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Research, part of a Special Feature on [Do we need new management paradigms to achieve sustainability in tropical forests?](#)

Domestic Forests: A New Paradigm for Integrating Local Communities' Forestry into Tropical Forest Science

*Geneviève Michon*¹, *Hubert de Foresta*², *Patrice Levang*³, and *Francois Verdeaux*¹

ABSTRACT. Despite a long history of confrontation between forest agencies and forest people, “indigenous” or “local” practices are increasingly considered as a viable alternative of forest management. This paper is a synthesis derived from various long-term research programs carried out by the authors in Southeast Asia and Africa on forests managed by farmers. These researches looked at local practices and underlying science, including their social, political, and symbolic dimensions. They also addressed evolutionary trends and driving forces, as well as potential and limits for forest conservation and development, mitigation of deforestation, biodiversity conservation, and poverty alleviation in a context of global environmental, political, and social change. We discuss how forest management by local communities, contrary to the unified models of professional forest management, exhibits a high historical and geographical diversity. The analysis we draw from the various examples we studied reveals several invariants, which allows proposing the unifying paradigm of “domestic forest.” The first universal feature concerns the local managers themselves, who are, in their vast majority, farmers. Management practices range from local interventions in the forest ecosystem, to more intensive types of forest culture, and ultimately to permanent forest plantation. But in all cases, forest management is closely integrated with agriculture. The second universal feature concerns the conceptual continuity of planted forests with the natural forest, in matters of vegetation’s structure and composition as well as economic traits and ecosystem services. The resulting forest is uneven-aged, composed of several strata, harboring a large diversity of species, and producing a wide range of products, with timber seldom being the dominant one. The term “domestic forest” aims at highlighting the close relationship the domestication process establishes between a specific human group, including its elementary units, the “domestic units,” and the forest, transformed and managed to fulfill the needs of that group. The domestic forest paradigm calls for the integration into forest science of a new concept of land management in which production and conservation are compatible, and in which there is no choice to be made between people and nature. It does not aim at contesting the value of conventional forest science, but it proposes domestic forests as a new scientific domain, for the combined benefit of forest science and of forest people. It does not contest the value of conventional forest management models, but pushes towards more equitable relations between forest agencies and farmers managing forest resources on their own lands.

Key Words: *forest management paradigms; indigenous forest management; local forest management; tropical forestry.*

INTRODUCTION

All over the tropics, forest people have developed forest management practices that have proven their efficiency and their sustainability in accommodating local users' needs and in maintaining a healthy and dynamic forest cover over centuries (Noble and Dirzo 1997, Kuehli 1997, Boffa 1999, Wiersum

2004, Cairns 2007).

Despite a long history of confrontation between forest agencies and forest people, these indigenous or local practices are increasingly considered as a viable alternative of forest management. But to what extent has this acknowledgement changed the forestry paradigms? When the normative discourse

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on local forest management gives way to real management plans, these local forests are generally considered as being too secondary or too degraded to serve global conservation objectives or sustainable production goals. This discrepancy reflects the failure of most professional foresters, especially in developing countries, to admit that forests used and transformed by locals have a value of their own and that the social needs and values through which these forests were designed and shaped are legitimate and deserve consideration.

In spite of a strong move for more local participation in forest management in the tropics, why are these forests still neglected? Beyond their diversity, do they represent a comprehensive mode of forest management? If so, what are forest agencies losing by ignoring this type of management? What can be done to integrate these forests into global forest development and conservation?

This paper is a synthesis derived from various long-term research programs carried out by the authors on forests managed by farmers in Indonesia and Laos from 1992 to 2005, and in Kenya, Tanzania, and Ethiopia from 1996 to 2007. These researches involved multidisciplinary teamwork in ethnobotany and ethnoecology, anthropology, economics, ecology, and botany. They looked at local forest construction practices and underlying science, including their social, political, and symbolic dimensions. They also addressed evolutionary trends and driving forces of the resulting forest systems, as well as potential and limits for forest conservation and development, mitigation of deforestation, biodiversity conservation, and poverty alleviation in a context of global environmental, political, and social change.

By pointing out the major elements of continuity and universality behind the high diversity of local forests, we define the concept of “domestic forest.” We propose to adopt this concept as a new forest management paradigm. Beyond the common belief in social justice and equity of local forest management, beyond the common allegation that indigenous people are noble forest stewards, we suggest ways by which this domestic forest paradigm could help revisiting the global norms, standards, and methods of forest management. We conclude with the need for a redefinition of forest policies and regulations to accommodate this neglected but widespread aspect of forest

management and to fully integrate its benefits for the society at large.

WHICH AND WHOSE TROPICAL FOREST?

Forests have not always been considered as a tract of wooded land. In the early Middle Ages in Europe, forests were defined as a legal category of resource management. The “*foresta*” or “*silva forestis*” progressively became a portion of land reserved for the privilege of the ruler (Bechmann 1990), thus having little to do with nature or ecology. The preservation and management of high forests soon became a concern to European monarchies, as forests were the favorite hunting grounds of the aristocracy, and were essential for the building of naval fleets. An edict of 1291 by Philippe le Bel mentions for the first time the existence of “masters of waters and forests” (Pardé 1986). The mission devoted to these forerunners of modern forest agencies was clear: to preserve the forest and its sustainable use for the benefit of its owner. This legal origin of the concept of forest, instituted as a particular domain, fuelled a forestry ideology in which the perpetuation of the existing forest, in composition as well as in structure, often became a dogma (Guillard 1999), resulting in the exclusion of farmlands, peasants, and local tree management practices. Local farmers were considered as the enemies of the forest and agriculture as a rival of forestry (Westoby 1979). This perception was transferred through colonial regimes to most tropical countries (Buttoud 1995, Barton 2002, Guizol and Ndikumagenge 2004, Pretzsch 2005), where it has been maintained up to now, especially in areas where agricultural land is still gained to the detriment of the forest. In the tropics, forest agencies still consider that forests should be managed exclusively by professionals under a comprehensive legal, administrative, and technical regulatory framework (Dove 1992, Fay and Michon 2005). Consequently, forest people are almost never considered as legitimate and knowledgeable forest managers.

Tropical forests present a unique combination of specific features:

- forest lands and resources are usually incorporated into a national, highly regulated forest domain administered by a national forest body. Millions of forest people are

excluded from this domain. They are denied the ownership of the land and resources they depend on, and more often than not they are displaced, dispossessed, or marginalized (Repetto and Gillis 1988, Lynch and Talbot 1995);

- tropical forests are considered as a major source of valuable timber to be exploited and managed by forest concessionaires under the strict supervision of the forest administration (Smouts 2003);
- tropical forests also represent a unique ecosystem, hotspot of biodiversity, and exclusive habitat of many endangered plant and animal species (Mittermeier et al. 2000). A new kind of self-appointed legitimate forest manager has recently emerged: environmentalists and conservationists, active at the local level through the creation of parks and reserves, and at the global level through the development of international conventions;
- last but not least, tropical forests have been recently invested with a key role in the protection of the global environment against global warming, as potential carbon sinks, regulated and managed through global economic and financial instruments (Nielsen 2002, Cramer et al. 2004).

From the feudal forests of the European Middle Ages to the tropical forest as a global environmental concern, two abiding features appear: the rejection of local rights on forests and their appropriation by outsiders (Westoby 1979, Ribot 2001, Barton 2002, Bon 2003, Pretzsch 2005). Visions, norms, standards, and practices related to local forest management are ignored, whereas the reality of the actual forest is not even acknowledged (Scott 1998). Though forestry, especially since the "Forests for People" World Forestry Congress held in 1978 in Jakarta, increasingly mentions the concern for sustaining the livelihoods of forest-dependant people, forests in the tropics are still managed for timber production, for watershed protection, for biodiversity conservation, or for carbon storage. This multidimensional aspect of tropical forest management in the name of "the public interest" is defined by specialists who most often do not even belong to the tropical world. However, beyond timber, soil erosion, biodiversity, and carbon, there is also a tangible forest, daily visited, harvested, and

reshaped by farmers. This entity makes up a highly significant part of the forest matrix in the tropics (Boffa 1999, Gibson et al. 2000, Belcher et al. 2005).

The attitude of professional foresters, environmentalists, and scientists from various disciplines toward local knowledge and forest-related practices is changing (Dove 1995, Valeix 1999). Central to this change is the need to incorporate the objectives of local development and of poverty alleviation into forest management, but also the hope that local forest users could become the guardians of the forest (Forest Trends 2002). Though commendable, this shift has still to be coupled with the necessary changes in conceptual and methodological tools (Hannam 2000, Mayers and Bass 2004, Kumar and Kant 2006, Temu et al. 2006). Participation is the buzzword, which is somehow revolutionary, given the centuries of imposed forest regimes. However, management defined a priori and pursuing exogenous objectives, e.g., biodiversity conservation, timber production, or environmental services, which seldom relate to local objectives (Dove 1995, Castro and Nielsen 2001, Sekhar and Jorgensen 2003). Foresters, environmentalists, and scientists always see local forests through the prism of an ideal, primary forest. If local forest management is praised, then existing local forests, whatever their structure and composition, are generally considered degraded, transitional, or secondary (Fairhead and Leach 1996). Contrary to timber concessions and forest reserves, local forests are not seen as a concrete and objective condition of the tropical forest, and are barely considered as resulting from a voluntary management system in which farmers' objectives and forest dynamics are complementary. There is not even a specific word to designate them. Are they local forests (Long and Nair 1999, Colfer and Byron 2001, Sherr et al. 2001), community forests (Bishop 1991, Arnold 1998, Wollenberg 2001, Kusel 2003), traditional forests (Hartshorn 1995, Kellman and Tackaberry 1997), sacred forests (Gadgil and Vartak 1976, Juhé-Beaulaton and Roussel 1998, Byers et al. 2001), peasant forests (Balent 1996, Ichikawa 1998, Cinotti and Normandin 2002), forest gardens (Wiersum 2004, Belcher et al. 2005), agroforests (Michon and de Foresta 1999), intermediate systems (Angelsen et al. 2000, Wiersum 2004)? Are they better characterized by the ethnicity of their managers: the Kayapo forest (Posey 1985), the Aka pygmies forest (Bahuchet 1985), the Ifugao forest (Conklin 1954)? This lack of proper terminology reflects a lack of conceptualization, and if nothing generic is said

about these particular forests, they will indefinitely remain a nonconcept in forestry and forest management. But is conceptualization possible?

We propose to call these forests domestic forests. Domestic here does not refer to national, but to both the process of domestication and the relation to a household or to a group of households. The term domestic forest aims at highlighting the close relationship the domestication process establishes between a specific human group, including its elementary units, i.e., the domestic units, and the forest, transformed and managed to fulfill the needs of that group (Schlaifer 1997, Verdeaux 2003, Michon 2005).

THE DOMESTIC FOREST AS AN OBJECTIVE CONDITION OF THE TROPICAL FOREST: FROM THE VISIBLE FORESTS TO SILVICULTURAL MODELS

What do domestic forests have in common?

Domestic forests are site specific by nature. To be integrated into global forest management, some universal features must emerge from the various technical, structural, economic, and social dimensions of these forests.

The first universal feature concerns the local managers themselves. They are, in their vast majority, farmers. They secure their subsistence and income through production, be it of annual crops, animal husbandry, or tree crops. Forest management is one obvious component of their farming system, and we could therefore talk of “farmers“ forest.”

As an object, the domestic forest can be defined as the sum of the different forest ecological units that co-exist in a given landscape. These units are derived from natural forests through various practices including selective clearing as well as slashing and burning, discrete protection of native forest species, as well as plantation of native or introduced species, monitoring, or manipulation of natural production processes, as well as deliberate intervention in natural cycles.

Let us first elaborate on the visible forest and show how general silvicultural patterns and models can be drawn from the multiple existing examples (Michon and de Foresta 1999, Wiersum 2004).

The visible forest and related silvicultural models

A whole range of management practices aims at intervening locally in the forest ecosystem to favor particular species. These practices are highly localized and integrated within the existing forest matrix. They can involve slashing bushes or *liana* around valued species, opening the canopy or fostering shade, thinning out clumping species, or deliberately planting seedlings or wildlings in suitable locations. There are various degrees in management intensity, in practices, and in visible impacts. The resulting forest can bear only transient signs of human activity, such as the relatively high density of yams in the Pygmies' forests in Cameroon (Dounias 1996), or of fruit trees in the Kubu's forests in Sumatra (Sandbukt 1982). It can also appear as spots of modified vegetation in a matrix of more or less undisturbed forest. The most famous example is the Euterpe palm forests of the Amazon estuary, which are managed for the production of juice and palm heart (Anderson 1988, Emperaire 1997). The same process exists in Southeast Asia for the sago palm, *Metroxylon sagu* (Barrau 1959). Other examples include the creation of Brazil nut groves in Amazonia (Lescure 1995), and of fruit tree groves in mainland Borneo (Seibert 1989). In Laos, forests are managed for cardamom production (Aubertin 2000, Foppes and Ketphanh 2000), in northern Thailand for *miang* tea production (Watanabe et al., 1990), in central Borneo for rattan production (Godoy and Feaw 1989, García-Fernández 2001), in southwest Ethiopia for coffee and spice production (Senbeta and Denich 2006), etc.

However, more intensive types of forest culture can also be found. These involve a cultivated phase purposely integrated and maintained within the forest matrix, showing greater and longer-term interactions between human efforts and natural forest cycles. In the example of benzoin cultivation developed by Batak Toba people in North Sumatra (Watanabe et al. 1990, García-Fernández et al. 2003), the silvicultural pattern integrates a medium-term phase of forest production into a global continuum of old and successional forest. Benzoin tree (*Styrax benzoin*), a medium-sized tree producing a fragrant resin, is introduced as seedlings in the undergrowth of a patch of pristine mountain forest. As benzoin develops, canopy trees and other undergrowth species are selectively cut, so that the manipulated forest turns into a benzoin garden. As

long as trees are tapped from year 10 to 40, the garden is more or less carefully maintained. It is then gradually abandoned and reverts to a typical successional forest. Several decades later, the forest can eventually be reused for benzoin production (Figs 1 and 2).

In other cases, the integration of planted trees leads to a permanent agroforestry system: in high elevation areas of southern Ethiopia for instance, many coffee agroforests (Fig. 3) result from the replacement of the undergrowth of natural forests by coffee trees, planted along with other useful crops such as *Ensete ventricosum*, whereas most trees of the natural forest canopy are conserved (Abebe 2005). The same kind of coffee agroforest system has been developed in Karnataka, India (Depommier 2003).

Another example of domestic forest, certainly the largest in terms of area covered, is directly linked to food crop production. It consists of the various stages of regrowth or forest fallows linked to the swidden cultivation cycle. Unlike the management models presented above, the original forest ecosystem is more-or-less completely removed, and a new forest is allowed to regenerate. This forest is generally classified by biologists as degraded or secondary. For local farmers however, it is an integral and essential part of the swidden cultivation system (Conklin 1954, Colfer et al. 1997, Levang et al. 1997). Many of these forest fallows are actually enriched through plantation (Balee and Gely 1989, Cairns 2007) for fruit production, restoration of soil fertility or for hunting purposes. In some cases, the swidden is totally planted with trees, and the fallow becomes the main component of the swidden cultivation cycle, as in the numerous examples of rotational forest plantations in Indonesia (Michon and de Foresta 1999). In Kalimantan for instance, rattan is intercropped with upland rice in the swiddens, and grows up in the regenerating forest, along with spontaneous fallow trees. Rattan can be harvested from 8 yr after planting, and produces for the following 20 to 35 yr. The rattan garden is then recycled through slashing and burning for a new rice-and-rattan succession. Except for its exceptionally high density of rattan and other useful species, it structurally resembles a dense, naturally regenerated secondary forest (Fried 2000, García-Fernández 2001). In the lowlands of Sumatra and Kalimantan, rubber gardens, also known as rubber agroforests, constitute another outstanding example of rotational forest production (Gouyon et al. 1993, Dove 1993, 1994) with cycles ranging from 40 to

70 yr (Fig. 4). Due to these long cycles, combined with tending practices that encourage enrichment planting, rubber gardens harbor a considerable number of plant species. This half-managed richness allows for the provision of plant foods and material, timber, and game (Fig. 5), and these compensate, at least partly, for a lower latex productivity. Beside this economic importance for farmers, rubber gardens play a determining role in the conservation of plant and animal biodiversity in the lowlands. This role is dramatically increasing with the present depletion of the last unlogged dipterocarp forests (de Foresta 1992).

Last but not least are the domestic forests consisting of permanent forest plantation (Michon and de Foresta 1999). As the aforementioned rotational forest model, these forests arise from the slashing and burning of the original forest ecosystem, with tree seedlings planted within the swidden. They evolve through gradual forest reconstruction involving plantation, protection, selection, and facilitation of the natural regeneration processes. Once developed, the planted forest will reproduce itself without disruption in structural or functional patterns, thanks to a balanced combination of anticipated replacement of decaying individuals, mimetic gap planting, and respect of natural dynamics, which all allow further diversification through the colonization of many forest species among the cultivated stand. After several decades, the forest plantation is structurally close to an old secondary forest, with the restoration of the global ecological features of a diversified forest ecosystem. Some very interesting models of integral forest plantation have been described in Indonesia (Torquebiau 1984, Sardjono 1992, Aumeeruddy 1993, Momberg 1993, Padoch and Peters 1993, Sundawati 1993, de Jong 1994, Salafsky 1994, Michon and de Foresta 1999). The Damar agroforests (Michon et al. 2000), developed in the south of Sumatra since the beginning of the 20th century for resin production, nowadays cover some tens of thousands of hectares. Like natural forests, they are characterized by a high canopy, dense undergrowth, high levels of biodiversity, and a perennial structure (Figs 6 and 7).

Outside Indonesia, without trying to be exhaustive, such a model encompasses the coffee agroforests and the cocoa agroforests in Central and South America (Somarriba et al. 2004, Schroth et al. 2004a), the rubber agroforests in Amazonia (Schroth et al. 2004b), the home gardens of Kerala

Fig. 1. The benzoin forest establishment and cycle in North Sumatra, Indonesia.



in India (Depommier 2003), the coconut-based agroforests in the Pacific islands (Lamanda et al. 2006), the Chagga home gardens on Mount Kilimanjaro (Fernandez et al. 1984, Verdeaux 2003), the village groves of forest-savanna mosaic in Guinea (Fairhead and Leach 1996), oil palm groves in central and West Africa (Dupire and Boutiller 1958, Raison 1988), or cocoa growing under forest canopy in Ivory Coast (Rougerie 1957, Gastellu 1980, Léonard and Oswald 1996) and Cameroon (Dounias 2000) where even the most intensive cocoa plantations are increasingly shifting away from monoculture toward a more mixed system. Agroforestry parklands, though exhibiting different structures in relation to a dryer climate, are equivalent in their principles to these agroforests of the humid tropics. They encompass the Khejri

system based on *Prosopis cineraria* in Rajahstan, India (Depommier 2003), but also all the numerous facets encountered in sub-Saharan Africa, where néré (*Parkia biglobosa*), karité (*Vitellaria paradoxa*), baobab (*Adansonia digitata*) and *Faidherbia albida*, along with many other species are favored, planted, and managed by local farmers, perfectly integrating agriculture and forestry (Pélissier 1964, Seignobos 1982, Raison 1988, Boffa 1999).

All these silvicultural models are not exclusive in the sense that they usually coexist with others in a single location; the domestic forest being composed of a mosaic of different units that may be related to one or another of the above models.

Fig. 2. Harvesting and sorting benzoin resin.



Fig. 3. A coffee forest in Ethiopia, evolved directly from the natural forest.



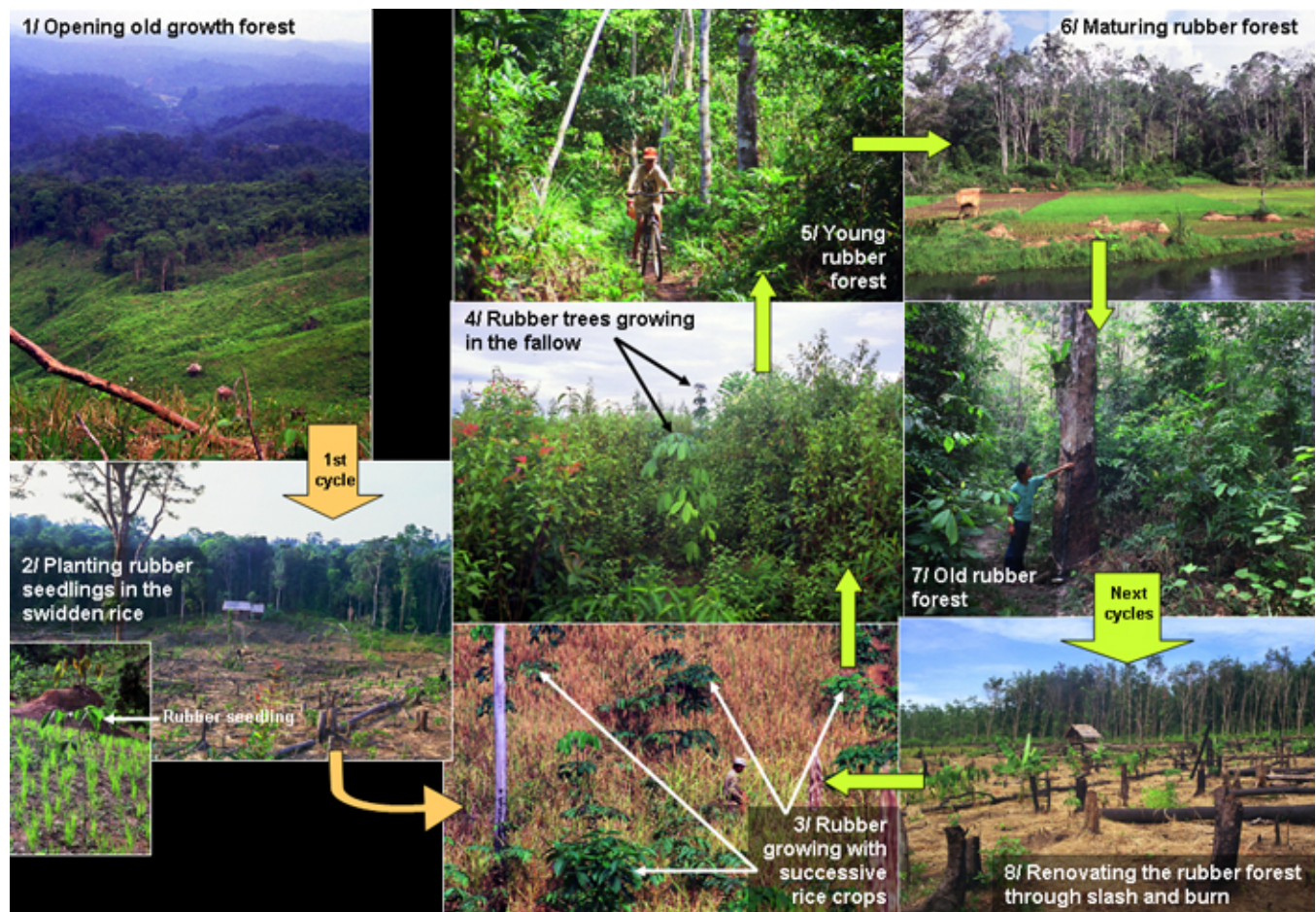
**FROM THE OBJECT TO THE CONCEPT:
FOREST DOMESTICATION AND THE
UNIVERSAL FEATURES OF DOMESTIC
FORESTS**

The various domestic forest facets exposed above reveal two major underlying principles that are lacking in conventional silviculture: a close integration with agriculture, and a conceptual continuity of planted forests with the natural forest.

A close integration with agriculture

Professional forestry developed first through fencing in the forest to protect it from farmers (Rietbergen 2001). On the contrary, the domestic forest did develop and succeed precisely because of its close articulation with swidden cultivation. The practice of fallowing plays here a catalytic role for the establishment and development of the forest, whereas the dynamics of cyclic production supports its long-term maintenance and reproduction, not to mention economic and social complementarities. Beyond this technical and socioeconomic articulation, there is also a real symbiosis between

Fig. 4. The rubber forest establishment and cycle in Sumatra and Kalimantan, Indonesia.



swidden cultivation and domestic forest management. Agricultural and forest-related practices are coevolving and this coevolution is usually positive for both sides, as it has facilitated the emergence of a profitable forest culture and has in turn deeply changed the dynamics of swidden agriculture (Dove 1993, Levang et al. 1997).

Foresters have often denied that forest plantations can be profitable at the smallholder's scale in the tropics (Dove 1992, Evans 1992). Domestic forests do prove the contrary. The estimated 2×10^6 ha of rubber agroforests, and 50,000 ha of Damar agroforests in Sumatra are brilliant examples of smallholder's success in forest culture (Michon et de Foresta 1999). The swidden has been central to this success. In return, the development of the

planted forest has allowed a quick intensification of swidden agriculture. The introduction of forest culture increases labor productivity as well as the global productivity of the whole farming system. Unlike traditional fallows, planted forests provide cash and other economic resources, without major constraints on land and labor. This intensification is achieved by a smooth adaptation of practices, without any painful crisis or profound change in the farming system. This has important social consequences, as it avoids the marginalization and impoverishment of a whole class of farmers. Moreover, it allows securing land appropriation and capital accumulation, a patrimony that can be transferred to the next generation (Michon et al. 2000, Suyanto et al. 2001). In this sense, it constitutes the very sustainable basis of the

Fig. 5. Various facieses and products from the rubber forest.



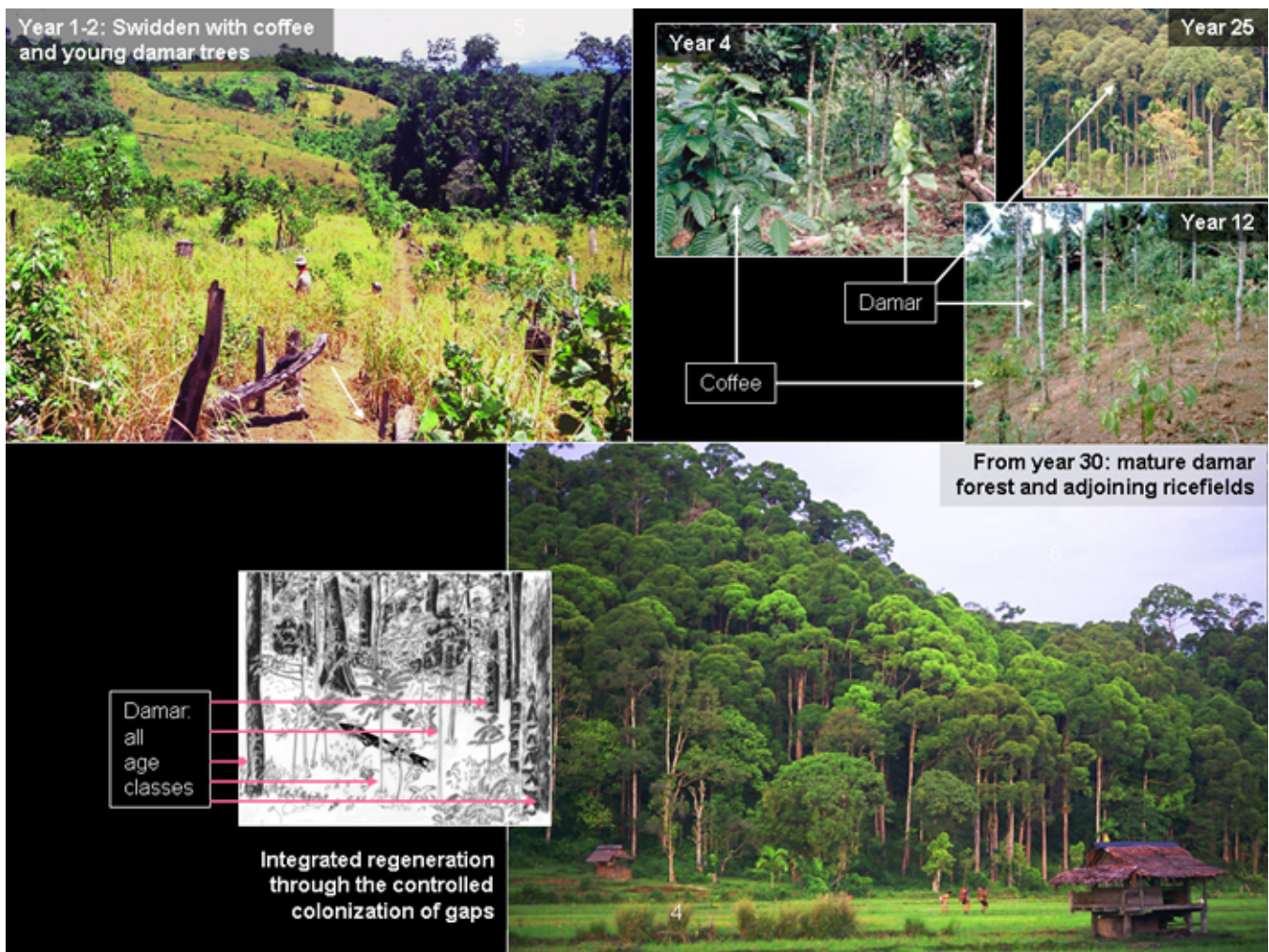
foundation of the domestic group. The large areas covered with agroforestry parklands in sub-Saharan Africa, which sustain the livelihood of millions, constitute a similar example of the silvicultural success of local farmers in the drier regions of the Tropics (Sheperd et al. 1993, Boffa 1999, Bodin et al. 2006).

The “forest preference”: a clear continuity between domestic forest and natural forest

Professional foresters often stress that the only way to rationalize costs and maximize benefits in modern forestry, as in modern agriculture, relies on an artificial simplification of structures, and that tree crop diversity, if technically feasible, is not economically desirable (Evans 1992, Wormald

1992). In the tropics, this productivist approach has induced a clear dissociation between forest plantations and natural forests. Plantations deal mainly with short-lived tree species (*Acacia*, *Eucalyptus*, *Gmelina*), quick rotations, and a single output: timber. They are conceptually as well as spatially and temporally disconnected from natural forests. On the contrary, domestic forest culture has succeeded precisely because of its conceptual continuity with the natural forest, expressed in ecological as well as economic terms. This silviculture strategy that emphasizes diversity of products and heterogeneity in vegetation, and that respects or restores global forest structures, functions, and services over space and time is what we have called “forest preference” (Michon and de Foresta 1999).

Fig. 6. The damar forest establishment and development in Lampung, Sumatra, Indonesia.



Forest preference incorporates the notion of ecosystem management, a management that targets not a single species, but a manipulated ecosystem. By introducing a cultivated forest crop in the natural dynamic processes at a small or large scale, farmers practice a forest culture that, contrary to what happens in conventional monocrop plantations, becomes part of the structure and of the functioning of the forestland ecosystem. This forest preference leads to the restoration of diversified and autonomous biological structures mimicking the original habitat (Fig. 8), which allows the environmental services of the original forest to be sustained, including soil protection, regulation of

water flows, and conservation of high levels of biodiversity (Fig. 9) (Michon and de Foresta 1995, Garcia 2001, Garcia et al. 2003).

Forest preference also incorporates the idea of ecosystem development. Through the manipulation of the silvigenetic processes and through a high degree of mimicry of natural succession patterns, farmers can extend the life of a forest plantation over indefinite periods. The established forest grows and diversifies, and is able to produce and regenerate over the long run with minimal input. The forest preference therefore constitutes the ecological foundation of short- and long-term flexibility and

Fig. 7. Various facieses and products from the damar forest.



reversibility, but also of multifunctionality, which are nowadays considered as the three fundamental qualities of any sustainable resource management.

This strategy, targeting the ecosystem, allows us to question the domestication process underlying this forest construction. The construction of the domestic forest involves technical and biological processes of vegetation manipulation that clearly result in the domestication of individual plant species. But we can also conceptualize this construction as a process of forest domestication in which trees are manipulated for production improvement while maintaining their adaptation to

a diversified forest ecosystem, and trying to channel forest production through an optimized ecological model (Michon and de Foresta 1997). Far from the ecological oversimplification associated with modern agriculture or even tree culture, this process of domestication emphasizes diversity and complexity.

FOREST DOMESTICATION: THE INTANGIBLE DIMENSIONS

Models and concepts related to forest management do not deal only with techniques, but also with

Fig. 8. A sketch-profile drawn from a fruit forest in West Sumatra, Indonesia showing the complex, forest-like structure of the vegetation.



ideologies and representations, with economic strategies and socio-political relationships within and between human groups. The forests we see constitute the visible part of a larger space, which is altogether material, economic, mental, social, and political.

Defining the relationship between people and natural components

The material forest structure and the immaterial appropriation process are intimately and actively

linked (Godelier 1986). The reproduction of the former cannot be dissociated from that of the latter. Beliefs and religion, myths, and history define how forest elements, e.g., plants, animals, streams, springs, caves, etc., relate to the human world, to the group and to the domestic units. The way humanity, kinship and domesticity are vested in the forest is specific to each local group, but the mental process that sustains it follows universal patterns: forest domestication always includes defining which elements of the forest relate, or not, to the human group, which kind of relation every category of this group establishes with these elements, and

Fig. 9. Natural forest (left, Borneo), domestic forest (upper right, fruit forest, Sumatra), and monocrop forest plantation (lower right, Eucalyptus, Congo) confronted: if biodiversity levels in domestic forests are not as high as in natural forests, they are much higher than in monocrop forest plantations.



why it is so (Descola 1987, Brunois 2004). The Achuar people of the Amazon, for instance, exemplify how human societies may include in their cultural universe elements that modern thinking usually considers as natural and totally apart from humans. Forest socialization by the Achuar is thought as a relationship system organized at the domestic unit level and totally isomorphic with the one used for humans within that unit: forest animals and plants are considered as father, son, or brother in law and symbolically treated as such by their human partner (Descola 1987). More broadly, this symbolic domestication sets the principles that define how the group and its elementary units will interact with forest elements. Forest domestication

sometimes just consists in this symbolic process, but most often this process precedes the more tangible domestication for which it serves as a foundation and an organizational principle. This clearly contrasts with the principles orienting professional forest management, in which nature is considered as an object external to the social, religious or political spheres and treated according to technical norms considered as neutral.

Defining the social organization of forest use

Furthermore, material and immaterial forest domestication is closely related to the social structure of production. The immaterial domestication of the forest creates a double bond: to the whole social group as well as to the domestic units. This shaping of the forest-related social relationship, which does not define the relation between forest objects and people, but social and political relationship between people themselves regarding forest-related matters involves the definition of access principles and resulting property rights, consisting in formal and nonformal norms, rules, and regulations (Weber et al. 1990, Michon and de Foresta 1999, Gibson et al. 2000). It specifies who is allowed to do what in which part of the forest, or with which resource. It can be framed by religious, kinship, class, or other internal socio-political logics. But it always refers to the above-mentioned symbolic domestication: how and why the group and its elementary units define their relation with forest elements. Its modalities are again specific to every local group, but they present a number of commonalities:

- Socially, forest domestication is always defined by the group at the group's level, even when it incorporates norms or rules developed at extra-local levels. It is acknowledged and respected by all the members of the group (Michon et al. 2000, Verdeaux 2003). This comes in contrast with the various models of community forestry and other types of devolution processes to local groups, brought from outside with imported visions of forest, community, and management;
- The rights system often achieves an integrated balance between the rights and needs of the domestic units and those of the whole group. The practices that shape the forest logically induce long-term rights to users, which ensure the long-term reproduction of the forest units while consolidating that of related domestic units. But these rights are bound by collective institutions and rules aimed at ensuring the long-term maintenance of the whole forest system as a basis for the social reproduction of the whole group (Peluso 1996, Michon 2005). These rules specify that property rights on forest land and resources are inalienable outside the group, and set the social norms for inter-generational transmission;

- The association between local and collective rights results in the piling up of social spaces in the forest. As a result, the appropriation regime is neither private nor common property. At plot level, forest resources are owned and managed primarily by one domestic unit for specific purposes, but other units, or specific groups of people in the community, may have different rights on the same space, regarding the same, or different, resources (Michon et al. 2000, Bouamrane and Michon 2004). This piling up may fade away in planted forests where land itself has become a major resource, but the multiple-use/multiple-users aspect persists for secondary resources.

Forest domestication for the maintenance of social units

The domesticated forest is mainly targeted at sustaining the livelihood of elementary units. This first function is achieved through the provision of subsistence and cash benefits for consumption or distribution. Forest plots are always an important element in household economics. They are commonly associated to other productive activities and contribute to their economic reproduction. As a transferable patrimony, the appropriated forest resources also represent the material and symbolic foundation of domestic units, and the necessary condition of their social reproduction. In the same way, the whole forest system, even when divided into individual plots, constitutes the indivisible material and symbolic foundation of the group and helps preserving broader interests. As it embodies the group's social relationship system, it is essential to its cohesion and durability. Forest domestication therefore links the biological sustainability of a forest-based productive system to both the reproduction of the social system and to the economic sustainability of the embedded domestic units. Creating and maintaining this link is not usually the concern of conventional forest management. In the same way, the organic bond between individual and collective action and interests contrasts with the divide between the individual/private and the collective/public spheres that often characterizes conventional forestry.

Forest domestication as an arena of socio-political relationship between human groups

Forest domestication is closely related to the construction of the relationship of the local group with outsiders. It creates modified forest structures grounded in delineated spaces that can easily be recognized by outsiders, and that are associated with easy to express property rights and other locally specific social attributes. It therefore represents a major contribution in the definition and the perpetuation of a territory: a portion of appropriated land belonging to a specific group, which is acknowledged by neighboring groups.

This notion of permanent territory is inseparable from the notion of identity. Identity reinforces the emergence, the validation, or the reproduction of the territory. Because the domestic forest constitutes the economic and social foundation of the domestic units, forest domestication represents a major element in defining the identity of the whole group, through a double bond: the forest is appropriated, and therefore belongs to the group and is part of its own history, but in the same time, the group has a strong sense of belonging to that particular forest, i.e., it is part of the natural history of that forest.

However physically and socially rooted these domestic forests may be, their very existence is generally denied by global political institutions who neither consider domestic forests as a legitimate and appropriated territory nor as a valuable land-use system. This lack of acknowledgement constitutes a permanent feature, both through history and countries.

DOMESTIC FORESTS: A CHALLENGE FOR THE FUTURE?

Our studies on the evolution of domestic forests in Indonesia (Angelsen et al. 2000), as well as related studies in Africa and Southeast Asia (Verdeaux 1999, Asbjørnsen et al. 2004) have illustrated how the construction, development, or collapse of domestic forests is often related to the power relationship between local groups and politically dominant institutions. Other studies (Dounias 2000, Ruf 2001) have shown the evolution from monocrop plantations to agroforests and domestic forests, due to technical and economic factors. Our recent observations in Indonesia show an opposite evolution. In the present context of decentralization

and strong influence of globalization, particularly with the increasing demand of China for raw material, e.g., rubber, palm oil, domestic forests tend to evolve into monocrop plantations. Recently in Sumatra there has been a clear tendency among smallholders to replace old rubber agroforests by pure rubber plantations and even by oil palm plantations (Ekadinata and Vincent 2005). Whereas teak has been introduced on all farmlands in Lampung, isolated or on borders first, sometimes as a single crop on the whole plots, damar agroforest owners often consider selling their damar trees as timber to recently established local sawmills. Nowadays many families benefit from regular income deriving from off-farm activities. Often, farming is no longer considered for subsistence but as a source of additional cash income. The most favored opportunities are those that secure the land holding, need little labour and supervision, and provide high returns. Monocrop tree plantations supply these services better than domestic forests. This trend has also been recently observed in Borneo (Potter 2001, 2004) and Java (Parikesit et al. 2004). In this era of agrarian transition, with strong economic as well as political incentives for a new development of smallholders' plantation crops for biofuels or for carbon storage, domestic forests are not disappearing but changing, and it might be too soon to foresee their future.

CONCLUSION: ACKNOWLEDGING THE "DOMESTIC FOREST" AS A NEW PARADIGM

The process of forest domestication by local groups, through its combined material and immaterial dimensions, results in the creation of a particular forest space structured by both the whole group and its domestic units. This forest space supports altogether local livelihoods, culture, and socio-political relationships both within the group and with the outside world. Although the resulting forest systems range from punctual management of wild resources to entirely reconstructed forest ecosystems, this space, that we have called domestic forest, can be analyzed as a comprehensive model exhibiting invariant features.

The domestic forest constitutes a specific category of forest management which clearly differs from classic or more modern professional forestry as exposed in textbooks such as Pancel 1993, or more recently Higman et al. 2005) in terms of physical

and physiognomic components, of functions and benefits, of techniques, rationale and management objectives. The domestic forest is neither a production nor a conservation forest, and not even a forest management model that embodies multifunctionality. It is “a forest for living,” a forest that integrates production and conservation with social, political, and spiritual dimensions. It clearly constitutes a “third way” in global forest management.

The domestic forest is thus proposed as a unifying paradigm that points to the specificity of forest management by local users in the context of tropical forestry. This paradigm can help revisit forest management in general, and more precisely the way forest development accommodates forest people. Even though local participation is praised and local knowledge recognized, the shift toward giving a real place to domestic forests in forest development is far from being accomplished. More often than not, local knowledge is reduced to a few simple blueprint techniques. Real community-based forest development remains an empty box, especially in the humid tropics. In the dryer tropics, the forecasted fuel wood crisis probably urged the foresters to be more receptive to local peoples’ forest management practices (Sheperd et al. 1993). The acknowledgement of domestic forests not only calls for a revision of the normative, conceptual, and technical frameworks of forestry, but it also requires deep changes in the political, legal, and regulatory frameworks (Fay and Michon 2005). Official designations of forest areas not only ignore the existence, the originality, the legitimacy and the benefits of domestic forests, but forest regulatory frameworks most often discriminate against forest product management and tree growing by farmers. Current official definitions of planted forest are geared toward industrial monocrop plantation and deliberately leave little room for farmer-created forests and agroforests. Furthermore, over-regulation imposed on forest products restricts access to markets for farmer-grown timber and tree products.

That forestry should be helpful to rural people has been recognized long ago by foresters. Since 1978 and the World Forestry Congress, social forestry programs have developed everywhere and are shown as proofs that forestry now cares for the rural people (Dove 1995). But these programs have been added to other forestry programs with no major change in the organization and functioning of forest

agencies, as if all programs were of the same nature. Very few took into account the specificities forestry is confronted with in supporting rural peoples’ livelihoods. Such specificities were recognized by a handful of enlightened foresters such as Jack Westoby who, in his opening address to the 8th World Forestry Congress in 1978, insisted that agriculture-supportive forestry activities “are activities that cannot be carried out on the required scale and in the required manner by a conventionally oriented and a conventionally organized forest service” (Westoby 1979). Westoby could not go further in 1978. But 30 yr later, thanks to the numerous studies on local forests managed by rural people all over the tropics, we can go further and stress the need for tropical forestry to acknowledge the domestic forest paradigm and to adopt this paradigm as a basis for forestry development in a rural context.

The domestic forest paradigm does not aim at contesting the value of conventional forest management models, i.e., forest for production and forest for conservation, but it pushes towards more equitable relations between the administration in charge of forest management and farmers managing forest resources on their own lands. In areas where smallholders represent the main actors in resource management and where natural forests have been converted into domestic forests by an agricultural dynamics, production forest and conservation forest models are inadequate and cannot be implemented. The current exclusive domination of these models in forest management hampers the ability of domestic forests to further develop and provide their benefits. Adopting this new paradigm would be the best way to reverse the past and current trend that sees many concrete examples of domestic forest collapse due to disincentives, and sometimes to continuous harassment from the institutional environment.

It does not aim either at contesting the value of conventional forest science, but it pushes toward integrating domestic forests as a new scientific domain, for the benefit of forest science, but also for the benefit of forest people: like most forests, domestic forests have problems of their own, where foresters could help through developing adapted research, technique and science. But foresters should understand that their involvement in domestic forests cannot be the same as in conventional forests. Here, to quote Westoby

(1979), it can only be “to stimulate, offer guidance and suggestions, impart techniques and carry out training.”

Finally, it should be clear that the domestic forest paradigm that we propose here not only addresses the renovation of the conventional forestry framework, but beyond that, the context of sustainable development itself. The domestic forest paradigm calls for a new concept of land management in which production and conservation are compatible, and in which there is no choice to be made between people and nature. This means much more than just forests.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/vol12/iss2/art1/responses/>

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