

## Community-based Assessment on the Plant Resource Utilization of Mt. Maculot, Cuenca, Batangas, Philippines

Jethro Arsenio<sup>1</sup>, Melanie Medecilo<sup>1</sup>, Edna Mercado<sup>2</sup>, Esteban Salibay, Jr.<sup>3</sup> and Felinore Angelica Valera<sup>3</sup>

<sup>1</sup>Faculty, Biological Sciences Department, College of Science, DLSU-D, Dasmariñas, Cavite, Philippines

<sup>2</sup>Faculty, Mathematics Department, College of Science DLSU-D, Dasmariñas, Cavite, Philippines

<sup>3</sup>Faculty, Religious Education Department, College of Education, DLSU-D, Dasmariñas, Cavite, Philippines

**Abstract.** The plant resource utilization by the local communities in Mt. Maculot was studied. Questionnaires and personal interview were used to assess the utilization by the local people regarding the plant species in their area. Questionnaires were given to 160 respondents in five barangays around Mt. Maculot, namely: Pinagkaisahan, San Isidro, Barangay 7, Don Juan, and Dita. This research was carried out to assess the socio-economic status of the local community and identify the economically important plants. Economic plants mentioned by respondents were categorized into food, medicine, timber and ornamentals. Results of the study showed that the economically important plants include food (64.21 %) which ranks as the major utilization of plant resources in the area and the most important food plants are *Mangifera indica*, *Cocos nucifera*, *Colocasia esculenta*, *Musa sapientum*, *Dioscorea alata*, and *Manihot esculenta*. Other uses of the plant resources are: medicinal plants (47.37%), ornamental plants (13.68%) and plants utilized either for timber (3.16%), firewood (2.10%), and handicraft (1.05%). *Mangifera indica* L. and *Cocos nucifera* L. were plants identified by the local communities having multiple uses such as food, medicine, timber and firewood.

**Keywords:** Economically- important plants, local community, Mt. Maculot, Philippines

### 1. Introduction

Mt. Maculot is one of the few remaining forests of the Philippines. It is one of the most popular mountaineering destinations located in Batangas with 73 km distance southward of Manila, and has coordinates of 13°55.241'N latitude and 121°02.513'E longitude. The altitude ranges from 200 to 963 masl. It serves as a watershed of the town, windbreaker shielding the town harsh winds from the north and has rich biological diversity that inhabits plants and wildlife. Though there is no record of the exact area, the mountain has a vast forest/plant cover.

The mountain range lies within the municipality of Cuenca, Batangas and it is bounded by five barangays namely: Pinagkaisahan, Barangay 7, San Isidro, Don Juan and Dita. Most of the residents of the five barangays are natives of the place. Those who live near and along the mountains are engaged in farming, and those who reside near the lake take fishing as their means of livelihood.

Conservation of a wide variety of plant species can be justified on the grounds that since they are of direct economic importance to humans, a program for their sustainable use must therefore be initiated. Hence, the study aimed to assess the socio-economic status of the local community and identify the economically-important plants and their uses as specified by the respondents living around Mt. Maculot, Cuenca, Batangas, Philippines.

### 2. Methodology

Five barangays around Mt. Maculot namely: Pinagkaisahan, San Isidro, Barangay 7, Don Juan, and Dita were selected as study sites. The respondents consisted of one hundred sixty one (161) individuals from the five barangays. There were 32 respondents in Brgy. Pingkaisahan, 28 respondents in San Isidro, 36 respondents in Brgy. 7, 16 in Brgy. Don Juan, and 48 in Brgy. Dita. The age range of the respondents was above 18-70 years old of which 116 (72.5%) are female respondents while 44 (27.5%) were males. Prior Informed Consent (PIC) was obtained from the municipal government, through the office of the mayor.

The field study employed the descriptive method using a survey questionnaire to assess the status of floral species used by the respondents in Mt. Maculot, Cuenca, Batangas. This provides a description of the economically- important plants and their uses. The first part of the questionnaire included socio-economic information about the respondents, and the second part pertained to the uses of the plant species, and local conservation initiatives done by the local community. A survey instrument was made which included counting and identification of plants used as food, non-timber forest products ornamentals and medicinal. It also included important demographic variables of the selected respondents.

Vouchers specimens were collected for the plant species mentioned by the respondents. All plants were preliminary identified and further verified in the Philippine National Herbarium, National Museum, Manila, Philippines.

### 3. Results and Discussion

The five barangays have approximately 1,611 families residing along Mt. Maculot, Cuenca, Batangas. The respondents claim that within the Barangay, most of the residents are related to each other either by consanguinity or affinity. Among the study groups, 10 (6.21 %) families have 10 children or more while 22 (13.66 %) have children ranging from 7-9. A total of 69 (42.86%) families have children of 4-6 and 48 (29.81%) have 1-3 child/children, 12 (7.45%) have no children. Majority of the families are professed Christians dominated by Roman Catholics. Although education is very important to the respondents, majority of them (73) finished elementary level only, 48 respondents finished high school, and only 36 respondents were college graduates and 4 respondents obtained a vocational course.

The local community in Maculot, Cuenca, Batangas is a typical rural Filipino family characterized by close family ties and are very religious (Panopio and Raymundo 2004; Jocano 1998). Hence, the Philippines is well-known as religious people and the bulk of Filipino population are Roman Catholics. Such beliefs have influenced their lifestyle such that most respondents do not practice unnatural family planning as recommended by the church. This is reflective of the number of children that majority of the married respondents have. In addition, in rural areas, it is ideal to have a large number of children as locals consider this as a means of getting more help in accomplishing farming activities. They also believed that more hands increase the chance of feeding the family and will alleviate their life.

There are 13 (8.07%) respondents who are skilled workers (carpenter, driver, construction worker and beautician) while 17 or 10.56% were employed such as office work, teacher, barangay health worker, laborer, barangay *tanod*. Unemployed comprised 56 or 34.78% respondents. Among of these respondents are wives and are usually left in the house to take care of the children and to do household chores. The remaining unemployed males also took care of their children while their wives are working. About 75 or 46.58% were self-employed whose occupations include farming, fishing, food and general merchandizing, poultry raising within the vicinity of Mt. Maculot.

Among the self-employed, most of them are farmers who own varying parcel of lands. Majority of the respondents (59.63%) owned a lot area below 250 m<sup>2</sup>, and 13.04% owned 250-500. One family owned 501-750m<sup>2</sup> lot, while 3.73% owned 751-1000sq.m. lot, and 22.98% owned 1000 sq. m and above. Despite varying land distribution, the farmers generally have the same agricultural produce for income generation and consumption either as food or medicine. This is because they share their resources among themselves. Other resources are for ornamentals and timber production.

The economic status of the farmers in the Philippines is generally, categorized either in the marginal or poverty level (Hornedo 1997; Montemayor 1969). This is also manifested in the local community of Mt. Maculot. In fact, their failure to finish schooling was attributed to their financial problems. Just like the

other poor families both in rural and urban areas, these people prioritize food. Such condition clamored many Filipino farmers for genuine land reform and national industrialization as integral factors for breaking the persistence of large feudal holdings and realizing Filipino-owned industrialization in order to raise the level of economic development and change social relations for the better.

### Utilization of Plants

A total of 94 species belonging to 82 genera and 47 families were mentioned by the respondents as economically important plants. Among the 94 species mentioned, 63 species or 67% were categorized as food, 41 species or 43.6% were categorized as medicinal and 14 species or 14.89% were ornamental and 3 species or 3.19% were categorized as timber species. Among the food sources are fruits, vegetables, root crops, and grains. Most of the plant species have more than one economic value owing to the fact that most parts of the plant have economic value. The local people of Mt. Maculot also used species of plants with economic importance and are used for housing construction, ornamentals and raw materials for handicraft like mat-weaving. With the number of different species mentioned by the local people of Mt. Maculot, food and medicine have been identified as the most valued economically (Table 1). Other species mentioned are used as timber, firewood and construction wood and ornamental plants. All species mentioned are common and are planted in their backyards. Some of them generated their income from the crops produced in the farm.

Table 1. List of Economically-Important Plants Mentioned by Respondents

LOCAL NAMES	SPECIES	FAMILY	USES*
Sibuyas	<i>Allium cepa</i> L.	Alliaceae	F,M
Lirio	<i>Crinum latifolium</i> L.	Amaryllidaceae	M,O
Mangga	<i>Mangifera indica</i> L.	Anacardiaceae	F,M,T
Anonas	<i>Annona reticulata</i> L.	Annonaceae	F
Atis	<i>Annona squamosa</i> L.	Annonaceae	F
Guyabano	<i>Annona muricata</i> L.	Annonaceae	F
Gabi	<i>Colocasia esculenta</i> (L.) Schott & Endle	Araceae	F
Kaong	<i>Arenga pinnata</i> (Wurmb) Merr.	Arecaceae	F
Niyog	<i>Cocos nucifera</i> L.	Arecaceae	F,M,T
Sambong	<i>Blumea balsamifera</i> (L.) DC.	Asteraceae	M
Alibon	<i>Blumea balsamifera</i> (L.) DC.	Asteraceae	M
Kamaria	<i>Artemisia vulgaris</i> L.	Asteraceae	M
Mansanilya	<i>Chrysanthemum indicum</i> L.	Asteraceae	M,O
Mustasa	<i>Brassica juncea</i> (L.) Czern.	Brassicaceae	F
Petchay	<i>Brassica chinensis</i> L.	Brassicaceae	F
Repolyo	<i>Brassicca oleracea</i> L. var. <i>Capitata</i> L.	Brassicaceae	F
Pinya	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	F
Papaya	<i>Carica papaya</i> L.	Caricaceae	F,M
Kangkong	<i>Ipomea aquatica</i> Forssk.	Convolvulaceae	F
Kataka-taka	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	M,O
Ampalaya	<i>Momordica charantia</i> L.	Cucurbitaceae	F,M
Kalabasa	<i>Cucurbita maxima</i> Duch.	Cucurbitaceae	F
Patola	<i>Luffa acutangula</i> (L.) Roxb.	Cucurbitaceae	F,M
Pipino	<i>Cucumis sativus</i> L.	Cucurbitaceae	F
Sayote	<i>Sechium edule</i> Sw.	Cucurbitaceae	F
Upo	<i>Lagenaria siceraria</i> (Mol.) Standl.	Cucurbitaceae	F
Ube	<i>Dioscorea alata</i> L.	Dioscoreaceae	F
Bignay	<i>Antidesma bunius</i> (L.) Spreng	Euphorbiaceae	M
Kamoteng kahoy	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	F
San Francisco	<i>Codiaeum variegatum</i> (L.) Bl.	Euphorbiaceae	O
Soro-soro	<i>Euphorbia trigona</i> Haw.	Euphorbiaceae	M
Tuba	<i>Jatropha curcas</i> L.	Euphorbiaceae	M
Bataw/Patani	<i>Dolichos lablab</i> L.	Fabaceae	F

Cabalyero	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Fabaceae	M,O
Gogo	<i>Entada phaseoloides</i> (L.) Merr.	Fabaceae	M
Kadyos	<i>Cajanus cajan</i> (L.) Huth	Fabaceae	F
Kakawate	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Fabaceae	M,O
Kibal	<i>Vigna sesquipedalis</i> Fruw.	Fabaceae	F
Monggo	<i>Vigna radiata</i> (L.) R. Wilczek	Fabaceae	F
Sampalok	<i>Tamarindus indica</i> L.	Fabaceae	F
Singkamas	<i>Pacchyrhizus erosus</i> (L.) Urb.	Fabaceae	F
Bago	<i>Gnetum gnemon</i> L. var. <i>Gnemon</i>	Gnetaceae	F
Herba Buena	<i>Mentha x. cordifolia</i> Opiz ex Fresen	Lamiaceae	M
Lagundi	<i>Vitex negundo</i> Juss.	Lamiaceae	M
Lokoloko	<i>Hyptis suaveolens</i> (L.) Poir.	Lamiaceae	M
Oregano	<i>Plectranthus amboinicus</i> (Lour.) Spreng	Lamiaceae	M
Sulasi	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	F,M
Taheebo	<i>Orthosiphon aristatus</i> (Bl.) Miq.	Lamiaceae	M,O
Avocado	<i>Persea Americana</i> L.	Lauraceae	F
Laurel	<i>Cinnamomum</i> sp.	Lauraceae	F
Sabila	<i>Aloe vera</i> (L.) Webb.	Liliaceae	M,O
Banaba	<i>Lagerstroemia indica</i> L.	Lythraceae	M
Gumamela	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	M,O
Okra	<i>Abelmoschus esculentus</i> (L.) Moench	Malvaceae	F,M
Mahogany	<i>Swietenia macrophylla</i> King	Meliaceae	M,T
Santol	<i>Sandoricum koetjape</i> (Burm. F.) Merr.	Meliaceae	F
Makabuhay	<i>Tinospora glabra</i> (Burm. f.) Merr.	Menispermaceae	M
Suma/Katungal	<i>Arcangelisia flava</i> (L.) Merr. <i>Broussonetia luzonica</i> (Bleco.) Burr. var. <i>glabra</i> (Warb.) Corner	Menispermaceae	M
Himbabao		Moraceae	F
Langka	<i>Artocarpus heterophyllus</i> Lamk.	Moraceae	F
Malunggay	<i>Moringa oleifera</i> L.	Moringaceae	F,M
Saging	<i>Musa sapientum</i> L.	Musaceae	F
Cherry	<i>Eugenia uniflora</i> L.	Myrtaceae	F
Duhat	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	F
Guava	<i>Psidium guajava</i> L.	Myrtaceae	F,M
Sampaguaita	<i>Jasminum sambac</i> (L.) Ait.	Oleaceae	O
Orchids		Orchidaceae	O
Kamias	<i>Averrhoa bilimbi</i> L.	Oxalidaceae	F
Palmera		Palmae	O
Pandan	<i>Pandanus amaryllifolius</i> Roxb	Pandanaceae	F
Paminta	<i>Piper nigrum</i> L.	Piperaceae	F
Pansit-pansitan	<i>Peperomia pellucida</i> (L.) H.B.K.	Piperaceae	M
Mais	<i>Zea mays</i> L.	Poaceae	F
Palay	<i>Oryza sativa</i> L.	Poaceae	F
Granada	<i>Punica granatum</i> L.	Punicaceae	F
Rose	<i>Rosa</i> sp.	Rosaceae	O
Kape	<i>Coffea Arabica</i>	Rubiaceae	F
Kalamansi	<i>Citrus microcarpa</i> Bunge	Rutaceae	F,M
Lukban	<i>Citrus grandis</i> (L.) Osb.	Rutaceae	F
Sintones	<i>Citrus reticulata</i> Bleo.	Rutaceae	F
Lansones	<i>Lansium domesticum</i> Corr. Serr.	Sapindaceae	F
Rambutan	<i>Nephelium lappaceum</i> L. var. <i>Lappaceum</i>	Sapindaceae	F
Chico	<i>Manilkara zapota</i> (L.) v. Royen	Sapotaceae	F
Kaimito	<i>Chrysophyllum caimito</i> L.	Sapotaceae	F
Kamatis	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	F,M
Sili	<i>Capsicum annum</i> L.	Solanaceae	F

Talong	<i>Solanum melongena</i> L.	Solanaceae	F
Unti	<i>Solanum nigrum</i> L.	Solanaceae	M
Cocoa	<i>Theobroma cacao</i> L.	Sterculiaceae	F
Tsaang gubat	<i>Carmona retusa</i> (Vahl.) Masam.	Theaceae	M
Aratiles	<i>Muntingia calabura</i> L.	Tiliaceae	F,M
Alagaw	<i>Premna odorata</i> Blco.	Verbenaceae	M
Luya	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	F,M
Luyang dilaw	<i>Curcuma domestica</i> Valet.	Zingiberaceae	F,M
Limbas-limbas	<i>Scleria scrobiculata</i>	Solanaceae	M

\*Legend: F – Food, M – Medicinal, O – Ornamental, T - Timber

Fabaceae was the most represented family with 9 species having economic uses. Seven species are used as food while two species are for medicinal, as well as ornamental purposes. Fabaceae is the second most important family in terms of its use while Poaceae is the most important family. However, in the study there were only two species mentioned by respondents belonging to Poaceae namely *Oryza sativa* and *Zea mays*. Cucurbitaceae and Lamiaceae were the second most represented families with 6 species each. Cucurbitaceae is well known for its use as food while Lamiaceae was mentioned to have medicinal uses.

Among the medicinal plant species mentioned by the respondents, *Blumea balsamifera* is the most versatile. It can cure many common ailments they experience like fever, stomachache, relapses and cough and wounds. This is followed by *Plectranthus amboinicus*, *Lagerstroemia speciosa*, *Mentha arvensis*, among others. There are a number of plants which were identified by the local communities with multiple uses, among these are *Mangifera indica* L., *Cocos nucifera* L., which can be considered as food, medicine, timber and firewood. But one reactionary regime after another has done nothing more than to pay lip service to land reform and national industrialization, leaving the small-scale farmers in the marginal level of the society. Further, interview with the respondents revealed that hectares of lands covering Mt. Maculot were converted for tourism and business establishment.

Religiosity is also linked with superstitious beliefs rooted from their ancestors. They believed that some of the plant species that they mentioned like *Solanum* sp. and *Scleria scrobiculata* are used for burial rites to cast away the bad spirits. In rural areas, it is ideal to have a large number of children as locals consider this as a means of getting more help in accomplishing farming activities. They also believed that more hands increase the chance of feeding the family and will alleviate their life. They claimed that formal education does not warrant skills in using the resources. Although fruit trees have become sources of supplemental income as well as sources of food and other materials, the strict regulation of the municipality as well as the surrounding barangays on prohibiting illegal transfer of the forest products from the mountain has abated its destruction and helped in its conservation. The local government of Cuenca, Batangas fully supports the government program to conserve Mt. Maculot and the people are made aware on the detrimental effects of a disturbed forest. Hence, the residences take part in the conservation of the area. Unlike in other forests in the Philippines (Arances et al. 2006), illegal logging, agricultural expansion, and deforestation were not vastly observed in the study site. However, just like the other forests elsewhere in the country, the area can be facing threats of habitat loss due to logging and agricultural expansion if the program on conservation is not implemented. One of the threats of the area is the religious activities in the area bring environmental destruction through garbage problem and expansion of trails and trekking areas.

In conclusion, the local community residing along Mt. Maculot has established dependence on the economically important plants basically for their medicine, food and timber use. Corollary to this is the need for the local government *vis-avis* local community to strengthen their conservation programs of Mt. Maculot. Hence, to address this, the local community can design and develop resource use patterns and establish markets to appropriately utilize the plant resources of Mt. Maculot.

#### 4. Acknowledgements

We would like to acknowledge the Haribon Foundation for Conservation of Natural Resources and the Royal Embassy of Netherlands for the funding support. We are grateful to the office of the Mayor of the

Municipality of Cuenca, Batangas and the different communities around Mt. Maculot who cooperate with us during our research work.

## 5. References

- [1] J. Arances, V. Amoroso, W. Gruezo, C. Ridsdale, L. Visser, B. Tan, L. Rufila, J. Galvezo, J. Opiso, R. Comilap, P. Lumaray. Development of a Participatory Methodology for Inventory and Assessment of Floral Resources and their Characterization in the Montane Forest of Mt. Malindang. Biodiversity Research Programme in Mindanao: Focus on Mt. Malindang and Environs. Philippines: SEAMEO SEARCA, College, Laguna, 2006.
- [2] B. Campbell, and M. Luckert. Uncovering the Hidden Harvest: Valuation Methods for Woodland and Forest Resources. London-Sterling: Earthscan Publications Ltd., VA, pp.29-32, 2003.
- [3] E. De Guzman, M. Umali, E. Sotalbo. Guide to Philippine Flora and Fauna, IV: Dipterocarps and non-dipterocarps. MRC and University of the Philippines, Quezon City, 1995.
- [4] F. Hornedo . Pagmamahal and Pagmumura. Philippines. Ateneo de Manila University, Office of Research and Publication, pp. 115-128, 1997.
- [5] J. Montemayor. Philippine Socio-Economic Problems. Quezon City: Rex Publication, 1969.
- [6] I. Panopio and A. Raymundo. Sociology Focus on the Philippines 4<sup>th</sup> edition. Philippines: Ken Incorporated, 2004.