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Investigating the value of local biodiversity to communities in Madang Province, Papua New Guinea 2009

Dalia is from Lithuania and has a BSc in Biology and MSc in Ecology from Vilnius University. She studied for an MSc in Environmental Science, Policy & Management (MESPOM) at The Central European and Manchester Universities. She has previously worked in conservation research and on EU environmental policy implementation. In PNG she worked with a project that investigated the management and marketing of goods and services from cutover native forests around remote villages using remote sensing and growth modelling. Dalia worked on the ground interviewing villagers to provide input evaluating the importance of biodiversity to local communities. This work was conducted in cooperation with The Australian Centre for International Agricultural Research.

Below is Dalia's report on her research project in Papua New Guinea.

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The value of local biodiversity to communities in Madang Province, Papua New Guinea

The research was investigating opinions of Papuans about the value of biological diversity for their communities. The value was defined as a long term usefulness, desirability and importance for the whole community. Estimation of it was based on the consensus of a focus group.

The research was investigating the perceptions about the wild biodiversity more than domesticated one. According to the number of anthropological works the wild biodiversity traditionally is very important for the indigenous Papuans. It is claimed that the local cultures evolved in synthesis with the surrounding biodiversity. However, currently the lifestyles of people are changing and primary Papuan rainforests are extensively logged. The research aimed to understand if wild animals and plants still have their place in the newly forming mentality. Moreover, the research was investigating which species are the most valuable. Combining these values with the ecology of the species the research was exploring the possibilities of the usage in the future.

Methodology. Four focus groups (of 6 – 10 people) were participating in the research. The research aimed to explore if the opinions are gender-specific therefore there were separate men and women focus groups. The groups were from two villages - Ohu and Yagi. The villages are 15 and 90 km respectively from Madang, the main town in the province. There is a school and a church in Ohu, whereas Yagi is situated in a primary rainforest and even though there is a school building, but the village has not enough resources to support the teachers. Yagi people mainly are subsistence farmers, whereas people from Ohu supplement subsistence farming by market sales and sometimes other jobs in the town.



Figure 1 Men group doing PDM exercise in Ohu



Figure 2 Women group doing PDM exercise in Ohu



Figure 3 Men group doing PDM exercise in Yagi



Figure 4 Women group doing PDM exercise in Yagi

The participants for the focus groups were chosen on voluntary basis (Figure 1; 2; 3 and 4). It was assured that the participants were informed about the purpose and the benefits of the research, and the length and procedures of the exercise. Showing the gratitude for their participation after the exercises they were awarded.

During the research at first 8 source categories were compared, namely: wild plant from forest; wild plant, not from forest; cultivated plant; wild animal from forest; wild animal, not from forest; domestic animal; wild mushroom. The participants were asked to distribute 100 pebbles on the labelled cards according to their importance according to the methodology of the Pebble Distribution Method (PDM). After the group distributed the pebbles they were counted and the participants were asked to explain why they put this value on each of the cards. According to these explanations and discussions, the use categories for the wild biodiversity were defined. Seven use categories were defined in Yagi village (Table 1).

Table 1 Use categories of wild biodiversity defined in Yagi village

Category	Description
Food & Drink	Wild plants, animals and mushrooms used for primary and secondary daily food as

	well as food used for the festivals and ceremonies, and drinks (for daily uses and ceremonies) made from wild plants
Construction	Parts of wild plants used for building houses and fences
Medicine	Wild plants, animals and mushrooms used for treating diseases
Ornaments	Wild plants and animals used for planting in the village as aesthetic plants, shade trees; used for making clothes, adornments and decorations for everyday life, festivals and traditional dances
Recreation	Wild plants and animals used for leisure and recreation
Magic	Wild plants and animals used for coping with inimical spirits and malevolent people
Tools	Parts of wild animals and plants used as household and garden utensils

These use categories are arbitrary, chosen to facilitate communication with the participants. According to discussions with the participants the uses of wild biodiversity were grouped differently in Ohu village. Four use categories were defined in Ohu village (Table 2).

Table 2 Use categories of wild biodiversity defined in Ohu village

Category	Description
Food and drink, daily uses	Wild plants, animals and mushrooms used for primary and secondary daily food, and drinks made from wild plants
Ceremonies	Anything made from wild biodiversity and used for special occasions: wild plants, animals and mushrooms used for food and drinks for the festivals and ceremonies; parts of animals and plants used for adornment and decorations during the festivals and traditional dances; parts of animals and plants used for musical instruments; wild biodiversity used for magic.
Medicine	Wild plants, animals and mushrooms used for treating diseases
Construction	Parts of animals and plants used for building houses, fences and making tools

Afterwards the participants were asked to name the most important wild species according to the use categories (Figure 5). Next, the names of species in local language and Latin were written on the cards and the participants were asked to distribute the pebbles according to the value that each species had for the community in the use category under consideration. The PDM exercises and interviews were complemented with non-participant observations. The villagers were observed and photographed during their daily activities: doing house chores, working in the gardens, having their leisure time. Data were analysed using SPSS statistical package, Microsoft Excel and descriptive discourse method.



Figure 5 People from Yagi brought the plants they use, but do not know the names in Tok Pisin

Results. The comparison of the villagers' opinions was begun by comparing the mean relative value of the four source categories. Mean relative value was calculated using data from all 4 groups (men and women groups from Yagi and Ohu). (Table 3).

Table 3 Mean value of local biodiversity source categories for Ohu and Yagi groups

Source category	Composition of the category	Mean relative value (%)
Wild plants	This category includes wild plants from forest, wild plants not from forest and mushrooms	48,75
Cultivated plants		25
Wild animals	This category includes wild animals from forest and wild animals not from forest	18,25
Domestic animals		8

Comparing opinions about the value of wild and cultivated biodiversity between Ohu and Yagi indicated a significant difference for one use category. Ohu groups attributed significantly greater importance for the category of wild plants from the forest than Yagi groups. Comparing opinions about the value of wild and cultivated biodiversity of different gender groups indicated no statistically significant differences.

However, the explanations provided by the participants bring out their perceptions; therefore I would like to present them below.

Ohu village. The values attributed by Ohu focus groups are shown in the Figure 6. Ohu men noticed that wild plants from forest can be used for multiple purposes: one can find there medicine against running nose, a fruit to eat, a plant with water to drink, bark of a tree to

get rid of the spirits which affect people or to treat a snake bite, materials for drums which are used for local communication, bird feathers for traditional dances, ginger to improve the taste of food, plants to fence a garden or a vine for construction. Moreover, people are even more dependent on these plants in unfavourable conditions, for example, in periods of drought. Ohu women group confirmed the men’s opinion – wild plants from the forest are used for many purposes.

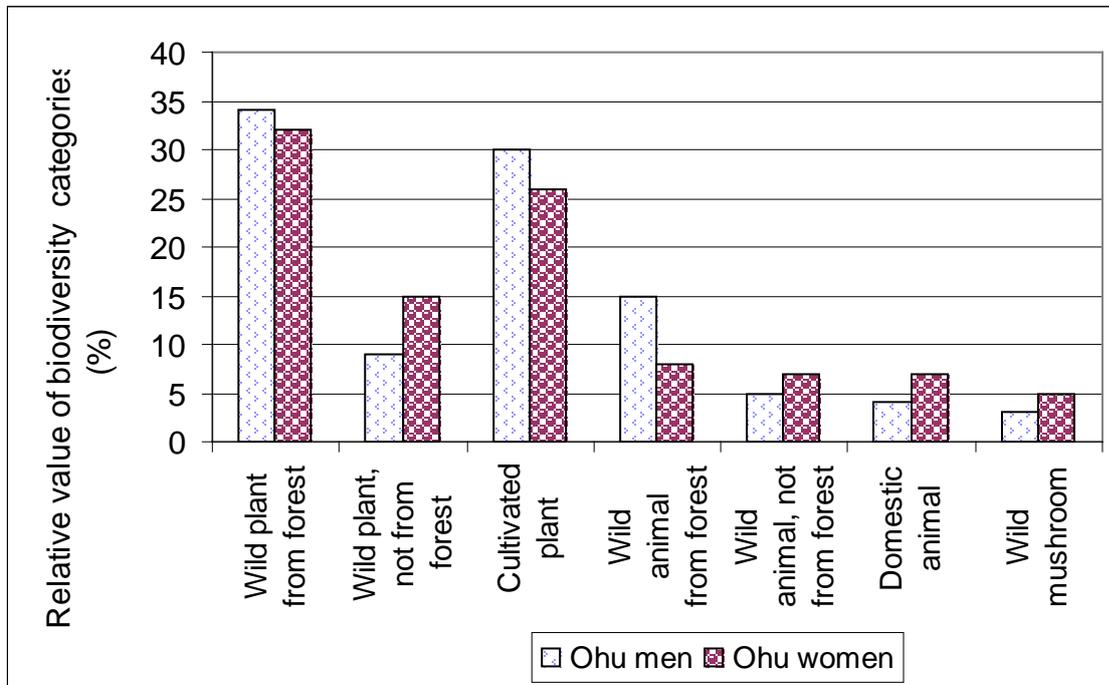


Figure 6 Value attributed by Ohu men and women groups for biodiversity use categories

It was agreed that wild plants not from the forest were not as important as the ones from the forest. It was explained that some of these plants are used for food, for example, the leaves of *Gnetum gnemon* are often used as greens in the staple food. Also some of the wild plants are used as decorative plants in the village. Cultivated plants were explained to be important because they are used for daily consumption as food (Figure 7). Moreover, they are used on festivals and as a bride price.



Figure 7 Preparing food in Ohu after the first harvest from a new garden

Ohu people explained that wild animals are hunted in the forest on occasions. Pigs, cuscus and wallabies are hunted for festivals and ceremonies. For example, before harvesting food from a new garden people go to hunt a wild pig or catch crabs, fish, prawns and lobsters from a river. Also wild animals are used for the cultural ceremonies called “sing-sing”, for instance, birds of paradise are a key item for traditional dancing. Without the feathers of birds of paradise traditional dancing cannot happen. Lizards are also important for cultural ceremonies, because their skin is used for kundu drums, which is the main traditional musical instrument in Madang Province. Since these animals are not used every day the value they were given was not as high as for the plants. Offspring of some animals can be taken from the forest and kept in the village, for example, pigs, cuscus and hornbills. However, it does not happen very often, therefore the category of wild animals not from forest were not highly valued.

Domestic animals did not get very high value, because they were not employed very often. Explaining why they attributed a low value for domestic animals Ohu people explained that dogs are used for guarding a house and hunting, pigs are used mainly for a bride price and are sometimes sold to get some cash income, and chickens are used for food and cats for protecting a house against the rats.

Mushrooms were valued the least from all the categories. It was explained that they are used only for food and as a medicine, but not from a wide range of diseases. Moreover, they can be utilised only in season, which is a short period.

According to conversations with the villagers, uses for wild biodiversity in Ohu village were grouped into 4 categories (Table 2). Individual use values (IUV) and combined relative importance (CRI) for all taxa were calculated. The CRI of 40 taxa which the participants from Ohu village indicated as the most valuable range from 0,6% to 7,1%. Some of the species

have high CRI because they are used in several categories, others because they are highly valued in just one or two use categories. *Pterocarpus indicus*, *Gnetum Gemon* and *Intsia bijuga* were estimated as the most valuable species for Ohu groups with CRI of 0,071; 0,66 and 0,63 respectively.

Yagi village

The opinions of men and women groups in Yagi diverged more than in Ohu (Figure 8). In particular, the women group seemed to value cultivated plants more than the men. Questioning explanation of why they put such a high value on the category of cultivated plants, Yagi women answered: “This is what we use from the morning till the night everyday” (Figures 9 and 10). However, the men explained that even though cultivated plants are used for food, as building materials and as medicine, their seedlings have to be bough in a market therefore it is difficult to access them. What is more, people have used wild plants from forest longer than cultivated plants, so people became more accustomed to those plants, therefore they have more uses. Moreover, only those plants are used for magic and this is a very important purpose. Here it has to be mentioned, that magic is practised only among men and gardens are usually worked by women in Madang Province.

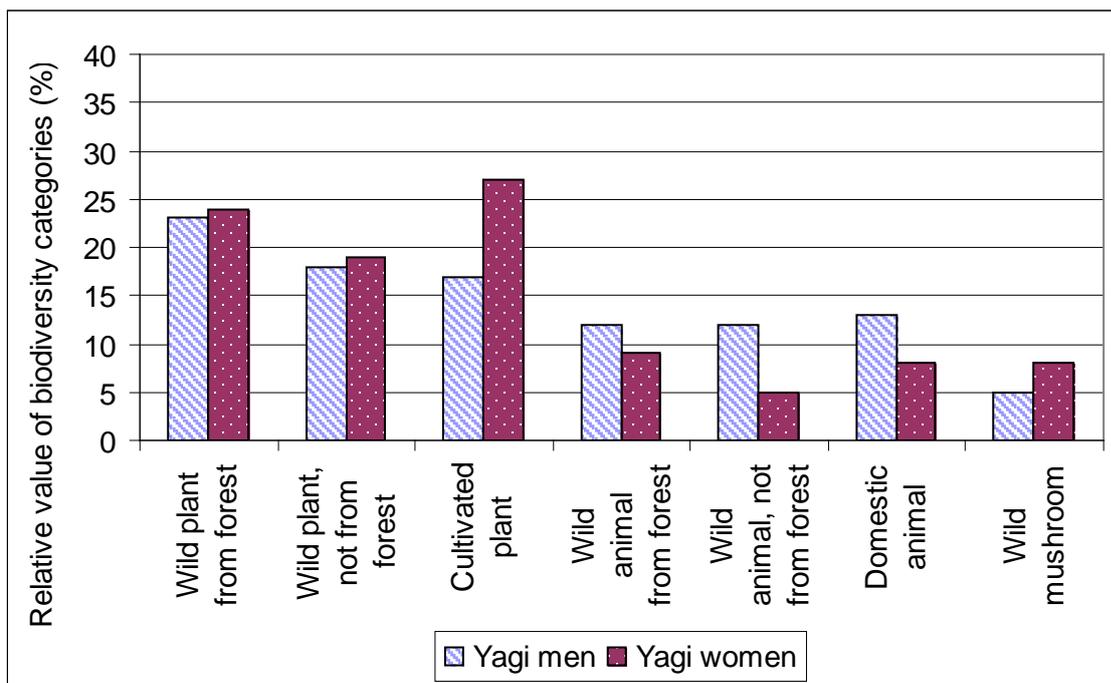


Figure 8 Value attributed by Yagi men and women groups for biodiversity use categories



Figure 9 A woman from Yagi is digging taro in her garden



Figure 10 A woman from Yagi is going home from her garden



Figure 11 The bark of a tree is used for making string bags in which little children are carried



Figure 12 Yagi woman with a young cuscus which was caught in the forest and is now kept as a pet



Figure 13 Biodiversity from different source categories can be sold in a market in Madang

Yagi people named quite a few uses for wild plants not from forest: they are used for food, medicine, as building materials, as aesthetic, ornamental plants, as trees providing shade in

the village and for selling in a market (Figures 11 and 13). Wild mushrooms in Yagi village are used only for food and only in season, so they have less value for the people than other categories.

Wild animals from the forest were used for many purposes, for example, for food, exchange, for selling in markets and for kundu drums and headdresses. However, people explained that wild plants from forest were much easier to access than animals. Hence, the animals are caught when people find them, but it does not happen often. Therefore the people usually use plants. It is interesting to notice that even though Yagi people specified that they use wild animals rarely, but they also specified that they use domestic animals even more rarely than wild animals. The lack of substitution increased the value of wild animals from forest.

The importance of the wild animals' category not from forest was explained similarly as for the wild animals from forest. Various animals are caught and kept in the village for different purposes: they are kept as pets, used for food, as bride price, sold in the markets, and their feathers used for headdresses and their bones used as utensils (Figure 12). The value of domestic animals in Yagi village was explained similarly as in Ohu village: they are used for bride price payment, for food, as pets, cats are used for chasing rats, dogs are used for security and hunting and buffalos are used for pulling a carriage. In addition their feathers are used for decorations and chasing the mosquitoes and parts of the animals are used for necklaces. However, they are utilized just on occasions.

According to conversations with the villagers uses for the wild biodiversity in Yagi village were grouped into 7 categories (Table 1). The participants were asked to name the most important species in the use category. It was found that the species *Casuarius sp.* and *Licuala lauterbachii* have many uses, with these species belonging to 4 use categories. Six taxons belong to 3 use categories, namely: *Artocarpus communis*, Bamboo, Cuscus, *Intsia bijuga*, *Mucuna sp.* and *Pometia pinnata*. There were 20 taxons named which belong to 2 use categories and 29 taxons which belong to one use category in Yagi village.

The value of wild taxa. Yagi village. Yagi focus groups identified *Casuarius sp.* and *Licuala lauterbachii* as the taxa used for most use categories, i.e. four. These taxa and their uses are described below.

Two species of genus *Casuarius* (*C. benetti* and *C. unappendiculatus*) inhabit the forests of Madang Province. The exact species was not identified during the discussions with Yagi villagers therefore both species are reviewed below.

Casuarius sp. (cassowary in English) belongs to the order *Struthioniformes* and is ratite, i.e. large, flightless birds of archaic origin. Cassowary needs large areas of thick tropical or subtropical forest as their habitat. Because of their important role in the tropical forest ecosystem cassowary is acknowledged as a keystone species (Wet Tropics Management Authority 2006). However both *C. benetti* and *C. unpendiculatus* are included in the IUCN Red List (IUCN 2008).

Casuarius bennetti (dwarf cassowary in English) is endemic to New Guinea Island. *C. bennetti* are big birds weighing 18 kg on average (Jones & Fraser 2006). According to IUCN Red List these birds have a status of near threatened. The population of *C. bennetti* is declining mainly because of heavy hunting pressure (IUCN 2008). ***Casuarius unappendiculatus*** (northern cassowary in English) has a narrower distribution than *C. bennetti*, it is restricted to the northern lowlands of New Guinea. Its habitat is rainforests in river floodplains. This bird is much bigger than *C. bennetti*. Northern cassowary constitutes a major food source for subsistence communities. Furthermore it has a major cultural importance. However, no breeding of domesticated birds exists. Because of its high value for indigenous people and unsustainable consumption, the species has a status of vulnerable in IUCN Red List. The species is claimed to be “dependent on the local culture and the availability of weapons and alternative meat-sources” (IUCN 2008).

People from Yagi named that they use *Casuarius sp.* for food and the manufacture of tools. Parts of these birds are also used for traditional dances and magic. People from Ohu mentioned several times during the exercises that they would like to include cassowary as a valuable species, but cannot, because this species does not live in their forest anymore. It seems that this species is one of the most valuable species for indigenous people. However the consumption habits seem to be unsustainable and when human populations reach higher density, the species ceases to exist in surrounding forest.

Licuala lauterbachii is an indigenous palm of Papua New Guinea and the Solomon islands (Riffle & Craft 2003). Yagi people use it for construction; furthermore the stem is split and sharpened into spears for hunting. Leaves are used as decorations for traditional dancing. This tree is not threatened according to IUCN and according to Riffle & Craft (2003) it is a common tree in the undergrowth of rainforests.

The two species mentioned above illustrate the general situation. Some of the species that Yagi focus groups identified as valuable are common, others are threatened.

Ohu. Out of 40 taxa Ohu focus groups identified as the most valuable, 3 species (*Pterocarpus indicus*, *Gnetum gnemon* and *Intsia bijuga*) had the CRI higher than 6%. These species and their uses are described below.

Pterocarpus indicus (red sandalwood in English), in comparison with above mentioned species, has a wide distribution. It is local in south-eastern Asia, northern Australasia, and the western Pacific Ocean islands. This huge (30–40 m tall and up to 2 m diameter) deciduous tree is used for many purposes. It is a hardwood species and its timber is highly valued because of its resistance and decorative appearance. The flowers and leaves of the tree are eaten, parts of the tree are used for folk medicine, and the tree itself is used as an ornamental tree (Traditional Tree Initiative 2006a).

Red sandalwood is extinct in some parts of its original range, in the other parts this species is heavily exploited and its population is decreasing. Therefore its status in IUCN Red List is defined as vulnerable. The largest remaining subpopulation is in New Guinea (IUCN 2009). Ohu focus groups identified *Pterocarpus indicus* as important for daily food, ceremonies, medicine and construction.

Gnetum gnemon (gnetum or two leaf in English) is a native tree in Indo-Malaya and Melanesia, but currently it is also widespread in south-eastern Asia and the Pacific islands. This species is tolerant to various environmental conditions. It is an important agro forestry species which timber, leaves and nuts are widely utilized. This tree is used for food, cordage, timber and medicine in Melanesia (Traditional Tree Initiative 2006b). Ohu people identified it as an important species for daily food and medicine.

Intsia bijuga (Borneo teak in English) distribution ranges through south-eastern Asia and islands of Melanesia, Micronesia and Polynesia. The tree is claimed to be one of the most highly valuable species in its range because of its cultural importance and its value as commercial timber. It is used as a timber, medicine and craft wood for high quality carving (Traditional Tree Initiative 2006c). Because of its immense importance the tree was exploited so heavily that only few large natural stands remain. Therefore it is classified by IUCN as vulnerable (IUCN 2009). Ohu people use *Intsia bijuga* for construction, food and ceremonies.

Hence, two out of three the most valuable species are classified as vulnerable because of over-consumption. Even though one of the participants revealed personally to the researcher after the PDM exercise that the species will never go extinct because indigenous people know the magic spells to invite species when they need, but IUCN Red List shows that a threat for the most valuable species exists. Some of these species are threatened because of the activities of local people, others because of the international logging companies. However 97% of PNG area belongs to traditional owners according to customary land tenure and only traditional owners decide which actions can be implemented on their land.

One more point which has to be made here is that traditional landowners in PNG have very few possibilities to sustain their livelihoods in other ways than consuming the local biodiversity themselves or selling it to the logging companies. To achieve sustainable development in the country such possibilities have to be created.



Figure 14 A present from Kennedy's family which was given leaving Yagi village

Dalia Bastytė