

AGROFORESTS
EXAMPLES FROM INDONESIA

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Examples from Indonesia

Creating profitable and sustainable multi-purpose forests
in the agricultural lands of the humid tropics



ICRAF





AGROFORESTRY

Creating a profitable and sustainable system in the agricultural lands of the humid tropics

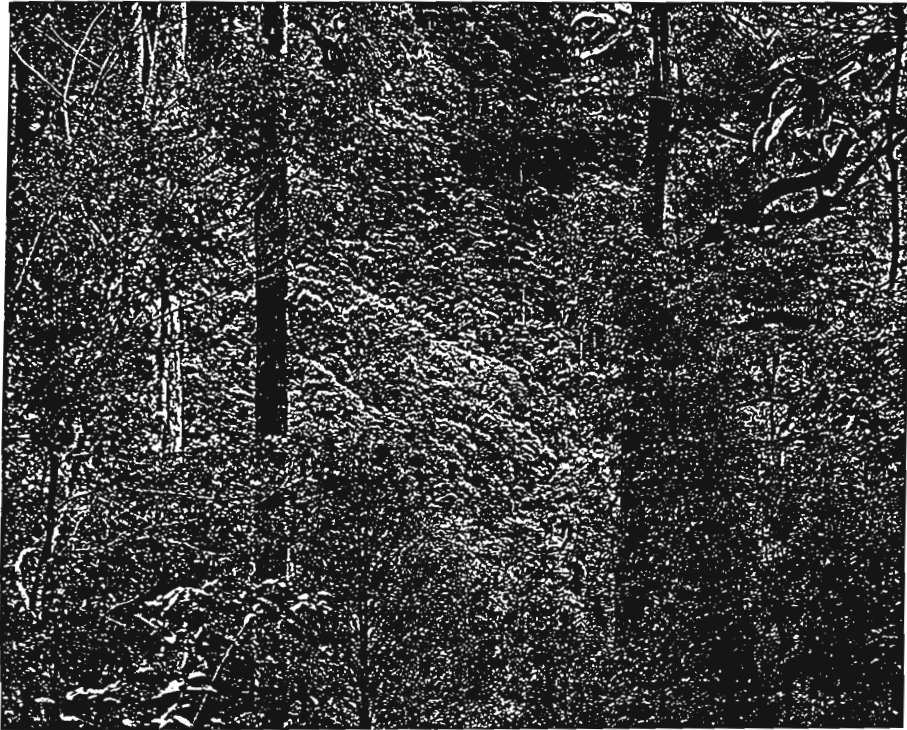
Agroforest benefits: linking biodiversity conservation with economic development for rural communities

Achieving a balance between equitable development and the preservation of biological resources in the humid tropics is a major challenge. Rural development too often leads to land degradation and loss of forest biodiversity. Forest conservation often encounters social problems and many countries simply cannot afford the economic and social costs of putting aside the forest areas needed to ensure the preservation of forest biodiversity. Alternatives to that dilemma do exist, and, among these alternatives, agroforests are of particular importance. The agroforest concept is derived from observation of the community-managed forest systems in Indonesia. In many parts of the archipelago, farmers have created and perpetuated remarkable systems that integrate traditions of forest management with agricultural development. These systems constitute artificial forest structures in agricultural lands. Whether the systems are called "forests", "forest gardens" or "agroforests" is not important. "Agroforest" is just a word used to emphasize the close interactions between agricultural and forestry components in this particular context of resource management. Agroforest is a new concept for scientists and policy-makers, but this leaflet provides evidence that its validity in the real world has been tested by farmers for many years in a number of places.

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ICRAF: International Centre for Research in Agroforestry
ORSTOM: French Research Institute for Development through Cooperation
CIRAD-CP: Tree-crop Department of the Centre de Cooperation Internationale en Recherche agronomique pour le Développement



A natural forest? No, an agroforest in West Sumatra, dominated by durian trees and timber species in the canopy, cinnamon, nutmeg and coffee in the lower layers. (Photo: G. Michon, Orstom)

Agroforests can appear to be “natural forests” to outsiders. Indeed, they are quite distinct from agricultural fields. They are complex plant communities dominated by trees and they provide many of the same amenities as natural forests. But agroforests are not a “gift of nature”, they are human artifacts. They are structures established and shaped by local communities for diversified production that complement subsistence food cropping in annual fields. They are part of the farming system. Farmers themselves do not consider them to be a natural forest, but more a form of either a “garden”, a “swidden”, or a “plantation”. Even though agroforests in their mature stages do not necessarily exhibit an association between agricultural crops and forest trees, they touch the very heart of agroforestry, where FORESTS and AGRICULTURE really meet, where forest structures and agricultural logic intersect.



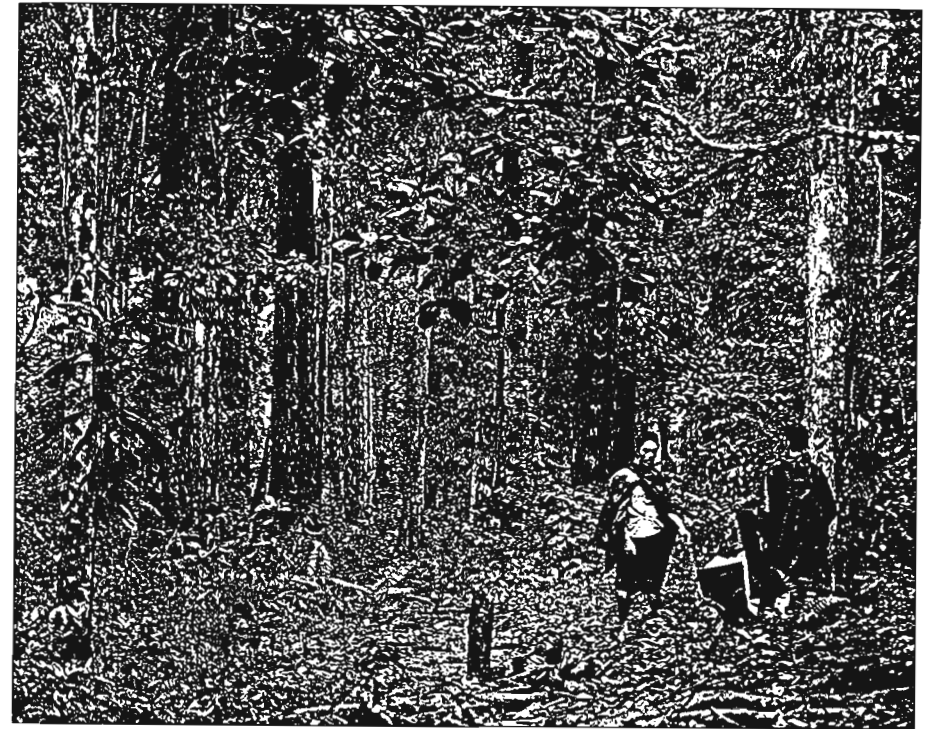
Evolving from traditional forest management practices, agroforests are conceived and managed by local communities; fruit/cinnamon/timber agroforest in West Sumatra. (Photo: G. Michon, Orstom)

Existing agroforests are not the product of top-down reforestation or agroforestry projects. They result from farmers’ needs and deliberate choices to restore and control forest resources. They are the fruit of farmers’ conception, investment and long-term planning. They rely on local representation and knowledge systems evolved from former forest traditions, are maintained by simple techniques and integrated practices, and controlled by well-defined social and tenurial systems that include rights as well as duties. This positive interaction among biological dynamics, knowledge, techniques and local institutional systems drives their success. But, as agroforests are not recognized as such in state laws, policies and development projects and exist on forest lands usually labelled as “public”, they have not yet been incorporated into national strategies for conserving and developing natural resources.



Most agroforests start as swiddens, through systematic introduction of commercial trees in cleared lands, like these rubber seedlings planted with upland rice in Jambi, Sumatra. (Photo: H. de Foresta, Orstom)

Agroforest development and shifting agriculture are closely interwoven. Most agroforests have been created by swiddeners. Most of them are still managed by swiddeners. Some of them need the swidden for regeneration. Recognizing the importance of the millions of hectares of rubber, fruit or dipterocarp agroforests in the Outer Islands of Indonesia and acknowledging their biological and economic importance, one cannot help but emphasize that shifting cultivators, who generally are blamed for deforestation and loss of biological resources, have made an essential contribution to reforestation, biodiversity conservation and economic development in forest areas.



Agroforests exhibit forest features, including a predominance of trees, a multilayered structure and a closed canopy; dipterocarp damar agroforest in West Lampung, Sumatra. (Photo: G. Michon, Orstom)

Because of the dominance, diversity and natural forest origin of most of the species, agroforests can be fundamentally similar to natural forest formations, they represent a balanced ensemble of biological individuals and processes reproducible in the long-term. Some of them, like the dipterocarp agroforests, hold structural as well as functional characteristics typical of a primary forest ecosystem, with high species richness, high ecological complexity, and closed nutrient cycling. Others, like the rubber agroforests that cover the lowlands of Sumatra and Kalimantan, are close to secondary forests, with dense stands of smaller trees and rapid turnover of species.



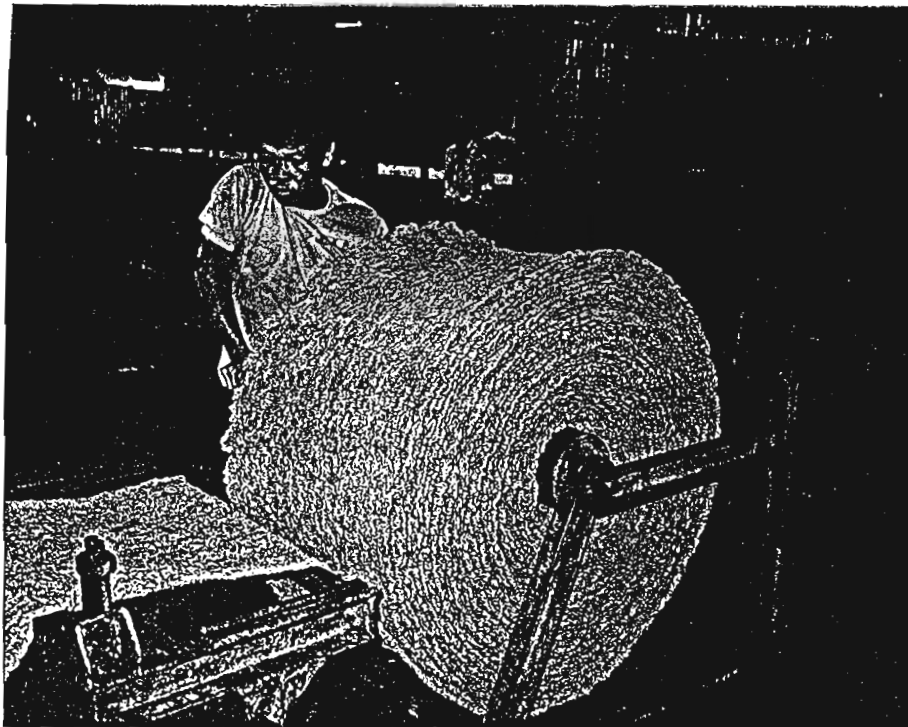
Agroforests create desirable structures for the restoration of forest biodiversity : fruit tree clumps in a rubber agroforest, Jambi, Sumatra. (Photo: H. de Foresta, Orstom)

Agroforests create structures and niches in which forest species, animals as well as plants, can establish and reproduce. Biodiversity levels, though significantly lower than for natural humid tropical forests, are amazingly high for a human-made ecosystem. Studies carried-out in Sumatra show that, if compared to natural forests, biodiversity levels in agroforests reach 50% for plants (30% for trees, 50% for treelets and epiphytes, 50 to 95% for lianas and 100% for undergrowth plants), 60% for birds and close to 100% for soil mesofauna. Most forest mammals are present in the surveyed agroforests. The surveys recorded more than ten new orchids for Sumatra, as well as the presence of the highly endangered Sumatran rhino in a dipterocarp damar agroforest in Krui, Lampung.



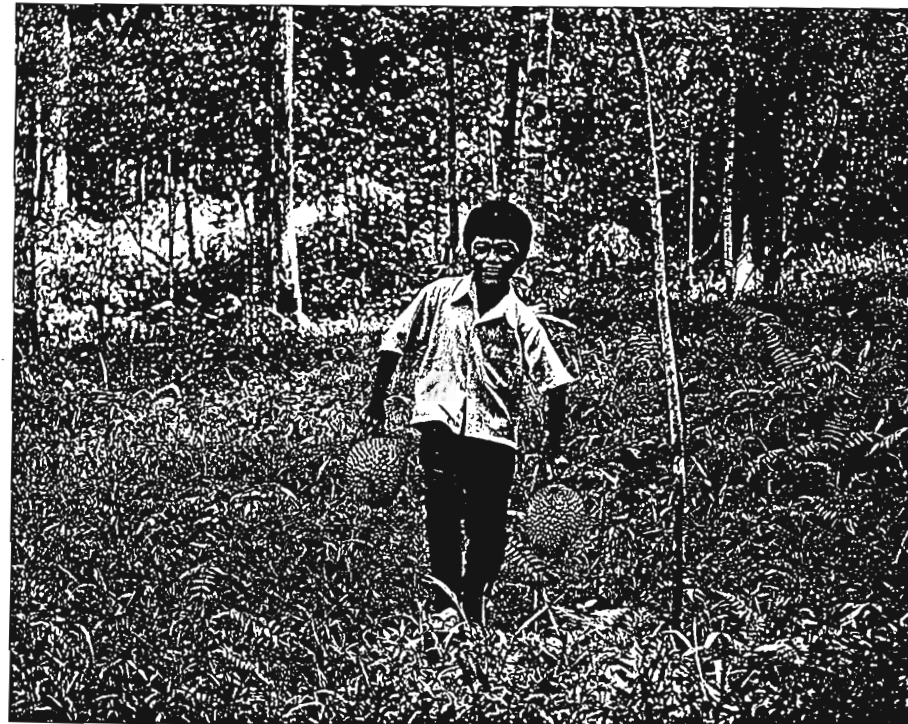
Agroforests include many important forest resources, like "damar" resin in West Lampung, Sumatra. (Photo: H. de Foresta, Orstom)

Agroforests are established primarily for intensified commercial production of non-timber "forest" commodities, such as resins, latex, rattan, fruits and nuts. As an income-generating strategy based on forest resources, agroforest development represents an interesting alternative to the two common options devised for non-timber forest product management: harvesting from natural stocks or domestication and establishment of specialized plantations. Like specialized plantations, they secure the conservation and multiplication of one -or more- forest resources and increase the income-generating capacity of the forest. But they also ensure the restoration of the forest as a whole as well as its integration into local agricultural production systems, while allowing local communities to maintain authority over its management, which plantations have often failed to do.



Agroforests are connected to important national industries, like rubber latex processing factories . (Photo: H. de Foresta, Orstom)

Agroforests are economically important for villagers. In Sumatra, they provide up to 80% of village income and enhance the living standards of the majority of the households. Commercial agroforest products also contribute to the national and international economy. In Indonesia, agroforests presently provide 80% of the rubber latex consumed and exported by the country, roughly 95% of some marketed fruits and nuts such as durian, duku or nutmeg, 75 to 80% of the commercially traded dipterocarp resins, and a significant proportion of rattans and bamboos. Agroforest products play a major role in regional economic development, by supplying regional industry and providing inputs to marketing chains that branch out far beyond regional boundaries.



Fruiting season is always a very active time in the agroforests: the good fortune of getting durian; West Sumatra.(Photo: G. Michon, Orstom)

Fruit trees, a universal component of agroforests, usually contribute to both subsistence and commercial needs of rural communities. The fruits can provide pleasure, nutritious food, and additional cash. They are sometimes the main source of income in the agroforest, and have the potential to gain in importance in the future. The development of communication and transportation systems has brought urban markets for fresh fruits within reach of many formerly remote villages. In Sumatra, fruits are emerging as promising agroforestry commodities that generate new job opportunities for villagers through harvesting and marketing. In Kalimantan, the demand for fresh or processed fruits is leading to the rapid expansion of new agroforest areas.



Agroforests provide many items for either immediate consumption or occasional sale, like fuelwood; dipterocarp damar agroforest, Krui, West Lampung . (Photo: G. Michon, Orstom)

Agroforests also represent diversified subsistence strategies that complement food cropping in open fields. Through agroforests, farmers have achieved the restoration of the whole forest resource base in the middle of agricultural lands. The agroforests' wild resources support a whole range of conventional "forest" activities: hunting, fishing, gathering of foods and materials. Agroforests have indeed taken over the subsistence role traditionally devoted to natural forests. They have become an essential place for daily survival, opened for collection and used in a flexible way according to the collectors immediate needs and to the local communities rules.



Timber is increasingly considered by farmers and researchers as an important agroforest by-product for its commercial value; damar agroforest in Krui, West Lampung. (Photo: H. de Foresta, Orstom)

Among under-utilized agroforest products, timber may be the most promising agroforest commodity for the future. Systematic harvest of timber of dead or old unproductive trees, as well as integration of specialized timber species can significantly increase agroforest income for rural communities. But national policies still inhibit the use of agroforest trees as a source of timber for trade. Though foresters and government officers fear that allowing farmers to collect timber for sale would lead to clear-cutting of the agroforest, it is more likely that timber production would create strong incentives for farmers to develop agroforests further .



Agroforests are not isolated management units; they always complement other agricultural activities like, here, permanent rice-growing in Krui, West Lampung. (Photo: H. de Foresta, Orstom)

Agroforests, in spite of their obvious forest nature, should not be dissociated from the larger agricultural strategy of villagers. Agroforests are part of lands claimed and developed from natural forest through agricultural techniques. They are integrated into agricultural land and agricultural production systems. They support the local agricultural economy. Recognizing the role of agroforests as a strategy for protecting the global forest resource through its integration into farmlands bears important policy implications. It may open a new field for negotiation over the sustainable management of renewable forest resources, between national forest and agriculture agencies, as well as between local communities and national agencies.



Establishing productive structures and property rights that will be transmitted to children is an essential aspect of agroforests.

(Photo: G. Michon, Orstom)

Through agroforests, rural communities in forest areas have developed a means for assimilating biological complexity, economic viability and long-term planning, essential ingredients for successful forest management. But the development of agroforests as a strategy for managing natural resources sustainably requires first and foremost the insurance of tenurial security over the long-term. The collapse of valuable agroforests in Indonesia has most frequently happened when activities of state or private companies have denied or ignored the authority and rights of local communities over agroforest resources. Acknowledging the legitimacy of traditional tenure rights and legally empowering local communities for the management of resources upon which they depend is important to protect agroforests. But it also is desirable to further create and develop agroforests as viable alternatives for integral, community-based forest resource management in the agricultural landscape.



Permanent plot for the study of tree population dynamics in damar agroforests, Pahlmungan, West.Lampung. (photo: H. de Foresta, Orstom)

Agroforests have just been “discovered” by researchers within the last fifteen years and, unlike classic cropping and plantation systems, they have not benefitted yet from research aiming at their improvement. The first mainly descriptive research stage produced a great deal of information: the agroforest current establishment processes and management rules begin to be well understood; the various economic, social and environmental benefits to smallholders and to society at large are now well known. These informations form a solid basis that now enables researchers to tackle problems faced by agroforests in terms of productivity improvement and agroforest expansion. The commercial use of timber, always present in large amounts in agroforests, has been identified as one of the major potentials for agroforests improvement. Through ecological and production studies, ICRAF and ORSTOM are presently trying to devise a set of minimum rules for sustainable timber harvesting as a new integrated activity of agroforests management.



Rubber budwood garden, established by researchers and managed by farmers; Sanjan, West-Kalimantan. (Photo: E. Penot, Cirad-CP)

In the central plains of Sumatra and Kalimantan, farmers have been cultivating rubber in agroforests for almost a century. While these “jungle-rubber” agroforests have many advantages to farmers and to the environment, their low productivity cannot currently enable them to compete with some other alternatives. Following the identification by CIRAD-CP and ORSTOM of rubber material quality as the major reason for this low productivity, ICRAF, CIRAD-CP, and GAPKINDO (Rubber Association of Indonesia) have decided to develop the “Smallholder Rubber Agroforestry Project” (SRAP) in Jambi, West Kalimantan and West Sumatra provinces. Through the introduction of adapted rubber clonal material, this adaptive research project aims at improving productivity and profitability of rubber agroforests while conserving their environmental benefits. Through participatory on-farm experimentation, the rubber agroforestry systems (RAS) developed by the project are expected to have high adoption potential, a guarantee for future expansion of these eco-friendly systems.

Agroforests: simple technics for complex structures

Agroforests exhibit complex vegetation structures but the technics involved in their establishment and in their management are simple and do not require high investments in terms of labour, cash and inputs. They have been set up by former shifting cultivators. Agroforests could easily be adopted by more farmers if agroforests are given due recognition and promoted accordingly by policy makers

Promoting agroforests: importance of the policy environment

Because of their qualities, agroforests could serve as a model for community-level "reforestation" strategies that would not only provide multiple social, economic and environmental functions, but also support rural development and rebuild biodiversity rich patches in agricultural landscapes. Technical, economic, social, institutional and legislative issues need to be addressed to foster this development. In addition to providing scientific information and illustrations on existing agroforest systems in Indonesia, this leaflet raises some of these issues. It also aims to raise awareness about policy conditions affecting agroforest development, including not only forestry and agriculture development or biodiversity conservation, but also national and international markets, industrial development, improvement of transportation and communication systems and the allocation of legal rights to natural resources.

For more information about agroforests and research programmes on agroforests (policy, economy, anthropology, ecology, biodiversity, modelization, experimentation...) please contact:

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