

Agrobiodiversity of Home Gardens in Selected Marginal Upland Villages of Inopacan, Leyte, Philippines

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ABSTRACT

Home gardens are subsistence crop production systems that significantly contribute to the socio-ecological resilience of peasant communities reducing vulnerability and ensuring food security. Because of their small size, they are neglected repositories of biological diversity. This paper describes the agrobiodiversity and management of home gardens in about 79 households in three marginal upland villages of Inopacan, Leyte. Semi-structured interviews and actual home garden visits were done to collect data. Results show that home gardens studied had high species diversity and exhibited a multilayered structure. A total of 171 species in 74 families and 146 genera were documented. The composites (Asteraceae) had the most number of genera and species followed by the orchids (Orchidaceae), legumes (Fabaceae) and aroids (Araceae). More than 70% of the species were exotics which were mostly ornamental plants. Erect herbs were the most common, followed by trees, shrubs, herbaceous vines and epiphytes. Majority of the species were ornamentals followed by fruit trees, medicinal plants, vegetables and spice plants, grown primarily for home use (62%) rather than as source of income. Established and managed by family members who provide free labor, the gardens mostly utilized cost-free planting materials and with no fertilizer or pesticide application.

Key words: agroecosystem, biodiversity, subsistence farming, backyard garden, medicinal plants

INTRODUCTION

In the humid tropics, home gardens are a common feature in village communities. Also called backyard gardens, these are small areas planted to various plant species situated in the immediate vicinity of human dwellings (Sunwar, 2006). These are often separated from the surrounding landscape by fences, hedges, trees or other barriers (Guarino and Hoogendijk, 2004). Although considered as a subsistence type of agriculture due to their small size and volume of production, they are multifunctional agroecosystems (Galluzi et al., 2010). Home gardens significantly contribute to the socio-ecological resilience of peasant communities reducing vulnerability and ensuring food security (Buchman, 2009). Throughout history, family members strengthen family ties as they work together in home gardens. They grow food, spice, ornamental and medicinal plants, fruit trees and other species, usually intended for home use but can sometimes be a source of additional income for the family. In some communities, home gardens play a role in cultural festivities and religious rites (Thrinh et al, 2003). In many countries around the world, home gardens have become part and parcel of life in the countryside.

Traditional home gardens are typically characterized by having a complex multilayered architecture and high species diversity (Soemarwoto, 1987, Coomes and Ban (2004)), where a variety of herbs, shrubs, epiphytes, vines and trees are grown together. Smith et al. (2006) explained that such stratified and highly diverse structure makes home gardens a generally sustainable and resilient ecosystem. Their close proximity to human dwellings ensures a more personalized type of management, making the biotic and abiotic conditions in the home garden unique or considerably different from the surrounding environment (Guarino and Hoogendijk, 2004).

In recent years, the threat of biodiversity loss both in natural environments and agricultural systems has received increasing attention. As a micro-agroecosystem of diverse structure, home gardens are important repositories of plant genetic diversity and thus could function effectively for the *in situ* conservation of plant genetic resources. The study of Eyzaguirre and Watson (2001) pointed out that home gardens are crucial reservoirs of inter- and intra-genetic crop genetic diversity. Galuzzi et al. (2010) stressed that a significant portion of the world's agrobiodiversity can be found in complex agroecosystems managed by small farmers. *In situ* conservation of crop species and landraces in these

complex ecosystems ensures their continuous adaptation to climate change.

The most important contribution of home gardening for conservation purposes resides in its capacity to represent agrobiodiversity at multiple levels over small spaces (Hodgkin 2001). Furthermore, they are often utilized as preliminary venues for new crops, as nurseries for growing plants which will be transferred for planting in open fields and domestication sites of weedy forms (Kulpa and Hanelt 1981; Leiva et al. 2001), which may also be used directly within the household.

According to Trinh et al. (2003) home gardening is one of the most under-researched topics. In a review done by Galuzzi et al. (2010), they found that much of past research on home gardens has been done in developed countries and focused more on their role as a distinct ecological or cultural entity. Little attention has been given to their role as critical repositories of plant genetic diversity. This study was therefore done to assess the agrobiodiversity of home gardens in selected sites in Eastern Visayas with emphasis on those found in marginal degraded uplands considering that these areas are highly vulnerable to climate change. Specifically, it aimed to identify the species and varieties of plants raised in the gardens, document their economic uses and, characterize the structure and management of these home gardens.

MATERIALS AND METHODS

The Study Site

The town of Inopacan lies on the southwestern portion of the province of Leyte, Philippines, some 130 km from the capital city of Tacloban. It is a fourth class municipality and has a total land area of 94.62 km². It is politically divided into 20 barangays and as of 2010, the population was about 19,904 people (www.inopacan.gov.ph).

A reconnaissance survey was first conducted in the upland villages of Inopacan to select suitable marginal upland sites for the study. Three villages were selected, namely; Brgy. Linao, Brgy. Guinsangaan and Brgy. Tao-taon (Fig. 1) These are three adjacent villages or barangays situated

towards the southeastern part of the town. The interior upland portions of these villages have wide stretches of hilly open grasslands where the soil is poor and infertile. Asio, et al (2014) described the soil in the marginal uplands of Inopacan as highly acidic and low in organic matter, total nitrogen and available P. Such soil characteristics aggravated by high temperatures and water scarcity make these sites unsuitable for crop production.

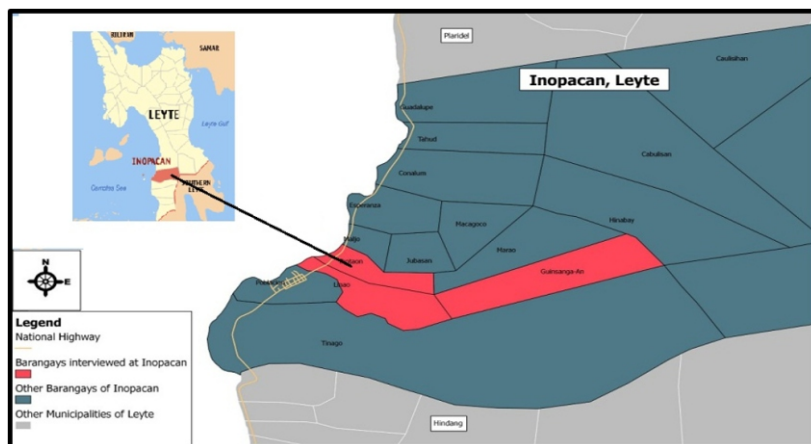


Figure 1. Map of Leyte province and Inopacan town showing the location of the study sites

Data Collection

A total of 79 respondents having home gardens were interviewed right in their homes using a survey questionnaire. Of this, 11 were from Linao, 23 from Guinsangaan and 45 from Tao-taon, representing 14%, 29%, and 57% of the total number of respondents, respectively. These respondents were randomly picked from an official list of residents living in the marginal upland areas of these villages. Actual observations of their home gardens were also done to identify the species and varieties grown, collect sample specimens and take photos for documentation. Voucher specimens of all species documented in the survey and home visits were processed into herbarium specimens and deposited in the VSU Herbarium, Visayas State University, Visca, Baybay City, Leyte.

Specimen Identification

All plant species recorded in the surveys and home garden/farm visits were identified and classified using every taxonomic reference available but Co's Digital Flora (Pielser et al, 2012–onwards) and the revisions of the Flora Malesiana series (Steenis, (1950 onwards) were heavily relied on.

RESULTS AND DISCUSSION

Diversity and Structure of Home Gardens

The home gardens studied were found to exhibit high species richness and diversity. A total of 171 species distributed in 74 families and 146 genera were documented. (Table 1). The family Asteraceae/Compositae was the most represented in terms of number of genera (9) and species (10) followed by Orchidaceae (7,8), Fabaceae (7,7), Araceae (7,7), Zingiberaceae (6,7), Lamiaceae (5,6), Poaceae (4,5), Cucurbitaceae (4,4), Asparagaceae (4,4), Apocynaceae (4,4) and Meliaceae (4,4). One hundred twenty-one (12) species or more than 70% of the total number of species documented are introduced or exotic species, especially for ornamental plants. It appears therefore that non-native species comprised a considerable part in the composition of home gardens in the marginal uplands studied.

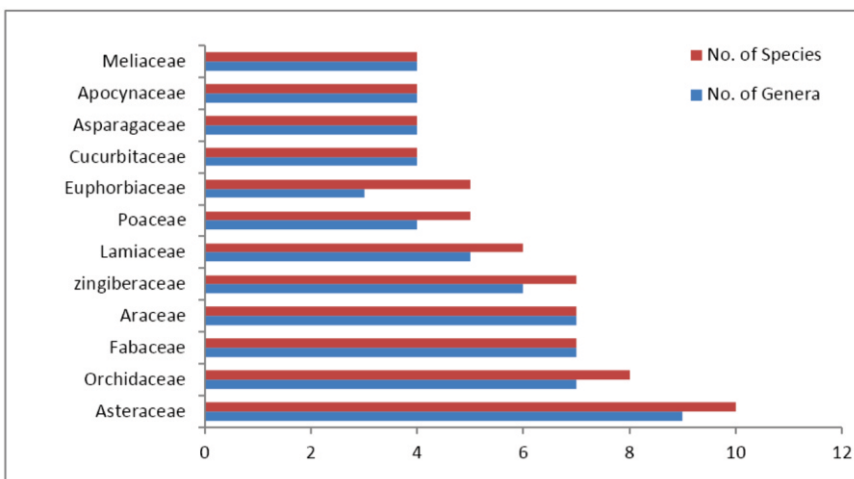


Figure 2. Plant families having the most number of genera and species

Table 1. Plant species recorded in the home gardens of the marginal upland villages of Inopacan, Leyte.

Family	Scientific Name	Local Name	Economic Uses	Origin
Acanthaceae	<i>Justicia brandegeana</i> Wassh.& L.B.Sm.	Shrimp Plant (Engl.)	Ornamental	Introduced
	<i>Pseuderanthemum reticulatum</i> (Hook.f.) Radlk.	Pasaw	Ornamental	Introduced
Adiantaceae	<i>Adiantum</i> L.	Lamon-lamon	Medicinal	Introduced
Agavaceae	<i>Cordyline fruticosa</i> (L.) A.Chev.	Baston, Ti plant	Ornamental	Native
Amaranthaceae	<i>Alternanthera ficoidea</i> (L.) P. Beauv.	Kutcharita	Ornamental	Introduced
	<i>Celosia cristata</i> L.	Pasong-pasong	Ornamental	Introduced
Amaryllidaceae	<i>Allium fistulosum</i> L.	Sibuyas- dahon	spice, medicinal	Introduced
	<i>Allium</i> sp. L.	Sibojing	Spice	Introduced
	<i>Allium</i> sp. L.	Ganda	Spice	Introduced
	<i>Crinum latifolium</i> L.	Lirio	Ornamental	Native
Anacardiaceae	<i>Mangifera indica</i> L.	Manga	Fruit	Introduced
	<i>Anacardium occidentale</i>	Kasoy	Fruit	Introduced
	<i>Spondias pinnata</i> (L. f.) Kurz.	Libas	Fruit	Native
Annonaceae	<i>Annona muricata</i> L.	Abana, Guyabano	Fruit, medicinal	Introduced
Apocynaceae	<i>Allamanda cathartica</i> L.	Yellow Bell	Ornamental	Introduced
	<i>Catharanthus roseus</i> (L.) G.Don	Kumintang	Ornamental	Introduced
	<i>Plumeria rubra</i> L.	Calachuching Pula	Ornamental	Introduced
	<i>Tabernaemontana pandacaqui</i> Lam.	Pandakaki	Ornamental	Native
Araceae	<i>Aglaonema commutatum</i> Schott	Aglaonema	Ornamental	Native
	<i>Anthurium aucbeanum</i>	Anthurium	Ornamental	Introduced
	<i>Caladium bicolor</i> (Aiton) Vent.	Gabi-gabi	Ornamental	Introduced
	<i>Colocasia esculenta</i> (L.) Schott	Gabi	Root crop, vegetable	Introduced
	<i>Cyrtosperma merkusii</i> (Hassk.) Schott	Palau	Root crop	Introduced
	<i>Dieffenbachia picta</i> (Lodd.) Schott.	Dieffenbachia (Engl.)	Ornamental	Introduced
	<i>Spathiphyllum commutatum</i> Schott	Peace Lily	Ornamental	Native
	<i>Polyscias fruticosa</i> (L.) Harms	Kalipay	Ornamental	Introduced
Araliaceae	<i>Schefflera arboricola</i> (Hayata) Kanehira	Five fingers	Ornamental	Introduced
	<i>Araucaria heterophylla</i> (Salisb.) Franco	Pine tree	Ornamental	Introduced
Arecaceae	<i>Livistona rotundifolia</i> (Lam) Mart	Anahaw	Ornamental	Native
	<i>Veitchia merrillii</i> (Becc.) Bec.	Lubi-lubi	Ornamental	Native
	<i>Cocos nucifera</i> L.	Lubi	food, lumber, firewood, medicinal	Native

Table 1. Continuation.

Family	Scientific Name	Local Name	Economic Uses	Origin
Asparagaceae	<i>Asparagus sprengeri</i> Regel	Asparagus	Ornamental	Introduced
	<i>Dracaena fragrans</i> (L.) Ker Gawl.	Fortune plant	Ornamental	Introduced
	<i>Sansevieria trifasciata</i> Prain	Espada-espada	Ornamental	Introduced
	<i>Chlorophytum comosum</i> (Thunb.) Jacques	Ribbon plant	Ornamental	Introduced
Aspleniaceae	<i>Asplenium nidus</i> L.	Mana-o	Ornamental	Native
Asteraceae	<i>Artemisia vulgaris</i> L.	Hilbas	Medicinal	Native
	<i>Aster ericoides</i> L.	Baby's Breath	Ornamental	Introduced
	<i>Blumea balsamifera</i> (L.) DC	Gabon	Medicinal	Native
	<i>Dendranthema indica</i> (L.) Des Moul.	Chrysanthemum	Ornamental	Native
	<i>Cosmos bipinnatus</i> Cav.	Cosmos	Ornamental	Introduced
	<i>Helianthus annuus</i> L.	Sunflower	Ornamental	Introduced
	<i>Cosmos caudatus</i> Kunth	Cosmos	Ornamental	Introduced
	<i>Tagetes erecta</i> L.	Marigold	Ornamental	Introduced
	<i>Pseudelephantopus spicatus</i> (B. Juss.) Gleason	Kuko's Banog	Medicinal	Introduced
	<i>Gerbera jamesoides</i> Bolus ex Hooker f.	Daisy	Ornamental	Introduced
Balsaminaceae	<i>Impatiens balsamina</i> L.	Swangga	Ornamental	Introduced
Basellaceae	<i>Basella alba</i> L.	Alugbati	Vegetable	Native
Begoniaceae	<i>Begonia</i> L.	Begonia	Ornamental	Native
Bixaceae	<i>Bixa orellana</i> L.	Achuete	Spice/condiment	Introduced
Bombacaceae	<i>Durio zibethinus</i> Murray	Durian	Fruit	Native
Brassicaceae	<i>Brassica rapa</i> L.	Pechay	Vegetable	Introduced
	<i>Ananas comosus</i> (L.) Merr.	Pinya	Fruit	Introduced
Bromeliaceae	<i>Guzmania lingulata</i> Mez	Scarlet	Ornamental	Introduced
Burseraceae	<i>Canarium ovatum</i> Engl	Pili	fruit, lumber	Native
Cactaceae	<i>Cactus</i> sp.	Cactus	Ornamental	Introduced
Caricaceae	<i>Carica papaya</i> L.	Kapayas, Papaya	Fruit	Introduced
Clusiaceae	<i>Garcinia mangostana</i> L.	Mangosteen	Fruit, medicinal	Introduced
Commelinaceae	<i>Tradescantia spathacea</i> Sw.	Bangka-bangkaan, Rhoeo	Ornamental	Introduced
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	Camote	Root crop	Introduced
	<i>Ipomoea aquatica</i> Forssk	Tangkong, Kangkong	Vegetable	Introduced
Crassulaceae	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Hanlilika	Medicinal	Introduced
Cucurbitaceae	<i>Cucurbita maxima</i> Duchesne	Kalabasa	Vegetable	Introduced
	<i>Lagenaria siceraria</i> Molina Standl.	Upo, Balantiyong	Vegetable	Introduced
	<i>Luffa acutangula</i> (L.) Roxb.	Sikwa	Vegetable	Introduced
	<i>Momordica charantia</i> L.	Paliya, Ampalaya	medicinal, vegetable	Introduced
Cupressaceae	<i>Thuja orientalis</i> L.	Cypress	Ornamental	Introduced

Table 1. Continuation.

Family	Scientific Name	Local Name	Economic Uses	Origin
Cycadaceae	<i>Cycas revoluta</i> Thunb.	Pitogo	Ornamental	Introduced
Dioscoreaceae	<i>Dioscorea alata</i> L.	Ube	Root crop	Native
	<i>Dioscorea bulbifera</i> L.	Ube	Root crop	Native
Ebenaceae	<i>Diospyros philippinensis</i> A DC	Mabolo, Kamagong	fruit, timber	Native
Equisetaceae	<i>Equisetum sp.</i> L.	Horsetail	Ornamental	Introduced
Euphorbiaceae	<i>Codiaeum variegatum</i> (L.)A. Juss	San Francisco	Ornamental	Introduced
	<i>Euphorbia pulcherrima</i> Willd. ex Klotzsch	Poinsettia	Ornamental	Introduced
	<i>Euphorbia nerifolia</i> L.	Suro-suro	Medicinal	Introduced
	<i>Jatropha curcas</i> L.	Tuba-tuba	Medicinal	Introduced
	<i>Jatropha gossypifolia</i> L.	Tuba-tubang Tapol		Introduced
	<i>Jatropha podagrica</i> Hook.	Ginseng	Medicinal	Introduced
	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Madre de cacao, Kakawate	firewood, fencing	Introduced
Fabaceae	<i>Leucaena leucocephala</i> (Lam.) De Wit	Ipil-ipil	firewood, fencing	Introduced
	<i>Psophocarpus tetragonolobus</i> (L.) D.C	Garbanzos, Kalabantos Kalabantos	Vegetable	Introduced
	<i>Pterocarpus indicus</i> Willd.	Narra, Naga	Timber	Native
	<i>Tamarindus indica</i> L.	Sambag, Sampalok	fruit, spice/condiment	Introduced
	<i>Vigna unguiculata</i> (L.) Walp.	Batong	Vegetable	Introduced
Gnetaceae	<i>Flemingia macrophylla</i> (Willd.) Merr.,	Malabalatong	Hedge plant	Native
	<i>Gnetum gnemon</i> L.	Bago	Vegetable	Native
Heliconiaceae	<i>Heliconia psittacorum</i> L.f	Saging-saging	Ornamental	Introduced
Hydrangeaceae	<i>Hydrangea macrophylla</i> (Thunb.) Ser	Millions	Ornamental	Introduced
Lamiaceae	<i>Orthosiphon aristatus</i> (Blume) Miq.	Balbas- pusa	Medicinal	Native
	<i>Plectranthus amboinicus</i> (Lour.) Spreng	Karabo	spice, medicinal	Introduced
	<i>Plectranthus scutellarioides</i> (L.) R.Br..	Mayana	ornamental, medicinal	Native
	<i>Hyptis suaveolens</i> (L.) Poit		Medicinal	Introduced
	<i>Mentha arvensis</i> L.	Mentol	Medicinal	Introduced
Lauraceae	<i>Mentha cordifolia</i> Opiz	Yerba Buena	Medicinal	Introduced
	<i>Persea americana</i> Mill.	Avocado	Fruit, medicinal	Introduced
Lythraceae	<i>Lagerstroemia speciosa</i> (L.)Pers.	Banaba	Medicinal	Native
Malvaceae	<i>Abelmoschus esculentus</i> (L.) Moench	Okra	Vegetable	Introduced
	<i>Hibiscus rosa-sinensis</i> L.	Antuwanga, Gumamela	Ornamental, medicinal	Introduced
	<i>Gossypium hirsutum</i>	Gapas	Cotton fiber	Introduced

Table 1. Continuation.

Family	Scientific Name	Local Name	Economic Uses	Origin
Meliaceae	<i>Lansium domesticum</i> (Osbeck) Sahni & Bennet	Lanzones	Fruit	Introduced
	<i>Sandoricum koetjape</i> (Burm.f.) Merr.	Santol	Fruit	Native
	<i>Swietenia macrophylla</i> King	Mahogany	timber, firewood	Introduced
	<i>Melia dubia</i> Cav.	Bangalga, Baganga	Timber, firewood	Native
Menispermaceae	<i>Tinospora rumphii</i> Boerl	Panyawan	Baby weaning	Native
Moraceae	<i>Artocarpus heterophyllus</i> Lam.	Nangka	Fruit	Native
	<i>Artocarpus odoratissimus</i> Blanco	Marang	Fruit	Native
	<i>Artocarpus altilis</i> (Parkinson) Fosberg	Kolo	Fruit	Native
	<i>Ficus benjamina</i> L.	Balite	Ornamental	Native
Moringaceae	<i>Moringa oleifera</i> Lam.	Kalamunggay, Malunggay	medicinal, vegetable	Introduced
Muntingiaceae	<i>Muntingia calabura</i> L.	Mansanitas	Fruit	Introduced
Musaceae	<i>Musa paradisiaca</i> L.	Saging	Fruit	Native
Myrtaceae	<i>Psidium guajava</i> L.	Bayabas	Fruit	Introduced
	<i>Syzygium aqueum</i> Alston	Tambis	Fruit	Introduced
	<i>Syzygium cumini</i> (L.) Skeels.	Lomboy	Fruit	Introduced
	<i>Syzygium mallacense</i> (L.) Merr. & L.M.Perry	Makopa	Fruit	Introduced
Nyctaginaceae	<i>Bougainvillea spectabilis</i> Willd.	Bumbil	Ornamental	Introduced
Ochnaceae	<i>Ochna serrulata</i> (Hochst.) Walp.	Mickey Mouse	Ornamental	Introduced
Oleaceae	<i>Jasminum sambac</i> (L.) Aiton	Sampaguita	Ornamental	Native
Orchidaceae	<i>Arachnis flos-aeris</i> (L.) Rchb. f.	Spider Orchid	Ornamental	Native
	<i>Cattleya</i> Lindl.	Cattleya	Ornamental	Introduced
	<i>Dendrobium cf. fairchildiae</i>	Dendrobium	Ornamental	Introduced
	<i>Dendrobium anosmum</i> Lindl.	Sanggumay	Ornamental	Native
	<i>Oncidium cf. varicosum</i> Lindl.	Dancing Lady	Ornamental	Introduced
	<i>Phalaenopsis amabilis</i> (L.) Blume	Butterfly Orchid	Ornamental	Introduced
	<i>Spathoglottis plicata</i> Blume	Ground Orchid	Ornamental	Native
	<i>Vanda sandariana</i> Rchb.f.	Vanda	Ornamental	Native
Oxalidaceae	<i>Averrhoa bilimbi</i> L.	Iba	Spice/condiment	Introduced
	<i>Averrhoa carambola</i> L.	Balimbing	Fruit	Native
	<i>Oxalis regnellii</i> Miq.	Clover	Ornamental	Introduced
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb.	Pandan-humot	Condiment	Introduced
Passifloraceae	<i>Passiflora edulis</i> Sims	Valencia	Fruit	Introduced
Phyllanthaceae	<i>Securinega flexuosa</i> Muell.-Arg.	Anislag	Timber	Native
	<i>Sauropus androgynus</i> (L.) Merr.	Chinese Malunggay	Vegetable	Introduced
Piperaceae	<i>Piper nigrum</i> L.	Paminta	Spice/condiment	Introduced

Agrobiodiversity of home gardens in marginal upland Villages of Inopacan

Table 1. Continuation.

Family	Scientific Name	Local Name	Economical Uses	Origin
Poaceae	<i>Bambusa multiplex</i> (Lour.) Raeusch	Dwarf Bamboo	Ornamental	Introduced
	<i>Cymbopogon citratus</i> (DC.) Stapf	Tangad, Tanglad	Spice, Medicinal	Native
	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda	Lawn grass	Introduced
	<i>Saccharum officinarum</i> L.	Tabo	Sweet sap	Introduced
	<i>Saccharum spontaneum</i> Linn.	Bugang-tapol	Medicinal	Exotic
Polypodiaceae	<i>Nephrolepis cordifolia</i>	Lukdo-lukdo	Ornamental	Native
Portulacaceae	<i>Portulaca grandiflora</i> Hook.	Vietnam Rose	Ornamental	Introduced
Rosaceae	<i>Rosa sp.</i>	Rosas, Rose	Ornamental	Introduced
Rubiaceae	<i>Coffea arabica</i> L.	Kape	Coffee, firewood	Introduced
	<i>Ixora chinensis</i> Lam.	Yellow Santan	Ornamental	Introduced
	<i>Ixora coccinea</i> L.	Dwarf Santan	Ornamental	Introduced
	<i>Mussaenda philippica</i> L.	Dona Aurora	Ornamental	Native
Rutaceae	<i>Citrus grandis</i> Osbeck	Buongon, Pomelo	Vegetable	Native
	<i>Citrus madurensis</i> Lour.	Lemonsito	Condiment	Introduced
	<i>Citrus</i> L.	Sangkis	Fruit	Introduced
Sapindaceae	<i>Nepheleum lappaceum</i> L.	Rambutan	Fruit	Native
Sapotaceae	<i>Chrysophyllum cainito</i> L.	Caimito	Fruit	Introduced
Solanaceae	<i>Capsicum annum</i> L.	Atsal	Spice/condiment	Introduced
	<i>Capsicum frutescens</i> L. (<i>hot chili</i>)	Sili-gagmay	Spice/condiment	Introduced
	<i>Capsicum sp.</i> (<i>green chili</i>)	Sili-espada	Spice/condiment	Introduced
	<i>Solanum lycopersicon</i> L.	Kamatis	Spice/condiment	Introduced
	<i>Solanum melongena</i> L.	Talong, Tawong	Vegetable	Introduced
Sterculiaceae	<i>Theobroma cacao</i> L.	Cacao	Fruit, cocoa powder	Introduced
Tiliaceae	<i>Corchorus olitorius</i> L.	Saluyot	Vegetable	Introduced
Turneraceae	<i>Turnera ulmifolia</i> L.	Turnera	Ornamental	Introduced
Verbenaceae	<i>Duranta erecta</i> L.	Duranta	Ornamental	Introduced
	<i>Vitex parviflora</i> Juss.	Tugas	Timber	Native
	<i>Vitex negundo</i> L.	Lagundi	Medicinal	Native
	<i>Gmelina arborea</i> Roxb.	Yemane	Timber	Introduced
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	Sabila	Medicinal	Introduced
Zingiberaceae	<i>Etilingera elatior</i> (Jack) R.M. Sm.	Torch Ginger	Ornamental	Introduced
	<i>Zingiber officinale</i> Roscoe	Luy-a	Medicinal, Spice	Introduced
	<i>Curcuma longa</i> L.	Luy-ang Tapol	Medicinal	Introduced
	<i>Kaempferia galanga</i> L.	Kisol	Medicinal	Introduced
	<i>Alpinia elegans</i> (Presl.) Schum	Tagbak	Food, Ornamental	Native
	<i>Alpinia purpurata</i> (Vieill.) K. Schum.	Red Ginger	Ornamental	Introduced
	<i>Zingiber spectabile</i> Griff.	Yellow Torch Ginger	Ornamental	Native
Total no. of families: 74		Total no. of genera: 146	Total no. of species: 171	

Vertical stratification

Forty percent of the home garden plants grown were erect herbs, followed by trees (27%), shrubs (21%), herbaceous vines (8%) and epiphytes (4%) (Fig 3A). The diversity of species and growth forms shows that the home gardens in the marginal uplands of Inopacan generally exhibited a multi-layered or stratified vertical structure which somehow mimics a tropical forest structure. At the ground layer were erect herbs and creepers and above it was a shrub layer consisting usually of the shrubby ornamentals like the Ti plant (*Cordyline fruticosa*), San Francisco (*Codiaeum variegatum*), roses (*Rosa* spp.), Santan (*Ixora* spp.); vegetables like okra (*Abelmoschus esculentus*), eggplant (*Solanum melongena*) and other crop species. The tree layer consisted mostly of fruit trees such as jackfruit (*Artocarpus heterophyllus*), mango (*Mangifera indica*), tambis (*Syzygium aqueum*), cacao (*Theobroma cacao*) and some timber and reforestation species like yemane (*Gmelina arborea*) and narra (*Pterocarpus indicus*). The climbing species such as string beans (*Vigna unguiculata*), upo (*Lagenaria siceraria*), squash (*Cucurbita maxima*) and ampalaya (*Momordica charantia*) were usually supported by especially constructed trellises made of bamboo sticks or bamboo branching twigs which the locals called “kagingking”. Orchids consisting of vanda (*Vanda sanderiana*), dancing lady (*Oncidium* spp.) and several varieties of dendrobium (*Dendrobium* spp.) and other epiphytic species were either mounted on bamboo posts, on the wiry trunks of the tree fern *Cyathea contaminans*, or directly attached to the trunks of trees, as in the case of sanggumay (*Dendrobium anosmum*), a large beautiful native orchid.

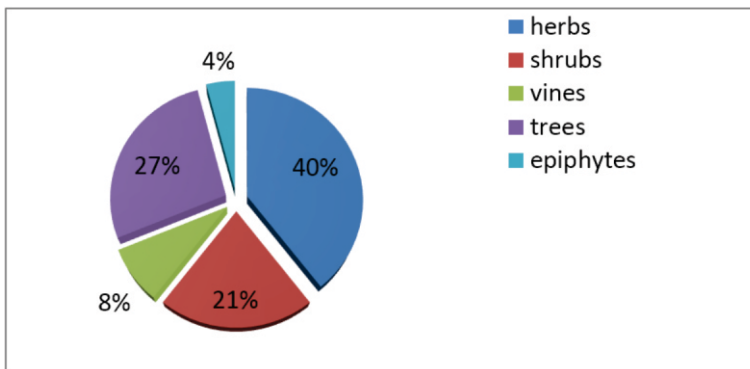


Fig. 3. Distribution of life forms in the home gardens

Economic Uses

It is interesting to note that majority of the species grown in the home gardens were ornamentals followed by fruit trees, medicinal plants, vegetables and species used as spices or condiments. The least species were the root crops. Crops intended for other uses like cacao as source of cocoa powder are represented only by a single species (Fig. 4 & Table 1).

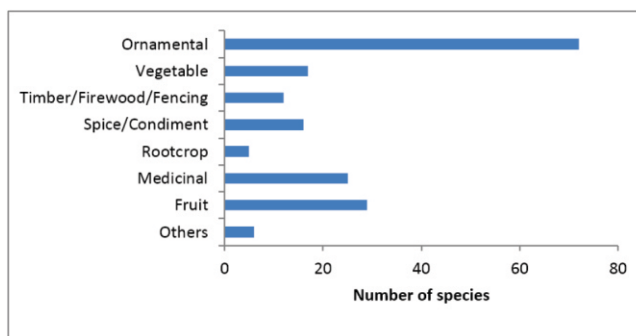


Fig. 4. Economic uses of plants cultivated in home gardens

Medicinal Plants

Due to distance from hospitals and the high cost of medicine, people in the marginal uplands grew plants in their home gardens for use as herbal medicine which they believed could alleviate or treat common illnesses like cough, fever, toothache, stomachache, loose bowel movement, sore eyes, hyperacidity and muscle pain. Table 2 shows the species of medicinal plants used by the respondents, the ailment/s being treated and the method of preparation.

In 75% the plant part used in 75% of the medicinal plant species, the leaves were the plant part used. Other less commonly used parts were the fruits, flower buds, young shoots, roots, bulb, bark, stem, rhizome and endosperm or meat (coconut). The leaves were usually prepared by first heating them over low flame, then crushing using the hands, and applying as poultice over the affected part (57%). Boiling the leaves in water and drinking the extract or decoction (51%), or simply putting fresh leaves in a cup of hot water for a few minutes to make an infusion (21%) were also commonly used methods of preparation. All preparations were done using fresh plant material. In the study of Busman and Sharon (2006), villagers

of the Lojo Province in Southern Ecuador utilized whole plants (61%), leaves (13%), flowers (6%), and seeds, roots, bark, fruits and latex (3%), for medicinal purposes.

The medicinal plant species documented were used to treat one to as many as seven ailments. Yerba Buena (*Mentha cordifolia*) is top of the list, reported by the respondents to cure ear infection, flatulence, muscle pain, stomachache, cough, hyperacidity and as an effective dewormer. Mayana (*Plechranthus blumei*) was reported to be a cure for five diseases, namely; cough, fever, red eyes, itchy eyes and for healing wounds. Guyabano (*Annona muricata*) was also used to treat simple ailments or discomforts like hyperacidity, loose bowel movement and flatulence, to more serious ones like cancer. The local folks mentioned that they also use guyabano to boost the immune system. The common Madre de Cacao or Kakawate (*Glericidia sepium*) was considered effective for wounds and fractures in humans as well as flea infestation, warts and skin diseases of goats, chicken and pigs, respectively.

Establishment and management of home gardens

Sources of planting materials

The planting materials used in home gardening were obtained from different sources (Fig. 5). More than half (58%) of the respondents got their planting materials for free, shared by relatives and friends. About a quarter (23%) simply gathered planting materials from their surroundings or collected from the wild. Only 14% purchased their planting materials and 5% obtained them in exchange for another plant found in their garden.

It seems evident that majority of those having home gardens did not prioritize purchase of planting materials in their family budget, especially for non-food plants like ornamentals. This is understandable as families living in the uplands mostly live below the poverty line so their priority must be their daily subsistence.

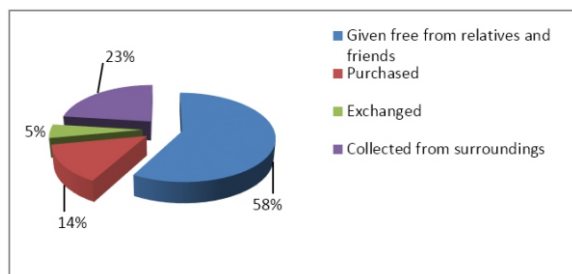


Fig. 5. Sources of planting materials for the home gardens

Table 2. Species of medicinal plants grown in the marginal uplands home gardens

Scientific name	Local name	Ailment (s) Treated	Plant Part Used	Mode of Preparation
<i>Artemisia vulgaris</i> L.	Hilbas	Cough, flatulence, muscle pain	Leaves	Slightly heat leaves over low fire. Crush leaves and rub on affected part.
		Painful urination	Whole plant	Boil leaves in water and drink the decoction.
<i>Plechranthus blumei</i> Benth.	Mayana/Manjana	Cough	Leaves	Boil leaves in water and drink the decoction.
		Fever	Leaves	Put leaves in a cup of hot water. Let it cool and drink the infusion. Alternatively, heat leaves over low fire, crush and apply as poultice on the forehead.
		Wound	Leaves	Slightly heat leaves over low fire. Crush and rub on the affected part.
		Red eyes	Leaves	Slightly heat leaves and place over infected eyes.
<i>Tradescantia spathacea</i> Sw.	Bangka-bangkaan	Fever from measles	Leaves	Crush leaves and squeeze the extract. Put a drop of extract to itching eye. Put leaves in a cup of hot water. Let it cool and drink the infusion.
<i>Persea americana</i> Mill.	Avocado	Loose bowel movement	Leaves	Boil leaves and drink the decoction.
		Hyperacidity	Leaves	Crush the leaves and rub on the stomach area.

Table 2 Continuation.

<i>Scientific Name</i>	Local Name	Ailment (s)/ Treatment	Plant Part Used	Mode of Preparation
<i>Citrus madurensis</i> Lour.	Lemonsito	Cough	Fruit	Put extracted juice in a cup of water, add a tablespoon of honey and drink it.
<i>Annona muricata</i> L.	Abana/Guyabano	Hyperacidity, Loose bowel movement, Flatulence	Leaves	Boil the leaves and drink the decoction.
		Cancer, Boost immune system,	Fruit	Boil the leaves and drink the decoction.
<i>Hibiscus rosa-sinensis</i> L.	Antuwanga	Boils, wound, skin rashes, sore eyes	Flower buds	Mash the flower buds and apply as poultice on the infected area.
<i>Musa</i> sp.	Saging	Boils	Pseudostem	Finely scrape the outer part of the pseudostem and apply as poultice on the affected part.
<i>Mikania cordata</i>	Vietnam, Asyang	Wound	Leaves	Crush the leaves and apply as poultice on the wounded area.
<i>Gliricidia sepium</i> (Jacq.) <i>Kunth ex Walp.</i>	Madre cacao	Wound	Leaves	Crush the leaves and apply as poultice on the wounded area.
		Fractures	Leaves	Crush the leaves and apply as poultice on the affected area.
		Fleas infestation in goats	Leaves	Crush or pound the leaves and rub on body of the goat.
		Warts of chicken	Leaves	Crush the leaves and put the extract on the warts.
		Skin disease of pigs	Leaves	Crush the leaves and rub on the affected part.
<i>Psidium guajava</i> L.	Guava	Wound	Leaves	Crush the leaves and put on the wounded part.
		Loose bowel movement, indigestion	Leaves	Boil the leaves and drink the decoction.

Table 2 Continuation.

Scientific Name	Local Name	Ailment (s)/ Treatment	Plant Part Used	Mode of Preparation
<i>Chrysophyllum cainito</i> L.	Caimito	Loose bowel, Flatulence, Hyperacidity	Leaves	Boil the leaves and drink the decoction.
<i>Saccharum spontaneum</i> L.	Bugang-tapol	Vomiting blood	Young fleshy shoot	Chew the young shoot and swallow the juice.
		Diabetes, high blood	young shoot	Cut the stem/culm into small pieces, boil in water and drink the decoction.
<i>Plechranthus aromaticus</i> Benth.	Karabo	Cough	Leaves	Boil the leaves and drink the decoction or crush slightly heated leaves and rub on the chest and back.
		Repelling mosquitoes	Leaves	Put freshly crushed leaves in a plate and let the smell diffuse out to repel mosquitoes.
<i>Moringa oleifera</i> Lam.	Kalamunggay	Wound	Leaves	Crush the leaves and apply as poultice on the wounded part.
<i>Sanseveira trifasciata</i> Hort. ex Prain	Espada-espada	Wound	Leaves	Squeeze out the juice and apply the extract on the wounded part.
<i>Cocos nucifera</i> L.	Lubi	Wound	Solid endosperm (meat)	Lightly scrape the soft surface of the coconut meat and apply as poultice on the wounded part.
<i>Kaempferia galanga</i> L.	Kisol	Dry cough	Bulb	Tie the bulb around the neck like a necklace.
<i>Allium</i> sp	Sibojing	Neck pain in children	Leaves	Slightly heat the leaves and extract the juice. Massage the extract on the neck.
<i>Mentha arvensis</i> L.	Menthol plant	Cough	Leaves	Chew the leaves to soothe the throat.
<i>Jatropha gossypifolia</i> L.	Tuba-tuba tapol	Flatulence	Leaves	Slightly heat the leaves and extract the juice. Massage the juice on the neck.

Table 2 Continuation.

Scientific Name	Local Name	Ailment(s)/ Treatment	Plant Part Used	Mode of Preparation
<i>Jatropha curcas</i>	Tuba-tuba	Stomachache	Leaves	Slightly heat the leaves over low flame and spread on the stomach area.
<i>Hyptis suaveolens</i> (L.) Poit	Albahaka	Stomach pain, Loose bowel movement	Roots	Boil the roots and drink the decoction.
		Wound	Leaves	Crush the leaves and apply as poultice on the wounded area.
<i>Kalanchoe pinnata</i> (Lam.) Pers.	Hanlilika/Katakataka	Boil, Toothache	Leaves	Crush the leaves and put it over the boil or the aching tooth.
<i>Adiantum sp.</i>	Lamon-lamon	Infected wound	Leaves	Crush leaves and apply as poultice on the infected wound.
<i>Lagerstroemia speciosa</i> (L.)Pers.	Banaba	Kidney infection	Leaves	Boil 7 mature leaves in 7 glasses of water and drink the decoction.
<i>Syzygium cuminii</i> (L.) Skeels	Lomboy	Toothache	Bark	Boil the bark for 15 min and drink the decoction.
<i>Cymbopogon citratus</i> (DC) Stapf.	Tangad	High blood	Leaves	Boil the leaves and drink the decoction.
		Ear infection	Leaves	Slightly heat the leaves and insert into the outer part of the ear.
<i>Mentha cordifolia</i> Opiz	Yerba Buena	Flatulence, body pain, stomachache	Leaves	Crush the leaves and rub on affected part.
		Cough, Hyperacidity	Leaves	Put the leaves in a cup, pour hot water. Let it cool and drink the water/infusion.
		Stomach worms	Leaves	Put the leaves in a cup, pour hot water. Let it cool and drink the water/infusion.
<i>Colocasia esculenta</i> (L.) Schott	Gabi	Wound	Petiole	Scrape the surface of the petiole and apply as poultice on the wounded part.

Table 2 Continuation.

Scientific Name	Local Name	Ailment (s)/ Treatment	Plant Part Used	Mode of Preparation
<i>Tinospora rumphii</i> Boerl.	Panyawan	Anemia	Stem	Cut the stem into pieces and boil in water. Mix the extract in the water for bathing.
		Stomachache	Stem	Cut the stem into pieces and boil in water. Drink the water.
		Weaning of babies	Stem	Rub the stem sap on the mother's nipple.
<i>Alpinia purpurata</i> (Vieill.) K. Schum.	Luy-a tapol	Body pain	Rhizome	Pound the rhizome and rub on affected part.
		Hoarse throat	Rhizome	Get a slice of the rhizome and use it like candy.
		Cough	Rhizome	Pound the rhizome and rub on the chest and back.
<i>Orthosiphon aristatus</i> (Blume) Miq	Balbaspusa	Kidney infection	Leaves	Boil the leaves and drink the decoction.
		Cough, fever	Leaves	Boil the leaves and drink the decoction.
<i>Bixa orellana</i> L.	Atsuete	Flatulence, fracture	Leaves	Spread fresh leaves on the affected part.
<i>Centella asiatica</i> L.	Jahong-jahong	Fever	whole plant	Put whole plant in a glass of warm water and drink the water.
<i>Euphorbia nerifolia</i> L.	Suro-suro	Pierced by a nail or other sharp objects	stem and leaves	Put a drop of plant sap on the affected part for 4 days
<i>Blumea balsamifera</i> (L.) DC	Gabon	Flatulence	Leaves	Boil the leaves and drink the decoction.
		Kidney infection	Leaves	Put whole plant in a glass of warm water and drink the water.
<i>Urena lobata</i>	Daupang	Wound in animals	Leaves	Pound the leaves and extract the juice. Use the extract to clean the wound.

Mode of cultivation

The locals used different methods of putting up their home gardens (Fig. 6A). About half of them (46%) did plotless planting or direct planting in the soil. Species like malunggay (*Moringa oleifera*), ornamental plants like santan (*Ixora* spp.) periwinkle or kumintang (*Catharanthus roseus*), bombil (*Bougainvillea spectabilis*) and golden duranta (*Duranta erecta*) and other tree species were usually planted using this method. About the same number of respondents used containers such as clay or plastic pots, polyethylene or ordinary recycled plastic bags while some recycled empty milk cans and similar containers. Vegetables like spring onions (*Allium fistulosum*) and ornamental plants like roses, bromeliads and cactuses were usually raised using this method. Only 7% of the respondents grew their plants in raised plots and was usually done for vegetables, especially if a portion of the harvested products was sold in the local market. Pechay (*Brassica rapa*), tomatoes (*Solanum lycopersicum*), bell pepper (*Capsicum annuum*) and eggplant (*Solanum melongena*) were the common plants grown in raised plots.

More than half (62%) of the respondents grew plants in home gardens for home consumption. About a third (35%) did it as source of additional income for the family while only 5% did it to beautify their surroundings (Fig. 6B). Cultivating the home gardens was mostly a family affair with members of the family providing labor (96%) and only a very small percentage (4%) hired laborers (Fig. 6C). The time the family members spent together in the garden helped build stronger family ties. Almost all of them (89%) did not apply fertilizer (Fig. 6D), and those who did used organic fertilizer (87%) derived from composted plant debris or animal manure such as chicken dung or goat manure (Fig. 6E). Since home gardens usually involved only small patches of land mostly used to provide additional food for daily subsistence, the family would use every opportunity to use free labor and production materials that are locally available and cost-free.

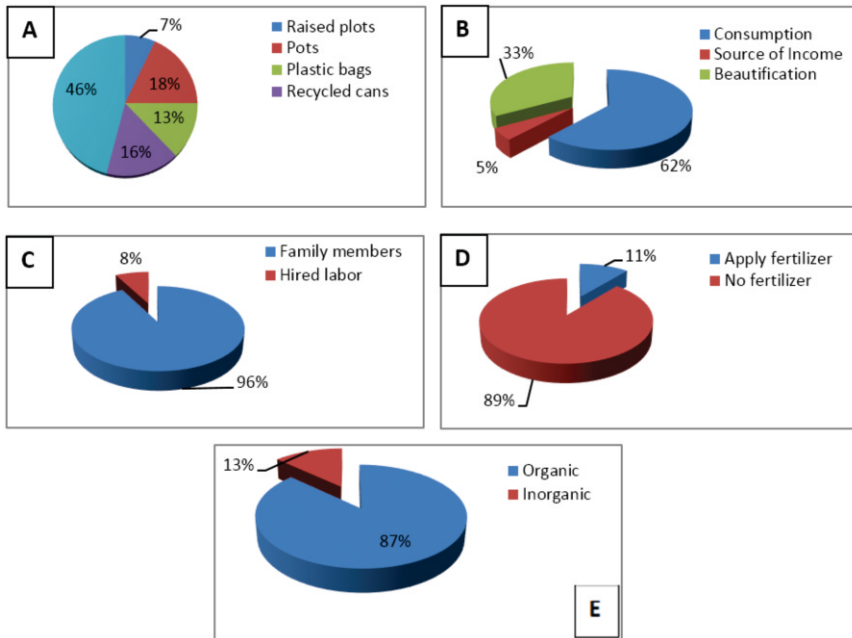


Fig. 6. Method of planting (A), reason for cultivating (B), source of labor (C), fertilizer application (D) and type of fertilizer used (E)

CONCLUSION AND RECOMMENDATIONS

Cultivating a home garden has indeed become an important subsistence and coping strategy of upland villages especially in the highly vulnerable marginal uplands. Based on this study, the home gardens of Inopacan, Leyte, contain a great diversity of species and varieties which the locals collect through donations, exchange and collection from their surroundings. The more personalized management of the gardens by family members further make home gardening an effective strategy for biodiversity conservation. Thus, the importance of home gardening in the conservation of biodiversity, especially for economically important species, should be given preferential attention in the present global efforts to halt or at least reduce biodiversity loss. However, there is need to effectively educate local villages on the importance of native species because of the continued patronage of exotic or introduced species, which can have drastic effects to the environment.

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