

Can deforestation help rebuild forests?

The Indonesian agroforests

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Until the nineteenth century – and before the Industrial Revolution and the start of modern agricultural development – the rural landscape in Europe centred on three components: fields and pasture; forests producing large amounts of wood and managed by the feudal, royal and then governmental forestry authorities; and small woods or domestic forests, defined by and centred on agricultural practices. Along with three-year rotation and fodder crops, this trinal system has disappeared from modern landscapes, to be replaced by a bipolar forest–agriculture structure.

This bipolar structure is reflected in most interpretations of tropical forests, in which the landscape is often seen as a binary system: on the one hand there is the forest – a closed, impenetrable, wild area – and on the other agriculture, which is open, domestic, civilized, and dominated by ‘crops’. As a result, it is not surprising then that we find it difficult to interpret areas that have been affected by smallholder practices and are no longer recognizable as ‘natural’ forest, but are not yet sufficiently organized to be classed as fields. Depending on the observer, these poorly defined areas may be considered as phases in the degradation of an ideal forest situation, which had formerly been characterized as ‘climactic’, or as a transitional situation somewhere between the two structural categories of ‘forest’ and ‘cultivated area’. In both cases, it is easy to detect more-or-less extreme ‘deforestation’ behind this feature, and there will always be people prepared to deny that these formations correspond to deliberate land and resource management choices, much less to ways of incorporating the forest resource into a domestic structure.

However, if one looks closer, these ‘degraded’ or ‘empty’ formations look remarkably similar to the old domestic forests. They are primarily forest agricultural fallow, but also former forests kept within agricultural areas, sacred woods or fruit orchards that have been protected or redeveloped by local communities for traditional, economic or religious reasons. There are also various types of additional forest or forest plantings on agricultural land, such as smallholder woodlands in East Africa and the Indonesian agroforests. Lastly, there are different types of agroforestry that include trees in the landscape, either in isolation, as live hedges, or mixed with crops, but always as a subsidiary to agricultural production. Around the last areas of virgin forest, these more-or-less densely wooded formations form the body of the forest matrix in

rural areas of the tropics. They are the tropical version of the small-scale forests in Europe and are essential to agricultural operations, vital for the smallholder economy and an essential part of local beliefs and social interactions.

Such domestic forests almost always developed from natural forest and often through the total destruction, followed by the nearly deliberate, more-or-less thorough, reconstruction of the woody component. For ecologists looking for primary forest, this reconstruction only results in a poor copy of what existed previously: less complexity, less biodiversity, fewer large trees, more weeds, fewer rare species and more common ones. In this case, why do farmers bother felling forest and then trying to re-establish it, if they cannot achieve the degree of perfection of the original?

By looking at reconstructed Indonesian agroforests, which are real artificial forests that mimic natural forests but are part of the agricultural sector, we shall attempt to demonstrate the relativity of the concepts of deforestation and degradation when viewed over a long period rather than at any specific time. This should enable us to draw attention to the possible political and ideological drift of theoretically neutral scientific concepts, and to suggest a new way of looking at the forest transformations taking place in the tropics.

IS DEFORESTATION A SCIENTIFIC CONCEPT, A HISTORICAL NECESSITY OR A RHETORICAL WEAPON?

Can the deforestation concept be either objective or scientific? It reflects socio-cultural history and beliefs, but is also a weapon in a debate that is never entirely neutral and thus varies depending not only on the speaker, but also on the audience, the message to be put across and the intended result.

As far as smallholders using forest areas are concerned, clearing forest to establish crops is not seen as destruction, but as the return on an investment: a promise of food or income, or the acquisition or maintenance of rights based on the principle of appropriation linked to the work invested. Conversely, for administrators of public forest areas, smallholder practices – clearing for agriculture and also harvesting of various products – are seen as an almost illegal intrusion that plunders the state's forest-based income and undermines national regulations. More than just the environmental loss, it is this 'potential loss' that is being compromised through the term 'deforestation'. Such situations have existed for many years, and have long been quoted to justify the creation of state forestry authorities throughout history and throughout the world.

The changing perception of 'deforestation' alludes to the subjectivity of the term 'forest'. Is 'forest' universal, as biologists and ecologists would conventionally have it, a specific ecosystem that functions without any human intervention and reproduces itself independently, which people destroy as soon as they begin to make use of it? Or is it more an area subjected to a specific jurisdiction? A mythical and symbolic area crucial to most civilizations? Or the historical product of the relations between society and nature?

Most tropical forests have been used and inhabited by human beings for hundreds if not thousands of years. It is now commonly acknowledged that the interactions between natural dynamics and human practice have had a determining influence on these forests, and that the idea of virgin forest, untouched by human hand, is a myth. Against this backdrop of continuous interactions between societies and forest systems, at what point does human activity start to result in long-term deforestation? The answer depends on the observation scale, in terms of both time and space.

In forest areas, agriculture necessarily means clearing. Clearings were initially justified as a way of reconstituting the forest component – through fallow: deliberate, indirect reconstruction by banning use of a given area temporarily – but has now become more marked, resulting in the sometimes almost total disappearance of forest from the landscape. However, in most cases, it has resulted in sustainable agricultural reconstruction, in which the forest is generally reconstituted, albeit generally restricted to clearly defined areas and functions, as shown by European landscapes. This deforestation is inextricably linked with human development and is inevitable; forests alone have never managed to feed large social groups, much less provide them with schools and dispensaries.

Smallholders in the tropics are currently converting forest on a huge, abrupt scale, generally through successive waves of clearing aimed at making an immediate, maximum profit from the fertility ‘return’ from mature forests, but with no claim to long-term sustainability. Smallholders are obviously not the only people responsible. In Indonesia, conversion for commercial agriculture by a few dozen major financial groups has proved more rapid and more extensive than that caused by millions of smallholder families. The current extent of the deforestation problem masks the fact that in some cases, smallholder practices have deliberately and directly reproduced cultivated systems that mimic forest structures, such as agroforest, forest-gardens or orchard-gardens. These forest-type conversions centre on commercial species, for instance benzoin, rattan, rubber and damar. These systems largely reproduce the species and functions of the original environment. Is this really deforestation? If so, it would be reasonable to ask what the objective criteria are that enable it to be classed as ‘deforestation’: are they solely biological and environmental? Or rather legal and political?

The debate about the Indonesian agroforests clearly illustrates the ambiguity of the scientific view of deforestation, along with the ideologically and politically biased way in which it is used.

Agroforest: deforestation? reforestation? forest conversion?

In the specific case of the Indonesian agroforests, we are faced with a subject of which the appreciation will vary depending on whether its development on a regional level is known and understood. Agroforests are the result of

a complex combination of deliberate forest destruction, planned planting of selected woody species and the involuntary restitution of a range of forest species. This succession of planned human interventions in the environment, environmental reactions to human intervention and farmers' reactions to the resulting mechanisms has resulted in a true forest whose structures and functioning are similar to those of the natural ecosystems it replaced. We intend to look at the damar agroforest in south Sumatra (Aumeeruddy, 1993; de Yong, 1994; Dove, 1993; Fried, 1995; Gouyon et al., 1993; Katz, 2000; Michon and Bompard, 1987; Momberg, 1993; Sardjono, 1992; Weinstock, 1983).

Was the development of damar gardens a deforestation process?

The starting point for this type of environmental conversion is conventional: destruction of the existing forest by slash-and-burn with a view to planting crops, then planting of a commercial tree species, in this case damar to produce resin. The subsequent phases are less conventional. While such systems generally continue deforestation of the environment by setting up artificial structures aimed at specialist products, in this case, they reproduce apparently 'natural' forest structures, although this may not be one of the smallholders' aims (Michon et al., 1995). For reasons of economic efficiency, plantation management is somewhat minimal, which enables the re-establishment of wild species. These 'weeds' gradually encroach the planted area. They are generally typical of the surrounding forest: trees, shrubs, creepers, epiphytic species or grasses. Their establishment among the planted trees rapidly makes the plantation look like a heterogeneous forest.

Forest or plantation? From natural to artificial forest and back again

The construction of plantations fits in more with a logic of alliance with the initial ecosystem than of environmental destruction. This damar agroforest fulfils its economic role as a commercial plantation by providing almost all the income of local households (Levang, 1992). It is part of an agricultural production system in which it has become an essential complement to rice. It is also the main component in local families' inheritance (Mary, 1987). Socio-economically speaking, it is therefore no different from other highly artificial farming systems. However, biologically speaking, it is more similar in terms of its composition, structure and functioning to the natural forest ecosystem it replaced than to conventional plantations. These 'tree gardens' or real smallholder forests are characterized by tall trees, dense undergrowth and high levels of biodiversity, and by their sustainability. Most of the region's forest mammals are found in agroforests (Sibuea and Herdimansyah, 1993), and around 60% of the birds found in the surrounding forests are also found (Thiollay, 1995). Moreover, in terms of management, there are no major disturbances equivalent to the establishment phase, since old trees are replaced

as and when necessary. Once established, such plantations remain as forest that is both specialized and diversified, and there is no subsequent return to a mass regeneration phase.

If we look at the historical processes involved in setting up such gardens, we have all the ingredients of deforestation in the conventional sense; the replacement of natural forest by a cultivated system. But if we look at the result, it is reasonable to wonder what has happened to the deforestation.

Over and above deforestation: appropriation of the forest

The example of damar gardens shows that when analysing deforestation, it is crucial to distinguish between states – the destroyed forest, the agroforest today – and processes – establishment, construction of new structures – and between what results directly from smallholders' objectives – production, management, control – and what is merely a by-product of those objectives; forest destruction or reconstruction.

Despite appearances, smallholders do not set out to destroy the forest or to rebuild an identical system so as to preserve its properties. The aim is merely to intensify the production of a resource that is crucial to the local economy, in this case damar resin. The resulting birth of forests is merely the consequence of a specific crop-management sequence, which initially causes the abrupt disappearance of the forest and then an apparent return to a natural environment.

However, the forest reconstruction seen also has an important social and political dimension. Whatever its form, for smallholders, agroforest is an original way of appropriating forest resources (Michon et al., 1995). Its establishment is inextricably linked with a change in how the environment is seen – introduction of a split between the forest and the human-made area – and the rules of resource appropriation; a shift from appropriation of trees to appropriation of land (Michon et al., 2000). The questions about the nature of agroforest come only from outside, where fields and pasture on the one hand and forest on the other are generally seen as incompatible (Michon et al., 1995), and where agriculture is seen exclusively as a simplification of natural environments. These questions are never neutral, and it is important in scientific discussions of deforestation to grasp the positive or negative connotations that are inevitably attached to the terms used, and to understand their political consequences.

The latent ambiguity of the prevailing views: scientific definition, political instrument (such as scientific analyses of agroforests).

What are the differences between damar agroforest and so-called natural forest? The answer to this question is bound to reflect the views or objectives of the observer. This variability of views is reflected in the names given to the system by different observers ('plantation', 'garden', 'agroforest', 'manmade forest', 'degraded forest', 'forest') and in the scientific and political reasoning

and arguments that underlie the views they suggest. The supposed qualities – or faults – of agroforests constantly refer to the – eminently variable – appreciation of the split between or continuity of forest and agroforest.

There is a difference of opinions about natural forests and agroforests. For smallholders, agroforests are the opposite of tall forest. The local term used, which roughly translates as ‘orchard-garden’, stresses the initial founding phase that leads to the establishment of agroforest. It reflects a deliberate process of appropriation of a range of natural resources, and recalls specific views, uses and rights (Michon et al., 1995). On a scientific level, agroforest can be seen as totally human-made: in relation to the initial ecosystem, agroforest has a sparse, simplified canopy; the trees are tapped and thus physiologically weakened, which means they do not live as long as their wild equivalents, which in turn speeds up the dynamics of the system as a whole; and numerous plant and animal species are no longer found in the agroforest.

This type of opinion always includes a clear idea of degradation. It is expressed by certain naturalists, for whom agroforest was created at the expense of natural forest, and thus, like any other consequence of a conventional deforestation process, results in an irreversible loss of biodiversity (Silvius, personal communication; Thiollay, 1995). It is also echoed by foresters, who also see the resulting loss of resources or cash. Such opinions can easily be ideologically or politically influenced. In particular, it is easy to use them to justify the exclusion of smallholders so as to protect biodiversity, or to preserve forest resources of value to the country as a whole. Such justifications are convenient for forestry authorities concerned that smallholders might ‘steal’ their forests.

Conversely, it is equally reasonable to see agroforest as a system that combines conservation and development. As the debate on sustainable development currently stands, with the emphasis on management systems that preserve the ‘natural’ environment and its resources while generating income, agroforest is seen as a system that differs radically from the various smallholder production systems by mimicking the initial ecosystem (Michon and Bompard, 1987). To take things to extremes, agroforest – without the ‘agro’ prefix – is seen by some as a ‘natural’ forest management system like any other (Nawir and Wollenberg, 1995).

This multiplicity of scientific analyses first and foremost reflects the ambiguous nature of agroforest in Western scientific opinion. However, it also refers to the intrinsic lack of objectivity of the debate on deforestation, and to the political or ideological use of the resulting concepts. After opposing damar planters, who were seen as ‘destroying the forest’, the Indonesian forestry authorities eventually recognized that agroforest had a ‘forest’ aspect, but insisted on introducing a clear distinction between ‘artificial agroforest’ – the forests established on private land – and ‘natural agroforests’ set up on state land. The latter clearly require protection against inappropriate smallholder practices (Dinas, 1995; Kanwil, 1995).

The difficulty of characterizing agroforest objectively in the debate opposing the natural – forest, conservation, biodiversity – and the human-made – agricultural production or forestry, domestication, artificialization, control – suggests that it would be wise to look more closely at the concepts involved. Is it appropriate to continue opposing artificial systems and nature? On the contrary, should the possible alliances be stressed? This example also suggests that an attempt should be made to identify the issues and objectives masked by the terms ‘deforestation’, ‘protection’ and ‘conservation’.

Deforestation: destruction or reconstruction? The issues in the debate

The debate about what will happen after deforestation is above all an opportunity to think about the different types of interactions between nature and societies, which range from integration to exclusion and their short, medium and long-term consequences. The basic assumption is that once there is an interaction between humans and the ‘natural’ environment – which in this case means entirely without people – the environment is bound to be modified and to evolve towards a different system.

Deforestation: the process and the state

To understand interactions between humanity and the environment as a whole, it is important to distinguish between what relates to processes and what relates to states. ‘Deforestation’ refers to environmental modification patterns: processes. However, if the study topic is the resulting system, the task is to characterize a situation. A situation is never anything more than the result – at a given time – of a process of change, and should not in any circumstances be seen as fixed. Deforestation should only be assessed over a given period, attempting to differentiate between what is relatively stable and what is still changing. Cut and then burned forest, fallow, Imperata grasslands, agroforest or rice fields, analysed as entities that exist in their own right, are also only the stages in a sequence of actions and reactions between human activity and the corresponding environment. A joint study of the environmental and social dynamics that lead to these stages can provide information on the degree of reversibility or irreversibility of the observed situation, which an examination of the system alone at a given time may not always demonstrate. This (ir)reversibility, which may be ecological, economic, social or political, must be taken into account in any analysis of the system, since it is this that determines the possibilities of future change and can provide information on the cost of maintenance and change.

Forest conversion: objectives and consequences

In scientific observations of a state of ‘deforestation’, the objectives that presided over the establishment of the situation observed are rarely

immediately visible. On the contrary, the apparent objectives suggested by logical scientific analysis are often quite far from the real objectives that lay behind the transformation. It is easy for outside observers to confuse the aims and effects of a transformation. In the case of the Indonesian agroforests, if observations are made from the fringe, where the system is still under construction, it is obvious that the observation will demonstrate that the natural forest has been felled and burned, that biodiversity has been lost and that the soil is bare. However, in older areas, the construction of tree gardens that mimic the natural forest can quite simply mask the existence of these systems. Thus official land-use maps for Indonesia do not even mention these agroforests, even though they cover several million hectares and produce most of the non-wood 'forest' products sold on the domestic and export market: rubber latex, damar resins, rattan, benzoin, cinnamon, nutmeg, fruits and so on. In both cases, the result of specific technical choices made when setting up smallholder tree plantations, as analysed at the time of observation, masks the actual objectives of most smallholder strategies on the outer islands of Indonesia in terms of land occupation: tree production and land appropriation.

This confusion between the objectives and consequences of forest conversion is also obvious among those proclaiming the validity of these smallholder agroforest systems. Forest biodiversity conservation and the ecological sustainability of agroforests, which are generally the qualities highlighted in the sustainable development debate, are never the smallholders' main priorities. These qualities appear after the event in a system initially set up with a view to production and land appropriation, and they can be jeopardized by even the slightest change in smallholder practices.

This type of confusion between what is related to aims and what is linked to interactions of cause and effect can have significant consequences when shifting from scientific analysis to its application with a view to development. Depending on the circumstances, smallholders may be seen as destroying the forest or as knowingly preserving biodiversity. The resulting programmes will seek either to redistribute the land appropriated by smallholders to 'better' managers – conservationists, forestry companies or commercial planting companies – or to make the smallholders the guardians of biodiversity. In both cases, such programmes are unlikely to succeed, since they will have failed to take account of the objectives behind smallholder practices.

From analysis to appreciation: political use of scientific observations

Characterizing deforestation is never a neutral operation, even on a scientific level. It depends on both the initial objectives and the observer's opinions. Nobody can deny that whatever reconstruction it may result in, deforestation inevitably results in the generally definitive loss of important

living species and ecological functions. Nobody, particularly in Western Europe, which was built on deforestation, can deny either that development consumes large quantities of resources and natural areas. Caution is required, on the other hand, when assessing these losses. In terms of environmental protection, deforestation is legitimately seen as a disaster: erosion of biodiversity, global warming, loss of resources, sterilization of soils, changes in microclimate. In terms of alleviating poverty or ensuring sustainable development, however, the losses caused by deforestation need to be seen in relation to the gains generated by conversion (and not only quantitatively).

Deforestation has often been seen negatively by the dominant social group, from landowners and royal forestry services to republican or colonial authorities, and the various stakeholders in modern forestry, and not forgetting the ecological campaigners of the past twenty years. In tropical forest countries, this campaign came at just the right time to breathe new legitimacy into policies based on excluding farmers from forest areas. It has also enabled authorities that were heavily involved in destroying the forests to shift the burden of reconstruction to farmers, through new 'social forestry' policies.

CONCLUSION

Over and above the contrast between the artificial and the natural: an alliance or a confrontation with nature?

Among the processes of 'natural' forest change, there are different degrees and paces of modification. This variation results in different degrees of loss of the ecological qualities of an environment.

The Indonesian agroforests demonstrate that converting tropical forests does not always mean a rupture with the initial state: it can also be viewed as a continuous process. This echoes the opposition analysed by French ethnobotanists (Barrau, 1970) between two agricultural development models: fields and pastures, as developed in the Middle East and then Europe with a view to domesticating cereals, and horticultural farming, as developed in the tropics from food-crop cultivation. Fields and pastures are a clear break from the natural environment, with the distinct aim of closely controlling production factors (the resources cultivated and the conditions of their production), by setting up more specialized structures and increasingly homogenizing the crops grown. In the humid tropics, this productivist model is based on the extreme artificialization of the farming system, which means making a clean break from the initial natural ecosystem: dense evergreen forest. Conversely, agroforests, which play upon the complementarity of living species and make optimum use of natural vegetation dynamics, are a perfect continuation of natural formations. Rather than setting up a cultivated system that can only be maintained and reproduce itself at the cost of a significant energy

investment, agroforest smallholders opt to reproduce natural structures and use their internal dynamics for production and reproduction. While gearing productivity towards human requirements, this imitation also ensures the renewability of both resources and structures, at very little cost to smallholders. The term 'domestication of ecosystems' can be used (Michon et al., 1995), as opposed to the domestication of species removed from their ecosystem.

These agricultural development models refer to more wide-ranging phenomena in social terms. In the one case, in addition to the total transformation of the natural environment, a technical choice can result in the radical, large-scale transformation of the societies concerned. In the other, the transformation takes account of the constraints of the natural environment and fits into the socio-cultural context. In this new light, rather than being seen in terms of destruction or reconstruction, the debate centres more on confrontation and alliances with nature (Henry, 1987).

Confrontation or deforestation breaks with no attempt at sustainable, long-term reconstruction – has many costs, be they biological – loss of existing resources – ecological – various environmental problems – energy related – increasing use of chemical inputs – economic – the real short and long-term costs of production – or social – the exclusion of the least privileged proportion of the rural population. In the light of the realization of the long-term costs, deforestation in its most simple terms can only be seen as a blatant disregard for sustainable development issues. As a result, reconstructive systems, which rely more on alliances than on breaks with the environment, are looking increasingly attractive. While it seems to be inevitable that old forests will be converted, local tropical forest management systems suggest that conversion does not have to mean destruction, and indeed that it can also mean a different form of 'forest' (Michon et al., 1995). This approach warrants a joint study by geneticists, agronomists, foresters, ecologists, socio-anthropologists and politicians.

Modern agricultural science and its considerable successes in terms of production – albeit mostly quantitative – are the result of a clear separation between *nature* and *culture*. However, at a time when the future of the links between society and nature are coming under increasing scrutiny in terms of their integration and interdependence, it is urgent to devote scientific studies to finding solutions that integrate nature into agricultural production. It is in tropical forest areas that we will find systems likely to inspire such solutions, given the successful if not entirely perfect longstanding examples of such integration in these areas. However, it is also unfortunately in tropical forests that the split between the natural and the artificial is most marked, sometimes almost to the extent of caricature, in the socio-political discussions underlying development operations.

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Beyond Tropical Deforestation

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