

Between scattered extraction and specialized production: which alternatives for the development of non-timber forest resources?

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Abstract:

Management systems for NTFPs are far from being homogenous. They globally range from scattered collection in natural forests for occasional consumption to intensive specialized production for international markets, going through various types of "integrated management" and "occasional cultivation" or "pre-domestication". These various systems have obviously different features in terms of either ecological, economic or social sustainability, of short term or long term productivity, or of cultural validity. Among others, they may have totally diverging impacts on either forest ecosystems and biodiversity conservation, on forest populations' development and welfare, or even on the respect of indigenous peoples' rights.

This paper will first attempt to give a dynamic overview of this diversity of current management practices for NTFPs, highlighting past and present evolutionary trends and insisting on those currently less investigated models that are intermediary between "extraction from natural stocks" and "true domestication for cultivation", with a special focus on the Southeast region. Starting from these current situations, it will elaborate on the available "existing models" for NTFPs management, giving attention to matters such as scale and scope of management, levels of inputs and knowledge, economic and social logics, institutional and social bases. It will launch important bases for a comparative assessment of the global sustainability of these models, examining ecological, economic, cultural and social efficiency and gaps.

It will finally try to derive "alternative models" for future scenarios of forest management, giving a special attention to unexplored ways for domestication of forest resources.

Note: This paper synthesizes the arguments developed in the framework of a research project sponsored by the European Communities and conducted by a consortium of European and Southeast Asia Research Institutes and NGOs. Comparative research on management systems and derived models is currently being carried-out in several locations in Indonesia and the Philippines. For more information on the project, contact the authors

Introduction

After having devoted a fairly important dose of time and energy to classification matters, NTFP research has turned towards supporting the assumption that NTFP development will enhance conservation of natural forests and improve the economic welfare of local forest people (Peters & al. 1989; Plotkin & al 1992). This NTFP ideology has somewhat expanded at the expenses of the assessment of the real NTFP world. A reality that includes occasional collection of forest tubers by African bushmen in times of food scarcity as well as the multi-billion dollars collection and trade of rattan in Southeast Asia¹. If scattered case studies about existing NTFP management practices are multiplying, a well founded, systematic and comparative assessment of the merits and shortcomings of different management models is still lacking: we still need to evaluate the range of variations on the hows and whys of NTFP management, and their inherent consequences.

Management implies much more than just harvesting practices. It globally refers to the integration between (1): techniques and practices for the manipulation of the resource base and of the related products, (2): the socio-cultural and knowledge bases of these practices, and (3): the social, economic, and ecological strategies expressed through these practices. Current management systems for NTFPs all over the world are far from being homogenous. They globally range from scattered collection in natural forests for occasional consumption to intensive specialized production for international markets, going through various types of "integrated management" and "occasional cultivation" or "pre-domestication" (Wiersum, 1997). These various systems have obviously different features in terms of either ecological, economic or social sustainability, of short term or long term productivity, or of cultural validity. Among others, they may have totally diverging impacts on either the evolution of forest ecosystems, on biodiversity conservation, on forest peoples' development and welfare, or even on the respect of indigenous peoples' rights.

An interesting entry point for analyzing this diversity is that of the distinction between **extraction** --tapping natural stocks-- and **production** --controlling natural processes, usually through cultivating and domesticating wild species-- (Michon & al, 1997). Many forest products are actually managed through true production processes, ranging from scarcely managed forest in the Amazon to the intensive oil palm estate of Indonesia, through various types of permanent or semi-permanent forest-gardens. These systems are largely documented, but more as examples of indigenous forest management than as alternative models for NTFP development through production.

Modern forestry science, with its strong focus on timber production, tends to promote two diverging management models: sustainable extraction from natural forests or intensive production from highly specialized fields of trees. How does this apply to the development of NTFPs? As illustrated in indigenous examples, there seems to be other ways: active management of wild populations, in-situ plantation, rotational agroforestry systems, agroforests, multi-layered tree gardens... Are these ways worth exploring? or are they merely "primitive" stages of forest production that should be abandoned on the ascension towards modernization? This question is increasingly important as the present revival of interest in NTFPs on the international scene puts traditional extraction systems under pressure. A highly probable future scenario is that NTFPs for which commercial demand is strong will be increasingly integrated into agricultural systems through cultivation (Homma, 1992). Which models will science have to propose for such an integration?

¹In 1994, exports of finished rattan product for Indonesia only reached US\$ 360 million.

Future development of forestry in general and NTFPs in particular obviously needs a fair dose of fresh inspiration and imagination to promote new production/conservation scenario and models. Can the production strategies developed in indigenous examples feed further inspiration? Comparative analysis of current systems for NTFP management can bring interesting highlights to this question.

1/ NTFPs management in SEA

1.1 Tapping natural stocks: forest hunting, gathering and extractivism

Harvesting products from natural stocks in natural forests is still a common way for getting NTFPs in Southeast Asia: an essential part of plant material for household use --leaves, lianas, resins and latexes, bark and palm fibers, but also timber and firewood--, of medicines, and some foods, among which game meat and fish, is still provided by the forest.

Harvesting per se does not constitute a management system, but, embedded in a framework of practices, beliefs and knowledge, customs and institutions, it is commonly referred to as "forest hunting and gathering" which represents a broad category of forest management. Hunting and gathering concerns, to more or less important degrees, the majority of rural people in the region. Besides subsistence collection, an important branch of forest gathering is **extractivism** in which products are extracted for commercial purposes. Extractivism is not a recent practice in Southeast Asia, as it emerged as far as the pre-historic period with the development of inter-island exchanges based on products such as resins and animal products. It slowly flourished as the main economic activity in the region with the development of Chinese, then Hindu and Arab trade routes, and with products ranging from resinous exudates for medicinal purposes--eagle wood, benzoin, camphor-- or spices to various animal products --rhino horns, gall bladders, birds nests...-. Colonial trade to Europe first focused on spices --cloves, pepper, nutmeg--, but extractivism gained an outstanding importance during last century as developing industries in the Occident demanded resins --damar and copal, turpentine--, and latexes --gutta percha, rubbers--. Since the second world war, many of these NTFPs lose their economic importance because of synthetic substitutes. Present extractive economy in the region develops around two important poles: rattan, that represents, in volume and benefits, the largest forest activity after timber, and luxury products like birds nests, gall bladders, dragon's blood or eaglewood. Production of natural chemicals for pharmaceutic or insecticide industries is emerging as the potential domain for next century' extractivism. Extractivism is actively practiced by traditional forest people, but it increasingly involves, often as the main income-generating activity, migrants in forest areas.

Extractive models and extractions practices vary with the nature of the extracted product or the origin of the collector. However, extraction dynamics are mainly determined by traders strategies and by government policies. The global tendency of present extraction habits is to be punctually non-sustainable in the short term --important economic resources are rather mined than carefully extracted-- but globally sustainable in the long-term --"extractivism" as an economic strategy is maintained as long as the forest itself exists--.

2. producing NTFPs

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2.1 historical perspective

Production of forest commodities in Southeast Asia is by no means a recent strategy. It probably launched the bases of plant domestication in this part of the world through the transfer of forest trees producing essential materials --such as tannins for fishing nets or bark fibers for clothes-- to artificialized environments nearby dwellings (Sauer, 1952; Barrau, 1967). Systematic production of resources formerly taken from the forest really developed under two complementary dynamics.

One was linked to forest foods and materials for daily use. It led to the domestication and cultivation of more than hundred of fruit and nut tree species, which gave rise to various models of diversified home-gardens that are a universal feature of indigenous agricultures throughout the tropics. The other NTFP production dynamics developed with the expansion of trade in forest products (Dunn, 1975; Hutterer, 1988). It most probably started emerging with the early trade from the rich lowland forests of insular SEA to China and the Middle East, with the domestication of forest species producing spices and stimulants --tea, clove, nutmeg and local species of pepper--. Commercial production of NTFPs really expanded during colonial times, but, again, along two very distinct lines (Michon, 1997). One was conducted by the colonizers themselves and was based mainly on species carried to the region from other parts of the world, like oil palm and rubber, cinchona or cocoa. This colonial NTFP production dynamics launched the bases for modern plantation agriculture through large-scale estates. The other line remained conceived and managed by local people and gave rise to highly varied models of domestication and cultivation. It concerned resources as varied as cinnamon --produced in specialized gardens from the 18th century in the central highlands of Sumatra (Michon & Bompard, 1987; Aumeeruddy, 1993)--, tengkawang, or illipe nut --in highly diversified fruit-and-timber tree gardens in western Borneo (Momberg, 1992; Sundawati, 1993; de Yong, 1994)--, rattan --incorporated into the fallows of shifting cultivation cycles at the beginning of last century in Central and East Kalimantan (Weinstock, 1983; Godoy & Feaw, 1989; Fried, 1995)--, damar --in complex forest-like gardens in the south of Sumatra (Michon & al., 1987)-- or rubbers --first native species, then Hevea rubber, incorporated in local swiddens at the beginning of this century (Pelzer, 1945; Dove, 1994; Gouyon & al., 1993)--.

Incorporation of forest food resources into agriculture reached its climax many centuries ago. But new trials for controlling commercial NTFPs through production are still emerging: the last examples are birds nests from artificial caves in Java, eaglewood from controlled "planted-and-infected" populations. However, in contrast to what happened during the previous centuries of forest domestication, when switching from "experimentation" to active production, present production systems tend to concentrate along a single, homogen model that can be defined as "productivist openfield tree culture". Rattan plantations in Sabah or Java, like Brazil nut plantation in the Amazon, replicate the cropping patterns designed for industrial grain production and the socio-economic model of estates.

2.2 Current systems: some examples

In contrast to the uniform plantation model --inherited from the colonial estates, promoted by modern foresters--, indigenous production systems in the region exhibit a noticeable diversity. A convenient way for analyzing them is to place them along a gradient of intensity of human intervention

and control over natural processes, which goes along with an *inversely related* gradient of resemblance between the cultivated system and the original forest ecosystem.

a - Integrated production: from forest species cultivated in the forest to rotational systems

Some indigenous production systems rely on an *in-situ* replacement of wild individuals by planted ones, with increased densities, coupled with practices that locally modify the forest to the benefit of the planted tree --selective slashing of competing vegetation, slight opening of the canopy...--. This enrichment planting integrates into existing forest structures, it never totally destroys or replaces them². The forest is artificialized by spots, to more or less important degrees, but without any essential biological, structural, ecological or functional change. This practice remains somewhat limited in SEA. Best examples of it concern tea production in old growth forests of Thailand, Vietnam and China.(Watanabe & al, 1990) and rattan production in Central (Godoy & al, 1989) and East Kalimantan (Michon, pers. obs.) in late successional forests.

Most cases of rattan production in Kalimantan, however, are associated with younger stages of forest succession under the form of rattan fallows that fully integrate within shifting cultivation cycles, with a rotation of 20 to 35 years (Weinstock, 1983; Mayer, 1988 ; Fried, 1995). Another outstanding example of rotational production of NTFP is represented by rubber gardens that roughly cover 2.5 to 3 million hectares in the lowlands of Sumatra and Kalimantan and hold the largest share --80%-- in Indonesian rubber production (Pelzer, 1945; Dove, 1993; Gouyon & al., 1993). Bamboo production in West Java follows a similar cyclic pattern, in which an 8 to 15 years phase dominated by bamboo growth and harvest alternate with a 2-3 years period of vegetable growing (Karyono, 1981; Christanty, 1982).

b - Cultivated forests in farm lands, agroforests

Other indigenous practices constitute examples of true "forest culture", best models of which can still be found in Indonesia (Torquebiau, 1984; Michon & Bompard, 1987; Sardjono, 1992; Aumeeruddy, 1993; Dove, 1993; Gouyon, 1993; Momberg, 1993; Padoch, 1993; Sundawati, 1993; de Jong, 1994; Salafsky, 1994; Fried, 1995). Though destroying pre-existing forest ecosystem --usually quite degraded secondary forests--, this practice, as it restores forest structures that appear more or less equivalent to the original ones, maintains the global ecological qualities and socio-economic functions of the original environment.

This process of forest reconstruction can be found in Sumatra, with damar agro-forests (Michon & Bompard, 1987; de Foresta & Michon, 1993; Michon & al., 1995). Damar agro-forests are not fundamentally different from any specialized commercial plantation as they are designed for cash income provision (Mary, 1987; Levang, 1992). However, from a biological point of view, it is a true forest with a high canopy and several under-canopy layers, a dense undergrowth, and fairly high plant and animal biodiversity levels. And, unlike plantations that evolve through repetitive cycles leading from plantation to total harvest and back to plantation, the damar agro-forest, once established, usually reproduces without any further major disruption, as decaying trees are replaced whenever needed. Benzoin gardens of the Tapanuli regency represent a similar practice of indigenous forest plantation. However, benzoin gardens are gradually abandoned, after 60 to 80 years, with less and less control over the self-established tree species, and soon revert back to a typical high growth

²this practice has been mainly documented in the Amazon, with the management of cultivated stands of *Euterpe* palms -for palm heart and juice production- in swamp forests (Anderson, 1990), or of Brazil nuts (Lescure, 1995)

forest (Yoshida, 1971; Simanullang, 1988; Watanabe, 1990). Other examples of such complex agroforestry systems exist in Indonesia, like illipe-nut gardens in West Kalimantan (Momborg, 1993; Padoch, 1993; Sundawati, 1993; de Jong, 1994), fruit forests of East Kalimantan (Sardjono, 1992), or durian agroforests of the Sumatra lowlands (de Foresta & al, 1993; Salafsky, 1994).

c - NTFP production integrated in multipurpose tree gardens

The last set of examples consists in more "ordered" permanent agroforestry gardens that might not be as diverse as the above-mentioned forest gardens, and in which the production of selected NTFPs integrate with other targeted productions like timber and/or fruits. Farmers in West Sumatra have thus developed an original example of rotational production of cinnamon below a permanent canopy of durian trees mixed with large timber-producing trees (Michon & al, 1986). Cinnamon can also be mixed in the undergrowth with either coffee and/or nutmeg, plus scattered fruit trees. Such multi-layered agroforestry systems can also be found in several islands in the Moluccas, with an association between forest trees and horticultural species: coconut trees and tall *Canarium* form a canopy under which *Inocarpus*, and nutmeg or clove, or a mixture of both, plus banana groves, are cultivated (Michon, 1990, pers. obs.). Some examples of smallholder coffee and cocoa production are also carried-out under different types of tree canopies.

d - specialized production

Smallholder farmers in the region have also developed highly specialized gardens that target maximum production through high levels of inputs. The "forest" component of NTFP production is totally lost: as it is in any system of intensive production, farmers deal with specialized stands of high-yielding plant material. The best examples are that of cinnamon production in the Kerinci highlands of Central Sumatra (Aumeeruddy, 1993) and gambir in the lowlands of Sumatra (). "Modern" rubber production by smallholders as promoted by World Bank programmes through the last two decades also converted many rubber agroforests into specialized fields of rubber trees. Specialized production by smallholders also concerns tea, coffee and cocoa, that are, as rubber, not considered as "forest" crops anymore.

When speaking of specialized production, one has to mention its industrial estate version. Though this is not an indigenous system, it tends to be the dominant model in both government-sponsored development schemes and government ideologies. Inherited from two centuries of colonial plantation, the estate model remains remarkably uniform through history and throughout the region. From a technical as well as ecological or social point of view, nothing really changed from old Dutch rubber estates to modern oil palm plantations of private firms. This stands true also in the present "diversification" process of forest estates: pulpwood estates in Sumatra or rattan plantations in Sabah derive from the same basic principles that sustain corn fields in the middle West of United States: uniformization, artificialization, concentration, productivism.

3 Which models for sustainable NTFP management?

The above-mentioned examples have emerged at different times in history. They sometimes tend to be seen by scientists as interconnected in a logical transitional process: indigenous managed forests and forest-gardens are considered as primitive stages in a domestication and cultivation continuum starting from forest collection and culminating into modern plantations. This assessment is

based more on historical empiricism than on any kind of evolutionary logic. The almost universal advent of the productivist openfield model for forest culture is more the result of scientific and political imperialism than that of scientific evidence of its advantages over other models.

NTFP production through one or another form of forest gardening is a rather modern fact in the sense that most of the above-mentioned examples appeared less than two centuries ago. They might synthesize centuries of interdependence between forest people and forest species, but they do not represent centuries of true domestication trials and experiments, and they never benefited from any integrated scientific research that could explore all their potentials. They are therefore "imperfect" --still to be perfected: in particular they do not make full use of the genetic potentials of the species upon which they rely, nor of the ecological model upon which they are built--. Rather than being prehistoric steps on this imaginary line that leads from forest extraction to modern production, these examples open parallel branches that do represent alternative evolutionary lines, each having reached different stages of "maturity". The present examples could be used as references --archetypes?-- upon which models could be elaborated for future forest culture.

3.1 Harvesting models

The first group of models --gathering and extractivism-- do not go further than tapping the natural forest rent. This category encounters infinite variations linked to the diversity of the forest itself as well as to the diversity of products, of economies and cultures, or of management and trade policies.

Forest harvesting models can be classified along two main poles. At one pole is the "generalist model", implying diversified, multipurpose, small scale and low input activities. This model is relatively sustainable and unharmed to the ecosystem. It concerns more home consumption than trade. But, with the monetarization of forest economies, this model is more and more unlikely to be adopted where it does not exist.

The other pole is represented by the "single-focus model", where forest is exploited for a particular (set of) product(s) --with exclusive timber extraction as the extreme of specialization-- or to meet a particular need. Extractivism, as focusing on income-generation, is the main model in this pole. Focused models may range from quite sustainable to totally destructive: the resource, or the whole resource base, is tapped until exhaustion. Significant variations of the focused model mainly concern:

(1) its scale: an important distinction needs to be made between small scale, low input systems --opportunistic extractivism as practiced by Punan in East Kalimantan or Kubu in Eastern Sumatra-- and those involving large-scale exploitation and high inputs --that culminates with the timber extraction model of logging companies in Indonesia and Malaysia--.

(2) the management of the natural stock: again, there is a large variation between pure collection and active management of productive individuals in order to affect natural productivity --increasing quantity, monitoring quality or product flow--. This last category closely relates to the first of the next production models

3.2 Production models