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Tropical Rainforests, Traditional Societies, and Dynamic Continuums. Toward a Regional History of Ethnicity in Borneo[1]

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ABSTRACT

Environmental and human features, and the interactions between them, in a key research region of the island of Borneo, are here all consistently regarded as continuums. Integrated studies, combining the biological and social sciences, of these continuums should provide an alternative view of the interactions between environment and society and, through a reconstruction of the eco-cultural history of this region, allow new insights into the history of Southeast Asia.

Keywords: *environmental history; subsistence systems; environmental, economic and social continuums; changing ethno-cultural identity; regional history.*

INTRODUCTION

The data used here mostly originate from three districts, Kerayan, Long Pujungan, and Malinau, located in the area of the Kayan Mentarang National Park in East Kalimantan[2] (Indonesian Borneo; Fig. 1). This region, covered with humid tropical forest and mostly accessible by rivers or footpaths, is populated by two major farming Dayak clusters, the Kenyah and Lun Daye (or Lundaye), and by Punan nomads.

1 This paper is largely based on an article published in French in the journal *Ecologie Humaine*, 12 (2): 3-22 (1994), and later reprinted in *Cahiers d'Outre-Mer*, 51 (204): 421-440 (1998). It has been updated by rewriting, added footnotes, and extra references.

2 Taman Nasional Kayan Mentarang (TNKM) is now located in the new North Kalimantan province. Each of the districts mentioned here has been divided into several smaller districts after the establishment of the new province.

Figure 1. The Kayan Mentarang National Park (KMNP), and adjacent areas

In Kayan Mentarang, the Culture & Conservation research program of the World Wide Fund for Nature (WWF/IP; see Sellato 1995), with funding from the Ford Foundation, carried out between 1990 and 1997 a number of studies on various aspects of the local peoples' cultures and their interactions with their forested milieu, leading to an interdisciplinary reconstruction of the dynamic interface between nature and society from a historical perspective.[3]

1. SUBSISTENCE TECHNIQUES AND SUBSISTENCE SYSTEMS IN BORNEO

What is referred to here as a subsistence system is a set of basic or elementary techniques, "subsistence techniques", for acquisition or production, deployed by a human community to meet its food requirements. The subsistence system is a feature of importance in the community's overall economic system. Henceforth, however, only staple foods providing vegetable carbohydrates are considered.

I shall briefly describe basic subsistence techniques, each of which exists only in combination with one or more others, thus constituting subsistence systems (except in the case of rare, totally nomadic bands of hunter-gatherers, should any still exist), and its relative weight in meeting dietary requirements for carbohydrates varies with groups and regions. Associated with these, techniques practiced among all of Borneo's inland groups for acquiring animal proteins (by hunting and fishing; see Puri 2005) or producing them (through animal husbandry) are generally remarkably homogenous. Bartering or modern commerce partakes in complementing food requirements.

The order in which these techniques are described below does not reflect any technological or cultural evolutionary categorization with anything more than a narrow value in time and space. A given technique may, over time, have been mastered or abandoned, and the geographical extent of its use may have increased or decreased; and a given group may have shifted from any one of these basic techniques to any other, or adjust the relative importance of several combined techniques according to local practical historical factors.

3 See Eghenter & Sellato 1999, Eghenter *et al.* 2003). Unreferenced information used in this article can be sourced to these two books.

1.1. Hunting-gathering

Only gathering for food is examined here. The gathering or collecting of valuable products[4] intended for barter or sale is not taken into consideration, even though it may indirectly contribute to a community's food supplies. The principal staple food is wild sago, although locally fruits can play a major role, not to mention large numbers of forest plant species.

The nomadic groups of Borneo, collectively called Punan or Penan, traditionally practiced hunting and gathering, to the exclusion of any other type of subsistence (see Brosius 1986, 1993, Jayl 1993, Kedit 1982, Sellato 1994). The concentration and distribution of sago palm groves bear on the size of the bands, their habitat, and the frequency and distance of their movements. These Punan and Penan altogether may number about 25,000, a truly tiny percentage of the island's population. Although less than ten percent of them are still really nomadic,[5] many groups, now half-sedentary, continue to make ample use of the forest for their subsistence. All farming groups living close to the forest also collect wild plant foods. This is especially true for communities practicing swiddening (rotating slash-and-burn hillside cultivation) in the hinterland, where forests are still abundant. They often resorted to wild sago during migrations, and still did recently, in case of a bad rice harvest.

The main species of sago are *Arenga undulatifolia* Becc. and *Eugeissona utilis* Becc. Other species (*Caryota mitis* Lour., *Caryota no* Becc., *Corypha* spp.) are also sometimes used. The relative abundance of these palm species varies with regions. The Penan Gang in Sarawak only exploit *Eugeissona* (Brosius 1993), but their cousins in Long Pujungan District (Fig. 2) more commonly consume *Arenga*. In Kerayan, where *Arenga* seems absent, *Eugeissona* is used. In Malinau, both are used. Taste preference should probably also be taken into account. The men fell and cut up the tree trunk before splitting the sections lengthwise, the fibrous pith is then extracted, and women trample and wash it. A starch, collected by filtration, provides the basis of numerous food preparations. The heart of these palm trees is also consumed, and Brosius (1993) reports that *Eugeissona* is more often felled for its heart than for sago.

4 NTFPs, non-timber forest products, generally of little significance to a community's subsistence, but often of high commercial value, hence eagerly collected by forest nomads (see Peluso 1983, Sellato 2002c).

5 These figures are obsolete. For (relative) updates, see Sercombe & Sellato 2007. Borneo in 2022 has an estimated total population of about 25 million.

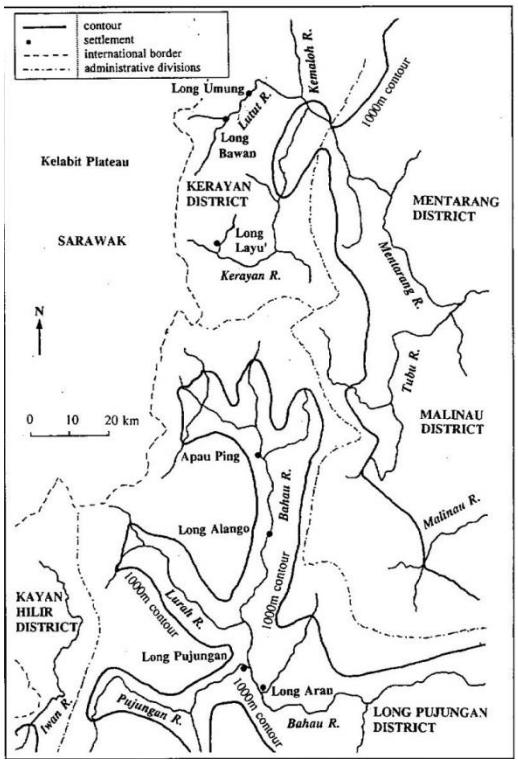

Figure 2. KMNP region: physiography and administrative divisions (Sellato 2009).

It is probable that the nomads consume some 200 species of wild forest plants for their fruits, roots, tubers, leaves, flowers, or shoots – plus ferns and mushrooms. Among both Punan and farmers, it is mainly the women and children who do the gathering. The simultaneous ripening of forest fruits (mastfruiting, an erratic "fruit season") and the coming of herds of wild boars attracted to the fruit lead to an interruption in the usual diet of the nomads, who then gorge themselves on fruit and meat.

The nomads apparently gather food in all types of forests,[6] except, probably, the high-elevation types, where they rarely venture, and possibly the xerophilous types (see 2.1.). Several species of sago palm trees (*Arenga* and *Caryota*) are reported to only grow in secondary forests. Among farming communities, gathering is mainly performed in abandoned swidden fields and in areas surrounding the village. The people practicing gathering, farmers and nomads alike, probably recognize (but do not discriminate amongst) wild and domesticated plant species (see 2.3.). A study carried out in Kayan Mentarang reported that local Kenyah swidden farmers collected at least eighty plant species for consumption.

Sago palm trees are subject to human interference: After the sago harvest, a palm grove is given some "maintenance" or "stewardship" care (pruning, cleaning) and left to grow again – the Punan call this *mulung* or *molong*, meaning "to preserve or foster" (Brosius 1993)**.** The very fact of exploiting (without abusing) a sago palm grove might help stimulate its regrowth (according to Brosius 1993, only *Eugeissona* propagates in a vegetative way). And the literature on Borneo nomads also mentions deliberate scattering of fruit seeds around camps.

6 See MacKinnon *et al.* 1996, Puri 2001.

Research on these nomads' sedentarization processes (see Sellato 1994) has shown that, in an early stage, simple forms of horticulture (cassava, banana) requiring little effort, technical skill, or presence on site (propagation by cuttings) are common, and comfortably coexist with the harvesting of wild sago. Locally, one may also find some swidden rice, though it requires a greater investment in labor and time (presence) and hence inhibits the mobility necessary to collect sago (or NTFPs). In many documented cases, a Punan community, once involved in agricultural activities, finally becomes assimilated into the farming Dayak community that initiated or oversaw its settling down, and changes its ethno-cultural affiliation (see 2.4.).

1.2. Horticulture

Sago palm trees (*Eugeissona*, possibly also *Arenga*) are sometimes planted in the highlands. This is the case among the Punan Bah of Sarawak, who grow *Eugeissona*, but also collect sago from wild *Eugeissona*. We can now see how difficult it may be to draw a line between food gathering and horticulture. On the coasts of Sarawak, Kalimantan's east coast, or around Banjarmasin, plantations of the larger palm tree species, *Metroxylon sagu* Rottb., have produced dry sago for centuries, sale and export of which generated an important income for coastal kingdoms such as Brunei.

Tuber crops have undoubtedly played a crucial role in the economic history of Borneo, particularly the New World *Manihot* (cassava/manioc; see Knapen 2001) and, to a lesser degree, taros (*Colocasia* spp.) and the sweet potato (*Ipomoea batatas*). The literature on Borneo does not mention planted *Dioscorea*, and the consumption of semi-wild *Dioscorea* species (*D. alata*, *D. hispida*) is now rare (e.g., some Kenyah groups in Apo Kayan). However, taros and *Dioscorea* were undoubtedly more frequently used before the advent and success-story dissemination of American cultigens. Today, cassava, sweet potato, and taro are still commonly planted and consumed by farmers. Among certain groups (e.g., Kenyah of the upper Bahau River), taro is frequently eaten mixed with rice; among many others, taro, a food of little prestige, is mainly used to feed domesticated animals. As for cassava, farming groups and settled nomads often use it to produce fermented or distilled beverages.

Banana "trees" are fast-growing, vegetatively propagated plants of major dietary importance. The same goes for jackfruit (*Artocarpus heterophyllus* Lamk.), very high in calories. The systematic practice of fruit tree planting implies a settled life, or at least a relatively continuous presence nearby over the long term. A fair number of species belonging to the *Nephelium*, *Lansium*, *Mangifera*, *Caesalpinia*, or *Durio* genera, among others, are commonly planted (Puri 2001).

Borneo swiddeners are zealous collectors of useful plants, bringing back seeds or cuttings of new species or varieties from their distant journeys, which they plant in their swiddens, orchards, or vegetable gardens. As a result of spontaneous cross-pollination, it becomes difficult to distinguish between different varieties (see 2.3.), something only genetic studies could achieve.

Among nomadic groups in the process of becoming settled (above, 1.1.), a subsistence system is commonly found combining horticulture (tuber crops) and gathering (wild sago). Some groups have maintained this viable and stable system in the same form over long periods. Others, adding to it some swidden rice, have developed a threefold system. Others still, abandoning sago, display a system combining tuber crops and swidden rice (Fig. 3; see Sellato 1994). Among the Kenyah of Long Pujungan, the adoption of swidden rice has not prevented taro from retaining an important place, now partly supplanted in their daily diet by cassava.

Figure 3. A combined cassava (left) and rice (right) subsistence system, with fruit trees (bottom right); note two successive levels of regrowth forest (background) (photo: B. Sellato, 2010).

Since tuber cultivation does not deplete soils as much as rice farming, clearing vast plots of forest every year was not compulsory, and horticulture could develop in Borneo, from several millennia ago, in the absence of metal. This led me to suggest the existence of an "horticultural civilization" extending over the whole of Borneo before the relatively recent generalized diffusion of iron tools (and rice swiddening) to hinterland regions (1993b, 1994). Tuber crops also play a crucial buffering economic role among farmers in case of failed rice harvest or periods of endemic warfare. In the past it enabled a community to secure its food supplies through the intensive and continuous farming of a smaller but safe area close to the village, which could be efficiently protected.

1.3. Swidden rice cultivation

It seems justified to assume that swidden rice farming (*padi ladang*) could only develop extensively with the use of metals. Since felling a tree with a stone axe could take five times more time than with a metal tool, the energy output required to clear a new rice swidden year after year seems out of proportion with its yield and, as a result, remains an unattractive option.

There is a wealth of literature on swiddening in Southeast Asia and, even on Borneo, good studies are available (Chin 1985, Dove 1985, Cramb 1993; see also Freeman 1955). I shall therefore refrain from discussing the detail of its techniques and practices here. Suffice it to say that the Kenyah, among others, make use of plots of secondary forest (*jekau*, former swidden fields left fallow for 10 to 25 years; Fig. 4), which are relatively easy to fell, and only rarely fell tall climax forest[7] plots, despite their better soils; that the native varieties of rice are long-season (six months) and, on Borneo's generally poor soils, only provide a single harvest per year; that yields, without fertilizers or pesticides, stand between 750 and 1,100 kg of unhulled paddy per hectare (compared with 1.9 tons in

7 Climax forest is defined as a plant community dominated by trees representing the last stage of natural succession (https://northernwoodlands.org/articles/article/what_is_a_climax_forest). I use this phrase here because it mostly refers to trees having reached their maximal size, which is directly relevant to the technical questions discussed, e.g., felling trees to open a swidden field. Regarding the use of the phrase "primeval forest", see Note 9.

South Kalimantan, where technology is more advanced), with a return on labor of 7 kg per manday.[8]

Figure 4. A pioneer swiddening community in climax forest, with various patches of successive fallow swiddens (regrowth forest in different shades of green) around the current swiddens (in brown; photo: B. Sellato, 1993).

The "collector streak" in the inland people (above, 1.2.) applies particularly to rice. Studies undertaken in Kayan Mentarang have shown that Long Pujungan District farmers know and retain 30 to 50 rice varieties originating from various regions of the island. Generally, more than half of these are for swiddens, whereas others (6 to 18) are planted in wet fields, and several varieties can be sown in swidden or wet field alike. Twenty to 25 percent are sticky rice varieties. A Kenyah farmer sows an average of five varieties each year, depending on an *ad hoc* personal assessment of diverse criteria (soil type, resistance to drought or disease, weather forecast). Some varieties are only kept for their genetic value, to maintain biodiversity: The farmer only plants a small patch in a corner of the field, not for consumption, but only to renew the seeds; and if, on the edge of the patch, he spots beautiful paddy stalks resulting from spontaneous cross-pollination, he keeps their seeds, thus adding a new variety to his collection.

Contrasting with horticulture and hunting-gathering, rice farming enjoys high prestige in the highlands, due to the rather recent introduction of rice along with that of metal, and especially to the fact that the ethnic groups that introduced metals – and thus made the expansion of rice swiddening possible – were, in the course of their wide-ranging migrations across the island, militarily aggressive and culturally dominant, and influenced other groups. In the highlands, therefore, rice farming tends to be an important element of ethnic identity, which is based, if not on a *de facto* prevailing practice of rice farming, at least on an ideological recognition of the pre-eminence and prestige of rice: some groups, e.g., the Punan Bah of Sarawak, in practice horticulturalists as much as rice swiddeners, would rather view themselves as rice farmers.

Swidden rice cultivation, complemented by horticulture and hunting-gathering, constitutes the most common combination – subsistence system – among inland groups of Borneo. Swiddening is currently rivaled locally by irrigated rice farming promoted by government agencies (see, e.g., Wadley 2005).

8 For figures and further details and for references, see Sellato 1997; for a broader scope, see Dove 1985.

1.4. Swamp rice cultivation

Swamp rice cultivation (*padi paya*) is practiced in some lowland regions, such as among the Lun Bawang of eastern Sarawak, and in the 1000m-high Kelabit-Kerayan plateau area. Nowadays, however, this agricultural type seems less common in Borneo (see Dove 1980), as swamps have been gradually converted to irrigated rice fields (see 1.5.). On the Kerayan plateaus, the various incoming Lun Daye groups of swiddeners (Fig. 5) found a vast complex of shallow lakes that were draining out. On the hillsides they made rice swiddens and, according to elderly informants, they threw the same dry rice seeds in the alluvial terrace swamps, where they grew well. Later, they learnt how to weed, build dikes, channel the water, and regulate its flow.

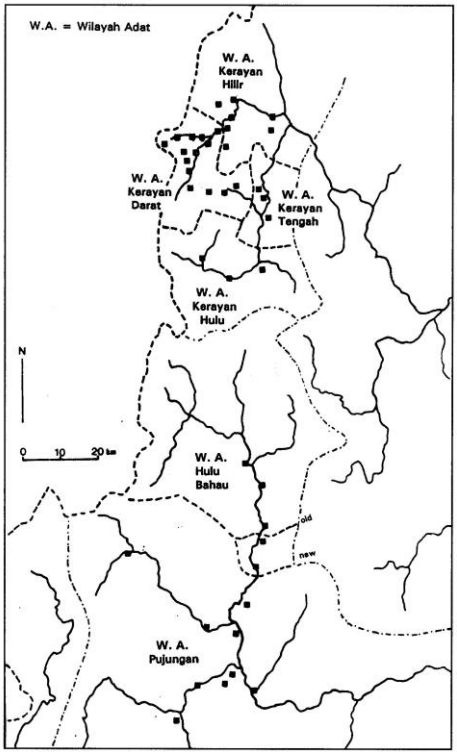

Figure 5. KMNP region: Kerayan (Lun Daye) and Kenyah customary domains (wilayah adat; Sellato 1997).

Until recently, swamp fields were fashioned with only a half sago tree trunk to dig up the mud and baskets to carry it out (Padoch 1983). The field, unplowed, was trampled and fertilized by water buffaloes. The water was then drained out and the rice seed sown on the hand-leveled ground. Only when the rice shoots had grown to about 10cm was the field flooded (see Sellato 1997).

This technique involving sowing rice in a simply prepared swamp is probably the result of local innovation, apparently as an alternative to swiddening – as is suggested by the practice of swidden rice seed germinating out of water (furthermore, villagers suggest that wet-rice seeds imported from the coast do not grow well on the high plateaus). It was carried out in the absence of metal, without plowing tools. Basic irrigation techniques may have been innovated locally or introduced from coastal regions during the first half of the 20th century but, in this isolated area, metals remained almost entirely lacking until after 1945, while stone tools were remaining in use (see Harrisson 1949, Padoch 1983).

In the Kerayan Darat area, swamp rice farming seems to have prevailed until the turn of the 20th century. Nowadays, irrigated rice farming, the only type present, co-occurs with taro cultivation (on dikes), a crop that probably, like elsewhere, played a greater role in the past. In the Kerayan Hulu area, a part of the farmers, in addition to their wet rice field, have a swidden field where they plant either rice or corn (see Sellato 1997). In the Kelabit area, till the 1920s, most farmers had swiddens, often on alluvial terraces. Only after 1960, it seems, did wet-rice farming really expand, thanks to the shared practice of nurseries and transplanting.

In Long Pujungan District, a few individuals adopted or adapted the technique of swamp rice cultivation from their neighbors in the Kerayan area. Apparently, they dug and prepared natural swampy spots as pools, for use first as fish ponds, and they later sowed dry rice seed.

1.5. Irrigated rice cultivation

Irrigated rice farming (*sawah*) is widespread in Indonesian Borneo's lowland regions. Javanese influence and, later, the State's economic development programs have promoted modern agricultural techniques. In the brackish tidal lowlands, the so-called *pasang-surut* areas, specific techniques of irrigated cultivation, as well as suitable rice varieties, were developed, as in South Kalimantan (see Potter & Ali 1989).

In the Kerayan and Kelabit highlands (Schneeberger 1979, Yahya 1979), "simple" irrigation techniques – transforming the swampy area and capturing surface waters without complex hydraulic works – have developed relatively recently (see above). It is apparently only after the start of the 20th century that they were introduced. Later on, with missionary activity in the highlands (1930s), the Japanese occupation and, later yet, the presence of Javanese soldiers in Kerayan during the Confrontation with Malaysia (1963-66), the techniques of nurseries and transplanting spread.

Traditional seeds (sometimes swidden rice), still used, are ever more challenged by varieties imported from the coast and promoted by the government. These new varieties are short-season, but the influence of elevation slows down their growth. To date, the use of chemical fertilizers and pesticides remains very limited, even non-existent in certain areas. The yield from irrigated rice farming, about 2 tons per hectare, is considerably higher than from swiddening, but remains lower than those obtained in coastal regions (2.9 tons per hectare per harvest in South Kalimantan plains) or in Java (2.75 tons in fertile Central Java), where two harvests per year are the norm, and sometimes three – but Kerayan farmers are said to harvest over 10 kg of unhulled paddy per manday (Padoch 1983), while the norm in Java is c. 4 kg (Dove 1985).

In Kerayan District, irrigated rice farming is now commonplace in areas wherever alluvial terraces are found (Kerayan Darat, western Kerayan Hulu; Fig. 6), but swiddening remains the norm in other regions of the district (especially Kerayan Hilir), where flat terraces are rare. Kerayan Darat, the region's granary, exports its surplus rice, along with water buffaloes, salt, and now human labor, to the Kelabit next door – but no longer holds those huge traditional rice-beer drinking feasts.

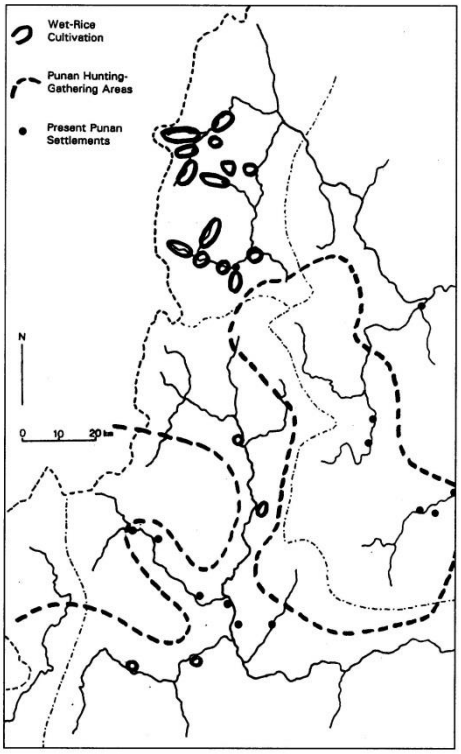

Figure 6. KMNP region: subsistence economy, wet rice field areas (and Punan lands and settlements; Sellato 1997).

Like swiddening, wet-rice cultivation is an ethnic identity marker. The Lun Daye groups of Kerayan distinguish between two categories: the Lun Tana' Luun, "people of the highlands" (swiddeners), and the Lun Baa', "people of the swamps" (wet-rice farmers; see Sellato 1997). In the absence of any strong cultural or linguistic contrasting feature, this distinction is essentially techno-economical. Wet-rice cultivation is gaining ground concomitantly on two fronts, by the opening of wet rice fields wherever possible on Tana' Luun land (in Kerayan Hilir) and by the emigration of whole Lun Tana' Luun villages to the Baa' lands (in Kerayan Darat); the new converts to wet rice, *ipso facto*, switch categories, despite dialectal variance, to become Lun Baa', which, in the modern Indonesian political and economic idiom, amounts to a marker of social prestige appreciation.

In Long Pujungan District, a Kenyah chief who had been detained in Java introduced, in c. 1950, the techniques of irrigation, terracing, and transplanting but, as flatlands there are rare and narrow, wet-rice farming has remained marginal. Farmers who plan to set up a wet rice field generally also prepare a swidden field, and schedule their work in the former around the constraints of the latter's work calendar. The wet fields are unplowed, water buffaloes are lacking in the Bahau River, and neither fertilizers nor pesticides are used. The long periods of drought that occurred in the early 1990s led many families of swiddeners, apparently harboring mixed feelings (*cf.* the "in-between" in Padoch *et al.* 1998), to set up small irrigated fields (with 2 to 4 kg of seed), in parallel to their swidden. In Apau Ping (upper Bahau), the percentage of villagers farming a wet rice field rose from 13 to 68 percent between 1991 and 1993,

2. FROM PRIMEVAL FOREST TO THE HUMAN SPACE: A CONTINUUM APPROACH

Building upon the idea of transition put forward above with regard to subsistence systems, the following pages propose to more systematically view the environmental and human features, as well as the interactions between them, as continuums, or as continuum-generating factors. The study of these continuum situations, taken globally, should offer a different perspective.

2.1. On the generic primeval[9] forest

In Borneo itself, there are many types of forest and it is essential to refute the model of a "generic tropical forest". According to this model, which appears too often, explicitly or not, in certain theoretical works (e.g., Headland & Reid 1989, Bailey *et al.* 1989), the primeval tropical rainforest is not a viable environment for "pure" hunter-gatherers' autonomous subsistence, either at the global or local scale.

We know of different types of forest in Borneo: Dipterocarpaceae forest at low and medium elevation (under 1000m); mixed sub-mountainous forest (1000m); mountain moss forest (over 1500m); *Rhododendron* forest at very high elevation; xerophilous forest (*kerangas*); limestone based forest; *Agathis* forest; freshwater swamp forest; brackish marsh forest (delta, coastal region); mangrove forest; (non-brackish) rocky and sandy coastal forest; tidal forest with *Nypa* palm trees (estuaries). Each of these types has a different botanical composition and vertical structure (it is not necessary to go into detail here).[10] Besides elevation (and its corollary, temperature), various factors intervene to alter the composition and structure of the forest; these are geological (substrate petrography and mineralogy), morphological (declivity), and climatic (rainfall, its abundance, intensity, and seasonal distribution, sunshine, and hygrometry). These factors combine to form specific and complex soil types, thus generating an infinite variety of regional and local conditions.

Although vernacular categories often do not recognize this variety, forest users (for food or trade) know exactly in what parts of the forest to look for sago palm trees, poison trees (*Antiaris toxicaria*), or incense wood trees (*Aquilaria malaccensis*). This variety and the local specificity of the forest's botanical composition are therefore implicitly recognized.

Of course, there is no generic "secondary forest" either. Ecologists crudely distinguish woods, brush, etc., without being clear enough about whether these are stable ecological types. Borneo farmers recognize several categories, loosely contrasting regrowth forest and climax forest, based upon the trunk diameter of the wood species that grew there in the abandoned field. In this case, a regrowth forest continues to grow until it reaches, in height, diameter, and density, the appearance of a climax forest, which is mostly relevant to the farmer in terms of the forest plot's potential use to clear a new swidden. Technologically and lexically, farmers regard forest as a fallow-regrowth-climax continuum, which they deal with according to their household's number of male labor available to fell the trees; meanwhile, its changing botanical composition is viewed as irrelevant, unless the regrowth forest includes planted fruit trees.

These categories do not take into account certain important factors, deriving from the history of human use (land tenure) of the plot concerned: e.g., the type of agriculture practiced, the number of years of use, the intensity and influence of burning, the leaching caused by rainfall, changes in soil types following their use, or the presence of cultivars, weeds, or invasive plants.

2.2. Human interference with the environment

The effects of human interference with the environment are certainly greater than could be pondered in view of the current situation. Borneo's inland regions have become markedly depopulated in the last fifty years in favor of the lowlands, and vast areas that had previously been farmed could

9 Primeval forest: this phrase, contrasting with the phrase "climax forest" (see Note 7), was selected here for its usual, somewhat poetic connotation of "unaffected by human action". This choice seems appropriate, in tune with the topics of this Section 2.3: the degree of anthropization of the forest, the continuum between a virtually totally unaffected ("untouched", "pristine", "primary", "virgin") forest and the deeply "cultured" space in which a human community lives, and the general nature-culture continuum.

10 See MacKinnon *et al.* 1996; also Voss 1979.

therefore grow again forests (Kenyah *jekau mukun*, "old regrowth") to climax stage. Although their composition is different from that of a primeval forest (Kenyah *mba', mpa'*), new forests cannot be distinguished without a close botanical (and genetic) study.

This interference also goes back quite a long way. The discovery, in an isolated region of the island's central mountain range, of pottery shards dated to c. 3,000 years ago (Chazine 2005) suggests that people were already farming there. It is reasonable to think that, even in such isolated regions and after such a long time, the composition and distribution of the forest still reflect the historical effects of interactions between those humans and their milieu. It then appeared necessary to attempt a reconstruction of the history of forested environments and of these interactions, which was one goal of the research program of the Culture & Conservation project.

2.3. From primeval forest to cultural space

The concept of "primeval" forest (or rather, forests), which posits a total absence of human interaction, is therefore ambiguous. It only becomes meaningful if we are able to irrefutably detect traces of past interactions, e.g., by studying the botanical composition of the forest. But the absence of such traces cannot constitute in itself proof of the absence of interactions. The question then arises of determining, for a certain number of species and varieties, whether their presence in the forest (or their very existence) is due to human intervention, and whether they are purely wild (native), semi-domesticated, or of domestic origin.

We know that the survival span of cultivated plants varies considerably when a secondary (regrowth) forest occupies an abandoned human settlement or cultivation site: e.g., banana trees (*Musa* spp.) disappear very quickly, areca nut trees (*Arenga pinnata*) can only survive two or three decades before being choked out, whereas species like *abung* (*Nephelium* cf. *cuspidatum*), *leset* (*Lansium domesticum*), *alim* (*Mangifera caesia*), and *isau* (*Caesalpinia* sp.) and, to a lesser extent, *dian* (*Durio* spp.) can survive much longer, probably for over two centuries. A study of post-abandonment sites in Kayan Mentarang tried to establish a calibrated correlation between the persistence of certain planted fruit tree taxa and the age of abandoned settlement sites.

Certain pioneer wild species find an opportunity to develop during the early growth phase of a secondary forest on an abandoned swidden. After cultivation, the nutrient-poor soil may not allow re-colonization by the original forest species, and such pioneer species can remain and possibly enable domesticated species to remain as well. We may even assume that some very adaptable cultivars or aggressive weeds can disseminate and colonize a primeval environment – which, *ipso facto*, would no longer remain primeval.

Whether by human intervention or spontaneously (cross-pollination), new varieties appear, as is the case for mango trees (*Mangifera* genus). Some of them not only manage to survive in regrowth forest, but may also spread around into primeval forest. We thus observe, in certain plants, a taxonomic continuum, by cross-pollination, between wild native species and various cultivars, which reflects an environmental continuum, that of botanical composition, from a virtual "primeval" forest (e.g., high mountains) to a highly anthropized space (village).

This nature-culture continuum, generated by human, purposeful or unintended, intervention and, later on, by the spontaneous diffusion of species, curiously goes against the vernacular social and religious concepts of Borneo's farming peoples, who tend to contrast the "primeval forest" or "great forest", as a place of wild nature and the domain of potentially dangerous resident spirits, with the "secondary forest", as a still relatively "tame" regrowth ("un-climax") forest, a monitored human creation that, having been felled in the past, now belongs in the cultural space and carries some edible plants. Only men, said to have stronger souls, venture into the former, whilst more vulnerable women dare not go

beyond the latter. This contrast does not exist among nomadic people, who call the great forest home and are often regarded by farmers as an intermediate category, in-between man and beast, nature and society (see Sellato 1994).

2.4. A continuum of subsistence systems

The subsistence systems known among Borneo's ethnic groups involve diverse combinations of a small number of what I have called basic subsistence techniques. The composition of these combinations and the relative weight of the techniques that play a part in them vary from one given community to its neighbor. Furthermore, composition and relative weight also vary for a community over the course of its history (e.g., nomads becoming settled, or wet-rice farming in Kerayan). Reasons for change are technological (e.g., presence or absence of iron), economic (e.g., exploitation of an ecological niche), ideological (e.g., prestige of rice farming).

There is therefore a continuum of subsistence systems, both in space and through time. This leads to the necessary refutation of certain normative notions of an ideological nature. First of all, the polar opposition[11] between hunter-gatherers and farmers that, in governments' official ideologies, reflects certain notions of backwardness and progress. Nomads are regarded as primitives and, in a way, the shame of the nation, and their contribution to the national economy (NTFPs, see Note 4) is downplayed. In order to become modern citizens, they must settle down and start farming. Official strategies aiming at their "socio-economic development" choose to ignore that most nomads nowadays rely on horticulture, and that most farmers, included those practicing irrigated rice farming, owe a significant part of their subsistence to hunting-gathering.

A second polar opposition of the same kind, still at the heart of a debate in Indonesia, concerned swiddeners and wet-rice farmers. Semi-nomadic swiddeners (horticulturalists or rice farmers) are also undoubtedly regarded as relatively primitive, but the debate takes place in environmental terms: These people are said to destroy the forest, regarded as either national patrimony or exploitable asset. Swiddeners, thus, must be made to become truly sedentary and switch to supposedly less damaging agricultural techniques.

It is also necessary to rebut a deeply rooted notion in local ideologies in Borneo, that of an evolutionary sequence of "ways of life" – really, subsistence techniques – articulated along an upstream-downstream axis along the island's major rivers (Sellato 1994, 2023). As these life ways participate in the construction of ethno-cultural identities, the wet-rice farmers of the lowlands look down upon the swiddeners living half-way up the river, and consider themselves more "civilized" than them; in turn, the swidden rice farmers mock those higher upstream from them, who grow tuber crops instead of rice; and, last in line, are the "savage" hunter-gatherers, often likened to monkeys and described as having tails. In this cultural construction, the savage is always the one higher upstream. The successive, discrete stages of this ideological sequence – hunting-gathering, horticulture, swidden rice, irrigated rice – match basic subsistence techniques, though they do not properly reflect the true and more complex subsistence systems of the ethnic groups concerned.

These systems, actually, do not form a succession of separate stages but rather a continuum that is, on the one hand, spatial – and not necessarily from upstream to downstream (e.g., irrigated rice farming in Kerayan high plateaus, *Metroxylon* sago palm tree cultivation in coastal regions) – and on the other hand, temporal – and not always in the way dictated by the ideological sequence (e.g., adoption of a technique ideologically "inferior" to the earlier one, after migration to a different ecological environment, whatever the reasons).

11 "Polar opposition", here a pair of terms/concepts commonly viewed as contrary, mutually exclusive categories – e.g., here, hunter-gatherer vs. farmer. It is substituted with a continuum between the two opposite poles/ends.

In turn, this continuum of subsistence systems contributes to the actuality of a parallel continuum in the field of ethnicity, in which ethno-cultural identities (and ethnonyms) are often connoted in relation to ways of life (or to a certain notion thereof), as much as to ethnic origin or linguistic affiliation. As has been noted (see 1.1. and 1.5.), a techno-cultural transition often leads to a change in ethno-cultural labels, and the ways of life, *i.e.*, of subsistence, clearly have a major impact on identity phenomena in Borneo. Again, I shall not get here into the detail of these processes.[12]

2.5. Economic history

The study of this continuum of subsistence systems, in its spatial distribution and diachronic dimension, is of considerable interest. While the relation between the natural environment and subsistence techniques and systems cannot be doubted, the question of the relation between these ecological and techno-economic factors and a human community's social features is not as simple as it has sometimes been argued. I have shown elsewhere, in the narrow framework of the Long Pujungan and Kerayan region and people (Sellato 1997, 2009; Fig. 7), that the mode of social organization – which governs, among other things, the type of habitat and use of space – and the set of farming techniques in usage are two independent features (see also Sellato 2002a). I also suggested that there was, in the same framework, no predictable (*i.e.*, deterministic) relation between the type of natural environment and the type of society. It would thus be possible, to some extent, to disregard certain societal features of the communities under scrutiny and, on the contrary, focus on strictly techno-economic features.

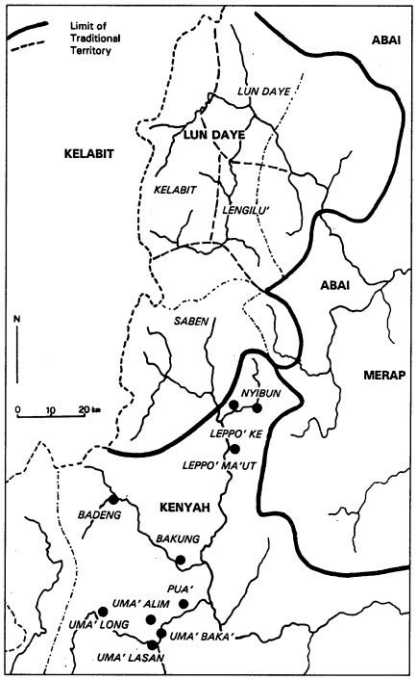

Figure 7. KMNP region: Kerayan (Lun Daye) and Kenyah ethnolinguistic clusters and sub-groups (Sellato 1997).

With this approach, it is important to study the diffusion of technologies (e.g., metals, irrigation), as well as of cultigens, both early (rice) and recent (cassava), and of ideas (e.g., prestige of rice). But it is essential to ponder the fact that, beyond the constraints of the natural environment, any community, as agent, can make free pragmatic choices, based on specific assessments (habits, tastes), resulting in the adoption, retention, or rejection of any given technique or other cultural feature.

12 See Rousseau (1990) and Sellato (1993a, 1993b, 1994, 1997, 2002b, 2023).

In the case of food plants, it is therefore possible to historically record the adoption of some (rice, cassava, corn), the retention of others (taro, sago), or the abandonment of yet others (Job's tears, millet, *Dioscorea*). Factors relative to the local economy also play a part: e.g., the late diffusion of metals and associated technology (forging, smelting) to the Kerayan region might be linked to the fact that metal was not of vital importance for the type of swamp rice farming that was practiced. We may also stress some inconsistency, common in Borneo, between ideals and practice: e.g., a standard practice of utrolocal post-matrimonial residence in conflict with an unequivocally expressed ideology of uxorilocality;[13] or an ideological primacy of rice expressed in a community whose subsistence system is *de facto* more horticulture-oriented.

An understanding of the historical development of subsistence systems can now lead to an attempt, based on techno-economic features, at reconstructing the regional cultural history.

3. ENVIRONMENT AND SOCIETY: TOWARD A REGIONAL HISTORY

I have suggested the existence of continuums in various domains – continuum in the intensity of human interference and its impact on the environment; ecological continuums (botanical and genetic composition of the forest, taxonomic continuum); continuum of subsistence systems – in which we cannot argue for the *a priori* reality of discrete, pure, or exclusive types or categories, or of polar oppositions or recognized evolutionary sequences (other than ideological).

An integrated study of these continuums – a study of the interactions between the environment and society and the history of these interactions – is essential, at the level of the region, to envision an environmental, economic, and social history as a meaningful inseparable whole. An interdisciplinary approach combines the social and natural sciences and examines the forest environments, their composition and history; the subsistence techniques and the management of natural resources; migration, trade, cultural diffusion, etc.

The region, then, functions as a field of social interactions – with a continuum of political, social, and cultural forms – and transformations, generating changing ethno-cultural identities. The reconstruction of the spatial and temporal distribution of those various "eco-cultural" traits in order to, for example, revisit the Zomia question, likely could shed some new light on the history of archipelagic Southeast Asia.

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13 Utrolocality refers to a practice of post-matrimonial residence in which a new couple may live either with the bride's family (uxorilocality) or with the groom's family (virilocality) with about equal frequency.

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