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Quick Inventory of Noteworthy Plants at Mantalingahan Range Palawan Island, Philippines

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Abstract

A quick floral inventory was conducted in the periphery of the forest in Mantalingahan Range to describe the composition, species richness and/or diversity and level of endemism of noteworthy plant species found therein.

Pre-identified sites in the four barangays of the four municipalities in Southern Palawan (Brgy. Pulot Interior, Sofronio Española; Brgy. Maasin, Brooke's Point; Brgy. Inogbong, Bataraza; and Brgy. Campong Ulay, Rizal) were surveyed following the Variable Transect Method for Rapid Assessment of Tropical Plant Communities.

The forest periphery of Mantalingahan Range is rich in diversified flora of at least 351 species distributed to 214 genera and 92 families. Species endemism is remarkably high at 57 species, 10 of which are only found in Palawan. The study sites contain a relatively high number of rare species with narrow habitat range. Economically important species are abundant while 14 vulnerable, 4 endangered and 5 critical plant species according to IUCN were encountered.

Although the method used in the survey was very rapid, the results demonstrate that Mantalingahan Range has high species richness with many endemic, rare and narrow range plant species. This mountain range can be considered, therefore as one of the most important sites in Palawan Corridor for conservation hence the best and strictest measures should be applied to prevent any degradation of such a rich genetic resource.

Keywords: biodiversity, Mantalingahan Range, Palawan, Philippines plants

INTRODUCTION

Palawan is botanically considered as one of the most diverse and rich islands in the Philippines. As a distinct plant geographic region in the country, Palawan harbors an estimated 3,000-3,500 flowering plant species mostly known to occur only in the island. Sharing a close floristic affinity with Borneo, its plant endemism is estimated to be about 15-20%, which is attributed to its geological, climatic, edaphic and biological features. The island has been described as among

the geographical landmarks with the highest species diversity per unit area and still relatively undisturbed compared to other parts of the country (Madullid, 1987 as cited in PTFPP, 1998).

Mt Mantalingahan in southern Palawan, the highest mountain in the island of c. 2,086 m above sea level, is a part of the Mantalingahan Range. The Mantalingahan Range includes an estimated 70,000 ha of montane mossy rainforest, with stunted forest on the exposed tops. There is lowland rainforest to the northwest on the coastal plain, such as around the Ilog-Ilog River in Rizal. To the southeast, the forest has been cleared up to 800 m on the slopes, although in some slopes, the forest still remains on the top of the flanking coastal ridge from about 400 m upwards.

Mantalingahan Range is given high conservation importance because its varied habitats harbor different organisms including some important wildlife, i.e. Philippine Cockatoo (*Cacatua haematuropygia*) and Palawan Striped Babbler (*Stachyris hyporammica*). This mountain is in fact one of the eleven Important Bird Areas (IBAs) in Palawan.

There is little recent information about the floristic composition of the mountain hence a quick survey was conducted to describe the vegetation composition of the periphery of the forest in the Mantalingahan Range, the species richness and/or diversity and level of endemism of the noteworthy plant species found therein.

METHODOLOGY

The Study Sites

The study sites were the 4 pre-identified areas in the periphery of Mantalingahan Range with lowland forest patches located in one barangay of each of the 4 municipalities in southern Palawan (Fig. 1). These were the following:

1. Bgy. Pulot Interior in the municipality of Sofronio Española
2. Bgy. Maasin in the municipality of Brooke's Point
3. Bgy. Inogbong in the municipality of Bataraza
4. Bgy. Campong Ulay in the municipality of Rizal

Habitat types of each study site, which include the riverine, ephemeral stream/gully, ridge, and lowland forests were selected based on the map and after the reconnaissance survey. At least 3 areas per habitat type were distributed at the periphery of the forest in each study site to ensure breadth of representation. In each selected habitat type, survey of flora was done while location coordinates were noted using a GPS device.

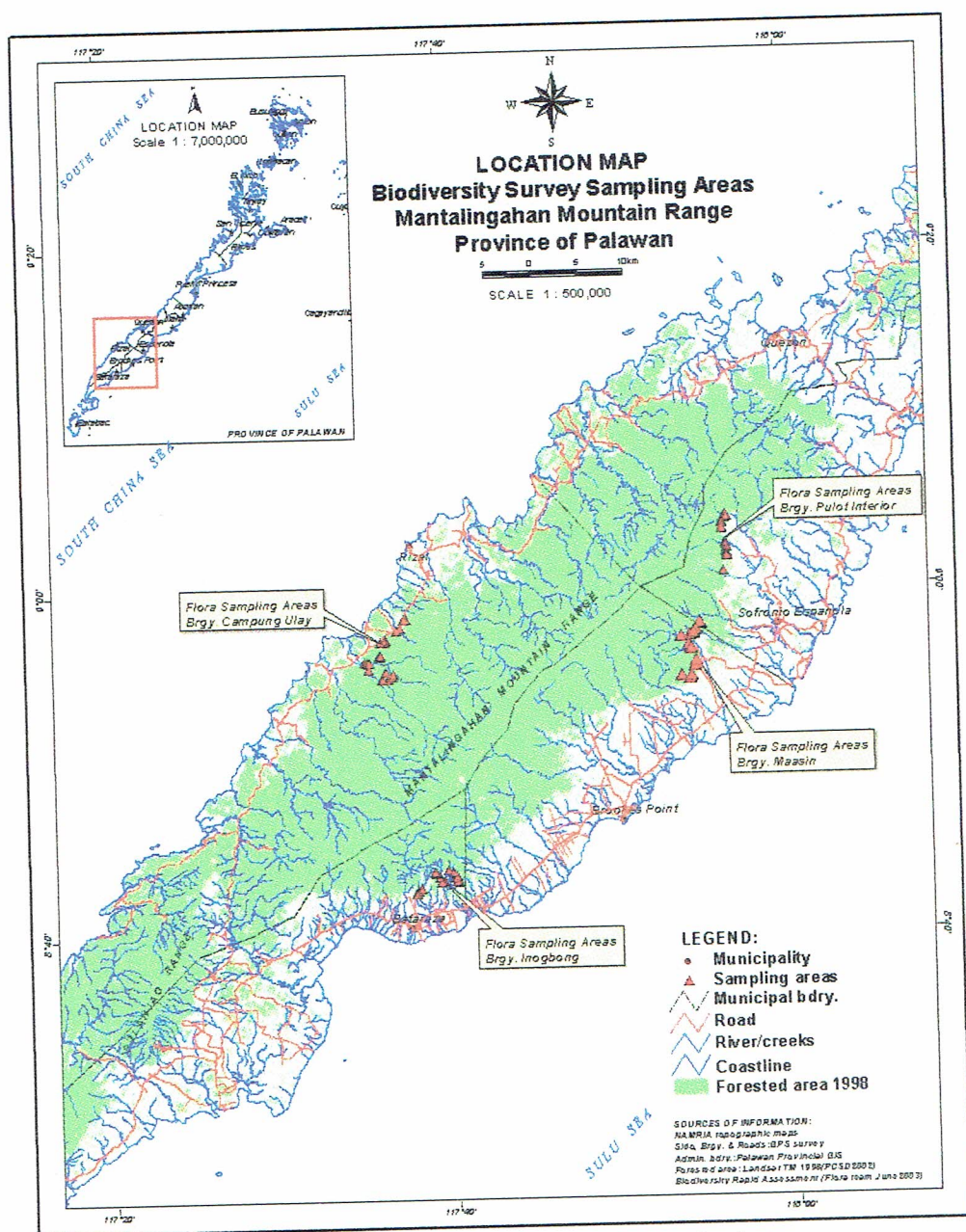


Figure 1. Map of Mantalingahan Range showing the study sites.

Sampling Method

The Variable Transect Method for Rapid Assessment of Tropical Plant Communities by Foster *et al.* (1995) was employed in this survey. This was done by walking down the middle of each habitat type and quickly registering the number of individuals of the identified plants. Major plant groups such as trees, ferns and their allies, palms, herbs and lianas were considered and identified up to the genus level but whenever possible, up to the species level. For uniformity, the sampling areas were defined by the extent by which 50 trees measuring 20 cm and above in diameter are accommodated.

Economically useful plant species found in the four sites were determined through interviews with local people and from available literatures.

RESULTS AND DISCUSSION

There were at least 351 plant species (trees, ferns and their allies, palms, herbs and lianas) distributed to at least 214 genera and 92 families encountered in Mantalingahan Range (Table 1). The predominant plant group is the flower-bearing plants while ferns and their allies have only 37 species. Considering that the method used in the assessment of flora was very rapid, the area surveyed was only a very small portion of the whole Mantalingahan Range, and the periphery of the forest is mostly disturbed, as it is accessible to human activities, results clearly demonstrated that Mantalingahan Range has a rich and diverse floral composition.

In the field surveys conducted in Mt Apo from 1988 to 1991, Zamora (1996) reported the presence of 555 species of plants. He added that high species diversity in Mt Apo is mainly due to the varied ecosystems in the area. The number of plant species (351) encountered in the selected periphery in Mantalingahan Range for about a month's survey is around 63% of the number of plant species encountered in Mt Apo which was surveyed for around three years. Likewise, this number is around 44% of the 800 plant species recorded in the St Paul Subterranean River National Park (SPSRNP) and vicinities (PTFPP, 1998). The intensive, quantitative survey in SPSRNP passed different habitats in the study area, thus the sample area is big enough to cover the different habitats in the park. On the other hand, Elliott *et al.* (1989) claimed that Doi Suthep-Pui National Park in Chiang Mai, Thailand rivals some tropical rainforest in terms of tree species richness having found 87 tree species per hectare. In the same forest Maxwell (1989) recorded 1,800 species of vascular plants for 2 years of collection. According to Maxwell (1988), Doi Suthep-Pui has a deciduous forest on the lower slopes (up to 850-950 m elevation) and an evergreen forest on the upper slopes. Mantalingahan Range has an estimated 70,000 ha of montane mossy rainforest and a lowland rainforest which provide various niches to support many different organisms. If detailed biodiversity studies will be conducted throughout Mantalingahan Range for a longer period of time, its biodiversity will probably surpass those tropical rainforests widely acknowledged as among the most

species-rich in the world including Sulawesi (Whitmore and Sidijasa, 1986), Papua New Guinea (Pajmans, 1970), Kalimantan and Sumatra (Kartawinata *et al.*, 1981). Mantalingahan Range is projected to represent a significant contribution to the known pool of Philippine and world biodiversities.

The study area is also rich in endemic plant species. At least 57 endemic species were recorded (Table 2), of which 10 can only be found in Palawan. Endemic life form is a taxon found only in a given geographic area; presumably having been evolved locally. Plants encountered, which are endemic to Palawan include *Licuala spinosa* Thunb., *Orania paraguayensis* Becc., *Protium connarifolium* (Perk.) Merr., *Ceuthostoma palawense* L.A.S. Johnson, *Dillenia luzoniensis* (Vidal) Mart. ex Jacks, *Glochidion dolichostylum* Merr., *Piper* sp., *Dinochloa palawanensis* S. Dransf., *Amomum palawanense* Elmer, and *Cinnamomum* sp. These 10 Palawan endemics are higher than those found in SPSRNP having 6 species only (PTFPP, 1998). Of these 10 species, 4 had narrow habitat range, i.e. *O. paraguayensis*, and *P. connarifolium*, which were found only on gullies; and *Piper* sp. and *Cinnamomum* sp. on ridges. Moreover, some of

Table 1. Plant families encountered in Mt Mantalingahan with number of genera and species.

Family	No. of Genera	No. of Species	Family	No. of Genera	No. of Species	Family	No. of Genera	No. of Species
Acanthaceae	2	4	Dioscoreaceae	1	3	Myrtaceae	4	10
Actinidiaceae	1	1	Dipteridaceae	1	1	Nepenthaceae	1	2
Agavaceae	1	2	Dipterocarpaceae	4	7	Nyctaginaceae	1	1
Alangiaceae	1	2	Dryopteridaceae	1	2	Oleandraceae	1	2
Anacardiaceae	4	6	Ebenaceae	1	5	Orchidaceae	2	2
Annonaceae	4	4	Ehretiaceae	1	1	Pandanaceae	2	5
Apocynaceae	4	6	Euphorbiaceae	13	17	Parkeriaceae	1	4
Araceae	6	11	Fagaceae	1	1	Passifloraceae	1	1
Araliaceae	1	1	Flacourtiaceae	1	1	Piperaceae	1	1
Arecaceae	10	20	Flagellariaceae	1	1	Poaceae	5	6
Asclepiadaceae	3	6	Gesneriaceae	1	1	Polypodiaceae	3	3
Aspleniaceae	1	3	Gleicheniaceae	2	2	Pteridaceae	1	6
Asteraceae	1	1	Gnetaceae	1	1	Rhizophoraceae	1	1
Begoniaceae	1	2	Guttiferae	3	9	Rosaceae	1	2
Bignoniaceae	1	1	Hypoxidaceae	1	1	Rubiaceae	9	13
Blechnaceae	2	3	Lauraceae	5	8	Rutaceae	3	3
Bombacaceae	2	4	Lecythidaceae	2	3	Sapindaceae	4	10
Burseraceae	3	5	Leeaceae	1	1	Sapotaceae	4	7
Casuarinaceae	3	3	Leguminosae	11	12	Schizeaceae	1	2
Celastraceae	1	1	Liliaceae	1	1	Selaginellaceae	1	3
Combretaceae	1	3	Lindsaeaceae	1	1	Simaroubaceae	1	1
Commelinaceae	1	1	Loganiaceae	1	1	Sterculiaceae	5	8
Convolvulaceae	1	1	Lycopodiaceae	1	1	Symplocaceae	1	1
Cyatheaceae	1	1	Malvaceae	1	1	Thelypteridaceae	1	2
Cycadaceae	1	1	Marantaceae	1	2	Thymelaeaceae	1	1
Cyperaceae	1	4	Marattiaceae	1	1	Tiliaceae	3	4
Datiaceae	1	1	Melastomataceae	2	2	Ulmaceae	2	3
Davalliaceae	1	1	Meliaceae	9	13	Urticaceae	2	2
Dilleniaceae	1	1	Moraceae	3	18	Verneniaceae	4	5
Dennstaediaceae	2	2	Musaceae	1	1	Vittariaceae	1	1
			Myristicaceae	1	6	Zingiberaceae	7	12

these Palawan endemics are already rare. A rare life form is a taxon of low-density occurrence that could be threatened to extinction if the environment where it occurs worsens. These are the *O. paraguayensis*, *Cinnamomum* sp., *S. dolichostylum* and *P. connarifolium*. A particular species of *Nepenthes*, which is endemic to the Philippines, occurs only along some spots near Ilog-Ilog river in Campong Ulay, Rizal.

Of conservation interest are the 23 species listed by the International Union for the Conservation of Nature (IUCN) as threatened (14 spp. Vulnerable, 4 spp. Endangered, 5 spp. Critical) thrive in the periphery of the forest on some specific municipalities (Table 3). In addition, Mantalingahan Range contains 16 species, which are considered as commercial Philippine wood (Table 4). It also contains several plant species, which are economically useful (Table 5). Several species on rattan were encountered during the survey especially in the municipalities of Sofronio Española and Rizal. Rattans are very important raw

Table 2. Endemic plant species recorded in Mantalingahan Range.

Botanical Name	Local Name
<i>Alocasia zebrina</i> C. Koch & Hort. Usitch	Dital/Kamiliti/Digkatan
<i>Alstonia scholaris</i> (L.) R.Br.	Tagbak
<i>Amomum palawanense</i> Elmer	Dagang
<i>Anisoptera aurea</i> Foxw.	
<i>Anisoptera thurifera</i> (Blanco) Blume	
<i>Antidesma microcarpum</i> Elmer	Baro
<i>Artocarpus blancoi</i> (Elmer) Merr.	Antipolo/Tigep/Gudang
<i>Artocarpus nitidus</i> Trecul. spp. <i>nitidus</i>	Kukubi/Karasakas
<i>Calamus diepenhorstii</i> Miq.	Abuan
<i>Calamus merrillii</i> Booc.	Palasan
<i>Calamus ornatus</i> Blume ex Schult. f. var. <i>philippinensis</i> Becc.	Kalapi
<i>Canarium asperum</i> Benth.	Sahing/Saleng/Salong
<i>Caryota</i> sp.	Batbat
<i>Caryota</i> sp.	Pugahan bato
<i>Ceuthostoma palawanense</i> L.A.S. Johnson*	Parongpong
<i>Centrostemma multiflorum</i> Blume	
<i>Cinnamomum</i> sp.	Palawan cinnamon
<i>Codiaeum megalanthum</i> Merr.	Panagang
<i>Croton leiophyllus</i> Muel-Arg.	Limbutan
<i>Cyrtandra</i> sp.	Lupa
<i>Daemonorops mollis</i> (Blume) Merr.	Gatasan
<i>Dellinia luzoniensis</i> (Vidal) Mart. ex Dur et Jacks*	Malakatmon/Dilawan
<i>Dinochloa palawanensis</i> S. Dransf.*	Bikal
<i>Diospyros pilosanthera</i> Blanco	Bolong-eta/Angkukubi
<i>Dischidia platyphylla</i> Schltr.	
<i>Drypetes subcrenata</i> (Merr.) Pax & K. Hoffm.	Karing karing
<i>Ficus balete</i> Merr.	Kulban/Balete
<i>Garcinia binucao</i> (Blanco) Choisy	Taiyagang
<i>Glochidion camiguinense</i> Merr.	Bunot-bunot

Table 2. Endemic plant species recorded in Mantalingahan Range.

Botanical Name	Local Name
<i>Glochidion dolichostylum</i> Merr.*	Tabangaw
<i>Guioa acuminata</i> Radlk.	Pasi
<i>Guioa myriadenia</i> Radlk.	Ulas
<i>Hopea philippinensis</i> Dyer	Gisok
<i>Licuala spinosa</i> Thunb.*	
<i>Macaranga ovatifolia</i> Merr.	Indangan
<i>Mangifera monandra</i> Merr.	Malapaho
<i>Myristica philippensis</i> Lam.	Duguan/Mambabalud
<i>Oncosperma tigillarum</i> (Jack) Ridl.	Anibong
<i>Orania paraguensis</i> Becc.*	Uredas/Banga
<i>Palaquium foxworthyi</i> Merr.	Tagotoi
<i>Palaquium luzoniense</i> (Fernandez-Villar) Vidal	Nato/Tadkan/Natangan
<i>Palaquium</i> sp.	Nato you
<i>Piper</i> sp.*	
<i>Planchonella foxworthyi</i> (Elmer) Lam.	Alalud
<i>Planchonia spectabilis</i> Merr.	Basak
<i>Protium connarifolium</i> (Perk.) Merr.*	Maraup
<i>Schizostachyum lumampao</i> (Blanco) Merr.*	Buho
<i>Shorea astylosa</i> Foxw.	Yakal
<i>Shorea assamica</i> ssp. <i>philippinensis</i> (Brandis)	Manginsurod
<i>Terminalia calamansanai</i> (Blanco) Rolfe	Samburagat/Malakalumpit
<i>Toona calantas</i> Merr. & Rolfe	Kalantas
<i>Tricalysia</i> sp.	Kape gubat
<i>Tristanopsis decorticata</i> (Merr.) P.G. Witson & Waterh.	Malabayabas/Kayo/palawan/ Magpalawan

*Endemic to Palawan

Source: Madulid (2002); Schulte (2002); Rojo (1999)

Table 3. Threatened plant species in Mantalingahan Range.*

Family	Scientific name	Local Name	
Anacardiaceae	<i>Mangifera altissima</i>	Manga-manga	Vulnerable
	<i>Mangifera monandra</i>	Malapaho	Endangered
Burseraceae	<i>Protium connarifolium</i>	Maraup	Vulnerable
Dilleniaceae	<i>Dillenia luzoniensis</i>	Malakatmon/Dilawan	Vulnerable
Dipterocarpaceae	<i>Anisoptera thurifera</i>	Apitong baboi	Critical
	<i>Dipterocarpus grandiflorus</i>	Apitong/Taruntung	Critical
	<i>Hopea plagata</i>	Laptongan/Yakal	Critical
	<i>Shorea astylosa</i>	Yakal	Critical
	<i>Shorea philippinensis</i>	Manginsurod	Critical
	<i>Diospyros pulgarensis</i>	Kanumay/Kamanita	Vulnerable
Ebenaceae	<i>Diospyros philippinensis</i>	Kamagong/Bantalinaw	Endangered
	<i>Neolitsea vidalii</i>	Puso-puso/Tarampusoan	Vulnerable
Lauraceae			
Leguminosae	<i>Intsia bijuga</i>	Ipil/Tigas	Vulnerable
	<i>Pterocarpus indicus</i>	Narra	Vulnerable
Meliaceae	<i>Aglaia cumingiana</i>	Alauhaw	Vulnerable
	<i>Sandoricum koetjape</i>	Santol/Apugan/Santol guba	Vulnerable
Moraceae	<i>Artocarpus blancoi</i>	Antipolo/Tigep/Gudang	Vulnerable
Myristicaceae	<i>Myristica philippinensis</i>	Duguan/Mambabalud	Vulnerable
	<i>Tristanopsis decorticata</i>	Malabayabas/Magpalawan	Vulnerable
Sapindaceae	<i>Guioa acuminata</i>	Pasi	Endangered
	<i>Guioa myriadenia</i>	Ulas	Endangered
Sapotaceae	<i>Palaquium luzoniense</i>	Nato/Tadkan/Natangan	Vulnerable
Verbenaceae	<i>Vitex parviflora</i>	Ablas	Vulnerable

*Based on IUCN Red List (2002)

Table 4. Commercial Philippine wood found in the periphery of Mt Mantalingahan.

Common Name	Botanical Name
Apitong	<i>Dipterocarpus grandiflorus</i> Blanco
Bolong-eta	<i>Diospyros pilosanthera</i> Blanco var. <i>pilosanthera</i> Bakh.
Ipil	<i>Intsia bijuga</i> (Colebr.) O. Kuntze
Kalantas	<i>Toona calantas</i> Merr. & Rolfe*
Kalumpit	<i>Terminalla microcarpa</i> Decne
Kamagong	<i>Diospyros philippinensis</i> A. DC
Malabayabas	<i>Tristanopsis decorticata</i> (Merr.) P.G. Wilson & Waterh.*
Malugai	<i>Pometia pinnata</i> J.R. & G. Forst.
Mangasinoro	<i>Shorea assamica</i> ssp. <i>philippinensis</i> (Brandis)
Mararango	<i>Azadirachta excelsa</i> (Jack) Jacobs
Molave	<i>Vitex parviflora</i> Juss.
Narra	<i>Pterocarpus indicus</i> Willd forma <i>indicus</i> Rojo
Nato	<i>Palaquium luzoniense</i> (Fernandez-Villar) Vidal
Palosapis	<i>Anisoptera thurifera</i> (Bianco) Blume asp. <i>thurifera</i>
Yakal-saplungan	<i>Hopea plagata</i> (Blanco) Vidal
Yakal	<i>Shorea astylosa</i> Foxw

Source: Monsalud and Tamolang (1969)

Table 5. Some useful plant species encountered during the survey.

Species	Economic Uses
<i>Alangium meyeri</i> Meir.	Firewood, round timber
All rattan species	Furniture, rope, handicraft
<i>Alstonia macrophylla</i> Wall. ex DC	lumber, round timber
<i>Antidesma microcarpum</i> Elmer	lumber
<i>Artocarpus nitidus</i> Trecul. ssp. <i>nitidus</i>	round timber
<i>Barringtonia balabacensis</i> Merr.	medicine (wound)
<i>Dehaasia cairocan</i> (Vidal) C.K. Allen	lumber
<i>Buchanania arborescens</i> (Blume) Blume	lumber for jealousy, lumber
<i>Callophylum blancoi</i> Planchon et Triana	round timber
<i>Canarium asperum</i> Benth.	Round timber
<i>Canadum hirsutum</i> Wilid. sap. <i>hirsutum</i> var. <i>hirsutum</i> forma <i>scabrum</i> (Blume) Leenh.	alternative fuel for lighting
<i>Casuarina equisetifolia</i> L.	lumber
<i>Casuarina sumatrana</i>	firewood
<i>Ceuthostoma palawanense</i> L.A.S. Johnson	ornamental
<i>Chisocheton cumingianus</i> (C.DC.) Harms.	ornamental
<i>Cinnamomum iners</i> Reinw.	lumber
<i>Cratoxylum</i> sp.	round timber, firewood
<i>Croton leiophyllus</i> Muell.-Arg.	lumber, post
<i>Cyathea</i> sp.	Round timber, firewood
<i>Diospyros multiflora</i> Blanco	ornamental
<i>Diospyros philippinensis</i> A.DC	medicinal (wound and itch)
<i>Diospyros pilosanthera</i> Blanco	medicinal
	post, pole timber

Table 5. Cont'd.

<i>Dipterocarpus grandiflorus</i> Blanco	flooring
<i>Dracaena</i> sp.	ornamental
<i>Durio</i> spp.	food for man/animals
<i>Litchi chinensis</i> Sonn. ssp. <i>philippinensis</i> (Radik.) Leenh.	firewood
<i>Ficus balete</i> Merr.	pole timber, medicinal
<i>Ficus variegata</i> Blume	bark for G-string, timber
<i>Garcinia binucao</i> (Blanco) Choisy	post
<i>Garuga floribunda</i> Decne.	lumber
<i>Gnetom gnemon</i>	food
<i>Grewia eriocarpa</i> Juss.	lumber
<i>Guioa acuminata</i> Radlk.	edible fruit
<i>Hopea philippinensis</i> Dyer	firewood
<i>Hopea plagata</i> (Blanco) Vidal	round timber
<i>Kokoona ochracea</i>	bark excellent fuel
<i>Licuala spinosa</i>	ornamental
<i>Leucosyke ovalifolia</i> C.B. Rob.	fence post
<i>Litsea philippinensis</i> Merr.	lumber (round post)
<i>Mangifera monandra</i> Merr.	food for man and animals
<i>Morinda citrifolia</i> L.	firewood
Most Aracea species	firewood
<i>Myristica philippinensis</i>	lumber
<i>Myristica</i> sp.	pole timber
<i>Myristica</i> sp.	medicinal
<i>N. ramboutan-ake</i> (Labill.) Leenh.	Lumber, post, fruit edible
<i>Nephelium</i> sp.	fruits edible
<i>Octomeles sumatrana</i> Miq.	fruits eaten by bats
	flower source of nectar
<i>Oncosperma tigillarium</i>	flooring
<i>Pangium edule</i> Reinw. ex. Blume	fruits eaten (like coconut)
<i>Palaquium luzoniense</i> (Fernandez-Villlar) Vidal	lumber, pole timber
<i>Parkia roxburghii</i> G. Don	lumber, round timber
<i>Pisonia umbellitera</i> (J.R. & G. Fost.) Seem.	for paste (maya)
<i>Pongamia pinnata</i> (L.) Meer.	lumber, medicinal (scratch)
<i>Pouteria macrantha</i> (Merr.) Baehni	round timber
<i>Radermachera biternata</i> Merr.	lampong
<i>Sandoricum koejape</i>	food, for boat, lumber
<i>Semecapus cuneiformis</i> Blanco	food for man and animals
<i>Sterculia oblongata</i> R. Br.	round timber
<i>Symplocos villarii</i> Vidal	firewood
<i>Syzygium costulatum</i> (C.B. Rob.) Merr.	lumber
<i>Syzygium hutchinsonii</i> (Merr.) Merr.	lumber
<i>Syzygium</i> spp.	lumber
<i>Syzygium vaccinioides</i> (Elm.) Merr.	pole timber
<i>Syzygium xanthophyllum</i> (C.B. Rob.) Merr.	lumber
<i>Tarenna bakeri</i> (Mar.) Brem.	lumber
<i>Terminalia calamansanai</i> (Blanco) Rolfe	lumber, pole timber
	for making guitar handle

Table 5. Cont'd.

<i>Terminalia foetidissima</i> Griffith	lumber
<i>Terminalia microcarpa</i> Decne	lumber, firewood
<i>Trema cannabina</i> Lour.	pole timber, fiber
<i>Trichospermum discolor</i> Elmer	flooring, fiber
<i>Trichospermum eriopodum</i> (Turcz.) Merr.	fiber
<i>Trigonostemon angustifolius</i> Merr.	pole, timber
<i>Turraea pubescens</i> Hell.	bangka
<i>Willughbeia sarawacensis</i>	food for man and animals

materials for handicraft and furniture-making industry, The Pala'wan tribe is also dependent of rattan for ties when they build their shelter. Economically important fruit trees, *i.e.* 2 species of *Artocarpus*, 5 species of *Nephelium*, a species of *Garcinia*, *Persea* and *Durio*, *Mangifera monandra* and tabo (*Willughbeia sarawacensis*) were also recorded in the area. Accordingly, these plants are important sources of food to the Pala'wan tribe especially during lean months. In addition, *Koompasia excelsa* (Becc.) Taub. is an important nesting place of important native birds like blue-naped parrots, talking mynah and Philippine cockatoo.

According to Madulid (2002), the plants of Palawan constitute one of the highest genetic resources in the country, which include high quality timber trees and other forest products such as rattan, gums and resins, fiber, wild fruits and vegetables, food plants, medicinal plants and plants for ornamental and industrial uses.

During the survey, *Dipterocarpus grandiflorus* is the most abundant tree species encountered in the periphery of Mantalingahan Range, except in Inogbong, Bataraza. The abundance of this species in most sampling sites tells that the lowland rainforests therein are Dipterocarp forests based on the 6 forest types adopted by DENR. The Philippines was in fact the number one supplier of lumber to Japan in the 1970s. The dwindling of dipterocarp forest in the Philippines is in fact due to logging of these species. Aside from *D. grandiflorus*, 15 other commercial Philippine-wood tree species are found in the mountain.

Even if the method used in assessing the flora on the periphery of Mantalingahan Range is very rapid, the results demonstrate that the mountain range is rich in flora with many endemic, rare, narrow range species, and many economically important plant species.

This mountain can be considered, therefore as one of the most important site in Palawan corridor for conservation so the best and strictest measures should be applied to prevent any degradation of such a rich genetic resource.

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Reinvigorative Pre-Sowing Treatment for Aged Rice Seeds (*Oryza sativa* L.) using Seawater

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ABSTRACT

The study was conducted to evaluate the efficiency of seawater as reinvigorative presowing treatment for aged rice seeds. The seawater concentrations used were: 0, 25.0, 50.0, 75.0 and 100.0%. Results revealed that among the treatments used, 50% seawater solution is the most efficient in restoring the germination capacity of aged lowland rice seeds. Seawater pre-treatment significantly improved the final germination capacity, final emergence capacity, and mean daily emergence rate of aged rice seeds. Further, seedlings from reinvigorated seeds were noted to be heavier (whether fresh or dry), taller, with more expanded leaf, and have longer shoots and roots.

Keywords: aged rice seeds, Oryza sativa, presowing, seawater

INTRODUCTION

Seed availability has been a persistent problem of the Philippine Rice Industry (Lara *et al.*, 1991). Seed growers nationwide can produce only around 35% of the total requirements in key grain areas. This problem is aggravated by the uneven distribution of seed growers in the country (Javier and Malabanan, 1997). Since farmers have limited access to good quality seeds, they resort to the use of low quality seeds available in the locality (e.g. aged rice seeds).

The poor germination of rice seeds is mainly due to viability deterioration after long storage. Rice seeds storability can only be maintained up to six months under ordinary room condition. However, under ideal storage conditions (i.e. in air-conditioned rooms), the viability and vigor of seeds could be maintained for three to five years (PhilRice, 1997).

Seeds of high vigor are highly desirable in the establishment of most crops. Rapid germination and uniform stand are among the properties of vigorous seeds but both decline in deteriorated seeds (Heydecker, 1972). Seed priming or other prehydration treatments accelerate the rate of germination of seeds in many crop species (Bradford, 1986). It is in this context that vigor restoration of aged rice seeds using seawater as pre-sowing treatment was studied.

METHODOLOGY

The experiment was laid out in Completely Randomized Design with 5 treatments and 8 replications. Treatments used were the following: T_1 = control (without seawater), T_2 = 25% seawater solution, T_3 = 50% seawater solution, T_4 = 75% seawater solution, and T_5 = 100% seawater.

The study made use of PSB Rc 58, an irrigated lowland rice variety stored for 9 months. This rice variety is high yielding, resistant to bacterial leaf blight, with high milling potentials and good sensory qualities.

Seed sterilization. Prior to reinvigoration, the seeds were washed in 5% solutions of zonrox for 30 seconds then rinsed two times with distilled water. The seeds were then surface dried on a clean cloth.

Reinvigoration. Priming the seeds was done after sterilization by soaking it in 15 ml seawater solution for 36h at 20-25°C temperature.

Germination tests. Germinability of reinvigorated seeds was observed for 5 days under laboratory condition. The germination test was carried out using transparent lunch boxes supported by glass platforms. One hundred seeds were sown on moist tissue paper in each of the boxes. The tissue paper was kept moist via paper wicks from a reservoir of distilled water at the bottom of the boxes. Germinants at radicle protrusion were counted at 24h interval. Counted germinants were discarded.

Emergence tests. Rice shoot emergence was observed for thirty (30) days in a greenhouse. The emergence test was carried out using galvanized iron plain sheet seed box filled with 15 cm soil media composed of fully decomposed rice straw, fine sand, and topsoil in 1:1:1 proportion. One hundred (100) seeds were sown on the seed box. Water was maintained at saturation point throughout the duration of the study. Emergents at hypocotyl protrusion were marked and recorded at 24h interval and were allowed to grow for 30 days.

Data gathered. In the germination test the following data were gathered and calculated: germination percentage, mean daily germination rate and number of abnormal seeds germinated. In the emergence test, emergence percentage, mean daily emergence rate, shoot length, root length fresh weight, dry weight, seedling height and number of expanded leaves were gathered and calculated. Except for the emergence percentage which was taken at 24-h interval, the rest of the data were taken at the end of the 30 day observation period.

RESULTS AND DISCUSSION

Germination Test

During the first day of observation, there was a significantly higher germination percentage of seeds at 0% seawater (control) compared to the reinvigorated ones (Fig. 1). This is because seeds primed in solutions with low osmotic potentials slowly imbibe water to a level that permits pregerminative metabolism to proceed, but prevents actual radicle emergence even for several days or weeks (Khan *et al.*, 1978). On the second day, reinvigorated aged seeds had already increased germination, with exception of those soaked in 75% seawater which had significantly lower germination rate. However, results showed that from day 3 to day 6, aged rice seeds soaked in different seawater concentrations improve their germination capacity. It was observed that seeds soaked in 50%, 75% and 100% seawater had significantly high germination and mean germination rate than those in 25% and control (Table 1). The germination capacity and daily germination rate increased by 18-22% and 3.50-4.2%, respectively. This findings confirmed the findings of Benedetto (1990), which stated that presowing treatment with sodium hypochlorite (NaOCl) solution increased the percentage of germination but contradicted the report of Pressman *et al.* (1977), that increasing concentration of seawater used to pretreat the seeds of two celery varieties inhibited seed germination.

The reported inhibitory effect of pure seawater in celery (Pressman, *et al.*, 1977) may be due to the penetration and accumulation of toxic ions causing deleterious effects (Brocklehurst and Dearman, 1984; Bliss *et al.* 1986a; Greenway and Munns, 1980; Nerson and Govers, 1986). However, this was not observed in this study. The effective action of salt as osmotica is to regulate osmotic pressure of the solution sufficient enough to prevent germination while permitting seed hydration to support enzymatic activities (Ells, 1963; Hadas, 1976). The presence of Ca^{2+} in conjunction with Mg^{2+} and SO_4^{2-} ions in seawater might have reduced cell membrane permeability thus, reducing the penetration and accumulation of Na^+ into catastrophic level (Toledo, 1997). The high Na^+ and Cl^- concentrations did not damage seeds before they reached the hydration threshold level (Bliss *et al.*, 1986b). According to Corchete and Guerra (1986), as cited by Toledo (1997), it is possible that these ions may be involved in the cellular osmotic adjustment of the seeds during priming that increased soluble sugars such as sucrose, galactose and mannose in the embryonic axes

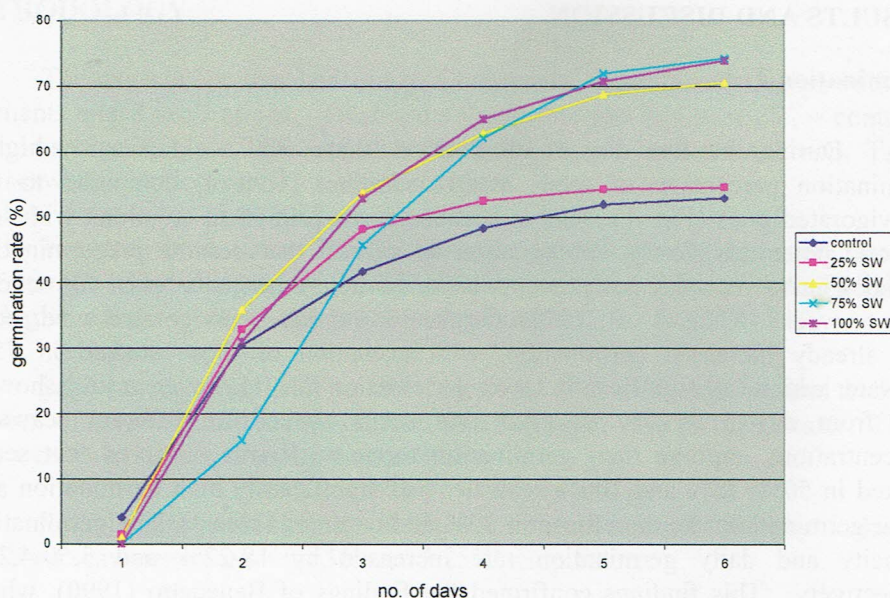


Figure 1. Mean germination rate of aged PSB Rc 58 rice seeds reinvigorated with different concentration of seawater.

Table 1. Mean daily germination and mean abnormal germination rate of aged PSB Rc 58 rice seeds treated with varying levels of seawater.

Treatment	daily germination rate	Abnormal germination rate
Control	10.575 ^b	19.500 ^c
25% seawater	10.925 ^b	16.250 ^c
50% seawater	14.100 ^a	30.000 ^c
75% seawater	14.775 ^a	35.500 ^{ab}
100% seawater	14.800 ^a	40.750 ^a

Note: Means with the same letter superscripts are not significantly different at 0.01 level.

On abnormal germination, results showed that 75% and 100% seawater reinvigoration has the highest abnormal germination showing stunted growth, distorted cotyledon with necrotic areas, and albinism. Seawater concentration of 25% and the control exhibits the lowest abnormal germination (Table 1).

Villiers (1974) and, Villiers and Edcumbe (1975) stated that seedlings grown from seeds with low viability manifested abnormalities like growth stunting, cotyledon distortion with necrotic areas, subdivided first leaves, and root swelling with necrotic radicle meristem that increase with time. Another characteristic of abnormally grown plants is albinism. Aging causes heritable specific gene mutation like albinism in barley and peas (Dourado and Roberts, 1984). These characteristics were observed in the present experiment both in the laboratory germination and greenhouse emergence.

The result revealed that high rates of seawater presowing treatments significantly increased the frequency of morphologically abnormal seedlings of aged rice seeds. Such results suggest that repair processes were activated but due to the deleterious effects of aging, the embryos were not able to grow normally.

Emergence Test

The final emergence capacity of rice seeds reinvigorated with different levels of seawater has remarkably improved. Seawater treatments greatly restored the emergence capacity of aged rice seeds with an increase of 7.75-10%. Among the different treatments, the seeds soaked in 25% and 50% seawater had significantly higher emergence rate than those in 75%, and 100% (Figure 2).

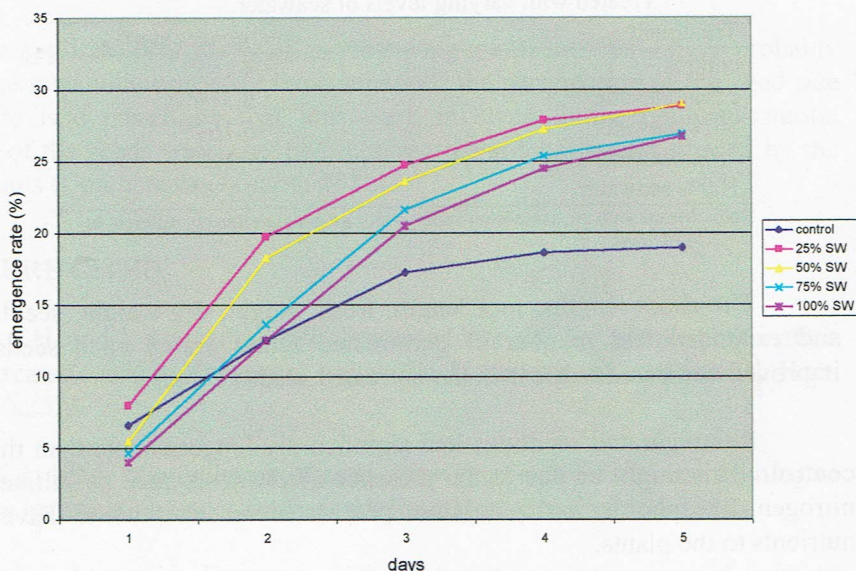


Figure 2. Mean daily emergence capacity of PSB Rc aged rice seeds as a result of different levels of reinvigorative seawater presowing treatment.

The positive response of the aged rice seeds to seawater presowing treatment on the emergence capacity might be due to the effective action of salt as osmotica which regulate osmotic pressure of the solution sufficient enough to prevent germination while permitting seed hydration to support enzymatic activities (Ells, 1963; Hadas, 1976). It might be possible that the presence of elements such as sulfate, calcium, nitrogen, phosphorus, and potassium in seawater, have provided nutrients while simultaneously reducing water uptake. Consequently, this improvement increased plant weight, height, leaf number, and root length.

Likewise, mean daily emergence rate of aged seeds primed with seawater improved. The seeds reinvigorated in 25% and 50% seawater had higher mean daily emergence rate than those seeds in control but had similar performance with those in 75% and 100% (Table 2).

The remarkable response on the daily emergence rate of aged seeds in higher concentration of seawater might be due to the lower incidence of fungus compared to the control. Many pathogen such as field and storage fungi are associated with most crop seed species (Christensen, 1972; Neergaard, 1977), such pathogens initiate deterioration and accelerate the aging process of seeds.

Table 2. Mean daily emergence rate of aged PSB Rc 58 rice seeds Treated with varying levels of seawater.

Treatment	emergence rate
control	4.165 ^b
25% seawater	6.319 ^a
50% seawater	6.169 ^a
75% seawater	5.550 ^{ab}
100% seawater	5.350 ^{ab}

Note: Means with the same letter superscripts are not significantly different at 0.01 level.

The shoot lengths, root length, fresh weight, dry weight, seedling height and expanded leaf number of germinated reinvigorated aged seeds likewise improved compared to those in the untreated seeds (Table3).

Reinvigorated seedlings had significantly longer shoots than those in the control. This might be due to the presence of elements such as sulfate, calcium, nitrogen, phosphorus, and potassium present in seawater which have provided nutrients to the plants.

Table 3. Mean observed values for various characteristics of aged PSB Rc 58 rice seeds primed with seawater.

Treatment	Shoot Length	Root Length	Fresh Weight	Dry Weight	Seedling Height	No. Expanded Leaf
control	33.362 ^b	7.200 ^b	4.613 ^b	0.930 ^b	40.550 ^b	5.150 ^b
25% sw	38.600 ^a	8.675 ^a	7.588 ^a	1.643 ^a	47.287 ^a	5.900 ^a
50% sw	39.763 ^a	8.913 ^a	8.663 ^a	1.750 ^a	48.575 ^a	6.000 ^a
75% sw	39.163 ^a	8.438 ^{ab}	7.538 ^a	1.492 ^a	47.613 ^a	5.575 ^{ab}
100% sw	40.862 ^a	9.588 ^a	9.300 ^a	1.852 ^a	50.313 ^a	6.100 ^a

Note: Means with the same letter superscripts are not significantly different at 0.01 level.

In terms of root length, rice seeds primed with seawater produced longer roots compared to those in the control. However, no significant difference in the mean root length was observed between the control and those primed in 75% seawater.

The same trend was observed on the fresh weight, dry weight and height of rice seedlings (Table 3). Those reinvigorated with seawater did not vary from each other but were significantly higher compared to those in the control.

However, in terms of expanded leaf number, seeds soaked in 75% seawater had significantly lower number of expanded leaf compared to those in the other treatments.

The observed increase in seedling dry weight of primed aged PSB Rc 58 rice seeds conform to the observations of Cantliffe, *et al.* (1992) in celery; Furutani *et al.* (1986) in onion; Fieldhouse and Sasser (1975), Ichan and Passam (1992), and Smith and Cobb (1987) in pepper; Durant *et al.* (1983) in table beet; and Ells (1963) and Mitra and Basu (1979) in tomato primed with NaCl or NaOCl.

The application of seawater as presowing treatment would have probably activated the metabolic processes thus, enhanced the germination of the aged rice seeds. There is a possibility that ions were involved in the cellular osmotic adjustment of the seeds which helped increase the soluble sugars needed by the growing plants (Corchete and Guerra, 1986).

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Neem (*Azadirachta indica*) Leaf as Dewormer and as Component of Swine Ration

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ABSTRACT

The effect of varying levels of neem leaf meal on the growth performance and internal parasites of swine was investigated. Results indicated that there is no significant difference on swine growth performance in terms of average weight gain, average feed consumption, and feed conversion efficiency. However, there is a significant difference in the percentage reduction of internal parasites based on egg per gram count. Percentage parasite reduction is greater at higher proportion of neem leaf meal in the ration.

Keywords: Azadirachta indica, neem leaf meal, neem, dewormer

INTRODUCTION

Azadirachta indica A. Juss. (neem tree) is a member of the family Meliaceae in the order Fagales of the Dicotyledonous class in the plant kingdom. Native to South Asia, it is widely planted and naturalized in semi-arid areas throughout Asia and Africa. It was introduced in the Philippines as fodder trees and a source of biological pesticides against rice pests.

The neem has been reported to contain several biologically active constituents such as Azadirachtin (Naganishi, 1975), melinatriol (Lavie *et al.*, 1965), salanin (Warthen *et al.*, 1978), as well as nimbin and nimbidin (Shin-foon, 1984). Garg and Bhakuni (1984) reported salanolide, a meliacin as one of the bitter constituent in neem seed oil. Furthermore, Raman and Sathanagopalan (1979) reported tignic acid (5-methyl-2-butanoic acid) as part of its seed constituent. These compounds have shown diverse effects as medicine, germicides and pesticides.

Azadirachtin, a limonoid has been reported to have adverse effect on the endocrine system of insects (Schmuthere *et al.*, 1981). It also acts as repellent, feeding and oviposition deterrent, growth regulating, sterilant and impairs hatching of eggs.

Neem has also been extensively used in the livestock industry. The neem seed cake in purified form is a protein supplement in livestock feed while the neem leaf paste is used as feed supplement to control intestinal parasites (Intaran, 2000). Creams containing neem oil are used as animal wound dressing and also act as fly and mosquito repellents. In Kenya, neem seed powder is used to protect the native chicken from New Castle virus disease (crescentlife.com, 2004). In recognition of the importance of neem tree as livestock feed and wormicide, this effort is made to evaluate the effect of neem leaf meal on the growth performance and internal parasites of swine.

METHODOLOGY

Sixteen swine aging ninety to ninety-seven days old were randomly assigned to 4 treatments (T_1 : control; T_2 : ration with 5% NLM; T_3 : ration with 10% NLM; T_4 : ration with 15% NLM) with 4 observations each following the Completely Randomized Design.

Milled air-dried neem leaves were incorporated in the swine ration consisting of rice bran, corn meal, "binlid", fishmeal, soybean oil meal and copra meal. The proportion of the ration ingredients in the different treatments is shown in Table 1.

Table 1. Experimental Ration.

INGREDIENTS	TREATMENT			
	1	2	3	4
Rice bran	39.1	37.6	37.1	36.2
Corn meal	23.4	22.6	22.2	21.7
Binlid	15.6	15.1	14.5	14.5
Fishmeal	11.0	9.9	9.4	8.8
Soybean oil meal	6.6	5.9	5.6	5.3
Copra meal	4.4	3.9	3.7	3.5
Neem leaf meal (NLM)	0	5.0	7.5	10.0
TOTAL	100	100	100	100
Calculated CP, %	17%	17%	17%	17%

The data gathered were the following: average initial weight, average final weight, average gain in weight, average feed consumption, feed conversion efficiency and internal parasitic load.

The internal parasitic load of the animals was determined as egg per gram counts using the McMaster Counting Technique.

All data were subjected to analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Growth Performance

There is no significant difference in the average weight gain and feed consumption of swine after 117 days of rearing (Table 2). However, data indicated that average weight gain and feed consumption decrease with increasing proportion of neem leaf meal in the ration. The animals fed with ration without neem leaf had the highest average weight gain of 54.50 kg and feed consumption of 216.7 kg, while those fed with ration containing 15% neem leaf meal had the lowest of only 48.25 kg weight gain and 205 kg feed consumption. The low weight gain can be attributed to lower feed consumption of animals in the treatment with neem leaf meal.

Table 2. Mean average weight (AWG), feed consumption (FC), feed conversion efficiency(FCE), and reduction in parasite egg (RPE) per gram count.

Treatment	AWG	FC	FCE	RPE (%)
0% NML	54.50	216.7	3.98	1.43
5% NML	50.25	212.7	4.28	38.35
10% NML	51.66	206.3	4.03	96.73
15% NML	48.25	205.0	4.27	223.33

A factor contributing to low feed consumption is the taste of neem leaves. The bitter taste to its meliacin compounds has affected the palatability of the ration. It was observed that the animals fed with 15% neem meal consumed their ration very slowly and even left some of it for sometime (although most of the time, the animals returned to finished the ration). Those fed with 10% neem meal, consumed their ration slowly but usually finish the ration before leaving the feeding trough.

Though animals fed with neem meal leaf ration has lower feed consumption, statistical analysis indicated that the difference in feed consumption is not significant. The average daily feed consumption of the animals is within the normal swine feed consumption of 1.7 to 2.0 kg per day under Philippine condition (Sayoc *et. al.* ____).

The animals fed with 15% neem leaf meal showed the highest feed conversion efficiency of 17% (Table 2) despite consuming lesser amount of the ration. Analysis of variance however indicated that the difference in the feed conversion efficiency between treatments is not significant.

Effect on Internal Parasites

The eggs seen under direct fecal smear and counted under the McMaster Counting Chamber resemble the morphological structure of *Ascaris* spp. Exact

species identification was not conducted since the study is only after the total percentage reduction in egg per gram count and not in the percentage reduction of individual species of worms.

Egg per gram count at the start of the study revealed that the experimental animals have mild, if not negligible, nematode worm infestation. However, the number of eggs of other parasites is high, ranging from 4,200 to 6,000 eggs per gram fecal smear.

After feeding the animals with neem leaf meal, the number of parasite eggs was reduced (Table 6). Reduction in the number of parasites was greatest in animals fed with 15% neem leaf meal. The egg per gram count was reduced by more than two hundred percent in this treatment, while only one-percent reduction was observed in the control group. This work demonstrates the potency of *A. indica* in the control of swine internal parasites.

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Organizational Commitment and Viability of Agri-Based Cooperatives in Palawan

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ABSTRACT

One hundred twenty-nine (129) respondents from ten (10) agri-based cooperatives in Palawan were interviewed to assess the background and viability characteristics of these cooperatives and to determine the variables that predict organizational commitment and viability.

Results revealed high viability ratings of the cooperatives attributed to their fast growth as shown by increased number of members, number of linkages, and capitalization. Twelve variables were identified to predict organizational viability based on path analysis. The revised path model identified that organizational viability is directly predicted by organizational commitment which in turn is directly predicted by satisfaction. Satisfaction through organizational commitment indirectly predicts organizational viability and is in turn directly predicted by centralization, distributive justice and feeling of importance. This finding rejects the proposition that personal factors are either direct or indirect predictors of organizational commitment.

Results of this study support Systems Theory which sees human organizations like biological organisms that live, grow, develop and made up of constituent parts that perform specific but interrelated function towards the attainment of organizational goals and partly supports the Exchange and Side Bet Theories which explain the emergence, the rise and decline of commitment of members in their organization, and reinforce the earlier observations that personal factors are not key exchange and side bet variables.

Keywords: cooperatives, agri-based, Palawan, organizational commitment

INTRODUCTION

A cooperative is a dynamic form of people's organization that embodies the philosophy of cooperation. It signifies the voluntary assent of people to form themselves into an organization for the promotion of their common needs by mutual action, democratic control and sharing of economic benefits on the basis of patronage by the members. Members get together to do certain act, knowing that

by their collective action they can effectively realize their objectives. Cooperative movement is by far the most practical, sustainable and accessible weapon for wiping out mass poverty. It is believed that through the cooperative movement, the economic miseries of the poor will be alleviated.

In Palawan, a total of 612 cooperatives had been registered at the Cooperative Development Authority up to the time of this study. Two hundred eighty-seven (46.90%) had been declared as operating and 325 (53.00%) as non-operating. Cooperatives are declared as non-operating due to lack of social and economic activity. This supports the claim of Hussi *et al.* (1993) that cooperatives and other farmer groups have often failed to develop into viable self-managed organizations capable of extending efficient services to their members. The lack or absence of commitment among the members that constitute them burdens this failure (Kanter, 1968; Aragones, 1977; Pablico, 1982; Alicante, 1991; Im, 1991; Batoon, 1984). This indicates that commitment and viability are desirable organizational outcomes (Angle and Perry, 1981). The big and real issue then is not organizing itself but the staying power of organizations (Hague, *et al.*, 1977) whose fundamental ingredients are membership commitment and viability. Therefore, the two major concerns of institutional development or organizing remain to be on how to secure and maintain commitment among the members over time (Siy, 1982), and sustain organizational viability (Hussi, *et al.*, 1993).

A few studies dealt on the performance of rural people's organizations and very few of these touched on organizational commitment and viability and their predictors. Mottaz (1988) in his review of studies conducted on the antecedents of organizational commitment observed that the results are inconsistent and confusing, hence, it is not possible to draw any definite conclusion. The dilemma lies on the following factors: 1) a good deal of the research in this area has not been guided by a well specified model of commitment from which predictor variables can be derived consequently 2) different studies vary greatly in terms of the variables included, and 3) most studies have bivariate rather than multivariate analytical technique. As a result, a wide variety of variables have been found to have a significant relationship with organizational commitment. The use of bivariate procedures does not allow one to accurately assess the relative importance of the various potential determinants of commitment when effects of other important variables are constant. Thus one cannot be sure that the reported relationship is not spurious.

This study was conducted to: (1) assess the background and viability characteristics of agri-based cooperatives in Palawan; and (2) determine the predictors of organizational commitment and viability in these cooperatives.

METHODOLOGY

Research Design

The study is descriptive and analytical in nature. The descriptive part describes the background characteristics and viability of the sample cooperatives, and the personal characteristics of the member-respondents. The analytical part deals with the fitting of the hypothetical model using the data obtained from the cooperatives as a collective unit and from the members. The causal structure of the interrelated variables was determined by coming up with a revised model that would be useful in predicting the organizational commitment and viability in agri-based cooperatives.

Sampling Procedure

The sample cooperatives were homogenized by including only cooperatives that are at least five years old. Likewise, only the cooperatives that have been in continuous operation from the time they were registered with the CDA up to the time of the study were selected. As a result, ten cooperatives in Palawan were considered composed of: San Juan Rural Improvement Club Multi-Purpose Cooperative at San Juan, Aborlan; OISCA Model Community Multi-Purpose Cooperative at Cabigaan, Aborlan; Bono-bono Gintong Butil Multi-Purpose Cooperative at Bono-bono, Bataraza; Princess Urduja Small Coconut Farmers Association Multi-Purpose Cooperative Inc. at Princess Urduja, Narra; Elvita Multi-Purpose Cooperative Incorporated at Elvita, Narra; Lapu-lapu Multi-Purpose Cooperative Incorporated at Poblacion, Narra; Antipuluan Small Coconut Farmers Producers Cooperative at Antipuluan, Narra; Sicud Multi-Purpose Cooperative Incorporated at Candawaga, Jose Rizal; Caramay Coffee Planters Multi-Purpose Cooperative Incorporated at Caramay, Roxas; and Piatnga Farmers Multi-Purpose Cooperative at Kamuning, Puerto Princesa City.

After determining the sample cooperatives, the list of members of identified cooperatives was obtained from the records of the Provincial Cooperative Development Office, Puerto Princesa City. Only the regular members with ages 18 years old and above and those who are physically accessible to their hometown or cooperative's address during the time of the study were included in the random sampling for the member-respondents. Twenty percent (20%) of the qualified members from the selected cooperatives were chosen through random sampling of member-respondents.

Data Collection

Two sets of questionnaires were used in the study. One was the eight-item organizational background and viability questionnaire which was administered to key officers of the sample cooperatives. The other set was the 52-item personal background and organizational commitment questionnaire administered to the individual member-respondents.

Primary data were collected through personal interview with the Board of Directors and other officers and the cooperative-member respondents. The researcher and one hired enumerator conducted the interview. The interviews were done in Filipino since most Palaweños know how to speak Filipino.

Data Analysis

The data gathered were analyzed using appropriate statistical software. Means, ranges, and percentages were used in summarizing the descriptive data. Path analysis, a linear regression analytical technique, was used in evaluating the direct and indirect causal connections between the dependent and independent variables hypothesized in the study. These causal connections are expressed in quantities known as path coefficients or *beta* coefficients (Wright, 1960). A path coefficient measures the concrete contribution that an antecedent variable or set of interconnected determinant variables is supposed to make a given dependent variable. The significance of the computed correlation and path coefficients was tested using the t-test. The F-test was used to test the significance of the path model.

The final path model was determined by first considering all variables in the hypothesized path model. All nonsignificant variable connections or paths were eliminated resulting to a new, simpler path model. Finally, path coefficients were recomputed and used in the in the modified model.

RESULTS AND DISCUSSION

Cooperative-Related Experiences of Members

Formalization in terms of the communication system is evident most of the time (3.51) as perceived by the members. The respondents moderately agree (6.29) that there was centralization in decision and policy making and the cohesion of members was moderately high (6.03). The respondents perceived slightly high (5.19) the feeling of added prestige derived from membership. The respondents felt moderately important (5.98) and rated the dependability of their cooperative as high (3.57). Distributive justice was perceived as moderately fair (5.89) and emphasized that their roles to and in the cooperative were moderately clear (6.33).

The member-respondents expressed their feeling of satisfaction in all cooperative-related factors. This only shows that they find it more favorable, satisfactory and gratifying to be included as members of such organizations.

Organizational Commitment of Members

The level of organizational commitment of the respondents was higher than average. Measured on the scale of seven, respondent-members of cooperatives had a rating of 5.91 with an adjectival rating of moderately committed.

Characteristics of the Cooperatives

Since their establishment, agri-based cooperatives have existed for an average of 10 years and 3 months. Through these years, the membership had increased from 30 to 77. The mean capitalization likewise increased from P540,067.42 to P5,583,687.63.

It can be noted that the cooperatives are composed of members from different ethnic groups. The data suggest that Palawan is indeed a "melting pot" of diverse ethnic groups from various parts of the country.

The cooperatives engaged in economic (production of rice and other crops, operating a sari-sari store, rice trading, operating of drying and storage facilities, farm machineries rental, credit, rice milling, and coffee production and milling) and non-economic activities. The non-economic services rendered by the cooperatives to their members included education and training and provision of any of the following: hospitalization, death benefits, and group insurance coverage.

Viability Status of the Cooperatives

Cooperative viability is defined here as the composite rating score obtained by the sample cooperatives in the five-item scale viability measure designed in this study. This was indicated by the increase in the number of membership, amount of capital, number of business operations, number of services rendered to the members, and the number of linkages either government, non-government and people's organizations over a period of time. Overall, the viability rating for the cooperatives was described at a high level with a computed mean viability rating of 3.82.

Among the five viability indicators used, the cooperatives scored or performed the lowest on the number of services rendered to the members (3.0) and the number of business operations (3.1). The level of these viability indicators had an adjectival rating of "medium". Viability scores were highest on capital build-up of cooperatives (4.8) followed by linkage (4.2) and size of membership (4.0).

These viability data suggest that out of five indicators or measures of viability, only three indicators, namely capital build-up, membership size and number of linkages were assessed to be "high" and thus have contributed to high over-all viability rating. The two other indicators, the number of services rendered and the number of business operations were assessed to be on the medium level of viability.

These five indicators revealed the weakness of the cooperatives in terms of number of business operations and number of services rendered to members. However, in the cooperatives studied, the weakness was partially offset by high ratings in the other three indicators giving an over-all adjectival rating of "high" for the viability of the cooperatives.

To further increase their viability, the cooperatives studied should increase or expand their business operations that may eventually lead to offering of increased services to their members. This shows that the key indicators of viability are equally important and are interrelated. Attempts at increasing viability of a cooperative should carefully consider all these indicators.

These results conform to the system theory proposed by Lilienfield (1973) which sees human organizations like biological organisms that live, grow, and develop. They are made up of constituent parts that perform specific but interrelated functions towards the attainment of organizational goals.

Predictors of Organizational Commitment and Viability

The results of path analysis based on the hypothetical model shed light on which antecedent variable exerts direct or indirect effect on certain dependent variables.

Certain variables were eliminated after the first round of the analysis. The result was a simplified and working path model for organizational commitment and viability. The elimination of certain variables in the original path model did not greatly reduce the coefficient of determination (R^2) for organizational viability. This shows that the retained variables really predict variability and that the contribution of the variables that were eliminated could be ignored.

The revised path model (Figure 1) contained 13 variables with organizational viability in the farthest end. The 12 antecedent variables contribute 75.24 percent of the variability in organizational viability of agri-based cooperatives. Nevertheless, the computed R^2 ($=0.7524$) is large enough to declare that the 12 variables sufficiently predict organizational viability.

Theoretically, a large difference in the values of the path coefficients computed from the hypothesized and revised models indicates a large contribution due to spurious relations (Valera, 1979). The elimination of the insignificant paths actually has removed these spurious effects.

The recomputation of the path coefficients in the second round of the analysis showed a significant direct effect of organizational commitment on viability with a path coefficient of 0.541. The value indicates the amount of change in organizational viability that would be expected whenever organizational commitment is changed by one unit.

Satisfaction leads directly to organizational commitment. The computed path coefficient was 0.548, considered to be significant. Even though there is no direct linkage between satisfaction and organizational viability in the revised path model, an indirect effect exists and the path coefficient of 0.297 is found to be significant. The value indicates the amount of change that could be expected on organizational viability indirectly through organizational commitment when satisfaction changes by one unit.

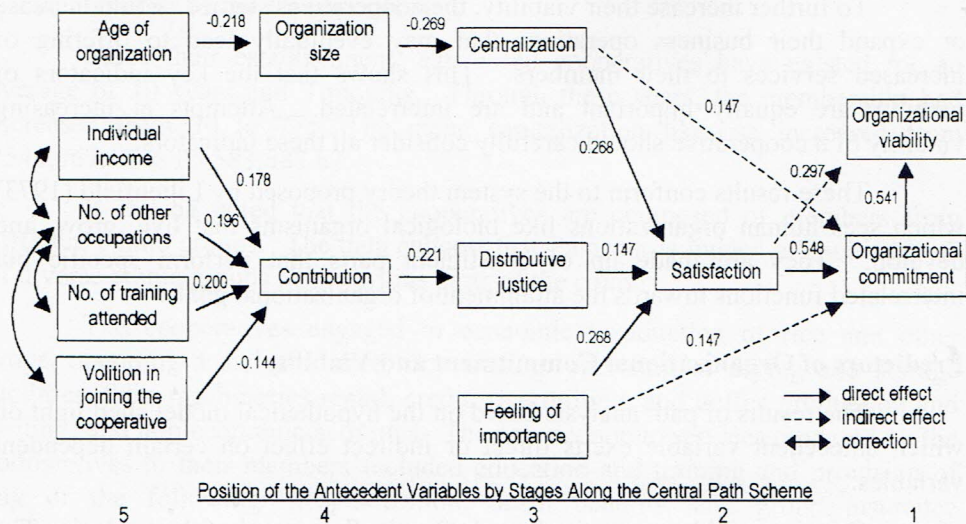


Figure 1. The revised path model of organizational commitment and viability in agri-based cooperatives.

All the retained variables in stage 3 of the revised path model have non-significant indirect effect on organizational viability, although centralization and feeling of importance significantly predict organizational commitment indirectly through satisfaction.

Both the sizes of the organization and contribution have no significant indirect effect on either organizational commitment or organizational viability. Stage 4 variables are already far from the ultimate variables, thus their effects are considered insignificant to cause a change in organizational commitment and viability. The same result holds for stage 5 variables, being one stage farther from the ultimate variables. Thus, age of organization, individual income, number of other organizations, number of training attended and volition in joining the cooperative have non-significant effects on organizational commitment and viability.

Although stage 4 and 5 variables have no direct or indirect effect on organizational commitment and viability, they are still considered as part of the predictors of the ultimate variables because of their significant effect on the variables in the next stage. Through this chain of related effects, satisfaction is predicted by stage 3 variables which is in turn predicted by stage 4 variables and consequently predicted by stage 5 variables. The effects of the variables in stages 3 to 5 are on satisfaction and based on earlier result, satisfaction is also a key to organizational commitment and viability.

RECOMMENDATIONS

The researchers recommend the following measures to improve organizational commitment and viability of the cooperatives:

1. Encourage closer coordination and concerted efforts of all government and non-government organizations, that are involved or concerned with the cooperatives. This would create favorable outcomes on the cooperatives rather than singular, isolated, and piecemeal activities by each of the concerned organizations. The mandate of the Municipal Cooperative Development Councils (MCDCs) should be carried out properly.
2. Provision of technical assistance geared towards the build-up of internal capability of the cooperatives by the concerned organizations. Training programs on more effective management of the organization and on resource generation should be conducted to officers of the cooperatives.
3. Provision of financial assistance to cooperatives to enable them to expand their business operations and services to the members. With additional or expanded business operations and services, the viability score for the cooperatives would increase, ensuring their continued existence and continued offering of services to their members.
4. Periodic monitoring and evaluation of the status of cooperatives should be done by concerned organizations to readily provide remedies and solutions to problems that beset them. Many cooperatives were established, stayed active for a while out then became inactive and ceased to operate. Before this situation happens, technical or even financial assistance could be provided to sustain the cooperative.
5. Work to increase the levels of satisfaction and commitment of members by providing them favorable experiences. Operations of the cooperatives should be improved by soliciting financial and technical assistance from concerned organizations leading to better services and more benefits offered to members. Through the path model, an increase in commitment, and hence, increased viability would be attained.
6. Encourage more active participation of members in terms of increased contributions to capital shares. When pooled together, funds are generated that could be used to finance new projects. The members may also be assigned roles other than being plain members so they could feel being treated with equal importance for the operations and existence of the cooperative. The members should also be encouraged to patronize or avail of the services being offered by their cooperatives to ensure growth of business-related services of the cooperatives.

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Culandanum, Aborlan, Palawan: Newly Discovered Habitat of *Pinus merkusii* Jungh. & de Vr.

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ABSTRACT

Pinus merkusii Jungh. & de Vr. (Mindoro pine) were found thriving on one of the mountain peaks in Culandanum, Aborlan, Palawan. Though not a thick stand, wildlings were found scattered especially on the open part of the area.

The said mountain is constantly subjected to forest fire thus soil is covered with ashes and is thickly vegetated with *Pteridium aquilinum* (Linn.) Kuhn.

The foot and the middle part of the mountain were not affected with the forest fires thus huge trees of various species were growing, especially *Agathis philippinensis* Warb. (Almaciga) of the Araucariaceae. The almaciga trees were utilized by the locals for resins but some trees were dying due to indiscriminate tapping and unscrupulous burning by some jealous locals. Few big *P. merkusii* were also found on this part of the mountain.

Keywords: Pinus merkusii, biodiversity, Mindoro pine, Palawan

INTRODUCTION

Palawan is botanically considered as one of the most diverse and rich islands in the Philippines (Figure 1). As a distinct plant geographic region in the country, Palawan harbors an estimated 3,000-3,500 flowering plant species mostly known to occur only in the island. Sharing a close floristic affinity with Borneo, its plant endemism is estimated to be about 15-20% which is attributed to its geological, climatic, edaphic and biological features (Madulid, 1987 as cited in PTFPP, 1998). The island has been described as among the geographical landmarks with the highest species diversity per unit area with still relatively undisturbed forest compared to other parts of the country.

It was surmised that the true flora of the island is insufficiently known as collections have been restricted to most accessible areas and much of the island has remained unexplored (Hilleshog Forestry AB, 1984). Also, Madulid (1987) categorized the island as moderately botanized.

With this, it is recommended that Palawan must be given priority for botanical research and conservation management.

Among the sites of high conservation importance in the island is Culandatum mountain in Aborlan, which is the habitat of threatened plant species, the *Pinus merkusii* Jungh. & de Vr., commonly known as Mindoro pine.

This survey was therefore conducted to initially document the newly discovered Mindoro pines and its habitat in Culandatum, Aborlan, Palawan.

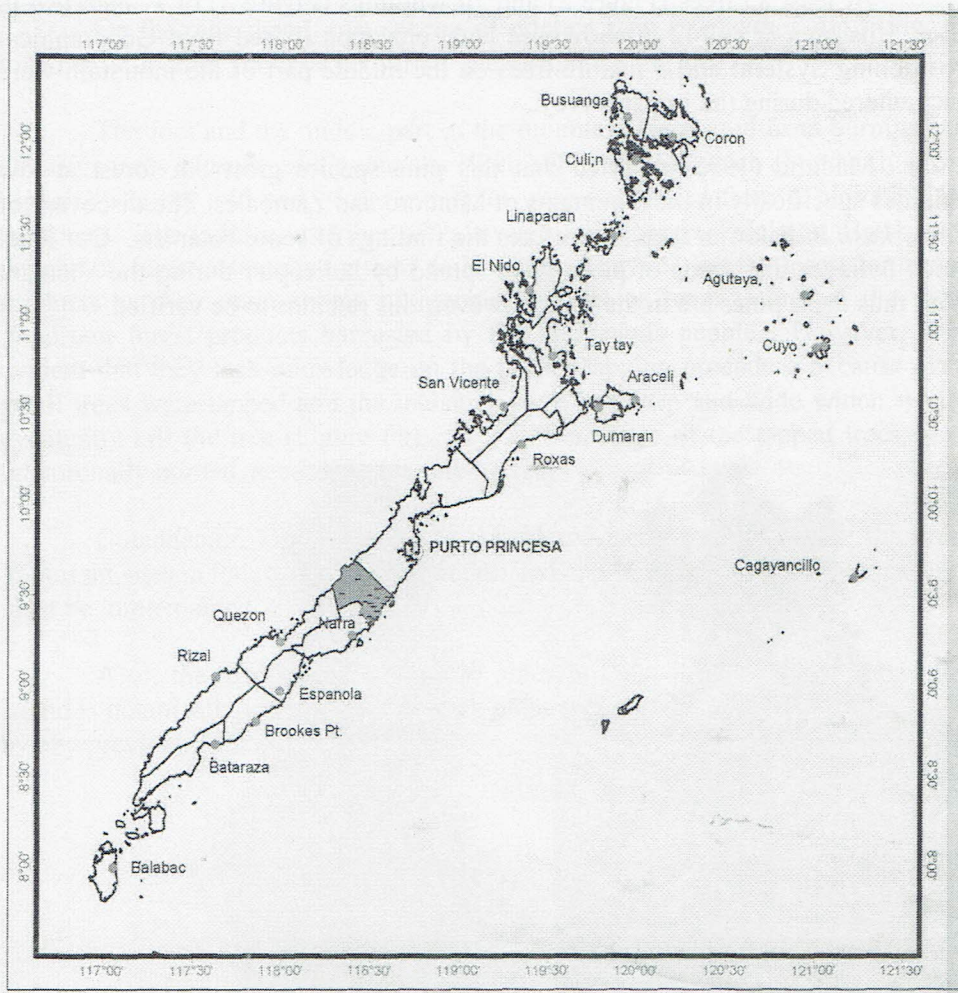


Fig. 1. Map of Palawan, highlighting the Municipality of Aborlan.

METHODOLOGY

As only five big pine trees were found on the middle part of the mountain, counting of wildlings and trees was concentrated on the mountain peak. Quadrats (1m x 1m) were randomly thrown to sample wildlings while trees were individually counted. Pictures were taken for documentation while local guides were asked with pertinent questions.

RESULTS AND DISCUSSION

At least 85 trees (Figure 2) and 70 wildlings (Figure 3) of *P. merkusii* in an c. 5 ha area at c. 742 m above sea level elevation (based from Geographical Positioning System) and 5 mature trees on the middle part of the mountain were encountered during the initial survey.

Madulid (1995) reported that this pine species grows in forest at low altitudes specifically in the mountains of Mindoro and Zambales. The discovery of *P. merkusii* in Palawan therefore refutes the findings of some botanists. Our local guide believes that seeds of pines were spread by helicopter during the Vietnam War, thus these pines are in the area, however, this remains to be verified.

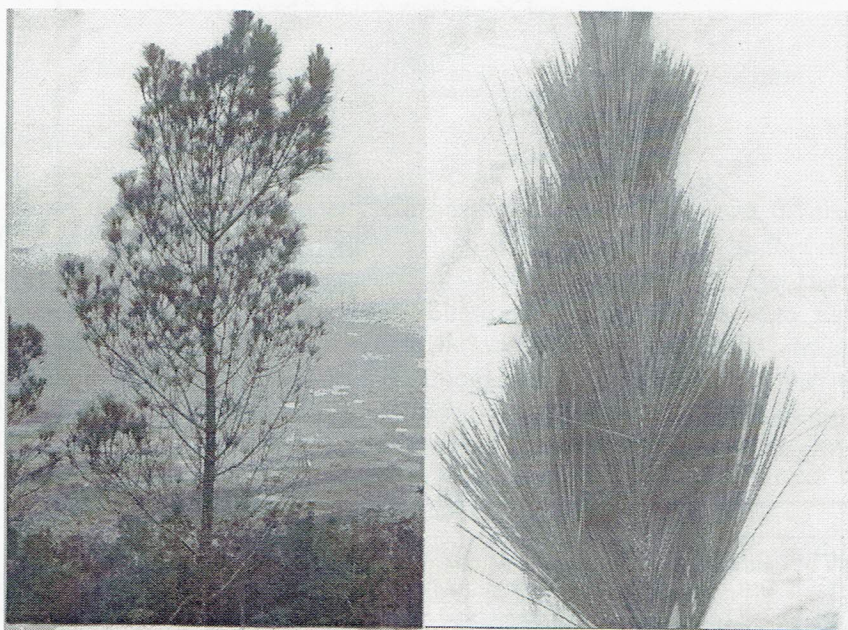


Figure 2. *Pinus merkusii* Jungh. & de Vr. found in one of the mountain peaks in Culandanum, Aborlan, Palawan.

Mindoro pine is considered vulnerable by the International Union for Conservation of Nature (IUCN) because its existence is fragmented (at not more than 10 locations) and its population is continuously declining either due to habitat destruction or low number of mature individuals.

The few population of pines in this area is in danger of extinction because of habitual burning. Due to constant burning, the soil is covered with ashes and there is an almost impenetrable growth of *Pteridium aquilinum* (Linn.) Kuhn (Fig. 4). Madulid (2002) stated that many species of plants in Palawan are in the verge of extinction mainly due to habitat destruction.

On the other hand, two species of pitcher plant (*Nepenthes* spp.) (Fig. 5) together with other yet to be identified plants inhabit the area.

The foot and the middle part of the mountain are spared from burning but almaciga trees (*Agathis philippinenses* Warb.) (Figure 6a), which abundantly grow especially in the mid part of the mountain were not spared from exploitation by the locals. The indigenous tribes of Palawan *i.e.* Tagbanua, Pala'wan, Batak, etc. depend on forest resources for their daily needs. They exploit the forest for minor products as their main source of income. Almaciga resin is one of the most important forest products harvested by the indigenous people. However, it is evident that they lack knowledge on the proper tapping procedure because even small trees were tapped and the incisions were too deep and wide which would eventually kill the tree (Figure 6b). In addition, some of the tapped trees were intentionally burned, according to some locals.

Culandandum Mountain can be considered therefore as a one of the most important sites in Palawan for conservation and appropriate management measures must be implemented.

Also, the discovery of Mindoro pines in Palawan demonstrates that the island is botanically important, harboring plant species which were never recorded by any previous botanical expeditions.



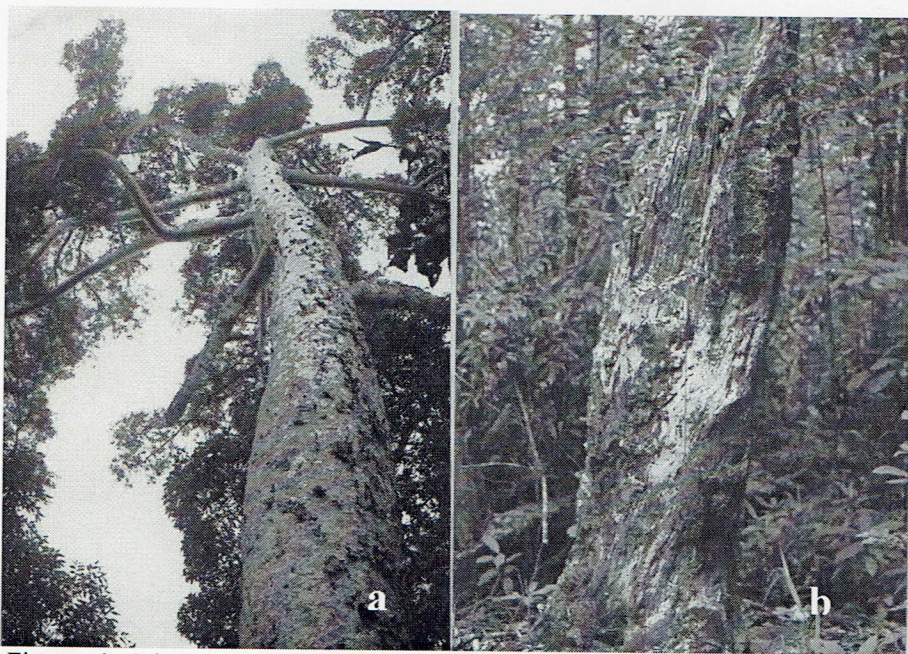
Figure 3. Wildling of *P. merkusii* thriving under thick growth of *Pteridium aquilinum* (Linn.) Kuhn.



Figure 4. An almost impenetrable growth of *P. aquilinum*.



Figure 5. The 2 species of *Nepenthes* found on the area.



Figures 6a & b. a. A huge Almaciga tree (*Agathis philippinensis* Warb.).
b. A dead Almaciga tree.

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Standardization of Production Technique for Marinated Semi-Dried Fish

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ABSTRACT

A protocol for marinated semi-dried siganids production was developed through standardization of marinating procedure and shelf-life determination. The process involves soaking the fish in saturated brine solution for 15 minutes and in 1:3 vinegar-water ratio for 60 minutes. The processed fish has a shelf life of 3 days at room temperature, 2 months when refrigerated, and 5 1/2 months under freezing temperature.

Keywords: siganids, semi-dried fish, marinated fish, fish processing

INTRODUCTION

Palawan has numerous coastal villages where the major livelihood is fishing. There are areas without the benefit of electricity and therefore has no ice plants or cold storage facilities where the fish catch can be temporarily stored or frozen prior to shipment.

Because of the relative isolation of these areas, the fishermen are forced to sell their products at a very low price or just dry their product traditionally. A new high value added product is gaining popularity among the local fish processors in Puerto Princesa City as an alternative to traditional drying. This product is called marinated semi-dried fish or locally known as "lamayo". Raw materials for this product are rabbitfishes and halfbeaks which are abundant in the area throughout the year. However, quality of processed product varies with each fish processor. The products are also packaged poorly, limiting the product market to the locality.

Standardization of production technique and development of appropriate packaging would further boost this industry. It would expand the product market out of the province and will command high price for the product. It would also generate more employment for women and help many fishing families alleviate their standard of living.

METHODOLOGY

The study involved two parts: Part I dealt with the standardization of procedure for marinated semi-dried fish production and Part II involved shelf life determination and microbiological analysis of the standardized products.

Part I. Standardization of Marinated Semi-Dried Fish Production

Fresh siganids, *Siganus canaliculatus* locally known as danggit, samaral or bararawan were used as raw materials. The fish samples were split into butterfly fillets, eviscerated and cleaned.

The cleaned raw materials were soaked directly in 25% brine solution at varying time (15, 30, 45 and 60 minutes), after which, the fish were brushed and washed thoroughly in clean water. The fish were then soaked in varying levels of vinegar-water solution (1:1, 1:2, 1:3 and 1:4) at different soaking time, (15, 30, 45 and 60 minutes). Amounts of other ingredients used like garlic and pepper powders were constant in all treatments. After each treatment, the fish samples were air-dried for 15-30 minutes. They were then fried and subjected to sensory evaluation using the 9-point Hedonic Rating Scale. Scores were statistically analyzed using Analysis of Variance (ANOVA).

Part II. Shelf life Determination / Sensory Evaluation and Microbiological Analysis

A. Shelf Life Determination / Sensory Evaluation

The standardized products were packed using different packaging materials such as sealed polyethylene bags, vacuum-packed polyethylene bags and styrofoam tray covered with cling wrap. The packed samples were stored at room, refrigerated and freezing temperatures and were evaluated every other day, weekly and twice a month, respectively. A sensory panel evaluated the fried products using the Hedonic Rating Scale. Scores were statistically analyzed using analysis of variance (ANOVA).

B. Microbiological Analysis

B₁. Total Plate Count Determination

A 10^{-1} dilution was prepared using 30 grams macerated sample with 270 ml sterile diluent (0.1% peptone). Using a sterile pipette, 1 ml of the 10^{-1} dilution was transferred to a test tube with 9 ml of the sterile diluent to prepare the 10^{-2} dilution. The process was repeated until a 10^{-6} dilution of the sample was obtained.

One ml each of the diluted samples was transferred to duplicate petri dishes. These were mixed with approximately 15 ml of melted agar at 45°C temperature. The plates were then allowed to stand on a horizontal surface until the medium hardened.

The petri dishes were inverted and incubated at 35°C for 48 hours. Only those plates with 30-300 microbial colonies were counted and marked. Spreading colony was counted as a single colony. The arithmetic mean count was determined and the value obtained was reported as colony forming unit per gram (cfu/g).

B₂. Cultural / Morphological Characteristics and Gram Reactions of Microorganisms

Cultural characteristics of colonies such as form, margin, elevation and color were determined as seen on the agar surfaces of petri dishes. Morphological characteristics such as shape, arrangement of cells and special growth features were determined on the prepared smears in glass slides. Gram stain reaction of each colony was determined in a prepared fixed bacterial smear. The smear was stained with 0.5 to 1.0 ml crystal violet. It was then rinsed with water, treated with Lugol's iodine for 1 minute, after which it was decolorized with alcohol and again washed with water. The smear was then counter stained with safranin for 1 min, rinsed with water again then air dried. The stain reaction was then observed.

RESULTS AND DISCUSSION

Standardization of Production Process

The fried processed fish under different treatments were all acceptable to the panelists (Table 1). Mean hedonic rating scores ranged from 6.5 to 8.3. These scores are equivalent to "like slightly" to "like very much". The acceptability of the process can be attributed to the osmotic effect of salt and the flavor enhancing effect of acetic acid. The salt diffuses through the fish flesh by dialysis mechanism and water diffuses out due to osmotic pressure between the brine and the fish muscle (Hall, 1997). The water removed from the fish muscle is then replaced by the marinating solution when the fish is soaked in it. The acetic acid in vinegar together with the action of proteolytic enzymes causes partial breakdown of protein and release some free amino acids giving marinades its characteristic taste (Clucas and Ward, 1996).

Table 1. Panel mean scores of fried marinated semi-dried siganids soaked in concentrated brine and vinegar-water solutions in varying levels and time.

Soaking Time in Concentrated Brine Solution (min)	Soaking Time in vinegar- water solution (min.)	Mean Hedonic Rating Scores			
		1:1	1:2	1:3	1:4
15	15	7.2	7.2	7.2	6.9
15	30	7.4	6.9	7.4	7.6
15	45	7.8	7.1	7.6	7.7
15	60	7.5	7.5	8.3	7.2
30	15	7.4	7.8	7.8	7.4
30	30	7.6	8.0	8.1	7.5
30	45	7.5	7.3	7.5	7.0
30	60	7.2	7.3	7.5	7.2
45	15	8.3	7.3	7.9	7.6
45	30	7.9	7.3	8.0	7.6
45	45	7.8	7.8	8.1	7.3
45	60	7.7	7.9	7.9	6.5
60	15	8.0	7.4	7.1	7.1
60	30	7.8	7.5	7.1	6.7
60	45	8.1	7.2	7.4	7.4
60	60	8.1	8.2	7.9	7.7

Analysis of variance indicated a significant difference between samples at 5% level. The sample causing a significant difference was identified as the sample soaked in concentrated brine for 15 minutes and in 1:3 vinegar-water solution for 60 minutes. This implies that production of marinated semi-dried siganids required a considerably shorter period of soaking in concentrated brine solution and in lower concentration but longer period of soaking in vinegar-water solution to attain the desired flavor. This sample was rated by the panelists as "like very much".

Part II. Shelf life Determination and Microbiological Analysis

Results of sensory evaluation indicated that marinated semi-dried fish packed either in polyethylene bag or styrofoam tray cling wrap are still acceptable on the 3rd day of storage (Table 2). However, microbial load of samples is high indicating the perishability nature of fish, but the value is within the 1×10^5 cfu/g food microbial load limit set by BFAD (1990). On the fourth day of storage, all samples were noted to be objectionable. Aside from the undesirable change in fish flesh flavor and odor texture, there is growth of molds, making them unfit for consumption. This can be attributed to the influence of

temperature on the microbial and enzymatic (cathepsins) activities which is greatest in moist foods (ICMSF, 1980).

Table 2. Panel mean scores and microbial loads of standardized marinated semi-dried siganids packed in electric sealed polyethylene bag and styrofoam tray with cling wrap stored at room temperature ($30 \pm 2^\circ\text{C}$).

Storage Period (days)	Sealed polyethylene bag		Styrofoam tray w/ cling wrap	
	Mean Score	Microbial load (cfu/g)	Mean Score	Microbial load (cfu/g)
1	7.3	6.8×10^3	7.5	4.3×10^3
3	7.0	2.6×10^4	6.5	6.5×10^4

Table 3. Panel mean scores and microbial loads of standardized marinated semi-dried siganids packed in polyethylene bag and styrofoam tray with cling wrap stored at refrigerated temperature ($3.0-7.0^\circ\text{C}$).

Storage Period (days)	Electric-sealed Polyethylene bag		Styrofoam tray w/ cling wrap		Vacuum-packed Polyethylene bag	
	Mean Score	Microbial load (cfu/g)	Mean Score	Microbial load (cfu/g)	Mean Score	Microbial load (cfu/g)
1	7.8	1.7×10^3	7.6	3.9×10^2	7.6	2.1×10^3
7	8.3	6.1×10^3	7.7	9.2×10^2	7.5	3.9×10^3
15	6.5	4.9×10^4	7	2.0×10^3	7.2	4.5×10^4
22	7.3	6.6×10^4	6.9	4.1×10^4	7.1	1.9×10^4
28	6.9	7.8×10^4	6.7	6.4×10^4	6.7	1.4×10^4
36	6.8	6.1×10^4			6.8	1.7×10^4
42	6.2	6.8×10^4			6.3	1.0×10^4
51	3.8	1.7×10^5			6.1	1.5×10^4
60					4.7	1.5×10^4

Samples stored at refrigerated temperature showed lengthened shelf life as compared to samples stored at room temperature. The result revealed that most refrigerated samples lasted from one to two months regardless of packaging material used. A shelf-life of 14 days for marinades stored at 0°C to 8°C with no specific species of fish mentioned had been reported by Clucas and Ward (1996). Their finding was surpassed by the result of this study. Based on panel mean scores, vacuum packed samples were unacceptable on the 60th day of storage while sample with cling wrap was still acceptable during that storage period. No distinct trend in microbial load was observed prior to the deterioration of sample quality. Samples packed in polyethylene bags however, exceeded the microbial standard limit set by BFAD (1990). These samples were objectionable on the 51st and 42nd day of storage, respectively. A long period of refrigerated storage common for many foods permits psychrophilic population to reach many million

grams in only few days resulting in objectionable changes in color, taste and texture (ICSMF, 1980).

Table 4. Panel mean scores and microbial loads of standardized marinated semi-dried siganids packed in polyethylene bag and styrofoam tray with cling wrap stored at freezing temperature (-18.0 °C).

Storage Period (days)	Electric-sealed Polyethylene bag		Styrofoam tray w/ cling wrap		Vacuum-packed Polyethylene bag	
	Mean Score	Microbial load (cfu/g)	Mean Score	Microbial load (cfu/g)	Mean Score	Microbial load (cfu/g)
30	7.4	3.4×10^3	6.8	5.6×10^3	7.5	3.2×10^3
41	6.9	2.4×10^4	7.5	6.0×10^4	7.5	5.1×10^4
55	7.3	4.2×10^4	7.3	3.1×10^4	7.4	5.6×10^4
70	7.2	3.1×10^4	6.9	1.4×10^4	7.6	3.5×10^4
84	6.8	6.2×10^4	6.8	5.1×10^4	7.2	2.7×10^4
99	6.9	4.5×10^4	7.2	1.7×10^4	7.8	1.3×10^4
113	7.4	6.3×10^4	7.2	1.9×10^4	7.8	1.7×10^4
139	7.1	1.7×10^4	7	1.2×10^4	7.1	4.8×10^4
168	7.3	1.3×10^5	7.4	3.4×10^3	7.2	1.02×10^3

Samples stored at refrigerated temperature showed lengthened shelf life compared to samples stored at room temperature. The result revealed that most refrigerated samples lasted from one to two months regardless of packaging material used. A shelf-life of 14 days for marinades stored at 0°C to 8°C with no specific species of fish mentioned had been reported by Clucas and Ward (1996). Their finding was surpassed by the result of this study. Based on panel mean scores (Table 8), vacuum packed samples in both production process were both unacceptable on the 60th day of storage while sample with cling wrap was still acceptable during that storage period. No distinct trend in microbial load was observed prior to the deterioration of sample quality. Samples packed in polyethylene bags however, exceeded the microbial standard limit of 1×10^5 colony forming unit per gram set by BFAD (1990). These samples were objectionable on the 51st and 42nd day of storage, respectively. A long period of refrigerated storage common for many foods permits psychrophilic population to reach many million grams in only few days resulting in objectionable changes in color, taste and texture (ICSMF, 1980).

Panel mean scores and microbial loads of all frozen samples packed using the three packaging materials indicated that the samples were still acceptable after 5 1/2 months of storage (Table 4). Bacterial load of these samples were far below the microbial standard limit set by BFAD (1990).

A decreasing trend in microbial count of different samples was noted in the frozen samples. This proved the efficiency of the freezing process in slowing or stopping microbial growth. Low temperature reduces reaction rates wherein water in fish freezes and become bound, thus reducing water activity and bacterial

growth (Gartwaite as cited by Hall 1997). Deteriorative processes are likewise retarded at reduced temperature eventually stopping spoilage.

The sensorial evaluation of all samples decreased as storage period lengthened. The sensorial characteristics (color, odor, texture and flavor) changed with prolonged storage. It was observed that fish that was frozen gradually develop an off flavor and off odor which can be likened to boiled clothes, wet cardboard and cold tea (Mc Grill 1974 as cited by Hall 1997).

Cultural and Morphological Characteristics of Isolated Microorganisms

Cultural characteristics of the microorganisms isolated from the marinated semi-dried siganids were macroscopically determined while the morphological characteristics and gram reactions were microscopically observed. These microorganisms were not assessed whether they were initial flora of the raw materials or were obtained during catching, on board handling or processing. Microbial assessment of the raw materials during catching, on board handling and during retailing were beyond the scope of the study.

There were two mold colonies identified in samples stored at room and refrigerated temperatures. Both colonies have the same cultural characteristics but possessed different morphological characteristics (Tab. 5). Colony 1 had a non-septate hyphae with stolons and rhizoids whereas Colony 2 possessed septate hyphae with branched mycelium.

Table 5. Cultural and morphological characteristics of prominent molds isolated from marinated semi-dried fish stored at room and refrigerated temperatures.

Colony	Cultural Characteristics	Morphological Characteristics
1	Cottony white	Non-septate hyphae
	Abundant	With stolons and rhizoids
	Raised from agar surface	Sporangiospheres arise at the nodes
	Circular in form	Sporangia black and large
2	Cottony white	Septate hyphae
	Raised from agar surface	Branched mycelium
	Circular in form	Heads tightly packed, globular and colored black

On the other hand, three kinds of prominent bacteria were isolated from samples stored at the same condition. The bacteria were all gram +, have the same form and elevation but possessed varying margin and color. They also have different morphological characteristics. (Table 6).

Table 6. Cultural, morphological characteristics and gram reactions of prominent bacteria isolated from marinated semi-dried siganids at refrigerated and room temperatures.

Form	Cultural Characteristics			Morphological Characteristics	Gram Reaction
	Elevation	Margin	color		
Circular	flat	Entire	white	cocci, arranged in masses	gram +
Circular	Flat	Entire	cream	non-swelling rods	gram +
Circular	Flat	Entire	slightly lobate	long and slender rods	gram +

A contributory factor to the perishability of finfish is the composition of the native microflora which appears to be a function of water temperature to which the fish was harvested. Also, the quality and microbial load of fresh fish is affected by the harvesting method. Abusive handling at harvest will be detrimental to subsequent quality and shelf-life of fish (Martin 1994 as cited by Ward). Moreover, Hermes (1998) emphasized that quality control and quality assurance must be both applied from the moment fish is harvested until it lands on the plate of the consumer.

The salt used and the added spices in marinated semi-dried products cannot be disregarded as possible sources of the isolated microorganisms. Hermes (1998) further stated that some salt tolerant bacteria are found in many commercial salts. Also, it has been found that spices frequently contain excessive number of microorganism unless subjected to antimicrobial treatment (ICMSF 1980). The mold in spices may vary with the spice to some extent. Furthermore, spices are of interest to microbiologists because they may become moldy, contain large number of microorganisms, some exhibit antimicrobial activity and stimulate microbial metabolism.

During processing of fish samples, proper techniques (i.e. gutting and splitting) and good housekeeping (cleanliness) hygiene and sanitation of workers, materials and surroundings were observed. These processes ensured that the finished products were safe and produced under the set of Good Manufacturing Practices.

Packaging Marinated Semi-dried Siganids

Polyethylene bag and styrofoam tray with cling wrap were the suitable packaging materials for marinated semi-dried siganids stored at room temperature. Best packaging materials for the product stored at refrigerated temperature were the electric sealed polyethylene bag and vacuum packed polyethylene bags. The use styrofoam tray with cling wrap was noted not appropriate at this temperature even though the styrofoam displayed good support for the samples. The high

water transmission property of the cling wrap increased the moisture content of the samples promoting growth of microorganisms. At freezing temperature, vacuum packing proved to be the most appropriate packaging method. Vacuum packed products showed better keeping qualities and the method also offered a better visual effect due to close contact of the packaging materials to the product (Hermes 1998). Further, ice build up within the pack is also avoided. The use of styrofoam tray with cling wrap was noted not appropriate for frozen packed samples stored at prolonged freezing temperatures because the styrofoam become brittle at prolonged storage.

The protocol derived from the above results is stated below:

Production Protocol for Marinated-Semi Dried Siganids

Materials:

- 10 kg siganids about 50-100 g each
- 1 kg rock salt
- 30 g white pepper
- 30 g garlic powder
- 1 l. vinegar
- potable water
- weighing scale
- basins
- strainers
- drying trays or racks
- chopping boards
- new toothbrush
- measuring cups and spoons
- knives
- packaging materials

Production Process:

1. Wash the fish thoroughly with clean water.
2. Split the fish into butterfly fillets. Eviscerate and remove adhering dirt and blood. Wash.
3. Prepare the 25% brine solution by mixing 1 part salt into 3 parts water. Note that there will be salt crystal that will remain undissolved.
4. Soak the fish into the 25% brine solution for 15 minutes.

5. Remove the fish and brush off the remaining adhering dirt and blood.
6. Wash 2 times with clean water. Drain well.
7. Prepare the marinating solution by mixing 1 part vinegar to 3 parts water. Add 30 grams each of garlic powder and white pepper.
8. Soak the fish in marinating solution for 1 hour. Drain well.
9. Air dry the marinated fish for 15 to 30 minutes or until no solution is dripping from the fish flesh.
10. Pack in desired packaging materials.

The product can be stored at room temperature for 3 days, at refrigerated temperature for 42 days and in freezer for 51/2 months using polyethylene bags as packaging materials.

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Cooperators' Perceptual Profile and Range of Participation in Community Environmental Programs in Palawan

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ABSTRACT

The study compared the cooperators' perceptual profile and range of participation in government (GO) and non-government organizations (NGO) community environmental programs in Palawan. The Department of Environment and Natural Resources' (DENR) Community Forestry Program (CFP) in Mariwara, Princess Urduja, Narra and Haribon Palawan's Community Development Program for Environmental Protection (CDEP) were analyzed based on the Kincaid's Convergence Theory.

Positive perceptions of the community cooperators on environmental programs were revealed for both GO and NGO. Four factors classified their perceptions under each program. These were: participation, economic benefits accruing from forest utilization and organizational concerns, sustainability, and role of community for CFP; and participation and provision of alternative economic sources, organizational concerns and environmental awareness, education and values formation, and preservation and its effect for CDEP. These factors reflect the elements and directions of the environmental programs. Furthermore, wide range of participation of the NGO and GO community cooperators particularly in the implementation phase of the two programs was evident.

With the growing concern on environmentalism and the proliferation of environmental programs, the community cooperators should already take part on the onset to ensure that the what, how, where, when and expected effects are attuned to their situation and geared towards their welfare.

Keywords: environmental programs, Palawan, NGO, community environmentalism

INTRODUCTION

Over the years, attempts have been made in changing approaches to rural development when efforts were not making the impact expected of them. Greater attention was directed towards participatory approaches involving more people in development activities aimed at empowering them. In this context, the role of communication is being increasingly recognized as central.

The impact of communication to community life can be seen in terms of people's social response to a development program. The clientele's perception of and participation are indicators of program effects.

It is on this premise that an analysis of the cooperators' perceptual profile and range of participation in the community environmental programs of government and non-government organization in Palawan was conducted. The province of Palawan, being the country's last ecological frontier, has been a recipient of environmental programs geared towards its sustainable development. Thus, efforts to this end must be provided and that consequences must ensure its realization.

Objectives of the Study

1. To describe the community environmental programs implemented, the communities and cooperators involved;
2. To analyze the perceptual profile of the community people on the environmental programs;
3. To determine the range of participation of the community people in pre-planning, planning, implementation, and post-implementation of the environmental programs;
4. To compare the perceptual profile and range of participation of the cooperators in GO and NGO community environmental programs; and
5. To draw policy recommendations for the implementation of community environmental programs in Palawan

METHODOLOGY

The study compared the cooperators' perceptual profile and range of participation in government (GO) and non-government organizations (NGO) community environmental programs in Palawan. The Department of Environment and Natural Resources' (DENR) Community Forestry Program (CFP) in Mariwara, Princess Urduja, Narra and Haribon Palawan's Community Development Program for Environmental Protection (CDEP) were analyzed based on the Kincaid's Convergence Theory.

The naturalistic inquiry and survey research were the methodologies used. The data were generated using the triangulation technique through focused group discussion, key informant and individual interviews, document analyses, and non-participant observation of workplace and community situations.

The community cooperators of the two programs served as respondents. Qualitative analysis supported by descriptive statistics, t-test, and factor analysis were used.

RESULTS AND DISCUSSION

The GO and NGO Community Environmental Programs

Community Forestry Program is a government program aimed at training and organizing local communities to protect and sustainably manage forest resources for their direct benefit. On the other hand, CDEP is a program of a non-government organization, the Haribon Palawan which aims to organize, empower and develop efficient support system for the communities to protect, improve and conserve the environment condition of the St. Paul National Park. CDEP is not only concentrated on forest protection but on the other aspects of the park's environment.

Both GO and NGO utilized the existing community organizations and education as entry points for their environmental programs although these were not the identified priority needs of the community. Consultations with the communities were made only when the programs were already ready for implementation and not during their conceptualization. As such, the introduction of the programs was met with resistance.

The GO has a multi-layered organizational structure as there are five organizations (DAI-NRMP-DENR-UPLBFI-SPPI) handling CFP alone while the NGO has a relatively flat structure where only one organization (Haribon Palawan) is carrying out.

The Program Sites

CFP site is in Sitio Mariwara, Barangay Princess Urduja, Narra, Palawan which is located 104 kms from the city of Puerto Princesa and 14 kms from the Narra town proper. It has total land area of 4,196.30 has, most of which are agricultural lands, with 555 households and a total population of 2,963.

CDEP site is in Barangay Cabayugan located 75 kms northwest of Puerto Princesa City. It has 2,000 people composed of 500 families residing in the less than 500 has forest and agricultural lands. It is also surrounded by the marble mountains going to the St. Paul's Subterranean Park.

Both sites are composed of people from various ethnic groups, those in the CFP site are migrants from Mindanao while majority of those in the CDEP site originated from Pangasinan. Majority of the community cooperators in the two sites are engaged in farming and forest-related occupations. Although radio is the most commonly owned media in both areas, interpersonal media are still the most accepted and accessible means of communication. Filipino is the medium of language used in both sites.

The Community Cooperators

A total of 86 CFP community cooperators were included for this study. Of whom, 54 are males and 32 females. More than three-fourths of them are married with a mean age of 34.5 years and have spent an average of 6.16 years only in school. Almost 85 percent are engaged in farming-related activities while the rest are into rattan and almaciga gathering, business, government and non-government employment, and studying.

Of the 71 CDEP members studied, there were more females (45) than males (26). Most of them were married, had an average of 39.8 years and had spent 10.14 years in school. Such educational attainment enabled almost half of them to engage in occupation other than farming.

Perceptual Profile of the Cooperators

The perception of the community cooperators on environmental programs was based on the degree of agreement and disagreement to the statements describing the elements of CFP and CDEP. The statements used in getting the perceptions of the community cooperators were based on the different elements/components of the environmental programs. Intercorrelations between the different statements included in each program were computed to identify the pair of statements that are related and to serve as basis for the generation of the factors. Factor analysis was done separately for each organization to determine the statements that are related and group them into factors. The original number of statements were reduced into factors, the number of which was less than the original number of statements.

Degree of perceptions of community cooperators. CFP cooperators were asked to rate 15 statement related to the program (Table 1). Their average rating reflect agreement to the 10 positive statements; disagreement to the four negative statements; and an uncertain rating to one negative statement. A strong agreement had been expressed to item #5 which deals on the CFP principles while an uncertain rating had been given to whether the community has the sole concern over forest management and the financial benefits sharing. The overall ratings indicate that the community people have a favorable perception about CFP.

Similarly, the community cooperators of CDEP were also asked to rate the 20 statements about the program (Table 2). Of the 15 affirmative statements, the community cooperators strongly agreed to the six and agreed to the remaining nine statements. For the five negative statements, they disagreed to the four and gave an uncertain rating to item which states that environmental protection and conservation lowers their income. Based on the total scores obtained from the responses, it could be deduced that the community cooperators of CDEP have a positive view of the program.

Table 1. Degree of perceptions of community cooperators on community forestry program.

Statements	Average Rating	Descriptive Rating
1. Grants the community the privilege to utilize forest resources	4.1	Agree
2. Encourage community participation	4.2	Agree
3. Licenses forest destruction	1.9	Disagree
4. Provides access to financial benefits of forests	4.1	Agree
5. Embodies principles of sustainable development	4.6	Strongly Agree
6. Lessens involvement of local residents with AO's presence	2.1	Disagree
7. Communities buffer between the forest line and intensely cropped areas	4.2	Agree
8. CFMA conditions follow DENR requirements only	2.5	Disagree
9. Consultations should be undertaken continuously	4.5	Agree
10. Communities are capable of managing forest responsibly	3.6	Agree
11. PO's could protect, plan and manage forest resources	3.9	Agree
12. Communities could find reforestation and rehabilitation activities	4.1	Agree
13. Affects livelihood activities adversely	1.7	Disagree
14. Communities have the sole concern on forest management operations and sharing of financial benefits	2.8	Uncertain
15. Lessens slash-and-burn farming (kaingin) by providing alternative livelihood opportunities.	4.0	Agree

Note: The perception statements were shortened for tabular presentation.

Table 2. Degree of perceptions of community cooperators on community development program for the protection of the environment.

Statements	Average Rating	Descriptive Rating
1. Increased environmental awareness	4.7	Strongly Agree
2. Disorganizes communities in the buffer zone	2.1	Disagree
3. Affects livelihood adversely	1.8	Disagree
4. Supports sustainable condition of the St. Paul National Park	4.3	Agree
	4.1	Agree
5. Encourage community participation	2.3	Disagree
6. Formation of new organizations and discarding existing ones	4.7	Strongly Agree
	4.6	Strongly Agree
7. Starts conservation values with the children	4.7	Strongly Agree
8. Promotes primary health care	1.9	Disagree
9. Stresses the need for day care center	4.4	Agree
10. Membership is not open to all		
11. Need for cooperation between the park administration and buffer zone communities	4.0	Agree
12. Instills appropriate technology for resource utilization and conservation	4.0	Agree
13. Inter-organization participation reinforces CDEP's	4.3	Agree

delivery system and enhance community welfare	3.0	Uncertain
14. Community people as principal actors in solving problems	4.7	Strongly Agree
15. Lowers the income of families	3.8	Agree
16. Tenurial rights sustain people's concern to the environment	3.9	Agree
	3.4	Agree
17. Provides alternative economic sources	4.7	Strongly Agree
18. Maintains healthy environment of the St. Paul Park	3.8	Agree
19. Sustains traditional practices in agriculture	3.9	Agree
20. Focuses on training and environmental education.	3.4	Agree
	4.7	Strongly Agree

Note: The perception statements were shortened for tabular presentation.

Results indicate that community people tend to have positive perception of an environment program be it implemented either by a GO or an NGO. Thus, the hypothesis that community cooperators of an NGO have a positive perception on environmental programs than those of a GO is not accepted.

This outcome could be attributed to the all out efforts exerted by both implementors in disseminating and explaining the elements of the programs to their respective cooperators. However, there is still a need to intensify these activities, as reflected in some of the items which yielded undecided responses so that the community people could have a better grasp of the programs.

Factor Loadings (CDEP). The statements under factor 1 are those numbered 3,5,10, 12,13,14,17 and 19. Based on these statements this factor deals on two elements of the program. The first is on participation. The community cooperators perceived that CDEP encourages participation in its various projects and problem-solving activities. Thus, membership is open to all households in the community. In addition, inter-organizational participation was believed to reinforce the program's delivery system and to enhance community welfare. The second is on the provision of alternative economic sources to lessen population pressure to the St. Paul Park's environment. The community cooperators agreed that through the program, appropriate technologies for resource utilization and conservation are instilled among the residents. With these technologies, it was also perceived that the traditional practices in agriculture were sustained and were not adversely affected by CDEP.

Statements under factor 2 are those numbered 1, 2, 6, 16, and 20. Based on these statements, this factor focuses on organizational concerns and environmental awareness. The organizational concerns referred to in this factor are the formation and strengthening of new and existing local associations of communities in the buffer zone for environmental protection and management. On the other hand, CDEP was perceived to increase environmental awareness and that training and education on health, agriculture and conservation are among its important components. As to this is the issue raised on Statement #16 on tenurial rights which is believed to sustain people's concern to the environment.

Statements under factor 3 are those numbered 7, 8, and 9. Based on these statements, this factor could be described as education and values formation. Education referred to in this factor is on: basic education (3R's), primary health care, ecology, environmental laws and other concerns while values formation is on environmental protection, conservation and sustainable management.

Statements under factor 4 are those numbered 4, 11, 18, and 15. The first three statements could be described as preservation and its effect. Preservation referred to in this factor is the concerted efforts of the communities in the buffer zone, park administration/city government, Haribon Palawan and other concerned organizations needed to preserve the ecological balance of the St. Paul Subterranean National Park. The last statement (#15) dealt on the effect on income of these preservation efforts. The community cooperators expressed uncertainty as to whether environmental protection and conservation lowers the income of the families in the locality.

These factors, namely: participation, provision of alternative economic sources, organization concerns, environmental awareness, education, value formation, and preservation subsume the elements of CDEP as reflected in its goal "to organize, empower and develop the environmental condition of the parks, in this case the St. Paul Subterranean National Park.

Factor Loadings (CFP). The statements under factor 1 are those numbered 1, 2, 3, 12, and 14. Based on those statements, this factor dwells on participation of the community people in forest resource utilization, conservation and management and in sharing financial benefits derived from such operations. Although the community cooperators believed CFP grants them the privilege to utilize forest products and encourages them to participate in all phases of the program, they disagreed on the statement that such an access can become a license to destroy their forest environment.

The statements under factor 2 are those numbered 4, 6, 9, and 13. Statements 4 and 13 deal on the economic benefits accruing from forest resource utilization. The community cooperators perceived that CFRP provides access to financial benefits and does not affect livelihood activities adversely. On the other hand, statements 6 and 9 focus on organizational concerns such as the existence of an assisting organization and the need to undertake continuous consultation among community people, DENR, and the AO. As perceived, the presence of the AO does not lessen the involvement of the local residents.

The statements under factor 3 are those numbered 5 and 8. Based on those statements, this factor covers the principles embodied by CFP on sustained yield, management, equity, and conservation of forest resources for the present and future generations. To make the program sustainable, the conditions which will be stipulated in the CFMA should not only follow DENR requirements (statement #8

disagreed upon by the community cooperators) but must also consider community needs as well. The statements under factor 4 are those statements numbered 7, 10, 11 and 15. The first three statements describe the roles of the community in CFP as: a buffer between forest line and intensively cropped areas; responsible forest managers; and capable protector, planner and manager of forest resources. The last statement (#15) points at a possible impact which could result from the community's assumption of these roles. This refers to the decrease in the slash-and-burn farming activities when alternative opportunities are provided to the community people.

These factors: participation, economic benefits from forest utilization, organization concerns, sustainability and roles of the community in CFP also subsume the elements of CFP as reflected in its thrust on organizing local communities to protect and sustainably manage forest resources for their direct benefit.

For both organizations, it can be noted that the factors identified for the perception statements were reflective of the different components of their environmental programs. The development and implementation of the communication strategies according to these program components might have contributed to the community cooperators' awareness and understanding of the principles, goals and objectives of the environmental programs. Thus, positive perceptions on CFP and CDEP prevailed.

Range of Participation

Range of participation in the two environmental programs was based on the number of activities undertaken during pre-planning, planning, implementation and post-implementation phases of the different communication processes and on the number of community cooperators involved in an activity.

Of the four phases studied, it is only in the implementation of the communication processes where almost all the community cooperators of CFP had participation. The same is true with the CDEP community cooperators except in materials preparation and production as they do not have their own community newsletter unlike those of the CFP's. In pre-planning, the difference in the proportion of GO and NGO community cooperators who participated was highly significant as revealed by the computed t-value. This can be attributed to the greater number of preliminary studies for needs assessments which were conducted by the GO than the NGO. In planning, the range of participation of the community cooperators for both programs was the same. The two groups had low proportions of community cooperators who has participated in the same number of activities, giving no significant difference in its computed t-value. In post-implementation, the NGO community cooperators had wider range of participation than those of the GO's. Statistical test revealed significant difference between proportions of community cooperators who had participated in the activities conducted. However, it is in post implementation phase where the least

range of participation of community cooperators was noted for both programs. The number of activities conducted were very few and the proportion of community cooperators who had participated in those activities was also very low for both groups.

These findings indicate similarities and differences in the range of participation of community cooperators in the different phases of communication processes for GO and NGO programs. However, in the overall proportions of community cooperators who had participated, no significant difference was revealed between the two groups. Hence, the hypothesis that the range of participation in the different phases of communication processes for the environmental programs of the NGO community cooperators is wider than that of the GO's is not accepted. The range of participation of the community cooperators of the two organizations are the same. This implies that community people not only participate in non-government programs like CDEP but in government-funded programs as well like CFP. However, such participation should not only be cultivated in the implementation phase but all throughout the program.

Conclusion

Despite the absence of clearly defined communication policies and strategies, the different approaches used by the GO and NGO in their community environmental programs have brought about favorable consequences in terms of positive perception and wide range of participation of the community cooperators.

Recommendations

Policy Recommendations

- ⇒ Inclusion of a communication unit in the org. structures of the agencies/organizations involved in environmental programs responsible for setting up the mechanisms pertinent to communication.
- ⇒ Enlisting people's participation on this regard will provide opportunity to establish a clear understanding of the environmental programs and a sense of ownership which are critical to their sustainability.
- ⇒ Flexibility in operations of implementing agencies should be allowed to respond effectively to varying local needs and conditions.

Operational CIPO Model for Environmental Programs

At the onset of the program, the community people should already take part to ensure that the what, why, how, where, when and expected effects are attuned to their situation and geared towards their welfare. By doing these, the appropriate communication approaches, methods, media and messages could be designed in accordance with the context at which the programs will operate.

For Further Research

- ⇒ Communication analysis of environmental programs using operational program activities as parameters.
- ⇒ Measuring other consequences of communication such as income, environmental protection, and management schemes adopted and community cohesiveness.

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Growth and Yield Performance of Multi- Stock Grafted Cashew

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ABSTRACT

This study was conducted to compare the performance of sexually and asexually propagated (*vis.* single stock, double stock and triple stock) cashew plants in terms of growth, age of trees at first fruiting, and yield.

Results showed that rapid growth of both sexually and asexually propagated plants in terms of height, girth and canopy size occurred on their 2nd – 4th year of field cultivation. Flowering of grafted seedlings was observed as early as 2 years, but their fruits was aborted after 3 weeks of development. Both sexually and asexually propagated plants bear fruits after 3 years.

In terms of yield, grafted cashew had significantly higher nuts and apple yield than those grown from seedlings. There is no significant difference however, on the yield in single, double, triple rootstock plants.

Keywords: cashew, Anacardium occidentale, multi-stock grafting asexual propagation

INTRODUCTION

Cashew (*Anacardium occidentale* Linn.) is widely known in the Philippines because of its vital economic importance. Traditionally, cashew are planted directly in the field through sexual propagation. Plants in most cases however, do not grow true-to-type when this kind of propagation is used. To minimize this effect, planting materials should be asexually propagated. Asexually propagation produces early bearing plants with desirable characteristics thereby producing good quality fruits.

At present, there are some practitioners planting grafted fruits trees like durian and mango in double or triple rootstocks. Among the possible benefits derived from this practice include high yields, more rapid growth of plants, increase resistance to drought, pests, diseases and resist breakage due to strong winds. It also reduces adverse effect of partial incompatibility between rootstocks and scion. Moreover, mortality in multiple rootstocks was found to be lesser than those of only single rootstock.

However, one disadvantage of multiple rootstocks is the need for more plants making the operation more expensive but the benefits derived appears to outweigh the additional cost (Pamplona and Garcia, _____).

This study was conducted determine the effect of multiple rootstocks grafting on the growth and yield of cashew. Specifically, it seeks to compare the effect sexually and asexually propagated cashew in terms of growth, age of trees at first fruiting, and yield.

METHODOLOGY

Nursery Operation

Sexual Propagation

Two hundred selected native cashew seeds were planted directly into the soil media contained in 14" x 18" plastic bag at a rate of one (1) seed per bag. Small amount of complete fertilizer was mixed with the soil media during potting. Two grams of Ammonium sulfate was applied per plant monthly until the seedlings were ready for grafting.

Watering and weeding of plants were done as frequently as necessary. Chemicals were sprayed on seedlings whenever there is an attack of pests and diseases.

Asexual Propagation

The single rootstock grafting using the cleft grafting method was performed prior to grafting double and triple seedstocks. This was carried out using seven-month old cashew seedlings. Cleft grafting was done by splitting the top of the rootstock to a height of 25 to 30 cm or where there is active growth. A wedge cut of 2-3 cm long was made on the basal end of the scion forming a tapering wedge. The wedged cut of the scion was then inserted into the rootstock. The stock-scion joint was firmly secured using grafting tape. The scion was then covered with plastic up to the point of union.

After five months, an additional one, and two rootstocks were attached to the single stock grafted plants (Fig. 1A) through modified inarching to produce the double-(Fig. 1B) and triple rootstocks plants (Fig.1C), respectively. Modified inarching was carried out by cutting the stem longitudinally about 2 cm long. A similar cut on the stem of scion was also made. Both cuts were then fitted together using plastic twine so that the cambiums of the stock and scion were held together. Four months after inarching or when the union between the stock and scion was established, the stocks were cut above the point of union. The wounds were treated with paint to avoid infection. The grafted seedlings were then transplanted to the field.

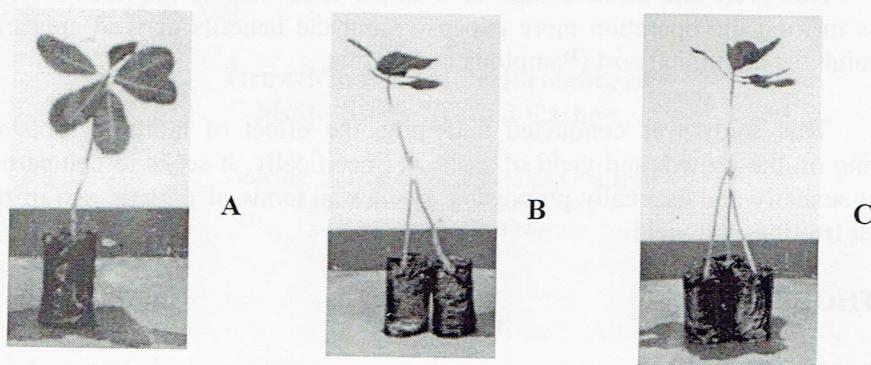


Figure 1. Asexually propagated cashew, (A) single rootstock, (B) double rootstock, and (C) triple rootstock.

Both sexually and asexually propagated seedlings were planted at a distance of seven (7) meters. Fifty (50) grams of urea was applied in each hole before planting.

Field Maintenance

Weed Control. The grasses in between the plants were cut regularly. The weeds around the base of the plants were also removed with the use of hoe and shovel as frequently as necessary.

Fertilization. The plants were cultivated and fertilized using the ring method of fertilizer application. Three kinds of fertilizer were mixed thoroughly and were applied to the individual plants as indicated below.

Table 1. Rate and time of fertilizer application.

Year	Fertilizer (grams)			Month
	N (45-0-0)	P (0-20-0)	K (0-0-60)	
1	50	-	-	October (planting)
2	100	-	-	October
3	175	350	530	October
4	255	510	760	October
5	255	510	760	October

Watering. Watering was done only during summer months in the first 2 years of field cultivation.

Control of Pests and Diseases. Spraying of cashew trees was done whenever there was an occurrence of pests and diseases.

RESULTS AND DISCUSSION

Growth

The asexually propagated seedlings grow faster in terms of height increment as compared to sexually propagated ones (Table 2). Results indicated that during the 1st and 2nd year of field cultivation, triple stock plants exhibited the highest mean height increment at 7.8 cm and 14.04 cm, respectively. On the 3rd and 4th year, the single stock plants grew faster with a mean height increment of 10.49 cm and 5.33 cm, respectively. There is a wide variation in height increment between treatment in the first three years of cultivation. The difference however is not statistically significant. This variation gradually declines until almost uniform growth can be observed. Generally, the growth of cashew in terms of height reaches its peak on the 2nd year of field cultivation (3 year old plants).

Table 2. Mean monthly increase in height (cm) of cashew trees per year

TREATMENT	1996-97	1997-98	1998-99	1999-00	2000-01	2002-02
T ₁ — seedling	5.50	9.53	5.43	4.05	2.57	2.58
T ₂ — single stock	3.80	12.85	10.49	5.33	2.55	2.98
T ₃ — double stock	4.00	11.62	9.79	4.99	2.84	2.38
T ₄ — triple stock	7.80	14.02	9.14	5.16	3.83	2.34

In terms of stem diameter, wide variation in mean monthly increase was observed between treatments with the asexually propagated plants showing the highest mean increase, though significant difference was observed only on the 4th year of cultivation (Table 3). Mean monthly increase in girth ranges only from 1.30 mm to 4.12 mm.

Table 3. Mean monthly increase in stem diameter (mm) of cashew trees per year.

TREATMENT	1996-97	1997-98	1998-99	1999-00	2000-01	2002-02
T ₁ — seedling	1.90	2.60	3.14	2.30 ^a	1.73	1.73
T ₂ — single stock	1.30	2.28	4.12	2.95 ^b	2.94	1.96
T ₃ — double stock	1.80	2.81	2.81	3.93 ^b	3.93	1.92
T ₄ — triple stock	2.90	3.43	3.43	3.76 ^b	3.76	2.31

Note: Means with letter superscripts are significantly different at 0.05 level.

The same growth trend was observed in terms of monthly increase in canopy diameter with asexually propagated plants exhibiting the highest mean increment in canopy diameter (Table 4). Highly significant difference was observed on the 3rd and 4th year of cultivation.

The highest mean monthly increase was observed on the 2nd year of cultivation with the triple rootstock plants showing the widest canopy diameter of 18.31 cm. As the plants mature, the mean canopy growth rate sharply declined to

5.61 cm (5th year). The same trend in canopy growth was observed among the single- and double rootstock plants.

The sexually propagated plants showed the least canopy growth increment at 14.75 cm (2nd year) to 3.75 cm (5th year). There was a slight increase on canopy growth on the 6th year in all treatments.

Table 4. Mean monthly increase in canopy diameter (cm) of cashew trees.

TREATMENT	1996-97	1997-98	1998-99	1999-00	2000-01	2002-02
T ₁ – seedling	-	14.75	8.91 ^a	4.93 ^a	3.75	3.76
T ₂ – single stock	-	16.52	15.38 ^b	11.92 ^b	5.09	5.05
T ₃ – double stock	-	16.46	14.14 ^b	10.88 ^b	3.79	5.14
T ₄ – triple stock	-	18.31	16.15 ^b	7.01 ^b	5.61	6.58

Note: Means with letter superscripts are significantly different at 0.01 level.

Age at First Fruiting

Grafted plants produced flowers as early as six months after planting in the field, but fruits were aborted after 3 weeks of development. The abortion of fruits might be due to the very young age of the plants. Eighteen months after field transplantation, both sexually and asexually propagated plants produced flowers and bear fruits.

Yield

The initial fruits produced by the cashew plants were heavier compared to those produced in the succeeding fruiting seasons (Table 5), this however is not statistically significant. The average weight of cashew apple ranged from 85.86 g to 96.30 g.

In terms of total yield per plant, significantly high yield was observed among double- and triple rootstock plants as compared to the single stock and sexually propagated plants (Table 6). There was a tremendous increase in apple production in the second harvest season. More than 400% increase in yield was observed in all treatments. Similar trend in apple production was observed in each harvest season wherein the sexually propagated plants consistently yielded the least.

Table 5. Mean weight (g) of cashew apple per harvest season.

TREATMENT	1999	2000	2001	2002
T ₁ – seedling	93.17	91.11	86.76	89.45
T ₂ – single stock	93.76	92.14	85.86	89.72
T ₃ – double stock	93.86	92.40	86.63	90.00
T ₄ – triple stock	96.30	90.71	90.58	87.91

Table 6. Average apple yield (kg) of cashew tree per harvest.

TREATMENT	1999	2000	2001	2002
T ₁ – seedling	2.14 ^b	12.66	16.53 ^b	23.10 ^b
T ₂ – single stock	2.65 ^b	12.81	17.22 ^b	29.83 ^a
T ₃ – double stock	3.23 ^a	13.42	20.87 ^a	28.98 ^a
T ₄ – triple stock	3.82 ^a	13.96	21.86 ^a	32.28 ^a

Note: Means with black letter superscripts are significantly different at 0.05 level. Those with blue letter superscripts are significantly different at 0.001 level.

There is no variation observed in average weight of individual nut per harvest season. Average nut weight ranged from 11.90 g to 13.61 g (Table 7). However, very low nut yield per tree was observed during the 1st harvest season. Cashew trees yielded only 0.296 kg to 0.539 kg nuts per tree. This can be attributed to the very young age of the plants, considering that the trees are only 3 years old. Furthermore, the plants were greatly affected by typhoon which coincided with its flushing period. This has significantly affected the cashew flower formation. Nut yield significantly increased to as much as 500% during the second harvest season.

Table 7. Average weight of seed (individual nut) per harvest season.

TREATMENT	1999	2000	2001	2002
T ₁ – seedling	12.87	11.90	12.16	11.93
T ₂ – single stock	12.52	12.99	12.06	13.17
T ₃ – double stock	13.17	13.29	12.61	13.61
T ₄ – triple stock	13.56	12.55	13.08	13.21

Significant difference in yield per tree was observed in all harvest season. Analysis indicated that cashew trees grown from seedlings has significantly lower yield than the asexually propagated ones (Table 8). Among the grafted cashew, triple rootstock plants had a slightly higher nut yield per tree compared to single- and double rootstock plants.

Table 8. Average nut yield (kg) of cashew trees/harvest season.

TREATMENT	1999	2000	2001	2002
T ₁ – seedling	0.296 ^b	1.63 ^b	2.30 ^b	3.30 ^b
T ₂ – single stock	0.364 ^a	1.81 ^b	2.39 ^b	4.36 ^a
T ₃ – double stock	0.461 ^a	1.93 ^a	3.00 ^a	4.39 ^a
T ₄ – triple stock	0.539 ^a	1.91 ^a	3.09 ^a	4.79 ^a

Note: Means with letter superscripts are significantly different at 0.05 level.

As expected mature plants yielded the highest volume of nuts as indicated in the production obtained during the 4th harvest season. This clearly demonstrates that as the cashew trees matures, the fruit production increases.

It can be concluded from the results that though the use of multiple rootstock grafting does not affect the growth rate and age at first fruiting of cashew plants, it however ensures high production in terms of nut and apple yield.

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"Learners' Modernity" of Department of Education Nonformal Education Trainees in Palawan

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ABSTRACT

A study on assessment of perceived outcome of DepEd Nonformal Education training program on learners' modernity revealed that the training programs had contributed to overall modernity of highly trained and slightly trained respondents. Moreover, when three comparison groups that represented a continuum of training experiences - the not trained, slightly trained and highly trained respondents were interviewed along attitudinal and behavioral dimensions of modernity, the Wilcoxon Rank-Sum test revealed that slightly trained, highly trained and not trained groups differed significantly in active public participation, occupational and educational aspirations, and openness to new experience, readiness to accept social change, time valuation and technology valuation. Meanwhile, the three groups did not differ significantly in efficacy; a result attributed to the Filipino belief that God's help is the most important factor for the future of the Philippines. This study indicates that DepEd training programs geared towards rural development with its strong socio psychological components of values integration in functional literacy cum livelihood skills development have contributed to the modernization of outlook and personality of farmers who have been raised in traditional settings.

Keywords: nonformal education, Palawan, learner's modernity

INTRODUCTION

Nonformal education in the Philippines is firmly anchored on the new concept of development which focuses on the actualization of human potential as linchpin of development. It follows that the alleviation of poverty rests on the improvement of the socio economic status and the quality of life of the poor and calls for the total development of the human person, his family and community. This involves among others the sustainable development in the social, moral, spiritual, cultural and political well being of every person (DepEd Bureau of Nonformal Education Circular, 1998).

In his study on individual changes in six developing nations, Alex Inkeles observed that education surely is one of the most powerful means of inculcating modern attitudes, values, and behavior. He further stated that education still

remained a substantial independent cause of individual modernity. Dreeben (1998) also identified normative behaviors that are essential for citizenship, political participation and workplace pursuits in citizenship in modern societies. The norms he identified are independence, achievement, universals, and specificity. In defining the essentials of a successful path to modernity, Inkeles (2001) correctly notes the preeminent importance of such factors as rationality and technical competence and efficiency and flexible innovation. in making economic decisions. Population segments must be capable of modern thoughts and actions and improving such modern capabilities in response to education and media dissemination of information, thus he recommends an enriched environment to speed up individual improvement and thus national development as shown in the studies of Lucido (2000), Gautam (1998), Sage (1999), and Ovesni (2000) among others.

Thus, if the nonformal education program is to provide proof of its legitimacy and effectiveness, it should be in the basic changes it causes in the very nature of its recipients. Recognizing the need, the institution of Nonformal Education programs through trainings and various activities is the government's answer to the masses of Filipinos who have gone out of school for many reasons. The government recognized the fact that these people through Nonformal Education can propel our country towards modernization and inevitably better quality of life.

If by virtue of having more education. the personal character of an individual is decidedly more progressive, it is assumed that Nonformal Education imparts modernity and that the more training or sessions a learner attends, the higher would be his modernity. According to Cabag (1999), scholars found out that participation in agricultural and rural development programs is significantly related to the adoption of improved farm practices and/or changes in attitudes, values, and behavior of participants.

To promote the development of the whole person into an educated, self-reliant, self sufficient and to function effectively as a citizen of a society, the individual must be exposed to all opportunities of learning (Nonformal Education Bulletin, 1982). In other words, he must be modern enough to be responsive to the challenges of the developing community.

This study aimed to determine demographic characteristics of respondents; identify DepEd NFE trainings participated by respondents and determine if there are significant differences in modernity between not trained respondents and learners under DepEd NFE programs in terms of attitudinal and behavioral dimensions.

METHODOLOGY

Research Design

The descriptive method was used in this study. Three groups of respondents who were more or less alike in several characteristics except for participation in training: represented a continuum of training experience; Group 1, the not trained; Group 2, the slightly trained; and Group 3, the highly trained. The Model of Analysis by Inkeles and Smith (1974) was used as basis in comparing the three groups of respondents.

Sampling Procedure

Stratified random sampling was employed to select the respondents. The towns of Palawan were ranked according to a set of criteria and six towns with similar characteristics were selected as the strata. These are Rizal, Brooke's Point and Narra in the south and Roxas, Taytay and San Vicente in the north of Palawan. Lists of learners/participants in DepEd projects and programs in each town were requested from DepEd personnel in charge of the NFE. These lists were used in the random selection of slightly trained and highly trained respondents. A list from the secretary of corresponding barangays was also requested for the selection of non-attendees as respondents.

Three groups of 8 respondents each (Group 1 - not trained respondents; Group 2-slightly trained learners and Group 3 - highly trained learners) were randomly selected from each town for a total of 144 respondents. Thus, Group 1 consists of 48 non-attendees of NFE programs henceforth called in this study as not trained respondents; Group 2 consists of 48 slightly trained learners, and Group 3 consists of 48 highly trained learners. Not trained respondents were those who have never attended any training under the DepEd NFE program. Slightly trained respondents were those who trained only once in any DepEd NFE Program from 1995 to 2000. Likewise, highly trained respondents were those who had participated in three trainings or more within 1995 to 2000.

Data Collection

The Interview Schedule developed for this particular study to measure modernity was patterned mainly from the Overall Modernity (OM) Scale of Inkeles (1974). Inkeles (1969) has successfully used the scale in a study of adult men in six counties. The Short Form 12 of the OM was tested in the Philippines by Flores (1977).

The instrument measured the following attitudinal-behavioral dimensions for which substantial inputs were provided by NFE training; active public participation; aspirations; planning valuation; readiness to accept social change; technology valuation and time valuation.

Meanwhile the "Individual Respondent's Level of Living Scale" adapted from Dabuet (1990) was used to determine the socio-economic level of respondents.

Data Analysis

Data analysis and interpretation was done at the State Polytechnic College of Palawan (now Western Philippine University).

The socioeconomic level of the respondents was determined on the basis of four items or indicators, namely: 1) ownership of house and lot, 2) type of house, 3) ownership of household possession, and 4) annual income. The Kruskal Wallis test was used to test the differences between mean scores of the three groups with regards to age, years of formal schooling, and socio-economic level of respondents.

The Wilcoxon Rank-Sum (WRS) test of difference in means for two independent samples was used to determine whether there were significant differences in modernity between two comparison groups.

The overall modernity score was the sum of scores obtained by the respondents for the different modernity dimensions. The following Overall Modernity Scale was used to determine the modernity level of the respondents;

- 45 - 80 = most traditional
- 81 - 116 = more traditional
- 117-152 = moderate (somewhat modern)
- 153 - 188 = more modern
- 189-225 = most modern

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

All the respondents in the three comparison groups are males, rice farmers, and had closely similar socio-economic characteristics. The respondents ages range from 25 to 45 years old with a mean age of 36.06 years old, the most productive years of their life years of formal schooling ranged from 0 to 6 six years and most of them reached only Grade IV.

Indicators of socio-economic level of living included house and lot ownership, durability of house, household possession and annual income. The average income was PhP13, 500.00, an indicator that most of the participants were living below the threshold of poverty. Although socio-economic level of highly

trained respondents was categorized under high level of living while those of slightly trained and not trained respondents were under low level of living, they did not differ significantly in age, years of formal schooling, and socio-economic level.

Participation in DepEd NFE Training Programs

Each slightly trained respondents had attended only one of the Basic Literacy Classes cum livelihood skills and values formation. On the other hand, aside from Basic Literacy Classes, all highly trained respondents had attended three or more NFE training programs, which included Basic Literacy Classes. Other training/classes attended by highly trained respondents included literacy class on Math, Literacy class (Reading), Literacy class (Writing), basket weaving, electronics, farmers training, wood carving, paralegal seminar, welding technology and leadership training.

Modernity Differences

The WRS test revealed that there were highly significant differences in modernity among the not trained, slightly trained and highly trained respondents. Specifically, the three groups differed significantly in almost all modernity dimensions such as active public participation (both attitudinal and behavioral) readiness to accept social change, openness to new experience, educational and occupational aspirations, openness to new experience, planning valuation, technology valuation, and time valuation (Table 1.). Although they did not differ significantly in efficacy, the highly trained still had the highest mean scores in this dimension.

The highly trained respondent differed significantly from the slightly trained respondent in some modernity dimensions such as active public participation (both attitudinal and behavioral), educational aspiration, readiness to social change, openness to new experience and technology valuation (behavioral dimension only). These results imply that exposure to more DepEd NFE training programs made the respondents more modern in the aforementioned dimensions.

The character of the slightly trained respondents approximates that of the highly trained especially in openness to new experience, technology valuation (attitudinal), efficacy, and time valuation.

As it emerged from this study, the character of the highly-trained farmer contrasted strongly from that of the never-trained in almost all dimensions except

Table 1. Modernity mean scores between comparison groups.

Modernity Dimensions	Group		P	Group		P	Group		P
	Not Trained (n=48)	Slightly Trained (n=48)		Not Trained (n=48)	Highly Trained (n=48)		Slightly Trained (n=48)	Highly Trained (n=48)	
Purely Attitudinal Items									
Active Public Participation	03.87	04.89	.003**	03.87	05.79	.000**	04.89	05.79	.024*
Aspirations									
Educational	12.45	13.08	.071 ^{ns}	12.85	13.83	.000**	13.08	13.83	.009**
Occupational	01.60	02.21	.064 ^{ns}	01.60	02.54	.002**	02.21	02.54	.255 ^{ns}
Efficacy	15.33	15.45	.705 ^{ns}	15.33	16.37	.284 ^{ns}	15.45	16.37	.105 ^{ns}
Openness to New Experiences	14.58	15.08	.784 ^{ns}	14.58	17.50	.039*	15.08	17.50	.007*
Planning Valuation	06.83	07.83	.041*	06.83	08.16	.006**	07.83	08.16	.674 ^{ns}
Readiness to Social Change	19.97	21.83	.050*	19.98	24.33	.000**	21.83	24.33	.012*
Technology Valuation	14.22	16.89	.000**	14.23	16.87	.000**	16.89	16.87	.878 ^{ns}
Time Valuation	09.87	12.50	.000**	9.875	11.98	.000**	11.50	11.98	.130 ^{ns}
Behavior-Information Items									
Active Public Participation	10.08	12.21	.003**	10.08	15.87	.000**	12.21	15.87	.000**
Technology Valuation	20.05	22.25	.033*	20.05	27.21	.000**	22.25	27.21	.000**
OVERALL MODERNITY SCORE	121	143.25	.000**	121	160.47	.000**	143.25	160.47	.000**
Adjectival Rating	Somewhat Modern	Somewhat Modern		Somewhat Modern	More Modern		Moderate	More Modern	

Legend: P - Probability

ns - Not Significant

* - Significant

** - Highly Significant

in efficacy in the sense that the former took active involvement in public affairs, and ready for new ideas and experiences. As a citizen, the highly trained respondent manifested more degree of concern in the resolution of some public issues arising not only from his dignity and rights of persons dependent on or subordinate to him. He tended to use formal rules as a basis for running thing

Openness to new experience was manifested by respondents' willingness to meet new people and to move to a new place. This was also suggested in his desire to be the first to try new birth control methods.

That the trained respondent valued planning was shown in his preference for planning moves in advance and in his belief that the man who plans ahead encounters less problems and difficulties. Moreover, his readiness for social change was shown by his respect for the dignity and rights of persons dependent on or subordinate to him. He tended to use formal rules as basis for running things. Moreover, he had an admirable sense of time and could be expected to work according to time schedules.

A highly trained respondent valued technology and applied it if circumstances allow it. Results of this study had shown that he had gained considerable knowledge and skills on modern farming.

The WRS test of differences in means for two independent samples showed that differences in overall modernity mean score among three comparison groups are significant at $\alpha = .01$ level indicating that the amount of training had positively affected modernity of the respondents. The findings of this study that participation in DepEd trainings helped raise the farmer's public awareness and involvement, made him more open and ready to social and technological changes, emboldened his resolve to meet challenges and improved his lot in life indicated that DepEd NEE programs had made respondents more modern in their outlook of life.

Recommendations

On account of the significant findings and conclusions of the research, the following are recommended for improvement of DepEd NFE training programs:

1. Intensification of values education program through participatory approach. DepEd NEE implementers should push for identification of desirable traditional Filipino values and enhancement blended with the needs of a changing society for appropriate work ethics, increased productivity, and self-discipline

2. Strengthening of the existing linkages and forging development institutions to operate together to supplant strongly embedded not only in the learner's personality community new alliances among rural unwanted values and behavior but also in the culture of his
3. Strengthening of partnership between school and LGU's to foster vigorous support by the government through allocation of appropriations especially for much needed infrastructure, equipment and personnel in the local and provincial budget.
4. Integration of learning experiences into training programs which teach values of efficacy and openness to new experiences
5. Scope of training should include clientele's influential microenvironment- his wife and children so that, together they could acquire the modern attitudes and behavior necessary for better quality of life.
6. Training site should be made more accessible and more consideration should be given on the traditional culture of tribal groups of Palawan and their migration patterns before establishing the training site.
7. Conduct of other studies using other measures or indicators of modernity including their positive and negative effect of environment concerns.

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Migration of Filipino Workers and The Philippine Economy

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INTRODUCTION

At no time in the history of the Philippines has the state been more actively involved in the migration process than now. In laying down the export of Filipino labor as policy integral to our economic development plans since the 1970s, the government has assumed a key role in its continued expansion. Conceived as a temporary measure in response to the unemployment problem, it has, through the years, become a permanent feature of our development strategy.

The multiple roles played by the government as both promoter and protector, regulatory body as well as a major beneficiary of the labor exporting industry puts it at the center of competing interests in which the state itself is inextricably linked. In 1982, the Philippine Overseas Employment Administration (POEA) was created and mandated to promote and develop overseas employment opportunities, afford protection to Filipino workers and their families, promote their interests and safeguard their welfare. The 1987 Constitution reiterates its pledge to provide "full protection to labor, local and overseas, organized and unorganized and promote full employment and equality of employment opportunities to all."

The government benefits from overseas migration through the workers' dollar remittances. Apart from their foreign exchange earnings which find their way back in the economy through consumption and reinvestment, government maintains a bureaucracy which charges fees for processing, accreditation, certification, licensing and pre-departure orientations, among a host of other services.

This paper is motivated by the need for a better understanding of international migration as a process. This liberating mobility is generally deemed inherent to the growth and advancement of the individual and the larger society of the individual's affiliation.

International Migration

International migration has always been a counterpart of international income inequalities, and an important equilibrating mechanism. After reduction in transport costs in the mid-nineteenth century, large-scale migration was a characteristic of the international economy until the early 1930s. The main flows were from Western Europe to the Americas, but large numbers of Indians and Chinese also emigrated and areas of Africa, South East Asia and Australasia received immigrants.

Migration is generated by push and pull forces, and facilitated by reduced transport and communication costs. The decision to migrate is often complex and driven by many considerations (the push of religious persecution or political repression or a poor climate), but the large-scale migrations described in the above paragraph were driven by economic considerations. Migrants could enjoy higher incomes by moving from their heavily populated homeland to the more sparsely populated continents with abundant natural resources.

Migration may be hampered by uncertainty because of poor information. An important mechanism for overcoming this barrier is the recommendation of friends and relatives. One consequence is that migrants to a specific destination often come from a distinctive locality in the sending country. Another consequence is that the response to economic incentives to migrate may be initially slow and then accelerate after a time lag. The lack of information can, however, be exaggerated. Already at the start of this century much of the migration from Italy to Argentina was seasonal as rural workers crossed the Atlantic twice a year in response to the differing harvest seasons. Much of the labor movement from China and India was also temporary, as migrants were to work on the plantations, in the mines or on the railways on a time-bound contract. In these circumstances, the flow of information back to the sending country about the destination must have been good.

A striking omission from the post-war liberal international economic order is labor. The free flow of goods and capital is encouraged, but nothing is said about labor. The high income countries have policies of deploring restrictions on emigration by undemocratic countries, while they themselves impose restrictions on immigration. Political refugees are sometimes allowed to enter high income countries, but economic migrants are subject to scrutiny which is typically biased in favor of wealthy or skilled immigrants and against the poor and unskilled.

The economic reasons behind migration, and behind the introduction of immigration restrictions, can be illustrated by a two country model (Figure 1). The labor market is in equilibrium when the wage rate (w) is equal to the value of the marginal product of labor (VMP). Without migration, the wage rate in country A, whose labor force is O_AQ , will be w_A and domestic output is measured by the area O_ACDQ . To include it in the same diagram, the labor force in country B is read

from right to left along the horizontal axis and the origin O_B is located such that the labor force in B is O_BQ (so the total labor force in the two countries is O_AO_B); the wage rate in B is w and output is O_BGFQ . With international migration, workers move from A to B in search of higher wages. In equilibrium (point E), the VWP and wage rate are the same in both countries, and QQ^* workers have moved from A to B. The two countries' combined output has increased by the shaded area DEF, because the migrants produce more in their new location than in the old one. Thus, when the marginal value product of labor differs in two locations, global output is increased by the movement of labor.

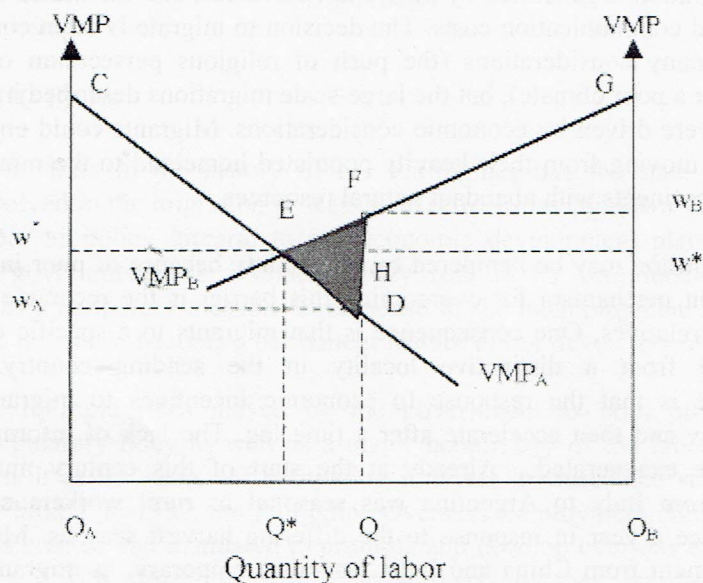


Figure 1. Wage determination in two countries.

In Figure 1 international migration has distributional effects. The migrants benefit, because they enjoy a higher wage. The workers left behind also benefit because the reduction in labor supply pushes up wages in the labor-abundant country (A). In the receiving country (B), however, workers lose out as the wage rate is bid down by the immigrants. The owners of other factors of production in B benefit (their income increases from GFw_B to GEw^*), but if the country has a democratic political system the votes of domestic workers will likely ensure that immigration barriers are erected. The pressure to exclude immigrant labor will be even stronger during periods when unemployment is high, so it is unsurprising that the USA and other receiving countries closed their doors to immigrants during the early 1930s.

The heterogeneity of labor and the existence of social services in high income countries complicate the assessment of immigration. Some foreign labor may be complementary to domestic labor, thus welcomed (e.g. to do the 3Ds - dangerous, difficult or dirty work). The possibility that immigrants' net contribution to the government budget may be negative because of their use of social services is also used to justify immigration barriers, especially against the poor or unskilled. Opposition to immigration may also be fanned by xenophobia or racist appeals.

Nevertheless, economic forces are strong, and Figure 1 captures the essential elements. The major international flows are from low-income to high-income countries. Restrictions on immigration into Western Europe or the USA are more lax when unemployment is low. Substantial numbers moved from ex-colonies or from south-east Europe to north-west Europe during the 1960s, and large numbers of Mexicans continue to enter the USA. The oil price increase in the 1970s led to a large demand for unskilled labor in the thinly populated Gulf States and large immigration first from Islamic countries and then from other Asian countries. In all of these cases, migration almost certainly increases global output and reduces income inequality, even if workers in the high income countries are adversely affected.

Assessment of international labor movements is more complex when it involves skilled labor. If the migrant's education were subsidized, then there is cost to his or her native country which loses the human capital in which taxpayers have invested. One solution is to offer higher rewards to train people in LDCs, but paying international-level salaries may not be possible if the workers' marginal product is less than it would be elsewhere, and it may be undesirable on equity grounds. Another proposal is for the high-income countries to levy a surtax on immigration from LDCs, the revenue from which would be redistributed to the country of origin or to United Nations development agencies. The issues arising from both of these solutions are the same: are they feasible and are they fair? There is a clear conflict between individual liberty and society's rights; the former consideration mandates freedom to live where one chooses, while the latter points to obligations towards the community into which one was born.

In the 1980s and 1990s as economic differences widened in East Asia, international labor migration became important once again in that region. Reliable numbers do not exist, in part because many migrants work illegally and immigrants are difficult to separate from temporary visitors. The major destination countries are Japan, the newly industrialized economies and Malaysia. Malaysia had over half a million foreign workers in the early 1990s, about 10% of the country's labor force.

The biggest sending country is the Philippines, whose Government has encouraged overseas work as a safety valve for the unemployed since 1974. By the early 1990s official estimates were of 3.5 million Filipinos working overseas,

and sending remittances of around \$3 billion in 1994 (equivalent to over 10% of exports and the Country's largest single foreign exchange earner). Since much migration is unregulated and the official figures only count remittances passing through the banking system, these numbers are substantial underestimates.

For some open economies the labor force flows are more complex, reflecting a high degree of international interdependence, Thailand became a major labor exporter in the 1970s, and many semi-skilled Thais continue to work overseas (especially in the Middle East). The rapid growth of Japanese foreign investment in the second half of the 1980s brought many managerial and technical staff to work for Japanese multinationals' some 30,000 Japanese citizens were living and working in Thailand by the early 1990s. At the same time, unskilled labor from poor neighboring countries sought work in the booming Thai economy; much of this cross-border movement was unregulated, but at least 100,000 Laotians and 20,000 Burmese have joined the even larger number of Cambodian (many of whom had originally been refugees) working in Thailand.

The main intra-Asian migration flows are into labor-intensive non-traded activities such as construction, domestic service and entertainment. There appears to be some specialization as Indonesian crews provide the labor for Malaysia's construction boom, while Filipinas work as maids in Malaysia, Hong Kong and Singapore and bands from the Philippines play throughout the region.

The Merits of International Transfers of Labour

In theory, international transfers of labour should provide a number of benefits. First, it is an opportunity to take advantage of the quantitative and qualitative complementarity of labour resources. This is particularly beneficial to the recipient economy, which could mitigate the problems of bottlenecks of labour resources or mismatches by importing the types of labour which is in short supply. This would contribute to increase of production and income of the recipient economy.

The second benefit relates to the revitalization of the workforce. By the supplementing able and vigorous workforce, the workforce of the recipient nation also is stimulated and revitalized. The United States is a good example. Though it has restricted immigration in recent years, it is still one of the most accessible countries in the world for people with advanced skills and knowledge. Knowledge and technologies developed by these people and people working together with them are then fed back into the world.

The third benefit is economic assistance at the individual level. People from labour sending countries can earn higher incomes and acquire skill in the course of their work. The money they send supplements capital supplies of home, countries, and industrial skills they bring back may represent an important source

of technology transfer. Employment of foreign workers can play the role of useful aid to labour sending countries.

Fourth is the reduction of unemployment and underemployment from the viewpoint of labour sending countries.

As the fifth benefit, one could cite the contribution to economic development at the broader regional level. The mutually complementary redistribution of labour force among different countries and regions will stimulate economic development of the broader region as a whole.

Yet another potential benefit is in the area of national security. To the extent that exchanges of labour strengthen the ties of inter-dependence, promote social openness, and improve mutual understanding, they can contribute to the economic and social stability of the countries involved and thereby enables them to enjoy a higher level of security.

In summary, the international movement of labour should be theoretically welcome for its potential to yield these and possibly other benefits for both the sending and host countries.

The Demand and Supply of Migrant Workers

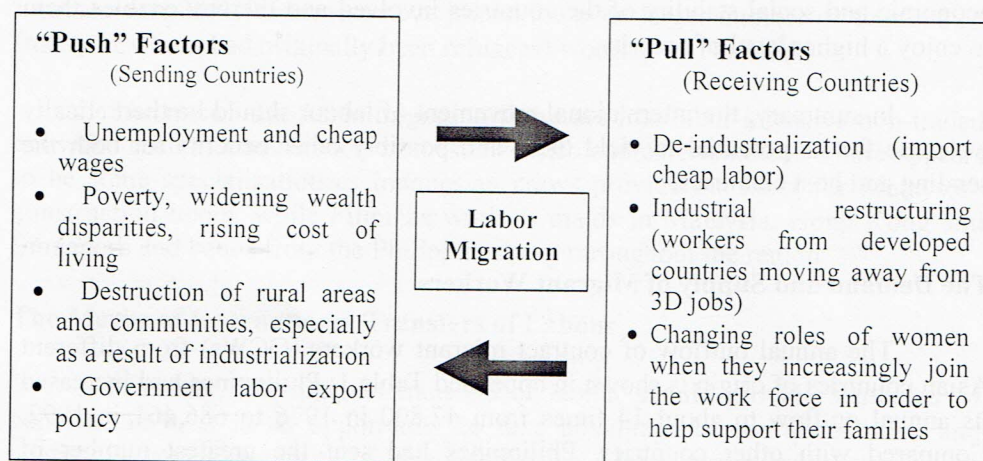
The annual outflow of contract migrant workers (OCWs) from different Asian countries of origin is shown in appended Table 1. Philippines had increased its annual outflow to about 14 times from 47,800 in 1976 to 686,461 in 1992. Compared with other countries, Philippines had sent the greatest number of OCWs; about 2 to 4 times greater than India and Bangladesh, the next succeeding ranking labor exporting countries. Clearly this phenomenon reflects the working of both the demand ("pull") and supply ("push") forces of the labor market as shown in the labor dynamics diagram.

On the demand side ("pull"), the labor shortage resulting from the rapid growth of the receiving country's economy has increased the demand of foreign labor. Appended Table 1 also shows that these receiving countries have an average GDP growth more than 5 percent a year. Another is the shortage of labor in the receiving countries due to increased choosiness of these population in selecting jobs, which increases demand for labor in certain types of jobs. With increased levels of education and expected high incomes, especially under the current tight labor conditions, young workers from the receiving host countries are shunning jobs that they see as "demanding, dangerous or dirty/demeaning, (3Ds)."

On the supply side ("push"), the first key factor is the income gap between receiving countries and the sending countries. Since the level of income per capita of receiving country is several times the income levels of the sending countries, it

is not surprising that people from sending countries who wish to work in these receiving countries expect to get large multipliers of their incomes at home. Another important factor is the economic development itself in these sending countries which has stimulated the desire to work in these high-income countries. The people who seek to work in this rich countries by no means come from the lowest strata in their home societies; rather they are people with some economic power and strong drive. They are not the people who leave home because they cannot get by in their own countries. This bring the case, supply side pressure may grow even stronger until these sending countries attain reasonably high levels of economic development.

Conceptual Framework: International Labor Market



In the case of the Philippines, over 50 percent of OCWs have attended college of education; of whom more than half are graduates. The number of deployed OCWs has remained more or less steady at 690,000 since 1992, while the number of new hires gradually decreased from 301,317 in 1991 to 206,670 in 1998 (POEA). Could this trend imply that the number of deployed OCWs is reaching saturation point so that equilibrium between labor supply and demand will soon be established? IBON (15 Jan 1998, p. 20) estimates that there are 1.6 million OCWs at any given time.

Trends of Filipino Migration in the 1990s

One trend pertains to fluctuations of migration flows, in which the decade of the 90s has witnessed three major moments. First was the Gulf War of 1991 and the repatriation of approximately 30,000 workers, mainly from Kuwait. Such repatriation, however was quickly offsetted by an increased deployment in the final

months of 1991 and accounted for a sudden increase of 46 percent in total deployment over the previous year. Deployment of overseas workers reached its peak in 1994, with most of the increase was absorbed by Saudi Arabia. Second was the decline of deployment by 13 percent in 1995. This was mostly set off by the adverse climate towards overseas labor created by the public outcry over the hanging of Flor Contemplacion, a Filipina domestic helper found guilty of murder in Singapore. Third is the increase by 15 percent in 1997 (Table 1).

Table 1. Deployed Filipino Overseas Contract Workers, 1990-1997.

Year	Deployed	Land-based	New hires	Rehires	Sea-based
1990	446,095	334,883	217,942	116,941	111,212
1991	615,019	489,260	301,317	187,943	125,759
1992	686,461	459,655	291,219	258,436	136,806
1993	696,630	550,872	274,305	276,567	145,758
1994	719,602	565,226	268,711	296,515	154,376
1995	654,022	488,621	219,018	269,603	165,401
1996	660,122	484,653	206,734	277,919	175,469
1997	747,696	559,227	222,139	337,088	188,469

(Source: Banistetla, Graziano, 1999)

Such an increase has occurred particularly in Asia, while the Middle East has continued to decline as a result of decreasing salaries and also of the preference-to-nationals policy. In 1997, Filipinos deployed in Asia for the first time outnumbered Filipinos deployed in the Middle East (Table 2).

Table 2. Deployed Filipino Land-based Contract Workers, by Region, 1990-1997.

Year	1990	1991	1992	1993	1994	1995	1996	1997
Africa	1,273	1,694	2,510	2,425	3,255	3,615	2,494	3,517
Asia	90,768	131,592	134,776	168,205	194,120	166,774	174,308	235,129
Americas	9,557	13,373	12,319	12,228	12,603	13,469	8,378	7,058
Europe	6,853	13,156	14,590	13,423	11,513	10,279	11,409	12,626
Middle East	218,110	302,825	340,604	302,975	286,387	234,310	221,224	221,047
Oceania	942	1,374	1,669	1,507	1,295	1,398	1,577	1,970
Trust Territories	7,380	11,409	11,164	8,890	8,489	7,039	4,859	5,280
Total	334,883	489,260	549,655	550,872	565,226	488,621	484,653	559,227

(Source: Battistella, Graziano, 1999)

Another trend, clearly visible through the 1990s, has been the constant decrease since 1991 of workers going abroad for the first time, and the constant increase of workers renewing their contracts. The small reversed trend in 1997, when newly hired migrants also increased (8 percent), remained at a lower magnitude than the increase of rehired workers (21 percent) (Table 1). In general this indicates that new job openings are not numerous. At the same time, it indicates that migrants are prolonging their time abroad, both because accumulation of savings takes longer, due to increasing migration costs and

decreasing salaries, and because replacement of workers is expensive for employers.

Deployment to specific countries has also witnessed some dramatic changes. Saudi Arabia, although it remains the number one destination for Filipinos, absorbed only 100,000 Filipinos in 1997, which was less than in 1992. At the same time, Taiwan, which was not a destination country in the 1980s, has within a few years become the number three destination after Hong Kong. Anxieties over political changes in Hong Kong as well as the effects of economic crisis were reflected in exceptional deployment in the first months of 1997, and a sudden decline afterwards. Of the top ten countries of deployment, only two are currently from the Middle East and one European country is among the top ten.

The breakdown by occupation and gender, available only for the newly hired, reveals that the proportion of women over men is increasing. Although there are some variations along the years, it appears that Filipino migrants are employed mainly as laborers, service workers, and professionals. Bearing in mind that service workers are domestic workers and that entertainers normally constitute at least 50 percent of professional workers, a broad idea of the major jobs and skills Filipinos hold abroad are obtained (Table 3). Specifically, the migration of entertainers has picked up again, 'the decline in 1995, when ballet skills were imposed among the requirements to permission to go abroad. The reversal in 1997 can also be explained by the of exemptions from some requirements, particularly the waiver on the minimum of twenty-one.

A final trend that has emerged in the 1990s is the increase of remittances. The increase, which was already evident in 1994, the year of the highest deployment of migrants, experienced an unexpected surge in the following years. This surge is explained by the increase of people abroad or by the increase of salaries earned by migrants alone. Two other factors account for such increase: the improved capacity of banks to channel remittances home; and the increased confidence of Filipinos (not just migrants) abroad on the Philippine economy and the attractiveness of investments in the country.

Current Economic Trend

Exports and remittances from overseas Filipino workers contributed to salvage economic growth during the period 1997-1998.

Net factor income from abroad % FIA grew by as much as 18.6% during the third quarter to reach 12.2B in real peso terms. NFIA consists mostly of remitted earnings of overseas Filipino workers (OFS).

NFIA in the third quarter accounted for as much as 5.3% of GNP, enabling the country to offset the 0.1% contraction in domestic production and ending talks of a recession, for the time being.

The Philippine Labor Officers, however, reported that at least 2,300 OFWs in the Asian region were retrenched during the first half of 1998 as a result of the economic crunch. As of August 1, some 2,262 OFWs in Brunei were retrenched, while as much as 123 workers were retrenched or terminated in South Korea. OFWs from Malaysia, Indonesia, and South Korea were among the harder hit, and remaining OFWs have had to reduce salaries and benefits owing to the depreciation of their host country's

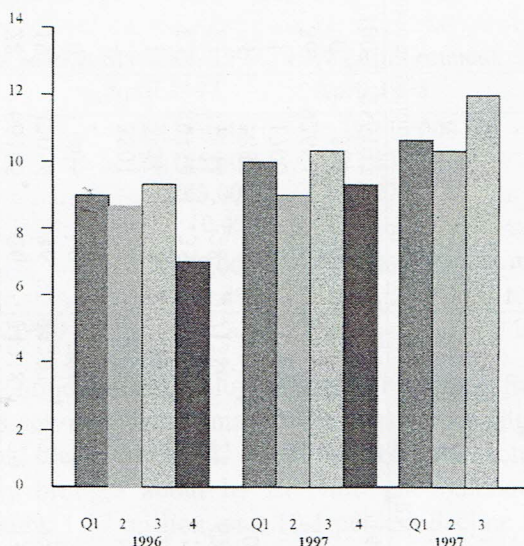


Figure 2. Net Factor Income from Abroad.
(Source: Jover, G. L. Remittances help boost GNP. Recent Economics Indicators. January 1999, p. 11)

The Current Labor Market Situation

The labor force survey (April 1998 round) erosion of the gains so far achieved by earlier reforms in the Philippine labor market. From April 1997 to April 1998, total employment contracted by almost 1 percent, compared with the 2.38 percent growth of the labor force. The April 1998 employment rate of 86.7 percent is the lowest since April 1991(85.6%).

Table 3. Deployment of Overseas Filipino Workers, by Skill Category (new hires), 1992-1997.

Skill Category	1992		1993		1994		1995		1996		1997	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Professional	72848	28	66105	26	74218	29	43976	21	36055	18	51228	23
Entertainer	49996	19	42056	16	53292	21	23434	11	18487	9	25636	12
Administrative	495	0	405	0	385	0	352	0	568	0	555	0
Clerical	4943	2	3801	1	3709	1	3386	2	3169	2	3534	2
Sales	2725	1	2576	1	2284	1	2090	1	1938	1	2560	1
Service	82440	32	89154	35	90967	35	81306	38	84745	41	76402	34
Maid	58700	23	71444	28	71386	28	62653	29	61986	30	47544	21
Caretaker	11399	4	7885	3	10088	4	10410	5	14695	7	19225	9
Agricultural	1920	1	1706	1	1204	0	972	0	822	0	538	0
Laborer	94525	36	92664	36	85816	33	81857	38	75683	37	83560	38
Not Classified	698	0	506	0	403	0	219	0	3345	2	3027	1
TOTAL	260594	100	256197	100	258986	100	214130	100	205791	100	221560	100

(Source: Battistella, G. 1999. Philippine migration policy: dilemmas of a crisis. SOJOURN. 14(1), p. 236)

Because of the contraction in demand, coupled with the fast growth of the labor supply, the unemployment rate increased from 10.4 percent in April 1997 to 13.3 percent in April 1998. This increase in the unemployment rate is translated to an increase of unemployed persons, from 3.26 million to 4.28 million. Surprisingly, the underemployment rate decreased from 23.4 percent to 21 percent during the same period, as the number of those employed who expressed some dissatisfaction with their current work decreased from 6.38 million to 5.84 million (Table 4).

Table 4. Summary Labor Market Statistics, 1997 - 1998 (April rounds).

	April 1997	April 1998	% Growth
Labor Force	31,368,000	32,113,000	2.38%
Employed	28,105,000	27,835,000	-0.98%
Unemployed	3,263,000	4,278,000	31.33%
Unemployment Rate	10.4%	13.3%	
Underemployed	6,577,000	5,837,000	-11.25%
Underemployment Rate	23.4%	21.0%	

(Source: Conferido, R. D. 1998)

The overall contraction in employment may be traced from the fact that while the industry and services sectors managed to post appeasing (lower) growth rates, the agriculture sector suffered from steeper and actual declines in employment, basically brought about by El Niño phenomenon. Agricultural employment decreased by 1.17 million, or a 10.1 percent decline from April 1997 to April 1998 (Table 5).

Table 5. Summary Employment Statistics, by Industry, 1997 - 1998 (January rounds).

Industry	April 1997	April 1998	% Growth
Agriculture	11,601,000	10,433,000	-10.07%
Industry	4,741,000	4,806,000	1.37%
Services	11,756,000	12,587,000	7.07%

(Source: Conferido, R. D. 1998)

Policy Recommendation

Overseas employment should be recognized as a legitimate option for workers within national development objectives, with government ensuring their protection and welfare. Ultimate protection of overseas Filipino workers must be a joint responsibility of the Philippines and the workers' host country. Hence, the forging of protective bilateral labor agreements should be high in our agenda.

As part of the commitments the Department of Labor and Employment (DOLE) should implement a package of interventions to address the needs of

displaced workers, including OFWs. The guidelines for this package are contained in Department Order No. 6, signed by the Secretary of Labor and Employment on 18 March 1998.

The objectives of the program, as laid out in D.O. No.6, are the provision of employment facilitation assistance; training assistance; credit and marketing assistance. It basically consists of three sub-packages, namely; job watch, job link, and job loss prevention.

Assistance will be provided both at the OFW's job sites and in the Philippines, to facilitate their access to gainful employment. Assistance is provided to returning OFWs whose skills and qualifications match the requirements of local employers, through the Placement Assistance Division of the Overseas Workers Welfare Administration (OWWA). Meanwhile, the Philippine Overseas Labor Offices (POLOs) can make representations with prospective/new employers to facilitate the provision of alternative employment to displaced workers.

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