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Community Tree Species Preferences in Zambales, Philippines

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Abstract

Reforestation and reforestation efforts are generally dependent on the species recommended by the government. In the Philippines, most reforestation activities use *Gmelina arborea*, *Acacia mangium*, and *Swietenia macrophylla* due to their usual economic returns. Thus, the use of native species is less favored over exotic species. This paper considered the species preferences of the local community as involved in reforestation activities in Zambales. Assessment of the stakeholders' preferences was based on a listing of species given by the respondents and community perceived benefits or uses. Familiarity of the respondents with the species presented to them was also considered in the analysis.

Keywords

Native Species, Species Preferences, Restoration, Zambales

1. Introduction

Reforestation using native trees is a promising idea. Native trees constitute every basic foundation of any forest ecosystem. Countless centuries of evolution through natural selection have given them the adaptability to their respective local environments. According to Lantican (nd), native trees for reforestation are good because they possess the natural ability to recover from damage caused by pests and diseases and even turbulent weather. The said species also help in restoring the natural habitats of various wildlife species. Also, native tree species are likely not to become invasive.

In response, government programs aimed at reforestation and the protection of remaining forests were created. Many countries in Southeast Asia imposed logging bans on natural forest lands, phased out large timber operations, and created

large-scale government reforestation programs and community forestry programs [1].

Between 1985 and 1997 the percent of total protected areas increased from 4% to 9% worldwide, and community forestry systems were widely adopted to produce locally required resources and reduce pressures on harvesting the remaining natural forests [2] [3]. Community forestry programs worldwide increased by 70% to approximately 250M hectares between 1985 and 2008 [2] [3].

According to FAO (2014) as cited by Chechina & Hamann (2015), in large-scale reforestation and restoration projects, native trees are preferred. However, the use of native species in such projects receives less support due to a lack of technical and regeneration knowledge on such species. In the Philippines, the use of native species has been promoted positively over exotic species as part of reforestation efforts due to the introduction of "rainforestation farming".

In general, understanding the perspective of the local forest stakeholders on the use of native species in restoring denuded and marginal forest ecosystems, particularly in Zambales, Philippines is a must. This understanding may be done by 1) documenting the tree species preferences of local forest stakeholders; 2) determining the ecological status of the tree preferences; 3) documenting the perspective of local forest stakeholders on native species; and 4) identifying the factors that dictate the preferences of the local forest stakeholders.

2. Materials and Methods

A survey on local knowledge about tree species by the local community was conducted through survey questionnaires. The survey was intended with open-ended questions about the forest and its uses. The questionnaire was given to community members who were identified as forest stakeholders and/or members of the people organization (PO) contractors. These community members were useful because they were forest dependents. These groups of locals may not embody a completely impartial sample of the preferences of the local forest-dependent population. However, they have provided a chance to efficiently gather a local knowledge base on social preferences and uses of local tree species.

The questionnaires were given during the coordinated field visits. Part of the questionnaire was to require respondents to list tree species that they perceived are important. The respondents listed local names of tree species that they considered were important and identified their uses such as source of food, lumber, firewood, medicine, and charcoal making or to the forest for general ecological observations (for example, use of fruit trees by wildlife). Local names were later matched with their scientific name and family using the online references such Flora Malesiana Series, Co's Digital Flora of the Philippines [4] and Guide to Philippine Flora and Fauna [5].

In addition to the distributed survey questionnaire, social preferences were obtained using FGDs and key informant interviews (KII) were used in interviewing the key informants. Analyzing their experiences gave the author an in-depth description of their preferences through their experiences.

3. Results and Discussion

3.1. Composition of Preferred Tree Species

Surveys of social importance of native species as a reforestation species resulted in 22 tree species as mentioned by survey participants. Based on the interview, the species mentioned by the respondents were *Casuarina equisetifolia*, *Albizia procera*, *Acacia auriculiformis*, *Lagerstroemia speciosa*, *Psidium guajava*, *Syzygium cumini*, *Eucalyptus deglupta*, *Gmelina arborea*, *Annona reticulata*, *Instia bijuga*, *Leucaena leucocephala*, *Diospyros discolor*, *Anacardium occidentale*, *Shorea* sp., *Swietenia macrophylla*, *Acacia mangium*, *Vitex parviflora*, *Artocarpus heterophyllus*, *Pterocarpus indicus*, *Sandoricum koetjape*, *Ficus nota and Afzelia rhomboidea* species. Due to respondents' limited knowledge on the difference between red lauan (*Shorea negrosensis*) and white lauan (*Shorea contorta*), these species were identified as *Shorea* sp. (Table 1).

Table 1. Tree species mentioned by respondents with their ecological status, Zambales, Philippines.

Family	Local Name	Scientific Name	N	A
ANACARDIACEAE	Kasoy	*Anacardium occidentale*		+
ANNONACEAE	Guyabano	*Annona reticulata*		+
CASUARINACEAE	Agoho	*Casuarina equisetifolia*	+	
DIPTEROCARPACEAE	Lauan	*Shorea* sp.	+	
EBENACEAE	Kamagong	*Diospyros discolor*	+	
FABACEAE	Acacia	*Acacia auriculiformis*		+
FABACEAE	Akleng Parang	*Albizia procera*	+	
FABACEAE	Ipil-ipil	*Leucaena leucocephala*		+
FABACEAE	Ipil	*Instia bijuga*	+	
FABACEAE	Mangium	*Acacia mangium.*		+
FABACEAE	Narra	*Pterocarpus indicus.*	+	
FABACEAE	Tindalo	*Afzelia rhomboidea*	+	
LAMIACEAE	Yemane	*Gmelina arborea.*		+
LAMIACEAE	Molave	*Vitex parviflora*	+	
LYTHRACEAE	Banaba	*Lagerstroemia speciosa*	+	
MELIACEAE	Mahogany	*Swietenia macrophylla*		+
MELIACEAE	Santol	*Sandoricum koetjape*	+	
MORACEAE	Nangka	*Artocarpus heterophyllus*		+
MORACEAE	Tibig	*Ficus nota*	+	
MYRTACEAE	Bayabas	*Psidium guajava*		+
MYRTACEAE	Duhat	*Syzygium cumini*		+
MYRTACEAE	Bagras	*Eucalyptus deglupta*	+	

Note: N = native species; A = alien/exotic species.

By matching these species with their scientific names, the said species represented 22 genera from 11 families namely Anacardiaceae, Annonaceae, Casuarinaceae, Dipterocarpaceae, Ebenaceae, Fabaceae, Lamiaceae, Lythraceae, Meliaceae Moraceae and Myrtaceae. Among the families, seven species are from Fabaceae, two species from each family of Lamiaceae, Meliaceae, Moraceae and Myrtaceae while the rest of the plant families have one species.

In the Philippines, reforestation efforts have been dominated by exotic timber species such as *Gmelina arborea*, *Acacia mangium*, and *Swietenia macrophylla*. The use of exotic timber species is driven by the need to generate an economic return on investment, as well as by the general lack of knowledge about how to cultivate some native trees. One of the main reasons why people have not tried using native species for forest restoration is that it is easier to use readily available and well-known exotic, site-generalist species.

However, in this study, there were at least 12 species (54.55%) that were identified as native species while 10 species (45.45%) were identified as alien or exotic species (**Figure 1**). The identified native species were *Casuarina equisetifolia*, *Shorea* sp., *Diospyros discolor*, *Albizia procera*, *Instia bijuga*, *Pterocarpus indicus*, *Afzelia rhomboidea*, *Vitex parviflora*, *Lagerstroemia speciosa*, *Sandoricum koetjape*, *Ficus nota* and *Eucalyptus deglupta*. While *Anacardium occidentale*, *Annona reticulata*, *Acacia auriculiformis*, *Leucaena leucocephala*, *Acacia mangium*, *Gmelina arborea*, *Swietenia macrophylla*, *Artocarpus heterophyllus*, *Psidium guajava* and *Syzygium cumini* were identified as exotic species. All the identified native species were found in the ecological sample plots evaluated in this study.

Among the preferred species, *Leucaena leucocephala*, *Artocarpus heterophyllus* and *Pterocarpus indicus* were the most mentioned by the respondents (**Table 2**). These species were opted to be planted in their respective tenured forestlands. These species were deemed to be more adaptable. Accordingly, the species were considered to be sources of fuelwood in their areas and *Leucaena leucocephala* is the most preferred species for fuelwood [6]. These preferred species are easy to propagate and grow, which is the main reason why the POs readily and widely accepted and planted these species in their area. *Acacia auriculiformis* and *Acacia mangium* species, which are two of the common introduced reforestation species, were only preferred next to *Leucaena leucocephala*, *Pterocarpus indicus* and *Artocarpus heterophyllus*. The least mentioned species were *Psidium guajava* and *Instia bijuga*.

The most popular reforestation species *Acacia auriculiformis*, *Gmelina arborea*, *Acacia mangium* and *Swietenia macrophylla* were still identified and opted not to be replaced due to readily available seedlings and are also considered to be adapted in their respective areas. Similar results were obtained by Mangaoang & Pasa (2003), where common exotic species were also considered by farmers in Leyte to have high utility, namely *Gmelina arborea*, *Swietenia macrophylla* and *Leucaena leucocephala*.

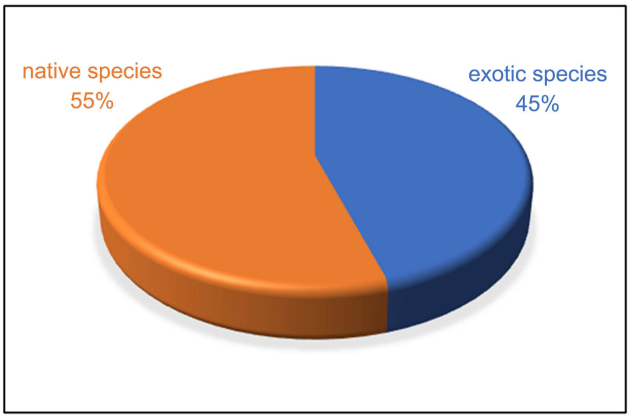

Figure 1. Native and exotic species distribution of socially-preferred species, Zambales, Philippines.

Table 2. Frequency of species as mentioned by the respondents, Zambales, Philippines.

Species	Frequency	Percentage
Leucaena leucocephala	32	8.77
Artocarpus heterophyllus	31	8.49
Pterocarpus indicus	30	8.22
Acacia auriculiformis	23	6.30
Acacia mangium	23	6.30
Diospyros discolor	21	5.75
Albizia procera	20	5.48
Gmelina arborea	19	5.21
Ficus nota	19	5.21
Annona reticulata	17	4.66
Vitex parviflora	15	4.11
Casuarina equisetifolia	14	3.84
Swietenia macrophylla	14	3.84
Lagerstroemia speciosa	13	3.56
Eucalyptus deglupta	12	3.29
Shorea sp.	12	3.29
Sandoricum koetjape	12	3.29
Afzelia rhomboidea	9	2.47
Syzygium cumini	8	2.19
Anacardium occidentale	8	2.19
Instia bijuga	7	1.92
Psidium guajava	6	1.64

Swietenia macrophylla and *Gmelina arborea* can be used for house construction and furniture-making. However, it should be noted that some respondents

less prefer *Swietenia macrophylla* since it limits undergrowth compared with *Pterocarpus indicus* where wildlings can survive undergrowth. *Acacia auriculiformis* is also less preferred by some respondents due to its low survival rate compared with other species. According to the respondents, *Pterocarpus indicus* and *Gmelina arborea* were observed to have the ability survive even after reforestation areas were burned. On the other hand, *Gmelina arborea* is less preferred over *Pterocarpus indicus* due to its complex seed extraction and seedling propagation. *Ficus nota* and *Albizia procera* species were favored because of its assumed capability to conserve water. Furthermore, *Ficus nota* is preferred to be planted along creeks in order to control erosion along the streambanks. *Shorea* sp. species was also considered but respondents failed to identify if it is *Shorea negrosensis* or *Shorea contorta*. The consideration to these species was due to the species' good wood quality for construction and furniture and is described as "hard wood".

3.2. Perceived Benefits of Preferred Species

Species preference of the local community is dictated by the perceived benefits derived from the tree species (Table 3). These benefits were based on perceived economic and ecological importance to the respondents. The perceived uses identified for the species were for construction, furniture, fuelwood, posts, tool handles and fruits.

Based on the results of the survey, there were six types of uses namely: construction, furniture, fuelwood, posts, tools and fruit sources. *Pterocarpus indicus* has the highest total number of mentioned uses (23). Next to *Pterocarpus indicus* were *Leucaena leucocephala* and *Artocarpus heterophyllus* with 20 mentioned uses while *Afzelia rhomboidea* has the least total number of mentioned uses. *Afzelia rhomboidea* has been identified to be used for furniture only.

According on the respondent's perception, *Diospyros discolor* and *Vitex parviflora* have the highest identified functional uses compared with other species. Respondents find *Diospyros discolor* and *Vitex parviflora* to be useful as raw materials for construction, as posts poles, tool handles and as fruit source. Four of the preferred species namely: *Eucalyptus deglupta*, *Gmelina arborea*, *Shorea* sp. and *Pterocarpus indicus* have been perceived to provide three uses. Perceived uses of these species were for construction, as furniture and tool use. *Acacia auriculiformis* and *Afzelia rhomboidea* were only identified as raw material for furniture while *Ficus nota* was associated only as source of fuelwood.

About 27.66% or 13 of the mentioned species were selected because it is perceived to be useful as fuelwood while 17.02% or eight species were mentioned because of the quality of their wood for furniture and tool handles, 14.89% or seven species for fruits, 12.77% or six species for construction purposes and 10.64% or five species for poles (Table 4). Based on these results, local communities prefer species that can benefit them in a short period of time. Species that can be used for constructions are good but it will require longer period before these can be utilized.

Table 3. Perceived uses of respondents' preferred tree species, Zambales, Philippines.

Species	Uses						Count	
	Cons	Furn	Fuel	Posts	Tool	Fruits	NU	TU
Pterocarpus indicus	8	12	3	0	0	0	23	3
Leucaena leucocephala	0	0	18	2	0	0	20	2
Artocarpus heterophyllus	0	0	0	0	0	20	20	1
Acacia mangium	0	11	6	0	0	0	17	2
Acacia auriculiformis	0	16	0	0	0	0	16	1
Albizia procera	0	0	10	0	4	0	14	2
Instia bijuga	0	0	8	0	6	0	14	2
Diospyros discolor	3	0	0	7	2	2	14	4
Vitex parviflora	4	7	1	0	2	0	14	4
Ficus nota	0	0	13	0	0	0	13	1
Shorea sp.	6	3	0	1	0	0	10	3
Gmelina arborea	5	6	1	0	0	0	12	3
Annona reticulata	0	0	0	0	0	11	11	1
Casuarina equisetifolia	0	0	8	2	0	0	10	2
Anacardium occidentale	0	0	4	0	0	4	8	2
Syzygium cumini	0	0	0	0	1	6	7	2
Eucalyptus deglupta	0	0	2	4	1	0	7	3
Swietenia macrophylla	3	4	0	0	0	0	7	2
Lagerstroemia speciosa	0	0	5	0	1	0	6	2
Psidium guajava	0	0	2	0	0	4	6	2
Sandoricum koetjape	0	0	0	0	1	5	6	2
Afzelia rhomboidei	0	5	0	0	0	0	5	1

Note: Cons = construction; Furn = furniture; Fuel = fuelwood; Tool = tool use; NU = total number respondents that mentioned the uses; TU = number of types of uses.

Table 4. Number of preferred species associated with perceived uses, Zambales, Philippines.

Uses	Number of Species	Percentage
Fuelwood	13	27.66
Furniture	8	17.02
Tools	8	17.02
Fruits	7	14.89
Construction	6	12.77
Posts/Poles	5	10.64

3.3. Ranked Socially-Preferred Tree Species

The importance was ranked by combining the number of uses noted by respondents, the number of respondents that mention the species [3] and the number of types of uses that was associated to the tree species. The highest-ranking trees are those that have several uses and were mentioned by many people as important to the community.

Species listed by the respondents when ranked, showed that the most preferred species was Pterocarpus indicus, a native species. *Pterocarpus indicus* has the highest computed rank followed by *Leucaena leucocephala* and *Artocarpus heterophyllus* while *Psidium guajava* was least preferred. Based from the results of interviews with members of the people's organization, selection and identification of tree species was primarily based on perceived ecological and economic usefulness of the species. It should be noted that only about 26.67% or 12 of the respondents are familiar about the classification as native or non-native species while majority of the respondents (73.33% or 33 respondents) are not familiar. Identification of most preferred species were not based on whether it is native or not.

Natural regeneration of native trees on field is usually managed and protected as a source of high-quality posts and lumber for house construction. It should be noted that natural regeneration is important for soil conservation particularly in steep slopes on forestlands.

According to Mangaoang & Pasa (2016), the study of Patindol (1998) on local knowledge on trees revealed similar results, particularly in relation to species preferred by farmers for construction, furniture, fuelwood, and poles and posts. In a same study conducted on tree species preferred for fuelwood, preference for tree species was not well-defined; the farmers appearing to simply gather whatever trees are conveniently available. *Pterocarpus indicus* for example, a premium species with high value for furniture production, is used by farmers as fuelwood.

Most of the uses identified by the respondents are on provisioning and partly on regulating services of the forest ecosystems. This is the reality that people tend to look at what benefits them the most. The familiarity of the community on the tangible and direct products extracted from the forest is based on whether these can be used or sold.

Results of the survey on using native species for reforestation are affected by tenurial security. Respondents tend to plant cash crops and tree species that can be harvested in a short time. The security in tenure determines their enthusiasm to manage and protect natural regeneration. The tenure serves as assurance that the benefits from trees will accrue to the respondents after years of maintenance.

The type of land-use system also influences the location of cultivated trees. For agroforestry projects, important native fruit trees are planted, protected, and managed in various locations—within and along borders of the project sites. Food and cash crops, however, are raised in relatively open areas, whenever

possible. The respondents are aware that certain project location is not suitable for cash crop planting due to slope, terrain, and rock formations. Another factor that hinders some of the respondents to plant native species is the availability of seedling materials. *Shorea* sp. were identified for planting but the lack of planting materials and the difficulty to raise these species hinders its planting in the project areas. It would have been beneficial to the PO if the government could assist them to look for sources and ensure their technical know-how on the said species.

4. Conclusion

Most members of the local community preferred the use of native species to be planted in their tenured forestlands over exotic species due to their cultural beliefs and experiences. According to the local people, native species are more adaptable in the area since they are naturally growing trees in the area and are already adjusted to the environment of the province. Native species conserve more water compared with exotic species. Furthermore, native species attract more wildlife fauna and allow undergrowth. Restoration projects would be more efficient in using the native species because of the undergrowth that can serve to reforest other upland areas. If given a chance and enough time, available native species will be preferred over non-native species listed in their contracts. Most of the identified native species show more positive growth in the sampled study areas.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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