

VI – Evolution

Are local forest management systems only early stages in a universal process leading from primitive horticulture to modern agricultural intensification? Or do they constitute alternative models of forest production and domestication representing an original but, rather universal evolution in smallholder forest management?

The question of evolution of smallholder forest management is a central one, especially in the perspective of extrapolating alternative models to other regions.

Many people in professional forestry or policy development, as well as some forestry and rural development experts and scientists, think that local and diversified forest management systems that have been conceived by local people and have evolved outside any project framework, as most of the examples we have studied in the project, represent backward systems of little interest for the future of global forest management. The arguments against smallholder forest management are a supposedly high local specificity, low economic profitability, a lack of ecological sustainability and a fading future. It is commonly said (see forestry reports and speeches in most tropical countries) that these systems are bound to disappear in the course of rural development and globalisation. These conclusions are linked to the common analysis that these systems, especially local examples of forest culture, are nothing more than ‘primitive horticulture’ and should only be considered transitional stages in the universal process of conversion of old forms of harvesting systems towards domestication and intensification.

The conclusions of our studies on current evolution of the existing systems demonstrate that local forest management systems hold many elements of universality, that their diversity usually tends to be reproduced rather than giving place to more specialization in resource management, and that their collapse is often a consequence of policies or market regulations that aim at promoting more ‘official’ models of resource management.

1. What are the current evolution dynamics of forest extraction?

Forest extraction has always existed in the region under study. Except for a few fragile animal species (especially rhinos), it has not led to a drastic reduction of existing resources or to an obvious degradation of the ecosystem itself. But is the practice decreasing or on the rebound as an economic activity and a support for livelihoods? What are its prospects and limiting factors?

We have shown that the economic niche of extracted products (local subsistence, local trade, national or international trade) and the policy environment in which the extractive activities are framed (land-use policies, concessionary policies for forest collection, restrictions on harvest and trade, mechanisms for formal recognition of local rights) are the two main factors driving the evolution of forest extraction.

Globally, there is a major difference between the evolution of extraction for subsistence and that of extraction for trade (extractivism). Talking about forest extraction in general, one therefore has to consider whether this extraction is undertaken primarily for the satisfaction of local needs in food or materials (including sale in local markets) or for external and distant markets.

a. Forest collection for subsistence purposes

1. Extraction of forest foods for subsistence purposes concerns small quantities, compared to extractivism, and seems to be stable over long periods of time.

- The collection of forest staples such as tubers, bananas and sago for flour is presently quite limited in the region, as it has generally been replaced by cultivation or exchange. In areas that are rich in sago palm, however, managed sago groves still provide an important part of the starch in people's diet, as noted amongst the Talang Mamak and the Punan of our study. Management of wild sago is preferred to swidden rice cultivation as it requires less labour and is less exposed to environmental and climatic hazards.
- Several tens of species and varieties of fruits may co-exist in the forest and in domesticated forests. Even though most of the fruits consumed in the region come from cultivated trees, wild fruits are still intensively collected in the forest, especially in Kalimantan, which exhibits an astoundingly high diversity in edible forest fruits from mangoes to rambutan jackfruit relatives, durian and langsung, lengkeng.
- The forest is still an essential source of protein and minerals. Inhabitants of villages at the forest margins collect game meat, fish and greens mainly from natural sources.

2. Collection of forest materials for subsistence uses is globally decreasing over the region and being replaced by purchased manufactured products. This decline has resulted from the reluctance to engage in the time-consuming and physically demanding activity of harvesting and processing the wild product, when manufactured goods for the same use are available, and from the prestige bestowed upon manufactured goods. Thus farmers would rather go to the forest to collect products for sale (extractivism) and use the money to purchase material. The perverted form of exchanging forest material against manufactured goods is represented by the exchange of timber for cement-based building material, in which case the profit obtained from selling timber largely exceeds the cost of a concrete house.

3. Collection of forest resources for subsistence purposes tends to increasingly be carried out outside of the 'forest', in cultivated forests and anthropogenic forest vegetations on farmlands. The importance of agroforests and fallows is often essential, because of the high diversity in spontaneously occurring species. Preferred species (especially fruits) tend to regenerate easily in these vegetations, from seeds dispersed by people. Old forests, however, keep their first role as providers of honey, game and fish.

4. The collection of forest products for subsistence purposes remains essential in times of crisis. This buffering role has increased, as climatic catastrophes have tended to become more frequent over the last 20 years.

b. Extractivism

5. Extractivism is still abundantly practiced. It is an important cash-earning activity for forest farmers and has a significant place in household and village livelihood strategies. Most farmers are aware that maintaining the possibility of resorting to the forest is a safeguard against economic and climatic unpredictability. It allows for flexibility in the allocation of scarce resources (labour, land, capital and chemicals) and maintains a certain independence from credit providers and traders.

6. Extractivism as an integral, or dominant, economic activity has lost its former place in household and village economies of forest areas, however, and is presently practiced more sporadically than before, in a highly opportunistic way. This decline stems from villages' increasing distance to natural forests and the development of alternative options for income generation. When given the opportunity, farmers generally prefer to engage in wage labour or commercial agriculture. This choice is not exclusively driven by profitability considerations, but commonly results from the combination of several factors:

- For high-value products (eagle wood, sandalwood, birds' nests, timber logs), prices of which have soared during the last two decades, extractivism at first encountered a quick renewal, with people rushing to the forest in order to make a fortune. Extraction of high-value products tends to be so fiercely competitive and risky, however, that only 'the big ones' finally make a profit. Engaging in the collection of such products requires capital facilities and good connections with powerful people. As a consequence, the organisation of this potentially highly profitable extractivism tends to be pyramidal, whereby the ones holding capital and power hire smallholders as wage earners for the collection. This practice makes the activity less interesting for the latter category of people.
- Everywhere, the collection of less-profitable products (rattan, latex, resins) is considered physically difficult and backwards. It is now mainly strong young people who need capital to start a new household who practice it.
- The trade in forest products is highly variable and unpredictable, especially for long-distance trade and high-value products. Collectors are completely dependant on traders' decisions regarding which products they will buy, in which quantities and at what price. This dependence of an economic activity on the presence, goodwill and local power of one particular agent in the whole process plays against its sustainability.
- The degree of collectors' dependence on traders is increased because most are indebted to them as a result of the prevailing financing systems of collection expeditions, especially for high-value products. The funding mechanisms of extractive expeditions often involve going into debt for the collectors, who borrow food and materials from the

trader and pay their debts with collected products, a scheme which considerably lowers the profitability of the activity, as those providing the credit and buying the product are one and the same.

7. *There is a general tendency of diversification of extractivism in the region through new actors and new products geared at nontraditional markets.* Because of the economic crisis, many villagers who had migrated to city centres returned to their villages. As they have no land, forest extraction represents an interesting economic option for them. Aware of the forest products sought in the cities, they developed an extraction sector aimed at city dwellers, with products such as ornamental fish, songbirds, tortoises, orchids and tree ferns. However, this neo-rural extractivism is practiced in a plundering mode and has a highly negative impact on coveted resources in most of the surveyed cases.

8. *Forest extraction gains importance in indigenous political movements.* In Kalimantan and in Riau, extraction has been revived as a ‘tradition’ linked to the reinforcement of a sociocultural identity connected to the forest. It is used as an argument to negotiate the maintenance of villages and forest-related activities in conservation areas. The Kenyah people in Kalimantan and the Kerinci people in Sumatra define themselves as the ‘stewards of the forest’ and have revived ‘sustainable’ forest collection practices in order to maintain their authority, and presence, over the forestlands on which they live.

9. *Many regulations have recently been introduced to protect coveted extractive resources from overharvesting.* The various economic and policy instruments include measures such as exclusive concessionary rights and periodic bans for sandalwood, a total ban governing rattan and an auction system for birds’ nests. Timber collection was totally forbidden for local people until 1999, but is now permitted through village-level concessions. It appears that the impact of most of these coercive regulations has been contrary to what was intended. They have increased illegal operations and smuggling for all products concerned, leading for example to the almost complete exhaustion of sandalwood in the Molluccas and to a rapid depletion of bird nest caves in Kalimantan.

10. *The decline of true forest areas in the region because of overlogging and conversion to nonforest uses deeply affects extractivism. However, extractivism can partly survive through integration of wild forest resources into cultivated forests and anthropogenic vegetations, but not on a sustainable basis.* If the reduction in old-growth forest areas does not necessarily affect forest collection for subsistence purposes—as forest collection is actually reviving in other spaces around villages—, it does put a threat on classical extractivism because most of its products are either lost or managed through forest culture on farmlands: extractivism from forest cultivation is restricted (except for rattan) and unsustainable as economically interesting products tend to be cultivated.

Conclusions

The current evolution of the management of wild resources in the region follows various dynamics. Its importance for subsistence purposes remains through the transfer of collection

activities from natural forests to managed vegetations that are still able to harbour wild resources. As a cash-earning activity, it decreases in some places because of competition

with more stable activities, negative perception of the activity, lack of market and discouraging policies, while it revives in others through a combined set of factors including new products, new markets, new actors and new political strategies. This revival, however, often entails a

quick exhaustion of the resource. The future of extractivism finally depends on the maintained presence of the forest itself, as well as on a regulatory framework and institutional bases that do not push towards resource plundering, but rather promote sustainable management.

2. Why do farmers move from forest extraction to forest culture?

Most economists stress that the main driving forces for the development of forest resource domestication and cultivation are of an economic nature, among which are developing markets and the reduction of the costs of production ⁽¹⁾. Social and political factors are not recognized as significant driving forces. This assumption is based mainly on the analysis of large-scale operations of domestication and plantation. The introduction of examples of forest cultivation by smallholder farmers may change this perspective.

The historical evolution of the cases analysed in our successive studies shows that the factors initiating the domestication process and those influencing its general adoption are usually quite different. In both cases, however, economic factors are not necessarily the dominant driving forces.

The emergence of domestication is mostly driven by the conjunction of two types of factors. These are

- increased access to existing markets for the cultivated forest product, which encompasses increased external demand and diversification of traders, credit and transportation facilities; and
- decreasing access to the wild resource, which encompasses natural exhaustion, restriction of or disrespect for local rights and regulations, and increased competition for collection.

The presence of local innovators is critical to achieving the first domestication trials and solving initial technical problems. The role of key actors, often outsiders, is important in suggesting the idea of cultivation or in supporting the first initiatives. Examples of the former influence include Chinese traders for rubber ⁽²⁾ and a local Haj for damar in the Pesisir ⁽³⁾, while the local forest administrator for damar in the Pesisir ⁽⁴⁾, leader villages for benzoin in the Toba highlands and the local sultan for rattan in Pasir district are examples of the latter.

Massive adoption of cultivation is catalysed by factors outside the economic field. Even though the generalisation of cultivation requires some market certainty and the resolution of the main technical problems, it appears to be driven mainly

1. Homma 1992.

2. Dove 1994.

3. Michon *et al.* 2000.

4. Rappart 1937.

by social and political considerations.

These considerations may be internal to the social group. The need of younger branches of lineages to acquire a real social status through the establishment of a land patrimony catalysed massive planting of damar in southern Sumatra⁽⁵⁾. The true expansion of damar cultivation happened at the moment when international demand for natural resins was declining, a development that has not affected the plantation dynamics until today.

The sociopolitical drivers often concern the relationship between a social group and outsiders. They relate to changes in forest-related policies or practices of external actors. Massive planting of benzoin in the highland forests after Independence aimed at strengthening, in a visible way, traditional authority of Toba Batak lineages over their customary forestlands in the context of postindependence uncertainty regarding land tenure and land status⁽⁶⁾. The adoption of rubber in Sumatra in the early 1920s⁽⁷⁾ was aimed at compensating for the double restrictions imposed upon swidden farmers on the collection of wild rubbers (from free harvesting to concessionary rights) and the participation in colonial plantation schemes (reserved for Dutch planters).

5. Michon *et al.* 2000.

6. Michon 2000.

7. Dove 1994.

Conclusions and recommendations

Massive conversion of former forest collection systems into forest culture appears successful when forest cultivation allows farmers to both meet their economic objectives *and* achieve noneconomic goals related to the social, political or institutional sphere. Planting trees has a starkly different social and political dimension than just extracting tree products from the

wild. These dimensions should be fully understood and taken into account. Basing policy support for smallholder forest culture on economic incentives is not the best way to ensure the success of the so-called 'social' or 'farm' forestry projects, if local social and political goals go unfulfilled.

3. What are the forms and impact of intensification of local forest culture ?

The term intensification here refers to changes in management practices that result in increased productivity of production factors. In agriculture intensification usually means more production per unit of land, which is achieved through strict specialization and 'rationalization' of crops and fields. In this intensification process, land is valued more highly than labour, and all inputs (labour, capital, chemicals) are increased, except for land. These changes allow for increases in the size of the management unit and the scale of operations. How much does this process apply to forest production? Why did farmers choose diversified rather than monocrop forestry? Do they stick to the diversified model when intensification (both internal and external) proceeds?

South-east Asian forest culture favours diversification over specialization. More than representing a 'primitive' attitude towards production, we suggest, as many ethnobotanists did for tropical horticulture, that forest culture as practiced in the studied area represents an alternative model of forest domestication. Unlike Western agriculture, which targets the improved control and increased production of individual resources, South-east Asian forest culture aims at domesticating the production processes of an entire ecosystem, which goes through encouraging diversity.

The switch from extraction to production represents the first stage of the intensification process in agriculture as well as in forestry. In their initial phases, tropical horticulture and agriculture were diversified rather than much 'intensified'. Scientific analyses of the evolution of farming systems usually assume that the second step in the intensification process of smallholder systems is towards more specialization for a more intensive use of scarce resources⁽⁸⁾. However, opting for uniformity and productivism in tropical agriculture also happened under the impulse of external policies brought in first by colonial administrations, then by development agencies. As far as forest culture is concerned, we did not find any evidence that intensification leads to more specialization. We even have evidence to the contrary: all the attempts farmers made to increase the productivity of their cultivated forest consisted of the introduction of more economically interesting tree species into existing structures, which practice adds diversity to the original stand.

Most examples of true specialization dynamics observed can be related to policy changes and incentives, or policy and economic disincentives aimed at local patterns of tree cultivation. The observed switch of Pasir farmers from diversified rattan gardens to monocrop oil palm plantations happened in the context of important policy changes for the rattan trade and policy support for oil palm development, a combination that constituted strong disincentives for rattan cultivation. Most farmers said that, given the choice, they would opt for a combination of oil palm fields and rattan gardens. Farmers in rubber areas would like to try improved varieties of rubber under 'jungle' conditions⁽⁹⁾, but clonal material was distributed only to those engaged in changing their cropping patterns towards specialized rubber fields. In Maninjau, extension agents refused to work in the agroforest, offering technical advice for cinnamon, coffee or nutmeg cultivation only when these crops were 'properly' grown, that is, in uniform, monocrop stands.

In developing forest culture, rather than controlling the species genes and the population structure, farmers have chosen to retain and manage the diversity of species, structures and functions inherent to local forest ecosystems. To the question, 'Why did you choose this model rather than monocrop forestry?' farmers respond by asking, 'Why should we choose monocrop forestry rather than our diversified model?' This inversion of a simple question reveals the fundamental opposition that exists between an Asia-Pacific model of horticulture and the grain-crop based theory of agricultural development. It shows that this opposition, which

8. Boserup, 1965.

9. Joshi *et al.* 2002.

has already been amply discussed by ethnobiologists working in the region, is valid beyond the observed systems and concerns resource and ecosystem domestication and management as a whole. Farmers in the study areas have achieved a model that emphasizes domestication of ecosystem structures and processes rather than domestication of individual species, conserved diversity rather than imposed uniformity.

Conclusions and recommendations

Intensification in forest culture should not necessarily follow the way of classic agricultural intensification. The way suggested by farmers cultivating forest goes through a full use of diversity, and it is based on the conception of ecosystem domestication rather than on individual plant species domestication. These alternative ways of intensive forest production through diversification remain to be explored, technically and conceptually. Instead of transforming forest species into light-demanding cultivars (which has happened with the

domestication of rubber, cocoa and coffee for example), the technical options include testing the existing high-yielding varieties of forest plants in the environmental conditions of diversified forest, or developing improved plant material specially designed for an heterogeneous forest environment. Forest domestication in the tropics still needs to be re-invented, and indigenous examples provide interesting models for that task.

4. Are local models of forest culture only transitional ? Will they disappear as development proceeds?

The common perception in agriculture and forestry sectors is that smallholder forests are just semidomesticated stages of primitive horticulture in a transitional process that leads from predation systems to modern agriculture or forest culture⁽¹⁰⁾. Selected forest species managed in these smallholder forests are still considered semidomesticates, if not just managed species. It is assumed that smallholder forests will either evolve towards true plantations or disappear. A critical analysis of these assumptions is essential. What can we learn from the observed collapse or success of smallholder forest culture? How can the scientific interpretation of the evolution of smallholder forest management in the light of the evidence collected through our research change this dominant concept of forest domestication?

The analysis of long-term evolution of local forest culture allows for the conclusion of its permanence beyond the observed evolution of individual systems, not only as an original land-use model in forestry, but also as a new paradigm for 'forest domestication'.

Some of the studied examples are old practices (fruit forests have been in use for several centuries; benzoin, rattan and cinnamon for 150 to 200 years), while others are more recent (rubber and damar, which began in the early twentieth century), and the literature reports the recent creation of durian-based forests in Kalimantan. Some of these systems,

10. Angelsen, Belcher *et al.* 2000.

including damar gardens in Sumatra, timber gardens in Java and rubber gardens in Kalimantan, are still expanding. We have analysed examples of limited or massive collapse of smallholder forests. From our studies, we can conclude the following.

- The age of a system is rarely a key factor for its evolution. Some may be quite stable over long periods of time, while others may exhibit shrink-and-expand dynamics.
- The collapse or success of a system is not linked to the nature of the dominant production in the forest garden. Damar gardens have collapsed in South Sumatra while they are still expanding on the west coast of Lampung. Rattan gardens have more or less disappeared from the East Sumatran lowlands, where they were reportedly important until 1930, whereas they have been expanding in Kalimantan until recently. After 1945, benzoin gardens have been replaced by rubber gardens in Palembang while largely expanding in the Toba highlands.
- The temporary collapse of a market for a given product does not usually entail the extinction of the related systems. The markets of damar and rubber, for example, have encountered wide variations over the last century, but these variations did not prevent damar or rubber agroforests from emerging, developing and expanding until today. Long-term recession, however, or better alternatives for a product may influence the composition or the permanence of a system. Rubber has replaced both rattan and benzoin in smallholder forests of the lowlands of Sumatra. The farmers themselves have questioned the future of rattan gardens, if export policies keep prices low.
- Massive destruction of smallholder cultivated forests has, to a significant extent, to be attributed to government policies favouring large-scale operations of forest—or export crop—production. The relationship between estate development and the collapse of local forest culture systems is either direct, as in the planned expansion of estates in the forest domain, or indirect, as through incentives for the conversion of local systems to estate crops or through disincentives for the pursuit of forest culture. In reality it is a combination of both categories of factors. For the last decade or so, current policies in Indonesia have favoured the development of pulp and oil palm estates. Plantation companies have slashed and burned rattan gardens in the Bentian area in East Kalimantan to make way for government-sponsored pulpwood plantations. Rattan gardens in Pasir are being converted because of a combination of the reported or perceived economic attraction of oil palm on the one hand, and the physical and symbolic violence against farmers who do not join the dominant oil palm project on the other hand. These factors are also threatening the existence of rattan gardens in Pasir and rubber agroforests in Riau and Jambi.
- There are positive examples of smallholder forest cultivators' resistance against the dominant land uses sponsored by the government. Damar growers successfully resisted the threatened conversion of their agroforest, first by logging in the 1980s, then through oil palm development in 1995–96. In the late 1990s, benzoin farmers resisted the total logging of their benzoin forest and its conversion to eucalyptus plantations by a pulp-producing company.

Conclusions and recommendations

Considering smallholder forest management as an alternative rather than a transition towards modernity requires a shift in dominant perceptions about forest, agriculture and development, followed by a shift in policies determining land development. What is needed is more a conceptual change and the invention of new paradigms, rather than the multiplication of nice case studies. Our studies have established the bases for elaborating

on this original association between short-term imperatives of production and long-term perspectives of forest conservation and development. This foundation opens the way for practical, alternative strategies for forest management, domestication and culture to be devised.



VII - Extrapolation



What are the preconditions for a successful development of smallholder forest culture versus monocrop tree culture ?

We have shown how forest culture on farmlands has emerged in various periods of history through different strategies related to complex sets of circumstances, which has resulted in the creation of different types of structures. These structures have evolved through existing conditions and are still maintained and developed by farmers.

We have gathered enough evidence to conclude that diversified smallholder forest culture, which goes along with the maintenance of extraction of wild 'forest' resources from either natural forests or farmlands, does not represent a transitional stage in a modernization process of primitive horticulture, but constitutes a true alternative of natural resource management devised in the context of smallholder production systems.

Forest culture is not only important where it exists. It does have potential for wider application. Our analyses allow the conclusion that examples of forest culture on farmlands are not local variations of a highly specific culture that cannot be extrapolated. They clearly demonstrate that forest culture, as an alternative model for the management of forest resources, can play a more global role in improving farmers' livelihoods and preserving ecological stability and biodiversity. Moreover, it could allow for the establishment of a new balance between smallholder farmers presently managing forest resources and lands and other actors in forest management, especially foresters, forest administrators and forest policy-makers.

1. What are the preconditions for the successful development of smallholder forest culture?

The successful development of diversified smallholder forest culture in other parts of the world will depend on a combination of factors from different sectors. Extrapolation should at least meet the following criteria.

1. Potential practitioners must perceive the proposed models as the best option. Factors include
 - economic considerations, taking into account the trade-off between cash income, labour and land inputs, and risk management
 - social considerations related to the attractiveness of the proposed solution: the proposed forest culture model should neither be restricted to a group of less-endowed farmers, nor restrict the possibilities for social change. In particular, it should not lock the less well off into relative poverty but be flexible and attractive enough to be integrated into social strategies for development
 - cultural considerations: forest culture has to be incorporated locally not as an external factor, but as part of farmers'

identity (or contributing to the strengthening or redefinition of their identity or territory) and valued beyond the boundaries of the region

- political considerations: forest culture should contribute to empower practitioners, and in particular help them maintain or regain local authority over land or resources, as well as assure them full access to the benefits of management.
2. The technical feasibility and the scale of cultivation in space and time must be carefully assessed with the framework of existing farming conditions and with the farmers concerned. For example, technical and strategic features have to be designed so that incomes or other benefits are provided until the planted forest becomes productive. This can be achieved through a well-tailored establishment process, reducing concerns of short-term profit on forest production and allowing long-term speculation.
 3. There must be a good complementarity between forest culture and other farmers' activities, especially agricultural activities, in terms of labour and land allocation, overall income and risk management strategies. Forest culture should be more systematically encouraged in areas where shifting cultivation has to be intensified.
 4. Farmers must be convinced of the long-term success, benefits and reproducibility of the forest they establish. Besides economic and social considerations inherent to the proposed model, this condition mainly implies full respect from technical and policy bodies involved for the difference between the commonly valued models of professional forestry and smallholder models of forest culture. Farmers' adhesion will come from
 - the sustained presence of a market for the main product, or possibilities of substitution, when needed, by other, more profitable forest products that can be easily integrated into established forest structures
 - the acknowledgement by forest administrators and policy makers of the value of the model of forest culture, not for local economic reasons, but more globally for the environmental and economic benefits it provides at the regional or national scale, as well as for global environmental concerns, when appropriate
 - the official acknowledgement of (even contingent) transferable rights over the land or the trees, especially entitlement policies
 - the official acknowledgement of the relevance and flexibility of locally devised rules, which are the warrant of the forest systems' adaptation to changing conditions.
 5. Restrictions imposed by policy makers on the management of cultivated forest, or the utilization of some of its products, must be carefully justified. In particular, there should be no *a priori* restriction on farmers' utilization and marketing of locally produced timber as long as rules and practices for sustainable production are devised.

The assessment of (potential) success should be based primarily on local valuation criteria using farmers' needs, constraints and expectations. Valuation of environmental benefits should come in second place. This prioritisation means that if the cultivated forest appears to be nonprofitable in the long term, its conversion should be encompassed.

We want to stress that the proposed models of forest culture and management of wild resources on farmlands are not supposed to solve all the problems encountered in global forest management. But there are particular domains where they seem to be quite relevant. These application domains concern the following areas.

- The already converted forestlands, where local tree farming and forest culture are burgeoning and constitute the main warrants of the maintenance of tree and biodiversity cover, constitute major arenas for the successful implementation of forest culture, as most of the bases mentioned above are present.
- The sustainable development of pioneer fronts and other types of fragile forest margins where slash-and-burn agriculture is dominant, and where natural conditions seriously limit the intensification of annual food cropping.
- The development of semi-intensive use zones surrounding protected areas, where a mosaic of smallholder cultivated forests, combined with secondary forests and patches of primary forests maintained for extraction, can be a tool for maintaining or restoring the environmental qualities of the protected forest.
- Biodiversity conservation outside protected areas, where development is the main objective, where forest conversion is difficult to avoid and where the development of smallholder forest culture can represent an effective buffer against conversion to inefficient slash-and-burn or intensive agriculture.
- The implementation of social forestry programs, where local communities need to be empowered technically as well as legally to ensure sustainable management of forest resources and equitable sharing of benefits.

2. The main condition for successful extrapolation: a general change in current paradigms of global forest management

The main warrant for a successful development of alternative models of forest management is a general shift in the dominant paradigms that have dominated forestry and land development in general for the last centuries. The models of forest culture developed in this book relate to representations and logics that are different from those from which 'modern' forestry has evolved from the European forest services of the seventeenth and eighteenth centuries. These logics and representations directly question, among others, the distinction between forest and agriculture, between 'natural' and 'cultivated' systems. They challenge the allegedly universal model of domestication, which relies on species adaptation to productivity and open-field conditions, and the agricultural intensification models, which rely on crop specialization and high input levels.

They put into perspective the modern quest for a total mastery of natural processes by humans. They shake up the idea that humans are not part of ecosystems, but either perturb or control them. They finally question the disciplinary approach of resource management where science and technique are supposed to be totally disjointed from economy and politics.

These examples encourage us to revisit our global relation to what we perceive as 'nature'. Whereas the productivist agricultural model (the *ager* model and the open-field preference defined above) has been based on centuries, if not millennia, of attempts of mastering nature*, the forest culture paradigm (the *hortus* model revisited through the above analysed forest preference) emphasizes taming and integration. The choice here is between confrontation and connivance. This choice does not only address technical issues, but clearly challenges conventional social and political approaches of forestry in particular, and development in general.

* And where nature conservation is encompassed as the redemptory activity of this excessive mastering of nature



VIII – Concluding remarks



The last 10 years have seen a change in the attitude of professional foresters and scientists from various disciplines towards local knowledge and forest-related practices. Central to this change is the idea that local users can be at least great inspirers, if not the legitimate managers of the forest. This shift in intention is important, but, if not coupled with changes in the intellectual, methodological, political and implementation tools, could contribute to the standardization of 'local knowledge' into a few simple 'blueprint' techniques of forest production and the idealization of indigenous people as the universal, legitimate and talented stewards of the forest for the future.

In our studies, we were not looking for a catalogue of relevant knowledge and practices. We did not try to support local systems unconditionally. We were aiming at reporting more globally on the local science that underlies management systems, including its very clear and sometimes major social, political and symbolic components, in order to challenge conventional views of forest development and local forest management. Based on this global assessment, we have tried to discuss the comparative advantages of smallholder models of forest management, and especially of forest culture, against those developed by professional forestry. We have also tried to define their evolutionary trends and driving forces. We have elaborated on the potentials and limits of smallholder models for forest conservation and development. We have insisted on the fact that models are not only about techniques, but mainly about representations, economic strategies and sociopolitical relations between human groups.

We have made our best effort to relate our analyses to the current priorities in international research and development in forestry and agroforestry, as well as in sustainable development in general. We have indicated the contribution that local forest culture could have for the larger problems of mitigation of deforestation, biodiversity conservation and poverty alleviation in a context of global environmental and social change. We have insisted on the fact that the aim of the proposed models was not restricted to capturing forest physical or physiognomic components on farmlands, but also to enhance the restitution of forest functions and benefits, as well as of the socio-cultural dimension of forest management, in a context that appears different from that of conventional forestry.

As a final statement, we reassess that there is a strong rationale and an urgent need for investment and policy interventions to support existing smallholder forest management as defined in this book, that is, a close integration between forest culture on farmlands and extraction of self-established resources from the landscape base, including natural forests and the various vegetation systems established on farmlands. There is a strong rationale and an urgent need to promote the expansion of the models that can be derived from the existing examples, granting special attention not only to the techniques, but also to the social modes of management and to the underlying systems of representation and knowledge.

Special attention should be given to the way policy-makers, trying to improve the global context of forest management, perceive, encompass and regulate local practices of forest management. The alternative models driven from the real world encourage us to work on the appropriate relations between farmers managing forest resources on their own lands and the administration in charge of forest management for the public interest. The relation between the actual benefits derived from

forest culture on farmlands (for the farmers themselves, the nation and the public interest) and the perceived ‘public environmental services’ should be carefully examined, so that the enforcement of regulations aimed at preserving these environmental services does not actually hamper the ability of forest culture to develop and provide its benefits.

At the same time, we want to stress that smallholder forest culture will not solve all the technical and social problems related to forest management. It should therefore be seen as a complement to more conventional approaches of production forestry and forest conservation, more specifically suited to the numerous areas where smallholder farmers represent the main actors in resource management and where natural forests are being converted by agricultural dynamics.

The age-old distinction between forest and agriculture as two technically, juridically and institutionally distinct sectors is totally questioned by the evolution of forest landscapes in the tropics. A large part of farming lands are under the jurisdiction of forestry services. A large share of not only managed forests but also successful forests are established on farmlands, through methods related to swidden agriculture. Farmers manage them as part of a global resource management strategy including the cultivation of short-lived crops in open fields, the cultivation of long-lived crops in complex ecosystems and the management of self-established plant and animal species throughout the landscape base. A new form of relation has to be invented between forestry and farming, in conceptual terms as well as from more technical or juridical considerations.

The models of forest culture on farmlands through cultivation and extraction discussed in this book do not only address the technical issues of integrating forest cultivation and agriculture. They aim at constituting a new paradigm that can help revisit the relations between farming societies, policy-makers and forest administrations for the management of forest resources at local, national and global levels. They call for the development of a new conceptual and legal framework for local forest management by farmers through the transfer of management responsibilities not necessarily into an agricultural context, but rather into an innovative context of integrated resource management. And it is clear that this approach also addresses the renovation of the conventional framework of forest management in general, and beyond that, the developing context of sustainable development itself. The models derived from the local examples of forest management and culture call for a new concept of land management where production and conservation are compatible, where there is no choice to be made between humans and nature. This concerns much more than just forests.

- Alcorn, J.B. 1984. Development policy, forests, and peasant farms: reflections on Haustec-managed forests' contributions to commercial production and resources conservation. *Economic Botany* 38(4): 389–406.
- Allegretti, M.H. 1990. Extractive reserves: an alternative for reconciling development and environmental conservation in Amazonia. *In*: Anderson, A.B. *Alternatives to deforestation: steps towards sustainable use of Amazon rainforests*. Columbia University Press, New York. 45–58
- Anderson, A.B. 1988. Use and management of native forests dominated by açai palm (*Euterpe oleracea* mart.) in the Amazon estuary. *Advances in Economic Botany* 6: 144–154.
- Angelsen, A. 1995. Shifting cultivation and 'deforestation': a study from Indonesia. *World Development* 23(10): 1713–1729.
- Angelsen, A. 1999. Agricultural expansion and deforestation: modelling the impact of population, market forces and property rights. *Journal of Development Economics* 58: 185–218.
- Angelsen, A., Belcher, B., Michon, G. and Ruiz-Perez, M. 2000a Intermediate systems of forest management: concept note. *In*: Asbjorsen, H., Angelsen, A., Belcher, B., Michon, G. and Ruiz-Perez, M. (eds.) *International FORRESASIA/CIFOR Workshop on Intermediate Systems in Forest Management*. Kræmmervika, Lofoten, Norway.
- Angelsen, A. and Kaimowitz, D. (eds.) 2001. *Agricultural technologies and tropical deforestation*. CABI Publishing in association with Center for International Forestry Research, Wallingford, Oxon, U.K.
- Angelsen, A., Rio, N., Lutnæs, K., Løken, A. and Tarigan, J. 2000b. Forest products for the poor, the rich, or the middle class? Three cases from Indonesia. *In*: Asbjorsen, H., Angelsen, A., Belcher, B., Michon, G. and Ruiz-Perez, M. (eds.) *International FORRESASIA/CIFOR Workshop on Intermediate Systems in Forest Management*. Kræmmervika, Lofoten, Norway.
- Asbjorsen, H., Angelsen, A., Belcher, B., Michon, G. and Ruiz-Perez, M. 2004. Cultivating (in) tropical forest: intermediate systems of forest management and culture. *European Tropical Forestry Research Network, Special bulletin n°3*.
- Aubertin, C. 2000. Intermediate systems: a concept for sustainable development? Case studies from Brazil and Laos. Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Aumeeruddy, Y. 1994. Local representations and management of agroforests on the periphery of Kerinci Seblat national park, Sumatra, Indonesia. *People and plants working paper*: UNESCO/WWF.
- Bahri, S. 1992. L'agroforestrie, une alternative pour le développement de la plaine alluviale de l'amazone: l'exemple de l'île de careiro. Ph.D. Thesis, Université de Montpellier II.

- Bahuchet, S., De Maret, P., Grenand, F. and Grenand, P. 2001. Des forêts et des hommes: un regard sur les peuples des forêts tropicales. APFT-Université Libre de Bruxelles, Editions de l'Université de Bruxelles, Bruxelles.
- Barlow, C., Jayasuriya, S., and Tan, C. 1994. The world rubber industry. Routledge, London.
- Barrau, J. 1967. De l'homme cueilleur à l'homme cultivateur. Cahiers d'Histoire Mondiale X(2): 275–292.
- Barrau, J. 1970. *L'homme et son environnement végétal en région tropicale humide: l'exemple malayo-océanien*. Fac. de Lettres/Muséum d'Histoire Naturelle, Paris.
- Belcher, B., Levang, P., García-Fernández, C. and Dewi, S. 2000. Resilience and evolution in a managed NFTP system: evidence from the rattan gardens of Kalimantan. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.
- Belcher, B., Ruiz-Perez, M. and Achdiawan, R. 2003. Global patterns and trends in NTFP development. *In*: Sunderlin, W. (ed.) Rural livelihoods, forests, and biodiversity. CIFOR, Bonn, Germany.
- Boserup, E. (1965) The Conditions for Agricultural Growth. London: George Allen & Unwin.
- Braam, J. S. (Van), 1917 — “Het Boschwezen in Tapanoeli”, Tectona, 10:209-214.
- Budiman, A.F.S. 2000. Prospects of the world rubber industry in the new decade. Paper presented at the Indonesian Rubber Conference & International Rubber Research & Development Board Symposium, 6. Bogor, Indonesia.
- Burkill, I.H. 1935. A dictionary of the economic products of the Malaya peninsula. Millbank, London.
- Cairns, M. 1997. Indigenous strategies for intensification of shifting cultivation in Southeast Asia (compilation of workshop abstracts). Bogor, Indonesia.
- Canadian International Development Agency Forestry Advisors Network (CFAN) 1993. Forests and food security. CIDA. Forestry Issues.
- Christanty, L. 1982. Traditional agroforestry in west Java, PhD dissertation, Institute of Ecology, Univ. Padjajaran Indonesia..
- Clarke, W.C. 1966. From extensive to intensive shifting cultivation: a succession from New Guinea. *Ethnology, an International Journal of Cultural and Social Anthropology* V(4): 347–369.
- Clarke, W.C. 1978. The maintenance of agriculture and human habitats within the tropical forest ecosystem. *In*: Clarke, W.C. (ed) Ecological effects of increasing human activities on tropical and subtropical ecosystems, 103–114. University of Papua New Guinea, Port Moresby, New Guinea.
- Clément, I. 2000. Sumatra. L'espace forestier et ses usages (représentation, appropriation et gestion des ressources forestières par une société malayu-jambi en Indonésie. Ph.D. Thesis, University Aix-Marseille, France.





- Clement, I., Djatmiko, W., Aliadi, A., Michon, G. and de Foresta, H. 1998. Natural forests: a luxury or a necessity for farmers? An El Niño dry season in Sumatra, Indonesia. *Agroforestry Today* 9 (1): 6-9
- Cleuren, H.M. and Henkemans, A.B. 2000. The resilience of agro-extractive systems of Cambas and Caboclos in the Amazon forest. Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Colchester, M. 1994. Salvaging nature: indigenous peoples, protected areas and biodiversity management. Discussion Paper 55. London, UNSRID, World Rain Forest Movement, WWF.
- Colfer, C.P. and Resosudarmo, I.A.P. 2001. Which way forward? People, forests and policy making in Indonesia. Resources for the Future, Washington, D.C.
- de Foresta, H., Kusworo, A. and Michon, G. (eds.) 2000. Agroforest khas Indonesia (Indonesian agroforests). ICRAF/Ford Foundation, Jakarta, Indonesia.
- de Foresta, H. and Michon, G. 1993. Creation and management of rural agroforests in Indonesia: potential applications in Africa. *In*: Hladik, C.M., Pagezy, H., Linares, O.F., Hladik, A., Semple, A. and Hadley, M. (eds.) Tropical forests, people and food: biocultural interactions and applications to development, 709–724. UNESCO & the Parthenon Publishing Group, Paris.
- de Foresta, H. and Vincent, G. 2002. Rubber agroforests and conservation of biodiversity. A project proposal to the FFEM, Paris.
- de Jong, W. 1994. Recreating the forest: successful examples of ethnoconservation among Dayak groups in central West Kalimantan. *In*: Management of tropical forests: towards an integrated perspective, 295–304. Oslo.
- de Jong, W. 2001. Tree and forest management in floodplains of the Peruvian Amazon. *Forest Ecology and Management* 150(1–2): 125–134.
- de Miguel, J.G, Malo, J.E., Hernández-Bermejo, J.E and Jiménez-Osornio J.J. 2000. The Mayan home gardens of Yucatan: intermediate or alternative systems? Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Doornbos, M., Saith, A. and White, B. (eds.) 2000. Forests: nature, people, power. Blackwell Publishers, U.K.
- Dounias, E. 2000. Cocoa production in Cameroon: from cash-crop plantations to agroforests. Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Dove, M.R. 1983. Theories of Swidden Agriculture and the Political Economy of Ignorance. *Agroforestry Systems* 1:85-99

- Dove, M.R. 1985. The agroecological mythology of the Javanese and the political economy of Indonesia. East-West Environment and Policy Institute, Honolulu.
- Dove, M.R. 1992. Foresters' beliefs about farmers: a priority for social science research in social forestry. *Agroforestry Systems* 17 East-West Center Reprint, Environment Series 12: 13–41.
- Dove, M.R. 1993. Smallholder rubber and swidden agriculture in Borneo: a sustainable adaptation to the ecology and economy of the tropical forest. *Economic Botany* 47(2): 136–147.
- Dove, M.R. 1994. The transition from native forest rubbers to *Hevea brasiliensis* (euphorbiaceae) among tribal smallholders in Borneo. *Economic Botany* 48(4): 382–396.
- Dove, M.R. 1995. Political versus techno-economic factors in the development of non-timber forest products: lessons from a comparison of natural and cultivated rubbers in Southeast Asia (and South America). *Society and National Resource* 8(3): 193–208.
- Dunn, F.L. 1975. Rain-forest collectors and traders: a study of resource utilization in modern and ancient Malaya. Edited by Malaysian Branch of the Royal Asiatic Society. Monographs of the Malaysian branch of the Royal Asiatic Society. Kuala Lumpur.
- Emperaire, L. (ed.) 1997. La forêt en jeu: l'extractivisme en amazonie. UNESCO/ORSTOM, Paris.
- Evans, J. 1992. Plantation forestry in the tropics: tree planting for industrial, social, environmental, and agroforestry purposes. London, Clarendon Press.
- Fay, C. and Michon, G. 2003. Redressing forest hegemony: where a forestry regulatory framework is best replaced by an agrarian one. *In*: Sunderlin, W.D. (ed.) *Forests and livelihoods*, 15. CIFOR, Bonn, Germany.
- Fearnside, P.M. 1989. Extractive reserves in Brazilian Amazonia. *Bioscience*. 39: 387–393.
- Fernandez, E.C.M., Oktingati, A. and Maghembe, J.A. 1985. The Chagga homegardens: A multistoried agroforestry cropping system on Mt. Kilimanjaro, northern Tanzania. *Agroforestry Systems* 2: 73–86.
- Foppes, J. and Ketphanh, S. 2000. Forest extraction or cultivation? Local solutions from Lao PDR. Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Fried, S.G. 2000. Tropical forests forever? A contextual ecology of rattan agroforestry systems. *In*: Zerner, C. (ed.) *People, plants and justice: the politics of nature conservation*, 204–233. Columbia University Press, New York.
- García-Fernández, C. 2001. Traditional management systems in tropical forest in Indonesia: ecology and silviculture. Ph.D. Thesis, Universidad Complutense, Madrid, Spain





- García-Fernández, C., Casado, M.A. and Ruíz-Pérez, M. 2000. Benzoin gardens and diversity in North Sumatra, Indonesia. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.
- García-Fernández, C., Casado, M.A. and Ruíz-Pérez, M. 2003. Benzoin gardens in North Sumatra, Indonesia: effects of management on tree diversity. *Conservation Biology* 17(3): 829–836.
- Geertz, C. 1966. *Agricultural involution: the process of ecological change in Indonesia*. University of California Press, Berkeley and Los Angeles.
- Gouyon, A., de Foresta, H. and Levang, P. 1993. Does ‘jungle rubber’ deserve its name? An analysis of rubber agroforestry systems in southeast Sumatra. *Agroforestry Systems* 22: 181–206.
- Harris, D.R. 1972. The origins of agriculture in the tropics. *American Scientist* 60: 181–193. Haudricourt, A. G., and Hedin, L. 1943. *L’homme et les plantes cultivées*. Paris
- Henkemans, H.M. and Cleuren, A.B. 2000. The resilience of agro-extractive systems of cambas and caboclos in the Amazon forest. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.
- Heyne, K. 1917. *De nuttige planten van Nederlandsch-Indië*. Dept. van Landbouw, Nijverheid & Handel in Nederlandsch-Indië, Buitenzorg.
- Homma, A.K.O. 1992. The dynamics of extraction in Amazonia: a historical perspective. *Advances in Economic Botany* 9:23–31.
- Hutterer, K.L. 1988. The prehistory of Asian rainforests. *In*: Denslow, J.S. and Padoch, C. (eds.) *People of the tropical rain forest*, 63–72. University of California, Berkeley.
- Jessup, T.C., Hardjani, S.S., Khumaidi, M. and Soedjito, H. 1983. *Forest for food*. East Kalimantan Transmigration Area Development Project. TAD-Materialien.
- Jessup, T.C. and Peluso, N.L. 1986. Minor forest products as common property resources in east Kalimantan, Indonesia. *In*: Panel on Common Property Resource Management (ed.) *Common property resource management*, 505–532. National Academy of Sciences, Washington, D.C.
- Joshi, L., van Noordwijk, M., Wibawa, G. Vincent, G., Hardiwinoto, S. and Sukandi, T. 2000. Gap replanting: an emerging trend in rejuvenation of jungle rubber agroforests in Jambi, Indonesia. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.

- Joshi, L., Wibawa, G., Vincent, G., Boutin, D., Akiefnawati, R., Manurung, G., van Noordwijk, M. and Williams, S. 2002. Jungle rubber: A traditional agroforestry system under pressure. ICRAF, Bogor.
- Karyono. 1990. Home gardens in Java: their structure and function. *In*: Landauer, K. and Brazil, M. (eds.) Tropical home gardens, 138–146. United Nations University Press, Tokyo, Japan.
- Kashio, M. and Johnson, D.V. (eds.) 2001. Monograph on benzoin (balsamic resin from styrax species). Rapa publication. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.
- Kaskija, L. 2000. Punan malinau and the bulungan research forest. Center for International Forestry Research, Bogor, Indonesia.
- Katz, E. 2000. From fallow to forest: evolution of benzoin gardens management in Sumatra. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.
- Katz, E., García, C. and Goloubinoff, M. 2002. Sumatra benzoin (styrax spp.). *In*: Shanley, P., Pierce, A. and Laird, S. (eds.) Tapping the green market: certification of non-timber forest products, 182–190. WWF/People and Plants, Earthscan, London.
- Landauer, K. and Brazil, M. 1990. Tropical home gardens. United Nations University, Tokyo.
- Lanly, J.P. and Clément, J. 1982. Present and future forest and plantation areas in the tropics. *In*: Oldeman, R.A.A. (ed.) Tropical hardwood utilization: practice and prospects, 47–92. Martinus Nijhoff Dr. W. Junk Publishers, The Hague, Boston, London.
- Lawrence, D.C. 1996. Trade-offs between rubber production and maintenance of diversity: the structure of rubber gardens in West Kalimantan, Indonesia. *Agroforestry Systems* 34(1): 83–100.
- Levang, P. and Wiyono. 1993. Agro-economic surveys in the Krui area, Sumatra: research report. ORSTOM, Bogor.
- Lutnæs, K. and Løken, A. 1999. Resource use and labour allocation in rural NTFP economies of North Sumatra. Master Thesis, Agricultural University of Norway.
- Lynch, O. and Harwell, E. 2002. Whose natural resources? Whose common goods? Towards a new paradigm of environmental justice and the national interest in Indonesia. Lemaga Study dan Advokasi Masyarakat, Jakarta.
- Lynch, O. and Talbott, K. 1995. Balancing acts: community-based forest management and national law in Asia and the Pacific. World Resource Institute, Washington.
- Marsden, W. 1783. The history of Sumatra. London.





- Mary, F. 1987. Economic and ecological functions of farm plantations: what possible alternative to forests? *In*: Stelin, G., Merlo, M., Harou, P. and Whitby, M. (eds.) 11th Seminar of the European Association of Agricultural Economists (EAAE), 359–370. Wissenschaftsverlag Vauk, Kiel, Germany.
- Mary, F. 1989. La panoplie des stratégies antirisques dans les exploitations rizicoles et agroforestières de maninjau: actions individuelles et garanties collectives. *In*: Eldin, M. and Milleville, P. (eds.) *Le risque en agriculture*, 269–274. ORSTOM, Paris.
- Mary, F. and Michon, G. 1987. When agroforests drive back natural forests: a socio-economic analysis of a rice/agroforest system in South Sumatra. *Agroforestry Systems* 5: 27–55.
- Marzuki, Y. 2003. Dare' ampiri: wanatani khas maros, sulawesi selatan. M.Sc. Thesis, Universitas Indonesia.
- Mayer, J. 1988. Rattan cultivation, family economy and land use: a case from Pasir district, east Kalimantan. New York, Institute of Current World Affairs.
- Michon, G. 1999. Cultiver la forêt: ager, hortus ou sylva? *In*: Pagezy, H. (ed.) *L'homme et la forêt tropicale*. SFEH, Marseille.
- Michon, G. 2000. Forest domestication by smallholder farmers: economic rationale versus socio-political strategies. Paper presented at the International Workshop "Cultivating (in) tropical forest: intermediate systems of forest management and culture". Kræmmervika, Lofoten, Norway.
- Michon, G., Angelsen, A., Garcia-Fernandez, C., Le Cotty, T., Muhtaman, D.R., Palis, Purwanto, H.A. and Tjitradjaya, I. 2002. Alternative strategies for forest resource management: extractivism, agroforestry or plantations? Final report. European Union, Brussels.
- Michon, G. and J. M. Bompard 1987. "Agroforesteries indonésiennes: contributions paysannes à la conservation des forêts naturelles et de leurs ressources." *Rev. Ecol. (Terre Vie)* 42: 3-37.
- Michon, G., Bompard, J.M., Ducatillion, C. and Hecketsweiler, P. 1983. Tropical forest architectural analysis as applied to agroforests in the humid tropics: the example of traditional village agroforests in west Java. *Agroforestry Systems* 1(2): 117–130.
- Michon, G. and de Foresta, H. 1995. The Indonesian agro-forest model. *In*: Halladay, P. and Gilmour, D.A. (eds.) *Conserving biodiversity outside protected areas: the role of traditional ecosystems*, 90–106. IUCN, Gland, Switzerland and Cambridge, U.K.
- Michon, G. and de Foresta, H. 1997. Agroforests: pre-domestication of forest trees or true domestication of forest ecosystems? *Netherlands Journal of Agricultural Science* 45: 451–462.

- Michon, G and de Foresta, H 1999. Agro-forests: Incorporating a forest vision in agroforestry. L. Buck, E. Fernandez and J. Lassoie: Agroforestry and sustainable agroecosystems. Michon, G, de Foresta, H., Kusworo, A. and Levang, P. 2000. The damar agro-forests of Krui, Indonesia: justice for forest farmers. *In*: Zerner, C. (ed.) People, plants and justice: the politics of nature conservation, 159–203. Columbia University Press, New York.
- Michon, G, Katz, E. and de Foresta, H. 1998. Between scattered extraction and specialized production: which alternatives for the development of non-timber forest resources? *In*: Vantomme, P. (ed.) Sustainable management of non-wood-forest-products. FAO, Kuala Lumpur, Malaysia. 55-70
- Michon, G. and Mary, F. 1994. Conversion of traditional village gardens and new economic strategies of rural households in the area of Bogor, Indonesia. *Agroforestry Systems* 23. 75-90
- Michon, G., Mary, F. and Bompard, J.M. 1986. Multistoried agroforestry garden system in West Sumatra, Indonesia. *Agroforestry Systems* 4: 315–338.
- Moegenburg, Susan. 2000. Economic and ecological drivers and consequences of managing forests for non-timber products. Paper presented at the International Workshop “Cultivating (in) tropical forest: intermediate systems of forest management and culture”. Kræmmervika, Lofoten, Norway.
- Momberg, F. 1993. Indigenous Knowledge Systems. Potentials for social forestry development: resource management of Land-Dayaks in West Kalimantan. Berlin: Technische Universitat Berlin. van Noordwijk, M. Tomich, T.P. de Foresta H. and Michon. G. 1997. To segregate -or to integrate? The question of balance between production and biodiversity conservation in complex agroforestry systems. *Agroforestry Today*, vol 9, n°1: 6-9.
- Okafor, J.C. 1991. Improving edible species of forest products. *UNASYLVA* 42(165): 17–23.
- Okigbo, B.N. 1990. Home gardens in tropical Africa. *In*: Landauer, K. and Brazil, M. (eds.) Tropical home gardens, 21–40. United Nations University Press, Tokyo, Japan.
- Padoch, C. 1995. Creating the forest: Dayak resource management in West Kalimantan. *In*: Fox, J. (ed.) Society and non timber forest products in tropical Asia, 3–12. East-West Center, Honolulu, HI.
- Padoch, C., Chota Inuma, J., de Jong, W. and Unruh, J. 1985. Amazonian agroforestry: a market-oriented system in Peru. *Agroforestry Systems* 3: 47–58.
- Padoch, C. and Peters, C. 1993. Managed forest gardens in West Kalimantan, Indonesia. *In*: Potter, C.S., Cohen, J.I. and Janczewski, D. (eds.) Perspectives on biodiversity: case studies of genetic resource conservation and development, 167–176. AAAS, Washington, D.C.
- Panayotou, T. and Ashton, P.S. 1992. Not by timber alone: economics and ecology for sustaining tropical forests. Island Press, New York.





- Peluso, N. 1983. Markets and merchants: the forest product trade of East Kalimantan in historical perspective. M.A. Thesis, Cornell University, Ithaca, NY.
- Peluso, N.L. 1990. A history of state forest management in Java. *In*: Poffenberger, M. (ed.) *Keepers of the forest: land management alternatives in Southeast Asia*, Kumarian Press. 27–55
- Peluso, N.L. 1996. Fruit trees and family trees in an Indonesian rainforest: property rights, ethics of access, and environmental change. *Comparative Studies in Society and History* 38(3): 510–548.
- Pelzer, K.J. 1945. Pioneer settlement in the Asiatic tropics: studies in land utilization and agricultural colonization in southern Asia. International Secretariat Institute of Pacific Relations, New York.
- Pelzer, K.J. 1978. Swidden cultivation in Southeast Asia: historical, ecological, and economic perspectives. *In*: Kundstadter, P., Chapman, E.C. and Sabhasri, S. (eds.) *Farmers in the forest*, 271–286. The University Press of Hawaii, Honolulu, HI.
- Penot, E. 1995. Taking the ‘jungle’ out of the rubber: improving rubber in Indonesian agroforestry systems. *Agroforestry Today* (July–December): 11–13.
- Pinedo-Vasquez, M. and Padoch, C. 1996. Managing forest remnants and forest gardens in Peru and Indonesia. Pp. 327–342, *In*: *Forest patches in tropical landscapes*. Schelhas, J. and R. Greenberg, ds. Island Press, Washington DC.
- Price, M. E. S. 1982. The tropical mixed-garden: an agroforestry component of the small farm. *In* CATIE (Ed.), *Short course on Agroforestry for the humid tropics*, CATIE, Turrialba, Costa Rica:
- Rappart, F. W. 1937. Oorspronkelijke bijdragen: de damar van Bengkoelen. *Tectona*, D1(30), 897-915.
- Rossi, G. 2001. *L’ingérence écologique: environnement et développement rural du nord au sud*. Collection: *Espaces et milieux*. CNRS Editions, Paris.
- Salafsky, N. 1994. Forest gardens in the Gunung Palung region of West Kalimantan, Indonesia. *Agroforestry Systems* 28: 237–268.
- Salafsky, N., B.L. Dugelby, and J.W. Terborgh. 1993. Can extractive reserves save the rainforest? An ecological and socioeconomic comparison of nontimber forest product extraction systems in Petén, Guatemala, and West Kalimantan, Indonesia. *Conservation Biology*. 7: 39-52.
- Sanchez, P.A., Garrity, D.P. and Bandy, D.E. 1993. Sustainable alternatives to slash and burn agriculture and the reclamation of degraded lands in the humid tropics. Paper presented at the Global Forest Conference: Beyond UNCED—response to Agenda 21: Bandung, Indonesia.

- Sardjono, M.A. 1988. Lembo: sistem pemanfaatan lahan tradisional di Kalimantan Timur. *In: Lahjie, A.M. and Seibert, B. (eds.) Prosiding Agroforestry Untuk Pengembangan Daerah Pedesaan di Kalimantan Timur*, 253–266: Kerjasama diantara Fakultas Kehutanan Universitas Mulawarman dan. Deutsche Gesellschaft für Technische Zusammenarbeit, Germany.
- Sardjono, M.A. 1992. Lembo culture in East Kalimantan: a model for the development of agroforestry land-use in the humid tropics. *GFG-Report* 21: 45–62.
- Sauer, C.O. 1952. Agriculture origins and dispersals. American Geographical Society, New York.
- Seibert, B. 1988. Agroforestry untuk pengawetan sumber genetika. *In: Lahjie, A.M. and Seibert, B. (eds.) Prosiding Agroforestry Untuk Pengembangan Daerah Pedesaan di Kalimantan Timur*, 253–266: Kerjasama diantara Fakultas Kehutanan Universitas Mulawarman dan. Deutsche Gesellschaft für Technische Zusammenarbeit, Germany.
- Seibert, B. 1989. Indigenous fruit trees of Kalimantan in traditional culture. *In: Siemonsma, J.S. and Wulijarni-Soejipto, N. (eds.) First PROSEA International Symposium on Plant Resources of South-East Asia*, 299–300. Pudoc Wageningen, Jakarta, Indonesia.
- Sellato, B. 2001. Forest, resources and people in Bulungan: elements for a history of settlement, trade, and social dynamics in Borneo, 1880–2000. Center for International Forestry Research, Bogor, Indonesia.
- Sellato, B. 2004. Forests for food, forests for trade, between sustainability and extractivism: the economic pragmatism of traditional peoples and the trade history of northern East Kalimantan. *In: Wadley, R.L. (ed.) Histories of the Borneo environment: economic, political, and social dimensions of transformation*. KITLV Press, Leiden. 125–143
- Shanley, P., Pierce, A. and Laird, S. 2002. Tapping the green market: certification of non-timber forest products. WWF/ People and Plants, Earthscan, London.
- Sibuea, T. and Herdimansyah, D. 1993. The variety of mammal species in the agroforest areas of Krui (Lampung), Muara Bungo (Jambi), and Maninjau (West Sumatra). Final report to the SOFT project. HIMBIO (UNPAD), Bandung, Indonesia.
- Soemarwoto, O. and Soemarwoto, I. 1981. Home-gardens in Indonesia. Paper presented at the IV International Congress for Pacific Science. Singapore.
- Spencer, J.E. 1966. Shifting cultivation in Southeastern Asia. University of California Press, Berkeley, CA.
- Sundawati, L. 1993. The Dayak garden systems in Sanggau, West Kalimantan: an agroforestry model. M.Sc. Thesis, Georg-August University, Germany
- Sunderlin, W.D., Angelsen, A., Resosudarmo, I.A.P., Dermawan, A. and Rianto, E. 2001. Economic crises, small farmer well-being, and forest cover change in Indonesia. *World Development* 29(5): 767–782.





- Sunderlin, W.D., Resosudarmo, I.A.P., Rianto, E. and Angelsen, A. 2000. Dampak krisis ekonomi indonesia terhadap petani kecil dan tutupan hutan alam di luar jawa. CIFOR occasional paper. CIFOR, Bogor, Indonesia.
- Terra, G.J.A. 1953. Mixed-garden horticulture in Java. *The Malayan Journal of Tropical Geography* 1: 33–43.
- Thiollay, J.-M. 1995. Are traditional agroforests an alternative for the conservation of rainforest bird diversity? Three case studies in Sumatra. *Conservation Biology* 9(2): 335–353.
- Torquebiau, F. 1984. Man-made dipterocarp forest in Sumatra. *Agroforestry Systems* 2: 103–127.
- Verdeaux, F. 2003. De la forêt en commun à la forêt domestique: deux cas contrastés de ré appropriation forestière (Côte d'Ivoire et Tanzanie). *Bois et forêts des tropiques, numéro special: Forêts détruites ou reconstruites?* 278: 63–74.
- Watanabe, H., Kawai, K., Takeda, S., Morita, M., Abe, K., Khamyong, S. and Khemnark, C. 1990. Tea cultivation in the natural forest in northern Thailand: a case study on rational forest management. *Thailand Journal of Forestry* 9: 219–226.
- Weinstock, J.A. 1983. Rattan: ecological balance in a Borneo rainforest swidden. *Economic Botany* 37(1): 58–68.
- Wormald, T.J. 1992. Mixed and pure forest plantations in the tropics and the subtropics. FAO, Rome, Italy.
- Zerner, C. (ed.) *People, plants and justice: the politics of nature conservation*, 159–203. Columbia University Press, New York.



'It would not be
the spontaneous
tropical forest . . .





‘But it would have the merit of being protective to the environment and of bearing sustained yield.’



**‘In this sense, man could continue to live in the forest, even if an anthropogenic forest. And some natural forests could continue to live.’
(Clarke 1978)**





Local people in South-east Asia are often cited as skilled forest managers. It is barely acknowledged that an essential part of this forest management does not concern natural forests, but forests that have been planted, often after the removal of pre-existing natural forests; forests that are cultivated not by professional foresters, but by sedentary or swidden farmers, on their farmlands; forests that are based not on exotic, fast-growing trees, but on local tree species, and harbour an incredible variety of plant and animal species.

This book concentrates on forest cultivation by smallholder farmers in South-east Asia, not only because it constitutes altogether the most original and lesser known aspect of local forest management in the region, but also because, in our opinion, it represents the most promising field for the design of alternative strategies for the management of forest resources and forest lands.

Natural forests are still present and actively managed in the region. So, why do people cut natural forests to replant the same species of forest trees they have just chopped down? Why have professional foresters, or the decision-makers in forest management, never seriously considered these examples of indigenous forest culture, however sustainable and profitable they may be?

Many elements of the answer to these questions are given in this book, which is built on the conclusions of 10 years of multidisciplinary research and analysis on these systems. We show how forest culture by farmers constitutes a strategy that questions the practical, conceptual and legal aspects of conventional forest management. We speak for more scientific and political support to these systems, because they are altogether neglected, endangered and full of potential. We explain why it is important to consider these examples as interesting alternative models to either forest extraction or specialized forest plantations, especially in the present context of depletion of natural forests all over the planet.

Can the transfer of these original examples to other parts of the world be achieved? How can it be successful?

We do hope this book will help to answer these important questions.

