The Spatial Environmental Organization and the life of the Dawan People in Timor, Indonesia

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ABSTRACT

The Dawan people residing in Insana district of Timor Island (Indonesia) recognize 8 types of natural, succession as well as man-made ecosystems based on the physiognomy or the vegetation cover of the habitat. This knowledge is derived from their long interactions with their environment, especially because their way of live is wholly dependent on their surrounding natural resources.

Consequently there is *nasi* (natural stand looked upon as traditional forest), *kiuk tokok* (natural area served as sacred sites), *lélé* (communal agricultural field), *po'an* (private agricultural land), *sémo* (abandoned arable land due to the cycle of the shifting agriculture), *kintal* (clearly marked private kitchen garden), kuan (communal hamlet garden) and *hu sona* (savanna used for communal ranching and hunting). Each type has its own characteristic plant species composition related to their uses by the people.

In recent years these long traditions have been under going changes (the conversion of *nasi* and *kiuk* ***tokok*** into arable land, the over exploitations of sandal wood *Santalum album* and timber trees such as *Schleichera oleosa, Parinari corymbosum* and *Pterocarpus indicus,* as well as the shortening of the shifting cycle due to population pressure). In view of the scarcity of the resources, a number of traditional practices (such as hunting by burning shifting agriculture) can not be maintained. Family planning, and other intensified agricultural techniques will have to be introduced together with the encouragement of motivation for the people to observe sound natural resources management as inherited from their ancestors.

Key words: Spatial environmental organization, , plant diversity, Dawan people, Timor, Indonesia

INTRODUCTION

Dawan is one of the seven ethnic groups (viz. Helonese, Belunese, Marae, Kemak, Rotinese) living in West Timor. This group occupies over 80% of the total land area.

The Insana district is situated approximately between 9°.30' South and 124°.45' East (Figure 1). The general characteristic of the land is that of extremely dry climate. Based on the meteorological data of Oelolok (500m), the average rainfall measured for a ten years period (1976-1985) is only 3.5mm per month in the dry season and 215mm per month in the wet season (Figure 2).

The population of Insana, approximately 33.000 people, live in 24 villages (*desa*) spread more over 668.9 km^2 land. More than 90% of them are farmers, mostly practicing swidden agriculture. In a very limited area they also set up wet rice fields but with little technology, where bare hands are still used to till the land.

Because of there long interactions with there environment, especially because their way of live is wholly dependent on the surrounding natural resources, Dawan people recognize eight types of natural, man-made and abandoned ecosystem based on the physiognomy or vegetation cover of the habitats

Since it is interesting to understand the nature of this vegetation classification based on folk knowledge, in the following an attempt will be made to analyze each type of vegetation and to relate them to the life of the Dawan.

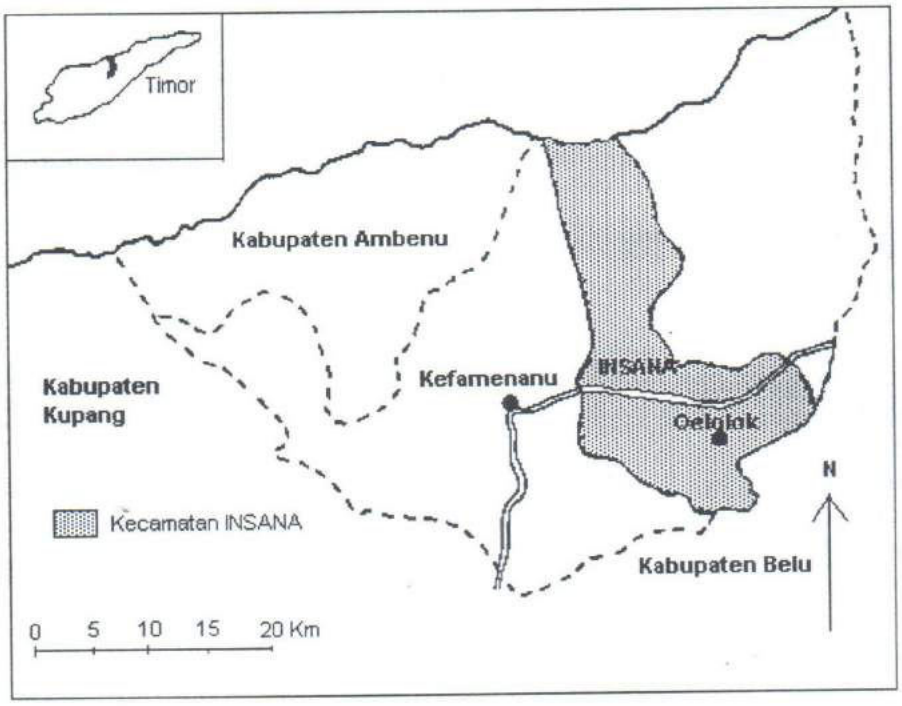

Figure 1. Study site and Kecamatan Insana

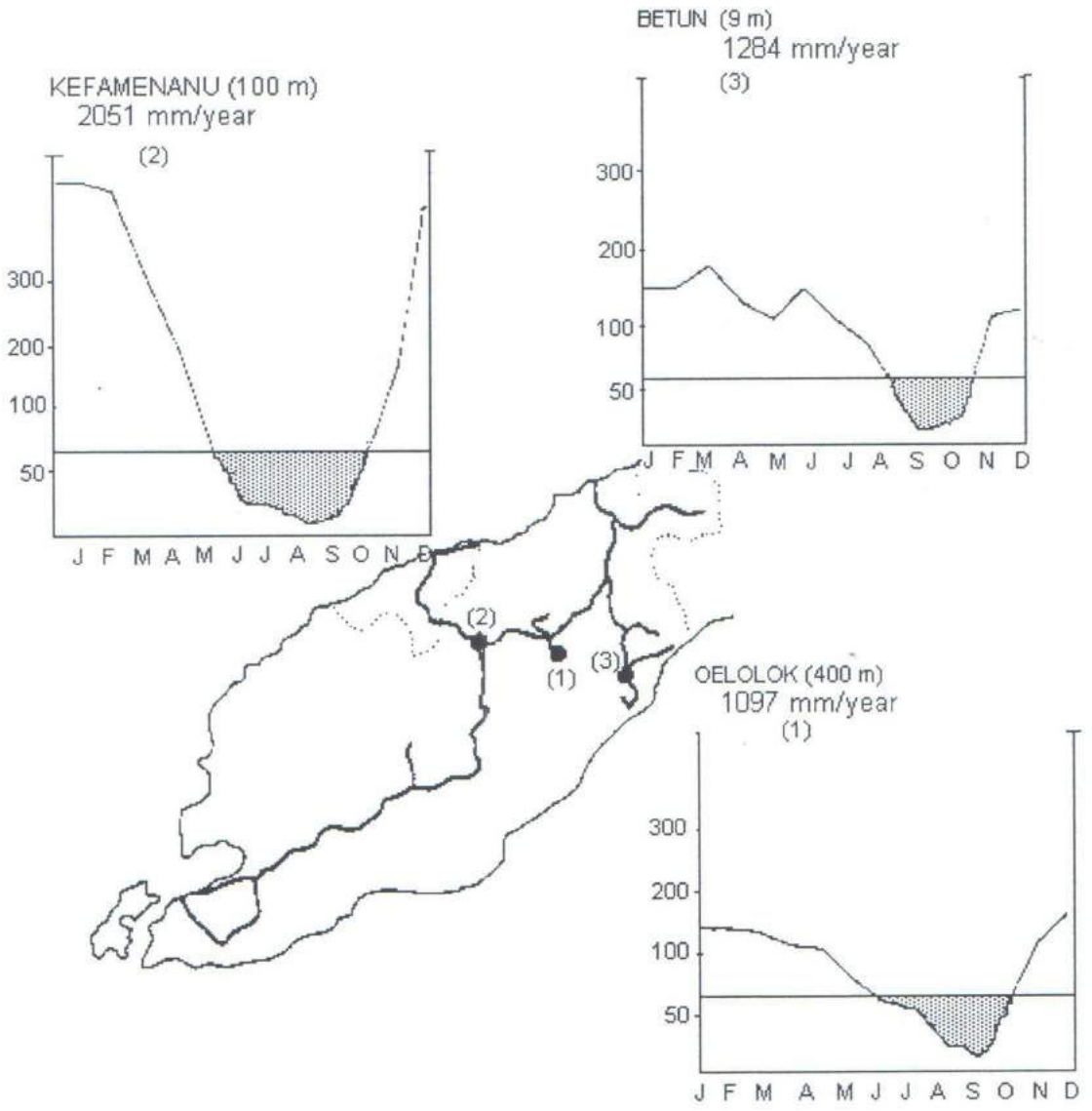

Figure 2. Average rainfall at Insana district

MATERIALS AND METHODES

A prolonged study was conducted in the Insana district. This was carried out during the course of research on the structural system of the Dawan people, and their effects on natural resources.

Extensive surveys were therefore carried out in four types of man-made ecosystems and savanna land. The plant resources of the areas were inventoried and analyzed.

A complete enumeration using 0.4-hectare sample plots was chosen for characterization of the vegetation cover in natural ecosystem and abandoned ecosystem.

A series if informal interviews to determine the local potential of each plant recorded in the inventory.

NATURAL VEGETATION

The natural vegetation type of Insana is monsoon forest which is structurally composed of trees with usually dwarf, trunks, and with curved, thick and low branches.

To determine the characteristic plant species in this type of natural vegetation, two categories of protected area were selected as sites of the study, namely *nasi* (natural stand looked upon as traditional forest) and *kiuk tokok* (natural area served as sacred sites).

In a 0.2 ha plot of *nasi* forest located in the low land area at Tiwaik hill (500m) 93 trees individuals were recorded with DBH > 10 cm. These belonged to 18 species and 18 genera in 15 families. The number of trees with DBH between 2-10cm was 122, including 23 species in 22 genera and 16 families (Table 1). The prominent species were *Mallotus philipensis, Micromelum pubescens, Tabernaemontana orientalis, Allophyllus cobbe, Pavetta indica, Ehretia acuminata, Wrightia calycina* and *Schleichera oleosa* are the most common species. Some scattered big trees of *Bombax ceiba* and *Ficus* sp. are also found in this area. In few places out of the plots *Pterocarpus indicus, Santalum album, Cudrania javensis* and *Peltophorum indicum* are widely distributed. Both these two groups of species are the most important to the local economy.

The vegetation investigated in this natural standpoint different in composition from the low land vegetation type found in Kalimantan or Sumatra. Here there is tendency that members of non-dipterocarps are dominant species.

Another type of natural vegetation investigated *kiuk tokok*, which the Dawan conserved as sacred sites. In tree different locations of *kiuk tokok* found in Insana, 27 trees species were recorded with three big trees (*Bombax ceiba, Ficus benjamina*) and *Tamarindus indica* were noted as central points of this sacred area. The associated species are *Bauhinia malabarica, Brucea javanica, Callicarpa candicans, Cassia timorensis, Pavetta indica, Tabernaemontana orientalis* and *Vitex pubescens.* Other elements but rather less frequent are *Aegle marmelos, Breynia recemosa, Cassia fistula, Cassia javanica, Fagara rhetsa, Ficus ampelas, Schleichera oleosa, Wrightia calycina* and *Zizyphus rotundifolia.*

Table 1. The different percentage of Important Value (IV) of species present in the natural forest (**nasi**) in a 0.2 ha plot.

Species	Family	Important Value (%)	
		¬ > 10 Cm	¬ 2 – 10 Cm
Aegle marmelos	Rutaceae	-	4.20
Allophylus cobbe	Sapindaceae	-	4.86
Annona squamosa	Annonaceae	-	2.75
Bombax ceiba	Bombacaceae	16.44	-
Breynia racemosa	Euphorbiaceae	4.58	15.06
Callicarpa candicans	Verbenaceae	-	2.72
Capparis sepiaria	Capparidaceae	-	2.41

Carmona retusa	Boraginaceae	-	7.21
Cassia timorensis	Fabaceae	17.21	12.47
Celtis philippinensis	Ulmaceae	-	2.35
Celtis sp.	Ulmaceae	-	9.59
Colubrina sp.	Rhamnaceae	10.12	-
Cordia myxa	Boraginaceae	19.90	10.48
Crateva religiosa	Capparidaceae	2.71	13.00
Ervatamia orientalis	Apocaceae	-	22.25
Exocarpus latifolius	Santalaceae	5.60	16.32
Ficus sp.	Moraceae	6.88	-
Garuga floribunda	Burseraceae	6.88	-
Grewia sp.	Tiliaceae	20.63	-
Gyrocarpus americanus	Hernandiaceae	2.95	-
Litsea sp.	Lauraceae	13.91	4.34
Mallotus philippensis	Euphorbiaceae	56.14	22.23
Micromelum pubescens	Rutaceae	-	84.09
Pavetta indica	Rubiaceae	-	7.26
Pterocarpus indicus	Fabaceae	26.85	-
Schleichera oleosa	Sapindaceae	17.90	4.04
Strychnos lucida	Loganaceae	-	3.36
Vitex sp.	Verbenaceae	10.22	-
Wrightia calycina	Apocaceae	26.50	14.10
Zanthoxylum rhetsa	Rutaceae	-	5.40
Ziziphus rotundifolia	Rhamnaceae	35.01	30.05

MAN-MADE VEGETATION

Because of their physical environment, especially the climatic condition, for food supply the Dawan people entirely depend on what they manage to produce during the short rainy season. For several centuries they have depended mainly on swidden agriculture. The average coverage of land cultivated by Dawan at Insana using shifting cultivation system is about 1.5 hectare per family.

According to local knowledge, the Dawan people distinguish four type of cultivation areas *lélé, po'an, kintal* and *kuan.*

Agricultural land

Traditionally the agricultural land was devised in two categories, based on their property. The communal property are were known as *lélé* and the private property which are called *po'an* in the Dawan language.

A complete inventory was studied in both type of land not only to understand the vegetation cover but also what species are planted.

The resume of intensive studies show that 69 species are found to 33 species (47.8%) of cultivated plant and 36 species of various non-cultivated plant (52.2%). Among the 33 species of cultivated plant, *Zea mays* and *Manihot utilisima* cover more than 70% of total land, and are planted essentially for staple food. Some other species groupings represent the secondary

food crops (5 species of tubers), vegetables (13 species), condiments (6 species), fruit trees (2 species) and other (5 species). The non-cultivated plants are composed of 11 species of trees, 1 species of climbing plant, and 21 species of weeds (Table. 2).

The phases of traditional swidden cycle from slashing, felling, burning, planting, weeding to harvesting is shown in fig.2. Normally at the beginning of dry seasons, occasionally in early August, the farmer will prepare the fields by such systems of clearing. Then they will plant in the beginning of the rainy seasons, which normally take place around December. The primary crop grown is the staple food (mays and cassava). Various cucurbits, tubers and FABAmes are also planted and used either for vegetables or sometimes also as staple food. The fields are weeded during January and February. The harvesting time depends on the varieties or species of crops. For example the young corn can be harvested 60-70 days after planting, whereas cassava and jams (some species of *Dioscorea* : *D. alata, D. pentaphylla, D. bulbifera, D. hispida*) normally are harvested at the end of August.

The preparation of the field is characterized by long fallow periods between short periods of intensive production. An area of forest is cleared, the remains are left to dry and are then burned. Crops are subsequently sown in the ashes between the tree trunks, which were to large to be burn out. After one or two crops, yield decrease. Weeds become a serious problem and the soil is left to recover. The most common weed species noticed are *Ageratum conyzoides, Acanthospermum hispidum, Bidens pilosa, Chloris barbata, Cyperus cyperiodes, Hyptis suaveolens, Sida rhombifolia* and so on. The less frequent ones are *Crotalaria nana* and *Mimusa pudica.*

Home garden

Home gardens represent a limitless resource for many things. It has been known that if these type of garden are managed properly, than may support the family for the whole year round.

Traditionally, the Dawan live in hamlet. The hamlets customarily are built surrounded with stone walls and hedges for protection. Usually these hamlets are inhabited by a group of families. The house is made from *bebak* (rib of palm-leaf *Borrassus flabelifer* or *Corypha utan*), rectangular in shape, with its roof reaching the ground. Each house has its own *lopo*. It is encircled by a communal garden, know by the Dawan as *kuan.*

Table 2. The diversity of cultivated and non cultivated plants in agricultural land (*lélé* and *po'an*)

Groups	Species	Family	Groups	Species	Fam
Cultivated			**Non Cultivated**		
Staple food	*Oryza sativa*	Poaceae	▪ Used like secondary food crops	*Amorphophallus campanulatus*	Aracaceae
	Zea mays	Poaceae		*Corypha utan*	Aracaceae
Secondary food crops	*Dioscorea alata*	Dioscoreae	▪ Fruit trees	*Annona muricata*	Annonaceae
	Dioscorea bulbifera	Dioscoreae		*Annona squamosa*	Annonaceae
	Dioscorea pentaphyla	Dioscoreae		*Psidium guajava*	Myrtaceae
	Ipomoea batatas	Convolvul.		*Uvaria purpurea*	Annonaceae
	Manihot utilisima	Euphorbiac			

Condiments	*Allium cepa*	Amarantac.	▪ Abandoned trees	*Acacia leucoploea*	Fabaceae
	Allium sativum	Amarantac.		*Cassia timorensis*	Fabaceae
	Capsicum annum	Solanaceae		*Ficus benjamina*	Moraceae
	Capsicum frutescens	Solanaceae		*Pterocarphus indicus*	Fabaceae
	Cymbopogon nardus	Poaceae		*Santalum album*	Santalaceae
	Zingiber officinalle	Zingiberac.		*Schleichera oleosa*	Sapindaceae
				Tamarindus indicus	Fabaceae
Vegetables	*Cajanus cajan*	Fabaceae	▪ Weeds	*Ageratuhum conyzoides*	Compositae
	Carica papaya	Caricaceae		*Biden pilosa*	Compositae
	Cucumis sativus	Cucurbitac.		*Borreria sp.*	Rubiaceae
	Cucurbita moschata	Cucurbitac.		*Brachiaria distachyum*	Graminae
	Dolichos lablab	Fabaceae		*Cassia tora*	Fabaceae
	Lagenaria siceraria	Cucurbitac.		*Chloris barbata*	Graminae
	Momordica charantia	Cucurbitac.		*Clitoria ternatea*	Fabaceae
	Mucuna pruriens	Fabaceae		*Croton hirtus*	Euphorbiac.
	Phaseolus radiatus	Fabaceae		*Crotalaria sp.*	Fabaceae
	Phaseolus lunatus	Fabaceae		*Cyperus cyperoides*	Cyperaceae
	Psophocarpus tetragonolobus	Fabaceae		*Cyperus kyllingia*	Cyperaceae
	Solanum melongena	Solanaceae		*Desmodium heterophyllum*	Fabaceae
	Vigna unguiculata	Fabaceae		*Eupatorium odoratum*	Compositae
				Euphorbia hirta	Euphorbiac
				Imperata cylindrica	Graminae
				Mimosa pudica	Fabaceae
				Paspalum conjugatum	Graminae
				Phyllanthus urinaria	Euphorbiac
				Sida rhombifolia	Malvaceae
				Synedrella nodiflora	Compositae
				Tephrosia pumila	Fabaceae
				Tridax precumbens	Compositae
				Vernonia cinerea	Compositae
Fruit trees	*Ananas comosus*	Bromelinac			
	Musa x paradisiaca	Musaceae			
Others	*Arachis hypogaea*	Fabaceae			
	Leucaena leucocephala	Fabaceae			
	Pachyrhizus erosus	Fabaceae			
	Saccharum officinarum	Poaceae			
	Sesbania grandiflora	Fabaceae			

Extensive surveys were therefore carried out in *Kuan Butak* near Oelolok to inventories the vegetation covers. The total numbers of cultivated and non-cultivated plant are listed in table recapitulative. Among the most commonly planted species here is the staple food *Zea mays.* More than 60% of the area covered by this crop. Other local economically important species are *Amaranthus hybridus, Cajanus cajan, Momordica charantia* and *Cucurbita moschata.* Non

cultivated plants but locally economically also important is *Borrassus flabellifer* and *Corypha utan.* One species of non-cultivated tuber found here is *Amorphophallus campanulatus* used by the people for staple food during famine. The climbing plant *Piper betle* is frequently found in this area.

The Dutch intervention at Insana radically changed this traditional pattern of settlement. According to Ormelling (1955), the village of Oelolok is a good example of this. A model settlement is illustrated here, on both sides of road with several tens of rectangular, single family, bebak house are shown. Each house has its own *lopo* and private garden, known by Dawan as *kintal.*

The results of extensive observation of 10 *kintal*s show that the vegetation cover is consisted of 96 species belonging to be cultivated and non cultivated plant as well (Table 3.).

The total number of cultivated plants including climbing /creeping plants is 72 species. Among the most commonly observed crops are *Zea mays, Ipomoea batatas* and *Dioscorea alata* used as staple food, while *Carica papaya* and *Cucurbita moschata* are intended for vegetable. Plants for condiments are also noted e.g. *Cocos nucifera, Capsicum annum, C. frutescens* and *Zingiber officinale.* There is also *Musa x. paradisiaca* considered to be common in each *kintal.* The ornamental plant not recorded in *kuan,* is observed in *kintal,* 11 species. Only a few species are preferred such as *Alamanda cathartica, Cordyline fruticosa* and *Costus* sp.

Some other non-cultivated plant but locally economically important and present frequently are *Borrassus flabellifer, Corypha utan* and *Tamarindus indica.*

Abandoned vegetation

The abandoned arable land due to the cycle of the sifting agriculture is know as ***sémo*** in Dawan language. This type of land generally is characterized by vegetation cover of small trees of shrubs (less than four meters in height) both herbaceous and ligneous.

Intensive studies in a 0.2 hectare sample plot of *sémo* (four years after second cultivation) show that floristically it is composed of 16.2% of trees with DBH > 10cm and 83.8% of trees with DBH between 2-10cm. The total individual of trees is 161 belonging to 17 species, 16 genera and 15 families. The prominent species are *Helicteres isorae, Lantana camara* and *Zizyphus rotundifolia* (Table 3.).

In some area, out of the sample plot, in newly abandoned land (1 year) the first succession is covered by *Hyptis suaveolens, Stachytarpeta jamaicensis, Bidens pilosa, Ageratum conyzoides, Widelia montana, Tephrosia pumila* and so on.

Table 3. The different percentage of Important Value (IV) of species present in the abandoned vegetation (***sémo***) in a 0.2 ha plot.

Species	Family	Important Value (%)	
		¬ > 10 Cm	¬ 2 – 10 Cm
Aegle marmelos	Rutaceae	-	2.60
Annona muricata	Annonaceae	-	9.36
Annona squamosa	Annonaceae	-	2.73
Brucea javanica	Simaroubaceae	-	5.34
Carmona retusa	Boraginaceae	-	3.03

Cordia myxa	Boraginaceae	33.10	32.52
Ervatamia orientalis	Apocynaceae	-	13.39
Helicteres isora	Sterculiaceae	-	84.01
Jatropha curcas	Euphorbiaceae	-	11.05
Lantana camara	Verbenaceae	-	60.43
Psidium guajava	Myrtaceae	9.13	13.10
Pterocarpus indicus	Fabaceae	-	8.54
Randia sp.	Rubiaceae	9.27	-
Schleichera oleosa	Sapindaceae	73.26	-
Spondias sp.	Aancardiaceae	10.88	-
Strychnos lucida	Loganaceae	-	2.73
Tamarindus indica	Fabaceae	13.21	2.92
Ziziphus rotundifolia	Rhamnaceae	150.95	37.26

Savanna land

Savanna land, which are called *hu sona* in the Dawan language, cover more than 60% of the Isana land surface. This type of land according to Steenis (1955) and Ormeling (1957) is not original vegetation. This formation is due to the traditionally system of agricultural, hunting and grazing were practiced by local inhabitant.

The landscape is generally more or less open with herbs mostly dominant. Of these, species frequently present is *Cyperus compresus, C. cyperoides, C. kyllingia, Ephorbia hirta, Imperata cylindrica, Paspalum conjugatum, Tridax procumbens* and so on with sometimes scattered of trees as *Bauhinia malabarica, Corypha utan, Zizyphus rotundifolia, Vitex pubescens* and very abandon *Eucalyptus alba.*

CONCLUSION

It may be concluded that the effects of the Dawan activities, have changed the landscape of Insana especially because of their traditional practices of agricultural which have been achieved through clearing and burning both for sifting agricultural. Therefore, its difficult to find piece of land in Insana that directly nor indirectly has not been influenced by human intervention. All the available land is being used, but the population is still increasing.

The present situation is not profitable. The physical environment is not enough to support agriculture activities. Consequently it is difficult to develop permanent agriculture system.

Customarily the natural vegetation is strictly protected. But the Dawan people generally prefer the forest area for their arable land rather than savanna. In addition, because of the economic pressure, the activities of forest clearing for agriculture increase. As the result the populations of *Pterocarpus indicus, Schleichera oleosa, Fagara rhetsa* and *Santalum album* are decrease.

It is also important to conclude that because of regular practices of sifting agriculture and hunting by burning the floristic composition of vegetation cover have been reduced. Comparison of vegetation analysis done in *nasi* and *sémo* (four years abandoned after second

cultivation) has shown that the number of species is decreasing. Only 7 out of 38 species, were recorded in both ***nasi*** and *sémo.*

The use of fire in savanna land *hu sona* generally for hunting and grazing, this another problem of degradation. These activities do not only decrease the floristic composition but also cause the soil to under going erosion. The result of floristic analysis of savanna shown that the species frequently present are *Bidens pilosa, Crotalaria nana, Cyperus cyperoides, C. kyllingia, Euphorbia hirta, Euphatorium odoratum, Flemingia, Imperata cylindrica, Hyptis suaveolens, Sida rombifolia, Tridax procumbens.* It is may be interesting to know what plant the grazing animals are eating, and how nutrition they are.

Because of "modernization", species diversity of crop plants is truly increased. The floristic composition on the settlement area of *kintal* and *kuan* are mostly composed of food and vegetable exotic crop plants.

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