

Environmental Knowledge and Biological Diversity in East Kalimantan

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Longhouses, the characteristic dwelling of many Dayak groups, require a great many plant species for building materials. To sustain their supply of materials, Dayaks have always protected their forests. Today we recognize the need for more forest cover for the earth, which may die without it. Indeed, the need for forests and, more importantly, for biological diversity is now becoming obvious. This diversity is important for people as well as nature. In the past, when Dayaks could still practice their traditional way of life, they helped maintain biological diversity.

Dayaks live interdependently and harmoniously with tropical rainforests. But we, who arrogantly call ourselves *modern* people from developing or already developed countries, have little regard for or appreciation of these traditional people. We harvest tropical wood only for our own economic benefit and thereby push the Dayaks to abandon their culture. They often cannot practice their culture because of modernization and because there is no forest left.

Fortunately, on this rare occasion organized by the Smithsonian Institution and Festival of Indonesia 1990-1991 Committee, we will be able to communicate directly with some of the Dayaks from East Kalimantan. From this communication, there is a chance for mutual understanding and a hope for mutual appreciation. Dayaks will present aspects of their valuable culture that still have relevance and importance for contemporary life. In this short essay I will use ethnobotany — the study of native peoples' systematic knowledge of the plant world — to illustrate how building longhouses, producing food, curing the sick, and making the tools of everyday life embody Dayak skills for exploiting and conserving the resources of their environment. There is considerable variation in architectural styles and

building skills, as Tim Jessup discusses elsewhere in this collection; but Dayaks' skill and knowledge of selecting building materials from natural resources is uniformly exceptional.

Botany of Longhouses

As noted, a great many plant species are used for building a longhouse. For example, in the construction of one longhouse in the Apo Kayan plateau of East Kalimantan, 48 different plant species have been identified. These building materials — plants of varying ages, wild and cultivated, from recently tilled and fallow fields — are collected from the surrounding environment, a living mosaic composed of rainforest, fields and village. To make various parts of a house, villagers select species of plants ranging from herbs, vines, rattan, palms and shrubs to big trees.

Strong hardwood, prized for its durability, is used for making piles and shingles. The best wood for these purposes is Borneo ironwood (*Eusideroxylon zwageri*), which is locally called *ulin*. Sixteen species of large trees have been identified that are used for the piles alone.¹ And some tree species are used for making shingles alone.² Not all parts of a tree can be made into shingles, only those with straight fibers that allow the wood to be split in thin sections. Not all longhouse roofs are made of shingles. Some villages use leaves of the trees *Eugeissona utilis* and

¹ Among these are *Aglaiia ganggo*, *Dipterocarpus kunstleri*, *Dipterocarpus* spp., *Elaeocarpus* spp., *Eugenia* spp., *Hopea dryobalanoides*, *Ochanostachys amentacea*, *Ochrosia* spp., *Podocarpus neriifolius*, *Shorea* spp., *Tristania whitianum*, and *Vatica cupularis*.

² Among these are *Castanopsis* spp., *Ficus concosiata*, *Lansium domesticum*, *Lithocarpus* spp., *Quercus argentata*, and *Shorea* spp.



Kenyah women pound bark to extract dye for decorating woven baskets. Photo by Cynthia Mackie

Phacelophrynium maximum for their roofs.

Lighter wood with a clear and straight grain is preferred for making floorboards.³ A good floor also should be properly resonant, for it is usually used as a musical instrument played to accompany dances, especially the *datan julut* dance. In their performances, dancers stamp on the floor creating loud and beautiful sounds. A longhouse floor capable of producing the most beautiful sounds is usually preferred for important ceremonies. The same tree species used for the floors is also used for making planks that separate long-house apartments, or *lamin*.

The beams of the middle *lamin* that belongs to the "owner" of the house are usually longer and thicker than others. But the tree species is no different. The main criteria for selecting beams are straightness and length.⁴ Rafters are made of timbers from the same species used for beams, but the most preferred is *Eugenia polyantha*.

Roof laths, which support the shingles, are

³ Among these are *Agathis borneensis*, *Cinnamomum* sp., *Lithocarpus* spp., *Persea rimosa*, *Podocarpus imbricatus*, *Podocarpus neriifolius*, *Polyosma intergrifolia*, *Schima wallichii*, and *Shorea* spp.

⁴ The species used for beams include *Dysoxylum hexandrum*, *Elaeocarpus glaber*, *Elteriospermum tapos*, *Eugenia* sp., *Ochanostachys amantacea*, *Ochrosia* sp., *Persea rimosa*, and *Scorodocarpus borneensis*.

made of the long, straight but small stems (approximately 4 cm in diameter) of a variety of species. There is apparently no preference as to the species used. Villagers usually collect the sapling stage of main canopy species (the tallest rainforest trees) or understory species (less tall). What they look for is straightness and durability.

Rattan rather than nails is used to fasten parts of the building together. A large number of rattan strips are used to fasten shingles to the roof laths. There are dozens of rattan species used to lash joints.⁵ Do you know that rattan is in the same family with the coconut palm (*Cocos nucifera*), and that a single stem of one kind of rattan (*Calamus caesi*us) can reach more than 100 meters long? People should learn more about the rich diversity of species in tropical rainforests.

Food Plants

The Dayak farmers carefully maintain a diversity of species in their fields as well as in their gardens close to home. Traditional tropical agriculturalists diversify their production to make their food supply as secure as possible. In one village of Long Sungai Barang, for example, farmers use at least 150 species of food plants, including 67 wild species. In their home gardens alone, there were 91 species that belong to 70 genera and 38 families. All of the specimens have been identified, recorded and preserved in the Herbarium Bogoriense, in the city of Bogor, West Java. Surprisingly, for one species of rice (*Oriza sativa*) alone, villagers have more than 25 local varieties, which are specialized for certain soil conditions such as wet soil, flat land, dry soil in slopes, black soil, etc.

Genetic diversity is very important for future agricultural development. Many breeders stress that we need more gene pools available because continuous cropping of rice can lead to serious problems like pest epidemics. This problem in food supply may come soon because, as Hargrove, et al. (1988) found, a large number of improved rice varieties carry similar cytoplasm. If we are not careful to preserve the germplasm resources that are still in the hands of traditional farmers, we may not be able to rebuild high yield crops, should disease or other forms of pestilence strike.

The Dayak environment might have wild species of crops that will be important in the future. For example, the shoot of the *Diplazium esculentum* fern (of the family *Polypodiaceae*) is now

⁵ Some of them are *Calamus* spp., *Ceratorobus concolor* and *Karibalsia echinometra*.

harvested from a wild habitat but in the future may produce a vegetable as valuable as asparagus. And *Setaria palmifolia*, a species of grass (*Poaceae*), yields a bigger edible shoot in formerly cultivated fields than in wild habitats. Its evolution might be unintentionally affected by human agriculture. As Jackson (1980) notes, the ancestors of our current crops may well have been “camp followers,” colonizers of the disturbed ground around human habitation. Varieties of habitat and successive forest stages — not just jungles or primary forests — yield valuable species for agriculture as well as for medicine and crafts. This shows the importance of cultural practices of Dayaks and other forest dwellers to the evolution and maintenance of biological diversity.

Medicinal Plants

Traditional medicine derived from plants still plays an important role in curing diseases and wounds. In Long Sungai Barang village, 37 species, 33 genera and 26 families of plants that have medicinal value have been recorded.⁶ These species grow in a variety of habitats: in the home garden, in the fields, in very young secondary forests in primary forests and on riverbanks. At present, many institutes and universities are hunting medicinal plants in tropical forests throughout the world that might contain a curing material for cancer and AIDS.

Plants for Crafts

Almost all utensils and handicrafts used by Dayaks are made from material available in the area. There have been at least 96 species identified that belong to 74 genera and 40 families.

⁶Species that were considered especially powerful were *Callicarpa longifolia* f. *subglabrata*, *Cassia alata*, *Fagraea racemosa*, *Kadsura scandens* and *Lindera polyantha*.



These Aoheng women who live several days upriver from the coastal city of Samarinda, East Kalimantan, are reviving the art of weaving local fibers of pineapple and orchid. Abandoned after World War II this weaving tradition was revived in the early 1980s to produce materials for sale to outside markets. Photo by Bernard Sellato

This is a very great biological diversity. They use almost all the parts of the plants: stems, leaves, bark, sap, fruit, branches, twigs and seeds. These species are also found in an array of habitats — home gardens, fields, secondary and primary forests. Habitat diversity is very important in sustaining a supply of materials for the Dayaks' handicrafts, some of which attain high artistic value.

Biosphere Reserve

To conclude this short article, it is obvious that the biological and ecological diversity in Dayak villages, especially in the Apo Kayan, is very high. This area embraces a great many species

useful for food, medicines, crafts, building construction and aesthetic uses. It is impossible to separate this useful diversity from the fact that Apo Kayan farmers practice shifting cultivation, carefully exploit the mountainous forest environment, and have cultures that enable them to live harmoniously with nature. Accordingly, it is essential to save this area from destructive economic development. This does not mean that local people should live unchanged or that farmers should be prevented from improving the quality of their lives. The welfare of indigenous peoples, their role in the environment, and natural conservation are combined in a new approach to conservation known as the "biosphere reserve."

The biosphere reserve concept is more realistic than earlier approaches that exclude humans, since it includes local populations as key contributors to and beneficiaries of the environmental process (Tangley 1988). Jackson (1980), for example, states that the most efficient storage of genetic variations is in the living plants, while seed storage in a laboratory is expensive and has difficult requirements. Therefore, many more species sanctuaries must be established throughout the world (Hill 1983). Indeed, it is time to recognize traditional farmers' active role in genetic resource conservation (Altieri, et al. 1987). Furthermore, when not disturbed by economic or political forces, farmers' modes of production generally preserve rather than destroy natural resources.

Finally, the most appropriate way to develop the Apo Kayan might be through the establishment of a biosphere reserve to conserve examples of the world's characteristic ecosystems, "landscapes for learning" about both natural and locally managed ecosystems. The Apo Kayan already achieves one of the goals of a biosphere

reserve, which is to provide models for sustainable resource use. The Kayan needs the legitimate status of biosphere reserve in order to protect the area from destructive powers before the beauty and value of its ecological diversity are gone.

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Citations and Further Readings

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