimio and other researchers (1995).

With pure sawdust as potting medium, this procedure results in 83.3% germination. Compared with untreated seeds (without scraping the hilum) sown in the same potting medium, germination period was significantly reduced from more than a year to only about 15 days.

Propagation trials for gugo using the stem cuttings from various portions of the stem (base, middle, top) planted in different potting media failed to produce shoots. Further trials showed that application of growth hormones (ANAA

Gugo seeds sown on jute sack with sawdust germinated after 15 days from sowing.

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Species-site compatibility software for forestation and tree plantation

Manolito U. Sy, Leuvina M. Tandug, Paulino A. Umali Jr., and Levi Nelson M. Lantican

For three decades or more, reforestation and tree development efforts in the Philippines have been largely a "hit-and-miss" or a "trial-and-error" undertaking. Except for a few endeavors that could be considered "success" in terms of satisfactory growth performances, government reforestation projects in the past had generally manifested poor survival rates — rarely exceeding 50% (Master Plan for Forestry Development, 1990). Poor quality seeds and planting stocks, ill-timed planting, ineffective protection measures, and species-site incompatibility, not to mention natural calamities, were almost always the causal factors.

Basically, perhaps the species-site incompatibility factor could be considered the main cause of low survival rate. A species put in a place not adapted for its optimal growth and development would not flourish to great expectations unless modifications or improvements on the planting area (which may prove rather costly) are applied. But where capital resources are scarce, the least expense that could yield good result (in terms of survival and growth, or financial returns) should be sought. In light of the foregoing, a study to determine which species thrives best in which site conditions was undertaken.

Through the combined efforts of the Ecosystems Research and Development Bureau (ERDB) and the Green Tropics International (a nongovernment entity) and with financial support from the Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development (PCARRD), a computer-based species-site compatibility assessment procedure was developed. This software could predict species performance in the field, given information on the site conditions prevailing thereat.

The study covered 15 regions in the country where the plantations of 14 forest tree species (including government reforestation projects and private tree farms) 3-10 years old were located. This age range was chosen because manifestation of adaptability (or inadaptability) to the site such as big height and diameter increments (or stunted growth) could be observed. In such plantation, sample measurements on the individual plant's height and stump diameter were taken from temporary plots consisting of 16-25 trees, depending on the spacing or distance between trees. Within the plot, soil samples from the A and B horizons were analyzed for their N, P, and K elements and pH value. The topsoil depth, soil texture, stand density, topography, elevation, aspect, and slope were also determined. Climatological data from the nearest weather station were obtained.

Sample measurements from this nine-year-old neem plantation in Apopong, General Santos City, South Cotabato showed an average basal diameter of 12.9 cm and height of 8.0 m at spacing of 2 m x 2 m.

A total of 1,718 sample plots in 491 municipalities and cities throughout the Philippines were established. These covered 14 tree species, mostly fast-growing exotic species. Originally, field data for 22 species were gathered from these sample plots but only 14 had adequate data to warrant statistical analysis. These species include the following:

- *Acacia auriculiformis*
- *Acacia mangium*
- *Azadirachta indica*
- *Casuarina equisetifolia*
- *Eucalyptus camaldulensis*
- *Eucalyptus deglupta*
- *Gmelina arborea*
- *Paraseianthes falcataria*
- *Pinus caribaea*
- *Pinus kesiya*
- *Pterocarpus indicus*
- *Shorea contorta*
- *Swietenia macrophylla*
- *Tectona grandis*

For each species, a regression equation for predicting tree height was derived using the model:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n$$

Where Y is tree height; b_0 is the regression constant, b_1, b_2 … b_n are

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Aquatic plants: Their benefits and uses

Manuel V.A. Bravo and Liza C. Ranes

Aquatic plants which thrive in wetlands such as lakes, rivers, ponds, and even in rice paddies contribute to the richness of flora biodiversity in aquatic and agroecosystems. Their dainty and colorful flowers and foliage beautify the usually abandoned and unattractive wetland landscapes.

These species are usually taken for granted and considered often as weeds and pests due to their prolific growth even without cultivation or tending. In spite of this, aquatic plants provide benefits or advantages to man and his environment.

Distribution

Aquatic plants are found in freshwater bodies such as lakes, rivers, ponds, creeks, and dams. Widely distributed in the Philippines, they commonly grow well in lakeshores, small drainage ditches, canals, rivers, swamps, and even ricefields (Quiñones and Bravo, 1992). Certain species are abundant in various areas as habitats like *Salvinia auriculata* which are found in ponds, pools, and lakes (PCAMRD, 1999). Occasionally, they are cultivated as ornamental plants in small ponds and large basins as motif of garden landscape.

Ceratophyllum demersum (arigman), *Vallisneria natans* (sintas-sintasan) are found in shallow lakes and streams. *Typhus angustifolia* and *Nelumba nucifera* are species high in stand and provide favorable habitat of mosquito breeding (Pancho, 1972). *Lemna paucicostata* (duckweed, liya), and *Nymphaea nouchali* (lotus lily) are found in stagnant pools and ponds. These species are occasionally grown in aquaria as food for fish. *Ottelia alismoides* (damong-ilalim) are found throughout the Philippines in shallow lakes, pools, and streams. *Pistia stratiotes* (water lettuce; kiapo) are plants floating on stagnant water, sometimes rooting on muddy banks. *Myriophyllum spicatum* is widely distributed throughout the Philippines in shallow pools, ditches, from sea level to 670 m asl.

Propagation

Typhus angustifolia Linn (cattail) is propagated by rhizomes and seeds (Pancho, 1972).

Monochoria vaginalis, Nymphoides indica, Pistia stratiotes (water lettuce), *Ceratophyllum demersum, Eclipta alba,* (higis manok), *Ludwegia adscendens, Echinochloa crusgalli* (daua-daua), *Coix lachryma jobi* (tigbi), *Pistia stratiotes* (water lettuce), *Sorghum halepense* (batad-bataran), *Cyperus alternifolius* (umbrella plant), and *Sphaerantus africanus* are species reproduced vegetatively and by seeds (PCAMRD, 1999).

Cyperus difformis' life span is rather short and also reproduced by seeds. *Azolla, Marsilea crenata* are species reproduced vegetatively by rhizomes and spores. *Lemna paucicostata* (duckweed) reproduce asexually by budding. *Salvinia auriculata* and *Azolla* sp. (water fern) are propagated by seeds but mainly by stem fragmentation.

Benefits and uses

Aquatic plants have economic and environmental uses, depending on their natural characteristics. Some are consumed in human diet while other species have medicinal values. Still other species are good sources of minerals like Ca, P, Fe, N, and vitamins B, C, and E. Certain species are used in handicraft like baskets, nets, and sleeping mats (Quiñones and Bravo, 1992).

Water hyacinths, *Pistia* sp. (kiapo), *Ipomea aquatica*, and other floating species act as biological filters by assimilating and accumulating heavy metals and similar toxic chemicals in their profuse root system (Quiñones and Bravo, 1992). Submerged and emergent species supply oxygen and make water quality favorable to fishes, shellfishes, and other fauna as exemplified by *Hydrilla verticellata* and *Vallisneria* sp. (Aguilar, 1997). When in profuse growth, these plants serve as spawning areas of fishes and provide shelter to fish and fry until they are able to feed independently. *Azolla* and other aquatic ferns are active in nitrogen fixation so that they are cultured in ricefields and ponds for fertilizer and feed (Pancho, 1972).

Ipomia aquatica (kangkong), *Vallesneria* sp. (balaika, sintas-sintasan), *Otella alismoides* (damong-ilalim) and *Nymphaea* (lotus lily) are among the edible ones relished as salad, or vegetables by cultural groups (Pancho, 1972). Some species have medicinal properties such as purgative, laxative, astringent, antimicrobial, and

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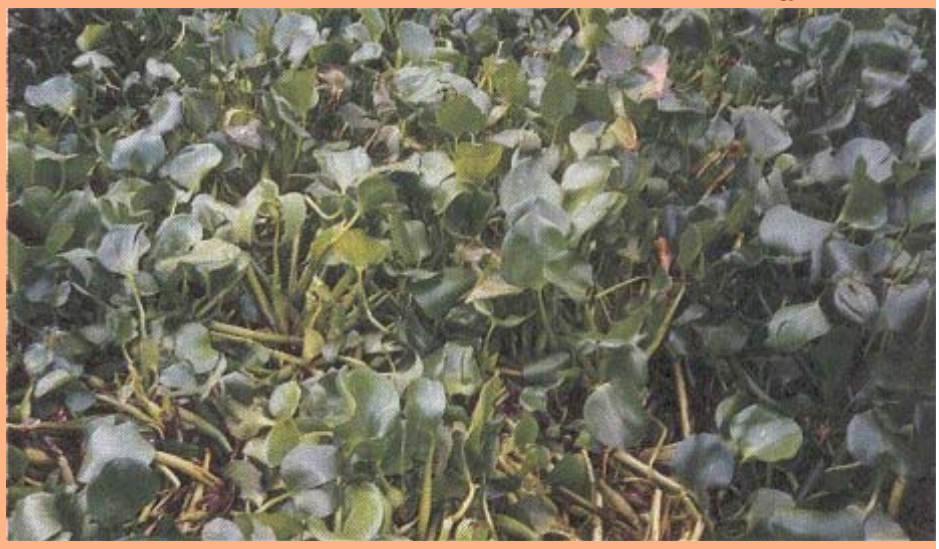

Water hyacinths abounding lakes and rivers act as biofilters of pollution, contribute to carbon sequestration, and give scenic beauty.

Revegetation of mined-out areas: The ACMDC case

Calixto E. Yao, Aguinaldo C. Bueno Jr., Crescencio M. Rocamora, and Vicente L. Orillo

Mining companies are supposed to rehabilitate disturbed areas (open pits, tailings, disposal areas, dumps) in order to minimize soil erosion, stabilize slopes, and improve drainage and land productivity. Presented in this article is the experience of the Atlas Consolidated Mining and Development Corporation (ACMDC) in the revegetation and rehabilitation of disturbed areas due to its operation. Out of its 5,500 ha mining claim, the company had about 700 ha disturbed areas which badly needed immediate revegetation. Otherwise, these areas would be subjected to soil erosion, water accumulation in the pit, and slope failures. In 1999, the water in the Biga pit gave way through the clogged drainage, releasing acidic water into the sea. The toxic water found its way into Sapangdako River and the seas of Toledo City, poisoning marine life in the coastal areas.

To avoid recurrence, the Atlas Commission was created through Executive Order No. 96, series of 2002. The Commission was tasked to rehabilitate the mined-out areas of ACMDC. Aside from revegetation, the Commission had two other projects: road construction and ecotourism. The revegetation project included community organizing and research. The research component of the project aimed to screen plant species in terms of growth, litterfall production, and rate of leaf decomposition to improve the soil and the microclimate. This was conducted immediately so that desired climax species were introduced accordingly, for use in agriculture, forestry, or ecotourism. The road project, on the other hand, involved construction of a paved road from Bobon-Sinsin to Toledo City passing through the project site.

The project site

The site was located west of the ACMDC mined-out areas within Barangay Loas, Toledo City, Cebu. It was originally a mountainous area with dense vegetation. However, it is now partially leveled off with a desert-like landscape, covered with wastes from underground and open pit mining. The wastes were dumped in gullies and depressions until the waste rock leveled off with the general terrain.

The area was generally acidic and saline due to the oxidation of pyritic materials. Acidity was sustained down to 1 m below surface (Maunsell, 2001). A large portion of the area remained unvegetated even after 20 years of exposure, giving the site a desert look, especially the yellowish-brown to cream acidic soil (pH = 2).

Objectives

Generally, the Atlas Mine Rehabilitation Project aimed to revegetate 200 ha of timberland of the mined-out areas through unconventional strategies. This was to improve the microclimate and enhance soil formation in the fastest and cheapest way for ecotourism purposes. Specifically, the project intended to:

- ❑ Evaluate the existing vegetation;
- ❑ Determine the soil nutrients, soil type, and the toxicity of soils to plants;
- ❑ Screen vines, shrubs, grasses, and trees best suited for mined-out areas under different management schemes;
- ❑ Introduce climax species for ecotourism and other economic purposes;
- ❑ Organize and empower the community to sustain the project; and
- ❑ Publish a guidebook on the revegetation of mined-out areas in the Philippines.

Strategies

With the extremely difficult condition in the site, the project used an unconventional approach to revegetation. This was to address the problems in rehabilitating a mine dump such as presence of heavy metals; high acidity/ salinity; nutrient deficiency; heavily compacted surface (flat areas); unstable surface (slopes)/soil erosion; absence of soil formation; absence of flora and fauna; high temperature/evaporation rate; exposure to strong winds; and water imbalance/low water holding capacity (adopted from Down and Stocks, 1978).

The approach was based on two guiding principles: first, the revegetation strategy had to initiate the natural plant succession process to minimize cost. Grasses, shrubs, and vines would be planted first to enhance soil formation before introducing trees, or combining trees and vines. Planting would be initially done in areas where there had been soil formation as in the depression in stockpile/hump and direct seeding

Mined-out areas can be replenished or restored through revegetation.

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Revegetation… *from page 6*

at the base of existing talahib grasses.

Second, the three major limiting growth factors would be taken into account in the revegetation strategy. Plants require a minimum amount of sunlight, water (soil moisture), and nutrients to have normal growth. Deficiency in one factor, even if the other two are in excess, will adversely affect plant growth. Since the site was open, sunlight was in excess, but moisture and nutrients were extremely deficient. Management focused on increasing the last two elements. With the water system in place, the only remaining problem was nutrients. Thus, the absolute need for continuous soil amelioration until the nutrient cycle was completed.

Species characteristics

To attain the objectives, it was imperative that the species introduced should have the following characteristics:

- *Acid-/saline-/drought tolerant* - adapt to acid/saline soil like most of the beach species (auriculiformis, acid ipil-ipil, agoho, banalo).
- *Fast growing* - allow for immediate soil cover (mangium, anabiong, vines).
- *High litterfall turnover and fast leaf decomposition rate* - enhance soil formation (e.g., anabiong, mansanitas, akleng-parang, kalukoi).
- *Nitrogen fixing* - provide additional nitrogen supply from the air (e.g., katuray, auri, mangium, leguminous shrubs).
- *Wide/dense - canopy* reduce rain impact on the soil and improve the microclimate (e.g., rain tree, fire tree, mansanitas, narra).
- *Massive root system* - break the compact substrates in flat areas (e. g., neem tree, rain tree, daat baye, vetiver grass).
- *Wildlife food* - attract wild animals for wider seed dispersal and improved biodiversity (e.g., kamachili, duhat, baliti, mansanitas).

Planting design/Cultural practices

Based on the foregoing backdrop, the following planting designs were introduced:

- *Regular planting*. Flat areas with at least 30 cu cm were planted to auriculiformis/mangium at 5-m x 5-m spacing, interfaced with species having leaves that could rapidly decompose such as those of antsoan-dilau, akleng-parang, sesbania.
- *Contour planting*. Applied in slope areas using hedgerows and bench terraces (e.g., kakawati cuttings, flamingia, grasses, and vines/ creepers such as lambayong, kudzu, and imelda (wedelia).
- *Base planting*. In stockpile areas, planting was done at the base of the humps and waterways where soil formation was apparent and soil moisture was high. Later, hilltops/ sides of humps were planted with leguminous shrubs/vines (LSV).
- *Roadside/boundary planting*. Flowering/shade trees were used.
- *Furrow planting*. In heavily compacted flat areas, plowing (about 15 cm deep, 2 m apart) was filled up with garden soil and chicken dung, and later planted to leguminous shrubs/vines/cover crops for soil enhancement.
- *Direct seeding (drill and broadcast)* of leguminous species (vines/cover crops, shrubs, ipil-ipil, kamachili) was done for immediate soil cover.
- *Trees-LSV combination*. Trees were seeded with leguminous vines (lambayong, kudzu/centrosima, and imelda (wedelia) to speed up soil cover at two levels: crown and ground.
- *Establishment of arboretum*. This was done to enhance biodiversity and seed production, as well as for ecotourism purposes. Species producing premium hardwood, luxury lumber, exudates, bast fiber, and wildlife food, including medicinal and fruit trees, were used.
- *Water entrapment or dam-and-plant method*. This was especially designed for stockpile areas with mini valleys/depressions that served as waterways. Outlets of these waterways were blocked/dammed using cuttings of kakawati/hauili, reinforced with twigs/grasses, or gravel, to conserve water.
- *Soil amelioration and mulching*. Plantations were fertilized and mulched to hasten growth for early canopy closure.
- *Assisted natural regeneration (ANR)*. Fertilization of natural vegetation was done to enhance growth and reproduction.

Accomplishments

Forest nursery. Water systems were established by gravity from a kilometer source with 5-m x 5-m x 4-m water tank. Five seedbeds and four hardening beds with a capacity of 20,000 seedlings each were constructed. In addition, 30 kg of seeds of 80 assorted species of trees/ shrubs/vines were collected/purchased. Similarly, 60,000 assorted seedlings consisting of 80 species were produced.

Plantation. A 60-ha plantation of auriculiformis, hauili, manzanitas, was established at 5 m x 5 m spacing interplanted with fast-growing trees/ leguminous shrubs. Direct seeding (broadcast and drill) of 7 kg of 10 species of trees (ipil-ipil, banalo, anabiong, sangilo, agoho) and shrubs/vines (tayum/ tagum, kudzu, gaway-gaway gamay, kudzu erect) was done. Fertilizer and mulch were applied in plantations. Roadside planting of narra and auriculiformis with lambayong/kudzu/ vegetables under the canopy was also conducted. Promising species were identified.

Research

The following studies were initiated:

- Resource assessment: soil survey and mapping, flora/fauna analyses, socioeconomic survey, and lake characterization
- Growth enhancement of natural vegetation: soil amelioration and fertilization
- Glasshouse experiments: nursery species trial, fertilization, inoculation (Mycovam and Bio-in)
- Field species trials: soil amelioration, mulching, fertilization, inoculation
- Slope stabilization and dam establishment: hedgerow, bench terracing using grasses, vines, and shrubs

Lessons learned and recommendations

- Watering seedlings with water sprinkler high above the plants caused soil compaction. Misting could be done, or clay-loam could be used as potting soil.

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Propagation of nito

Marcos J. Quimio Jr., Lucas L. Gonzales, and Rogelio M. Calinawan

Nito [*Lygodium circinnatum* (Burn)] Swartz belongs to the family of vines (Schizaeceae). As a nontimber forest product, it is useful in cottage industries. It thrives at various altitudinal levels and vegetation types. Generally, nito species are found mostly from sea level up to 800 m asl. In the Philippines, nito is distributed nationwide. It grows abundantly in open or partially-shaded areas of dipterocarp forests and coconut plantations.

Nito is commonly used as twine in making baskets, hats, fruit-and-food trays, jar base, fancy boxes, and other handicrafts. Nito has also medicinal value. Its shoots, when chewed and applied to wounds caused by insect bites, neutralizes the poison. It is also used to cure ringworms.

The supply of forest vines used in handicraft making has been insufficient. One of the major causes is the lack of technology to replenish existing raw material resources of nito that will support the needs of the forest-vine-based industry. This study, therefore, tried to assess the propagation of nito using suckers as planting materials with the use of rooting hormones (ANAA and Hormex), and the performance of the suckers in different potting substrates.

Materials and methods

Nito suckers were collected in Buenavista, Quezon and brought to the ERDB Jamboree Site nursery. The suckers were split into 3-4 planting materials depending on their sizes. Right after the suckers were split, the basal ends were immediately soaked into the prepared rooting solutions, ANAA and Hormex (in liquid form). These were exposed for 20 minutes (following factory recommendations).

The treated suckers were potted individually in the prepared potting media and arranged under the improvised nursery shade made of polyethylene plastic sheets. Thirty-five potted planting materials were allocated per potting medium treated with ANAA and Hormex. No chemical treatment was applied to the control.

Propagation of nito by asexual method (the rhizome is split into 3-4 planting materials), potted in pure soil.

The potting media used were as follows:

- pure sand and pure soil (1:1 proportion)
- pure soil
- pure sand

Each substrate was potted in a 4 mm x 8 mm x 0.02 mm polyethylene plastic bag. Survival and mortality were recorded for three months. Uniform watering was done to all seedling such that they receive equal amount of water.

Results

Nine days after potting, the shoots of the suckers did emerge (in sprouting stage). For planting materials treated with Hormex, best results were obtained from the substrate of pure sand with 28 survival and 7 mortality, followed by pure soil with 24 survival and 11 mortality and 1:1 mixture of sand and soil with 22 survival and 13 mortality, three months and 10 days after potting.

With the ANAA treatment, pure sand also had the best performance, with 25 survival and 10 mortality), followed by pure soil with 22 survival and 13 mortality and 1:1 mixture of sand and soil with 20 survival and 15 mortality.

For the control, pure sand was the best medium resulting in 22 survival and 13 mortality, followed by pure soil with 20 survival and 15 mortality and 1:1 sand and soil mixture with 20 survival and 15 mortality.

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Table 1. Survival and mortality of nito suckers potted in various media with hormones and without hormones (n=35 planting materials per treatment).

Potting Material	Survival		Mortality	
	ANAA	Hormex	ANAA	Hormex
Experimental (with hormone)				
Pure sand	25	28	10	7
Pure fine soil	22	24	13	11
Sand + soil (1:1 proportion)	20	22	15	13
Control (without hormone)				
Pure sand	22		13	
Pure fine soil	20		15	
Sand + soil (1:1 proportion)	20		15	

Blending nature and culture in biodiversity conservation

Marissa R. Parao

One important factor in managing the natural resources and in implementing the Indigenous People's Rights Act or IPRA (R.A. 8371) in Sagada is the ability of the Sagadans to create a forum wherein the local people are made aware of the regulations to protect nature and their culture. Certain systems and institutional arrangements have already been established to this effect. Most of the residents are familiar with the existing regulations and customary laws governing the use of forest resources including plants and animals.

The prevailing regulations with regard to the use of natural resources in Sagada have been formulated by the council of elders, called "dap-ay", and by the barangay council. The barangay council includes some of the highly respected members of the dap-ay. Respect in the law-making body allows the leaders of the community to enforce customary laws. This enables the inhabitants to translate certain ordinances into concrete actions.

Erosion of cultural values and degradation of nature

Unfortunately, not everyone knows about the indigenous practices of regulating the use of resources that have been promoted by members of the dap-ay. This, together with the impact of outside culture and modern way of living, has changed the way local people view nature. Cultural values that act as a cohesive force in biodiversity conservation has started to erode. This decadence has affected the implementation of customary laws that protect nature. Along with the dissolution of indigenous knowledge is the eventual vanishing of the natural resources in Sagada. There is also a lack of mechanism to monitor activities like tree planting and hunting.

Promotion of resource conservation

A number of activities have been undertaken by the community to promote resource conservation. These include the promotion of pine forest; forest protection campaign; strict compliance to land-use classification as set by the dap-ay; accountability in resource management through the "membantay" (overseer of the forest); respect for specific resources and sacred places; and direct conservation of specific plants and animals.

In Fidelisan, Sagada, community efforts have protected the forest from loggers. A women's group was established to promote adherence to the indigenous culture and to patrol and protect the forest. Nongovernment organizations, along with government groups and the local lawmakers (e.g., membantay and dap-ay) get together to police forest-resource use.

Furthermore, through the "umili" or the "lakay" (elders), local ordinances have been observed to protect the forest. Areas like the "Bawbawian" that are believed to be inhabited by spirits have been kept intact. Resources that are important to the community are being safeguarded by the umili, and are kept from the outsiders. According to the local researchers, spring waters are also being protected by the spirits. The local people believe that unless certain prayers are recited, water supply may dwindle. If an outsider goes to Bawbawian alone, the person may, as observed in the past, be afflicted with incurable diseases. At times, intrusion of outsiders is prohibited, thus, the use of forest resources is controlled.

Certain species of fauna and flora, especially plant species with cultural, ecological, economic, and medicinal uses, are strictly protected. In order to conserve plant resources, certain species are cultivated in home gardens. A candidate for this is the mountain tea, which has high economic and medicinal value. As regards fauna, some birds, for instance, are protected based on

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Aquatic plants… *from page 5*

analgesic, to mention a few.

With appropriate methods and technologies, aquatic plants could very well provide various uses and benefits to humankind.

Research and development issues

Aquatic plants as biological components require physicochemical factors in order to maintain the ecological balance in lake ecosystems. The healthy state of lentic bodies of water is brought about by the harmonious interactions between the biotic and abiotic components. Once this condition is attained, various goods and services can be obtained for the benefit of mankind.

Research areas that need attention are along effects on fish survival and productivity, and capability to detoxify, decontaminate, and filter off polluting substances like insecticides, pesticides, and heavy metals. These could be measured in terms of hydrobiological parameters like dissolved oxygen (DO), biochemical oxygen demand (BOD), acidity (pH), and salinity. Once data are available, aquatic macrophytes could be managed for increased fisheries and utilized in the cleaning and purification of polluted river and lake waters.

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Species-site… *from page 4*

regression cefficients; and X_1, X_2...X_n are predictor variables. The variables used as predictors were as follows:

- Tree age (years)
- Density (no. of trees/ha)
- Elevation (m asl)
- Slope (%)
- Aspect
- Soil texture
- Actual soil pH
- Topsoil depth
- Soil N content
- Soil P content
- Soil K content
- Annual rainfall (mm)
- No. of dry months (a dry month has less than 100 mm rainfall)
- Climatic region
- Interaction between rainfall class and no. of dry months

After obtaining an acceptable equation, predicted values for height (PHT) were derived for each sample with age fixed at 10 years and stand density class set at 750-1500 trees/ha. The PHT values were subsequently sorted according to magnitude (from the smallest to the highest). These values were used to classify the predicted heights into the following species-site compatibility (SSC) classes:

A (good)	> the 67th percentile value
B (average)	33rd to 67th percentile values
C (poor)	< the 33rd percentile value

The computer program for species-site compatibility assessment is written in Visual Basic 6.0 and runs under the Windows environment. It uses all the equations derived by regression analyses for the different species studied. It can be used to assess the compatibility of the 14 species in any prospective planting site within the country.

Since forestation and tree plantation development are among the thrusts of the government, particularly the Department of Environment and Natural Resources (DENR), training on the use of the software has been coordinated with the DENR regional offices. This technology transfer aims to: develop familiarity on the software for proper species-site matching; provide awareness on the importance of the environmental parameters (and how these were to be gathered) for the proper selection of species to be planted; and impart to the participants important concerns for the successful development and management of forest plantations.

With this technology, planting by chance may become a thing of the past—at least for the 14 species studied. The procedure has its limitations. Tree plantation developers and would-be tree farmers are cautioned that operational planning should be done ahead of time before planting. The use of high quality planting materials, proper maintenance, management and protection must be integral parts in the plan for any specific plantation to ensure success.

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Revegetation… *from page 7*

- Potting soil with 10% chicken dung ruined some seedlings, although other species were luxuriant. Hardening was difficult, for it produced oversucculent seedlings.
- The size of planting hole and the soilfill quality were critical to the growth and survival of seedlings.
- Lambayong and imelda (wedelia) creepers could be used as soil cover. The former had an average growth of 4 cm/day, while the latter, 1 cm/day. All trees must be seeded with either of the species and kudzu. All slope crests/edges should be planted with the said vines and with leguminous shrubs (r.g., acapulco, indigo plant, *Callandra* sp., avillosa) for effective seed dispersal.
- Seedlings should be applied with 50 g 14-14-14 foliar fertilizer, or equivalent twice a year. The dosage could be doubled at Year 2 and Year 3 (applied twice a year).
- ANR should be continued. Growing trees should be fertilized for seed production.
- Mulching should be applied at least 6 cm thick to conserve soil moisture and nutrients and increase water holding capacity
- Direct seedling, both broadcast and drill, did not fare well, but those that survived had produced wildlings. For higher survival, seeds could be drilled on soilfill.
- Pot/glasshouse experiment could be conducted before massive planting to ensure higher survival.
- Water is a limiting factor during summer. Drip irrigation could be resorted to.
- Best performing species: *A. auriculiformis*, kamachile, hauili, mansanitas, hambabalud, kapok, duhat, lambayong, imelda (*Wedelia tribolata*), kudzu (four species).
- Community organizing could be conducted way ahead of the actual planting for the communities to better understand the project.
- The community could volunteer for a day's work and donate planting materials if properly motivated.

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Editorial… *from page 1*

be concerned for it. Therefore it should be treated with respect for Him. Not only did God establish ownership of Planet Earth at creation, He has plans for a new earth, too.

At creation, man was given the responsibility for his environment, "to dress and to keep it." We are God's stewards and He takes stewardship seriously. He loves His creation and He calls us to respect and care for Planet Earth. He entrusts us with time and opportunities, abilities and possessions, and the blessings of His creation—the earth and its resources. We are responsible to Him for their proper use.

God asks us to partner with Him to care for the earth. We should do everything we can to maintain life on all levels, restoring the ecological balance and keeping it intact.

It is again time to commit to the task of environmental stewardship—to assist in developing systems of environmental education and conservation that will be a testimony to our desire to care for God's creations.

Biodiversity… *from page 2*

to the job of the reader/user is the bottomline of all the effort behind the CI.

Suggestions for further research

As conducted, this study only tackled the benchmark data on the characteristics of the readers/users of the CI; how they made use of the kinds of information in the publication; and what other types of information they need. Undoubtedly, this baseline survey has opened the door to some unexplored areas for future research in communications, particularly with respect to utilization of the print media.

The present study was only exploratory; it did not determine and prove relationships, or test any hypotheses. Thus, for future research, an in-depth study on readership itself is suggested. There were variables or factors related to readership. Determining these factors can be one of the objectives of future studies. In considering the relationships of the antecedents, the consequents and the intervening variables, it is suggested that a sophisticated statistical tool be studied, devised, and tested.

Corollary to the above suggested study is an attempt on content analysis. This has something to do with the effectiveness of the content or kinds of information on the readers'/users' lives. In carrying out such kind of study, a more sophisticated study design (perhaps, a field experiment) may be explored and a statistical method other than descriptive analysis may be tried. This requires careful study and hard work, for a study like this involves longer time to carry through than any ordinary research project.

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Gugo… *from page 3*

and Hormex) also failed to give positive result.

Based on nursery trials on the propagation techniques/methods for gugo, this forest vine could be successfully propagated. The propagation of gugo by seed through the scraping of hilum is prescribed as the adaptable and appropriate method/ technique for this species.

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Nito… *from page 8*

Concluding note

There were no differences among potting media in terms of the survival rate of nito suckers. This means that nito suckers may not require a special medium. While a slight advantage was observed on the survival (28) and mortality (7) of suckers raised on pure sand, this was not significantly different from the other two potting media. This suggests that nito may be raised in any of the potting media used in the study with or without rooting hormone (ANAA or Hormex).

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Blending… *from page 9*

specific value (medicinal, agricultural, religious).

Concluding note

The profound respect for the elders and the local lawmaking body (dap-ay) helps ensure the sustainability, productivity, and conservation of natural resources in Sagada. The indigenous practices of Sagadans are varied but have always been in harmony with nature. These are deeply rooted in their culture and indigenous knowledge systems. The present "modernization" may have threatened these cultural practices, yet the people strive to preserve their "ways". A strong link between culture and nature could be observed in Sagada. That is, one cannot exist without the other. This mutual exclusivity between culture and nature should pave the way for the government, as well as nongovernment organizations and other disinterested groups, to support local initiatives to conserve the biodiversity of Sagada.

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Canopy International accepts contributions for publication but reserves the right to edit such contributions. Only unsolicited manuscripts accompanied by self-stamped and self-addressed envelope will be returned. Contributions must be accompanied with a brief curriculum vitae of the author(s).

Canopy International was entered as second-class mail in College, Laguna, PHILIPPINES on 30 May 2003 (Permit No. 2003-7).

Environmental governance at all levels requires a new partnership between governments and civic society that can foster the eradication of poverty and an equitable distribution of environmental costs and benefits.

UNEP, 1999
Global Environmental Outlook 2000

Earthwatch

Praxedes Silvoza

The World Health Organization (WHO) reported that the human intake of chlorinated pesticides is particularly high in India, where the daily diet is reported to contain about 0.27 mg of DDT. Analysis of cereals, vegetables, fish, and meat indicated that more than 50% of the samples tested contained pesticide residues, and in more than 30% of the sample of residue exceeded tolerance limits prescribed by the WHO.

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Newly discovered chemical reactions convert sand into chemical compounds that may be used in making substances including plastics and ceramic, the University of Washington scientists report in the journal *Nature*.

*****

The UN Environment Programme (UNEP) reported that the destruction of tropical forests accounts for a quarter of the world's total carbon dioxide emission which further contributes to global warming.

*****

In developing nations, most indoor pollutants come from everyday activities like cooking, and heating with fuels such as coal, wood, crop wastes, or dung. The WHO estimates that as many as two-thirds of the world's peoples burn these fuels, often in stove with little or no ventilation..

*****

Atrazine, a herbicide suspected of causing cancer, was found in the Mississippi River samples taken by the U.S. Geological Survey. In 27% of the samples, levels exceeded those allowed by the U.S. Environmental Protection Agency for drinking water. Installing water filtering systems to remove the atrazine could cost millions, according to the Natural Resources Defense Council.

*****

The UNEP reported that of the 15 cities in the world with the highest levels of particulates—tiny specks of soot, dust, and other solid pollutants linked with breathing problems and heart attacks—12 are located in Asia. Six of these cities also have the highest levels of sulphur dioxide (SO_2).

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In India, the number of cars has been doubling every seven years for the past 30 years, adding to air pollution, while per capita use of commercial energy increased annually by 1.9% in South Asia and 3% in East Asia and the Pacific during 1980-98, revealed UNEP.

The compiler is Librarian II of the ERDB.