FOREST, PEOPLE, GOVERNMENT

A Policy-Oriented Analysis of the Social Dynamics of Tropical Deforestation

Main report of the project

'Local Actors and Global Treecover Policies'

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Preface

The present report is the result of the research project 'Local Actors and Global Treecover Policies', carried out by the Programme Environment and Development of the Centre of Environmental Science (Leiden University), and funded by the National Research Programme on Global Air Pollution and Climate Change, with additional support from Leiden University and the Tropenbos Foundation. The project has focused on the connections between the concrete choices of the 'real forest actors' such as farmers and logging companies on the one hand, and the necessarily general and more abstract options for global and national policy making on the other hand. Improved insights in these connections should result in more focused and more effective policies for the tropical rainforest and with that, for the development of sustainable livelihoods, the stabilization of world climate and the protection of an incounted number of plant and animal species.

Our work has been based on field visits and an intensive analysis of the literature. On a deeper level, the present report is also grounded in the joint field station of the Leiden and Isabela universities in the Philippines, that has supplied the researchers with a permanent stream of data, stories, contradictions and inspirations. Especially the help of Gerhard M. van den Top be acknowledged here.

This report is on social mechanisms, on economics and on power relations, all of which can be properly understood only if we are able to see the human dilemmas also of the actors involved in forest destruction. The report is dedicated, however, to the civil servants who have stood up for forest protection, even in the face of severe professional and personal risk. In the Philippines, Leonardo A. Paat is one of them. We as researchers do not have much to offer in return, other than trying to reach the limits of our analytical capacities and nightly working hours. In that respect, we hope to have followed the law of reciprocity.

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E.M. Kamminga and G.M. van den Top
Deforestation in Context: The Cagayan Valley Region in the Philippines
Case study report of the project 'Local Actors and Global Treecover Policies'
Leiden University, 1994

E.M. Kamminga
Deforestation in Context: The North-Eastern Amazon Region in Ecuador
Case study report of the project 'Local Actors and Global Treecover Policies'
Leiden University, 1994

F.H. Toornstra, G.A. Persoon and A. Youmbi
Deforestation in Context: The Southern Forest Region in Cameroon
Case study report of the project 'Local Actors and Global Treecover Policies'
Leiden University, 1994

1. Introduction

The research reported in this volume concerns the social causes of tropical deforestation, and the options for national and global policies to effectively address these causes. By way of preparation, it serves to first take a look at the forest itself, and to briefly enumerate why the forest is important for humankind on various scales. This overview of forest functions enables to make a grounded choice for the focus and approach of the research; these will be described in final sections of the chapter.

1.1 The tropical forest

Forest is the natural climax vegetation of most of the wet and humid tropics. In its natural state, the forest has a closed canopy in regions where the rainfall is above 1600 millimetres per year. Depending on the elevation and other regional characteristics, the closed forest may be dominated by broad-leaved, coniferous or bamboo species. In areas with a rainfall of 1600 down to 1200 millimetres per year, the natural cover may be either closed or open forest, depending on the length of the dry season, the soil and suchlike factors. Below 1200 millimetres per year, we enter into the semi-arid areas where the forest is usually open, mixed with grasslands. Tropical Africa contains more than half of the world's open forest, but only 18% of the world's closed forest. Latin America (57%) and Asia (25%) rank first in that respect, with Brazil and Indonesia as by far the most important countries (OTA 1984, Richards 1973, Warner 1991). In total, the tropical closed forest covers approximately 1.2 billion hectares today, which is 6 per cent of the total global tree cover.

Although many of this study's findings will apply to the open forests as well, it focuses on the closed forest, usually called the 'rainforest' also if a dry season may sometimes be present. Characteristically, the undisturbed rainforest is a multi-layered structure, the backbone of which is formed by trees, with 'forest giants' standing up to 50 metres tall. Almost all light is filtered away by the subsequent layers of smaller trees, so that only a few plants can grow near the ground and walking through an undisturbed rainforest is like walking through an endless pillared hall. The trees support a large number of other types of plants (lianas, epiphytes, 'tree stranglers', saprophytes and so on), and this huge collection in its turn supports a myriad of small and large animal species. Because of the many niches created by its three-dimensional structure, its high temperature and its constancy, the rainforest is the 'cooking pot' of bio-evolution, containing not only an unsurpassed biodiversity but also a continuous process of natural 'experimentation' of new life forms coming into existence (Jacobs, 1988).

One of the accomplishments of the rainforest is its tight nutrient recycling; every leaf that falls is decomposed and its nutrients are taken up again very rapidly by the vegetation. The soils, therefore, are usually very poor; the huge forest grows on 'nothing'.

If a large tree falls, light reaches the small trees and saplings, many of which have been waiting for decades for this opportunity, and the forest will regrow rapidly. This process

cannot operate, however, in the large gaps made by intensive logging, agriculture, and many other human interventions. In large gaps (and even more so when the forest is 'peeled off' from the edges), the sun's direct heat, dryness and lack of seeds and saplings cause a process of very slow recovery, if at all. In many cases, the thin soils are lost and only wasteland remains.

1.2 The functions of the tropical forest

Forests being there in many types and many contexts, their functions vary widely from place to place. Local analyses may use, for instance, the detailed functions listing of De Groot (1992, p.234). For the 'typical' rainforest, the most important functions may be enumerated[1] as follows:

- First there is the *intrinsic value* of nature itself, *i.e.*, the forest as a home for countless species of plants and animals that share with us a right to be on earth.
- Through the procurement of soil fertility, firewood, timber, wildlife and many other products, the protection of watersheds and the local climate, the forest supports the *livelihoods and cultures of millions of local people*, immigrant and tribal.
- Regional economies benefit from the sum of these local functions, but added to that are the special *regional functions* of forest, which are found in forest products, tourism and climate regulation, but especially in the regulation of the water and silt balances of rivers, protecting irrigation systems and infrastructure.
- National economies are built up of the sum of these regional benefits of the forest, but added to that are the *national benefits* of exportable timber and often other large-scale benefits such as the protection of coastal fisheries.
- The *global-level* forest functions, in their turn, are the sum of all the foregoing, but also add two specific global-level forest benefits, namely the 'gene pool' for future medicines, crops etc., and the protection of a stable global climate. The global forest functions are given special attention below.

This brief enumeration of forest functions helps to identity a characteristic social mechanism leading to deforestation. We may walk in an untouched tropical forest and admire not only its beauty and its habitat function for a myriad of life forms up into the treetops forty metres above our heads, but also its soil protection capacity, the scientific and economic benefits yet to be reaped from all these genes and processes, the benefits waiting for the local population if wildlife, timber and many other products are cropped sustainably, the national potentials for ecotourism, and so on. Ten years later, we may return to the same place and find nothing but a thin layer of poor grasses standing on a thin layer of degraded soils, and a few heads of thin cattle. The only forest value left, we find, is the meagre stock of nutrients in the forest soil, until even these will be exhausted and the pasture will be abandoned. All other functions, values and benefits of the forest have been lost. Why did this happen? The tragedy of the forest benefits was that they were only potential, they were only on the long-term, they were for only for people downstream, they were only global, in short, they were *not on the market for the actor who decided the forest's fate*. Only the cattle was.

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[1] This listing is compiled from Government of the Netherlands (1991), Luning (1987), Baker (1993) and Jacobs (1988).

This example also helps us to be aware of a forest function not often mentioned by scientific authors because it lies not so much in the forest as in its substrate only.[2] This is the function of the forest as just a piece of land that can be used for anything, such as pasture or cropland. As we just saw, this naked function of just land or even pure space may outweigh all the others in actual forest decisions.

A closer look at the global functions of the tropical forest

The bio-evolution is to a large extent a whole-earth phenomenon. Consequently, responsibilities to protect the intrinsic value of nature are to some extent shared[3] at the global level. Usually at present, this responsibility is joined with the instrumental ('anthropocentric') functions of the global gene pool under the heading of **biodiversity**. Although not always quite fortunate, this mixed category is good enough in many cases, and we will follow current practice in this report as well.

The global climate function of the tropical forests has several aspects. Some of them are connected to the albedo of the earth surface and the evapotranspiration of the forest area itself (Alcamo *et al.*, 1994) and the areas influenced by the forest through economic causal chains. The most straightforward, and probably the most important, connection between forest and climate is the influence of the forest on the **global cycles of CO_2**. Forests sequester carbon, and this entails three types of relations (Wiersum and Ketner, 1989):

- forest conversion (e.g., burning) adds to atmospheric CO_2 emissions
- forest regeneration and planting subtract from atmospheric CO_2 emissions
- forest use for firewood and other uses substitute for fossil fuel.[4]

The magnitude of these contributions is not known exactly, but roughly, the prevention of forest conversion will decrease current CO_2 emissions by 1 to 2 Gt carbon per year for several decades, which is a fair share of the current carbon emission excess of 3 Gt/y (Swart and Rotmans, 1990). From Atlas (1979) and WCED (1987) it can be calculated that the upkeep of present-day firewood resources will prevent 1 Gt carbon from being emitted, permanently. Obviously then, forest protection will be a substantial help in the protection of global climate stability. Moreover, tropical forest protection is certainly one of the most *efficient* options, as we will see below.

Economists have estimated what it will cost to stabilize global CO_2 emissions by way of taxes on fossil fuels; the order of magnitude of this global expenditure, ref. Annex II, is $ 150 billion per year. Effective protection of the tropical forest, as estimated in the same Annex, requires, again in order of magnitude, ten times less. On top of this relative cheapness,

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[2] This largely coincides with the 'carrying functions' of De Groot (1992, p. 234).

[3] This does not imply that nations themselves do not have responsibitities to take care of nature within their boundaries; ref. Annex II.

[4] Firewood burning in itself emits carbon dioxide, but it uses carbon that has been sequestered by the forest a few years before; the net emission, therefore, is zero when compared with the alternative of burning a fossil fuel.

protecting the tropical forest implies protecting all other functions of the forest, ranging from global biodiversity to local livelihoods, without involving any risks of unsustainability or irreversibility. **Tropical forest protection is the 'no-regret option'.**

It could be asked if planting new forests would not be more efficient than protecting existing ones. This is not the case. Apart from the fact that plantations often fail because they match so poorly with local people's interests that they are mysteriously fire-prone, planting trees is much more expensive than the protection of the trees which are there already (Annex II).[5] Although every tree planted contributes to climate protection, it makes no sense to burn trees first and plant trees later.

This observation leads to a second example of a social mechanism leading to deforestation. The story is told here in its most basic form. Let us imagine we are powerful political family in a country with a thorough lack of democracy. What would be a quick and sure way to get rich? Why not appropriate the 'public' forest, have it logged and partake in the spoils? After the act, there may remain a devastated area in urgent need of reforestation. Possibly, an international reforestation loan may be supplied. If so, we quickly establish a reforestation contracting corporation or NGO, we get hold of the loan and we will be rich *again*. (The loan, of course, will have to be paid back once, but that burden will not weigh on us but on future generations of the nation as a whole.)

1.3 General and proximate causes of deforestation; 'delinking'

The pace of deforestation has accelerated during the last decades, as ranching, agricultural plantations and wood logging have expanded, and land-seeking migrants have moved into the tropical forest in increasing numbers (Richards 1977, Warner 1991). It is estimated that 17 million hectares of rainforest are converted per year, while in addition vast forest areas are severely degraded (Regeringsstandpunt 1991). At the present deforestation rate, it is a matter of a few more decades before the forest will be vanished from the majority of places where it now stands (Sedjo 1992, Tacon *et al.* 1990).

For the analysis of the social dynamics of deforestation and the design of policies to prevent it, it is important to distinguish between two types of causes of deforestation. They are visible in the two examples given above. In the cattle example, the whole mechanism obviously only works if there is a market for meat. And this, in its turn, is a matter of population and economic level of development. In the second example, the mechanism obviously only works if there is, as we called it, a 'thorough lack of democracy'. Matters such as population, GNP per capita and basic political features may be called *general causes* of deforestation. Between the general causes and the forest itself stand the forest-relevant actors: forest agencies, political families, migrating farmers, logging companies and so on. Their decisions are the *proximate* causes of deforestation.

It might seem that policy-making with respect to the forest runs into a dilemma here. Naive

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[5] These costs and risks are the reason why tropical reforestation up till now amounts to only a percentage of the rate of deforestation (Singh, 1993).

policies focus on the proximate actors and factors and forget that the general processes continue to work against the forest. Yet, more fundamental forest policies would seem to need to stop population increases and economic growth; how could forest policies ever achieve such aims, even if they would be desirable? At this point, it serves to note that in many industrialized nations, high population densities and high GNP per capita go *together* with stable or even growing forest areas. Reversely, massive deforestation may take place in areas with hardly any population (Kummer, 1992). The proximate causes are not passive 'intermediary variables' between the general causes and the forest. They also have a life of their own.

In the field of fossil energy use, policy making faces a very strong correlation between energy consumption and GNP per capita. Policy making, therefore, is very much focused on *'delinking'* energy consumption from this general cause, *i.e.*, to try to have economic growth *and* energy reductions. Borrowing this image and term from the energy policy field, we may say that forest policies should focus on having people, economic growth *and* forest, in other words, on the delinking of economic and population growth from deforestation, by way of 're-organizing' the causal linkages between the general causes with the more proximate actors and factors.[6]

1.4 Scope and methodology of this study

The scope of the study reported here follows from the foregoing.

- For the global climate, forest *types* do no make much difference. For global biodiversity, it very much does. Because of this 'double value', the study focuses on the closed humid/wet tropical forest.
- For the global climate, biological forest *quality* does not make much difference either. Because of this, we focus on deforestation in the 'primitive' sense of loss of tree cover, neglecting aspects of forest quality decline without tree cover loss, such as excessive hunting or extraction of minor forest products.
- Because of the relative inefficiency of reforestation, all emphasis will be on (the prevention of) deforestation.

The methodology will receive more attention in Chapter 3. Summarizing, it can be said that:

- The image and aim of delinking has lead to a focus on the more proximate actors and factors, but studied in a way so as to reveal their linkages to 'farther' actors and general factors, especially those at the national and global levels.
- The 'Action-in-Context' framework (De Groot, 1992), a methodology designed especially for this type of work, has been used as a general methodological guide and as the backbone of the analytical chapters 8, 9 and 10.
- The state of the art does not yet allow for a fully deductive, 'theory-led' approach. Case studies remain necessary to stay in touch with the complexities and surprises of the real world. For that reason, a comparative approach has been chosen for this report. The chapters 4 to 7 describe the deforestation process in three case study regions. In the chapters that follow, the case studies are overlain by a layer of more deductive analysis in which the data

[6] Ref. Annex I for literature references.

are integrated and general insights are built up.

- The case studies have been located in the three major tropical forest areas of the world (South-East Asia, Amazonia and Central Africa). The three countries (the Philippines, Ecuador and Cameroon) have been chosen so as to catch a number of characteristic differences in terms of demography, national-level forest cover, policy development and role of elites.

The overall approach has been largely qualitative because this approach, rather than the statistical handling of quantitative data, is especially geared towards the elucidation of *causal* social structures and mechanisms that drive deforestation and motivate for forest protection. The conclusions of chapter 12 then are based on 'semi-quantitative' interpretations of what in the qualitative structures counts most and should be done first. To a certain extent, the degree to which these conclusions are more focused than those of other 'global policy reports' may be taken as an indicator of the adequacy of the 'Action-in-Context' framework.

Causal 'Action-in-Context' structures are well-quantifyable. In a next research phase, we hope to add this further quantification, linking up with global society-climate models such as IMAGE (Zuidema *et al.*, 1994). Some elements of the report, such as the micro-economic analysis of (legal and illegal) logging and the 'common-sense mathematics' of migration, are not only used for the conclusions of chapter 12, but act as preparations for that next research phase as well.

2. An Overview of Approaches and Issues

This chapter aims to survey a number of issues in the current state of the debate with respect to the social causes of deforestation. Most of these themes will be found back in the case studies and the later chapters of this report. The first part of the chapter goes into styles of thinking on the deforestation dynamics — what could be called 'paradigms', 'approaches', 'types of research'. The second part of the chapter moves away from types of research and into the world itself, focusing of types of causes of deforestation currently discussed in the literature.

2.1 *Types of 'social dynamics' research, and the role of deductive modelling*

Annex I of this report ('Science for the deforestation problem') enumerates a number of types of research with respect to deforestation. They will be summarized and somewhat reworked here. The majority of the literature references are in the Annex.

As may be expected in view of the ecological variety and diversity of the tropical forest, an overwhelming number of studies has a focus on the patterns and processes of the *forest itself.* Others, usually of anthropological origin, elucidate the *relationships* between the forest and traditional, often tribal, forest-dwelling people; 'local knowledge' is a well-known subject of this type of research. Third, there is a large number of studies of a more technological (*'prescriptive'*) nature, studying items such as sustainable forest management systems, agroforestry and land evaluation. And fourth, a large number of studies focus on the *impacts* of deforestation; the continuing debate on the hydrological impacts on deforestation is an example.[7] All these types of research have a relevance for alleviating the deforestation problem. Many, for instance, raise public awareness of the forest's beauty and uses, the current threats to its existence and the risks this entails. At the same time, they are not geared to the key question of *why* deforestation takes place, and it is to these research types that we now turn.

■ *Statistical studies and models*

The most common social-scientific approach to deforestation is to correlate regional, national or cross-national data concerning the factors believed to represent or to proxy the driving forces of deforestation. Typical examples are roads density, population density and average incomes. As explained in Annex I, these studies are haunted by problems of weak data, inappropriate equation structures and the like. Furthermore, they often amount to nothing more than complicated and confusing ways of 'finding' relations that can be discovered by

[7] As explained by Bruynzeel (1990), the key to this issue seems to be that taking away trees *as such* does not result in higher peak flows and lower base flows (even on the contrary). The usually ensuing soil erosion and degradation do, however.

looking at a map for a few minutes.[8] Then, there is the problem of unknown causality: if roads and deforestation correlate, does that mean that roads cause deforestation, or that deforestation causes roads? And finally, even if all these problems would be repaired and data sets would be perfect, what would be the relevance of knowing, for instance, the correlation coefficient of the relationship of 'higher population densities, lower forest cover'? As said, forest policies need to be policies of 'delinking' this general relationship. Thus, it is much more relevant to know *why*, in many regions and also at national levels such as the case of Korea, this relationship does *not* exist. Taken as a whole, the current statistical studies and the multiple regression models based on them can help to identify what may be possible general factors in deforestation. With that, their applicability seems to end.

■ *Local case studies*

Focusing as they do on causal relationships and specific circumstances, the local case studies of deforestation and forest protection have an obvious relevance for 'delinking' policy designs. Of special interest are the cases where, often by a mix of lucky circumstances and clear-cut policies, deforestation processes have been halted or even reversed. The great difficulty, of course, is how to transform the insights gathered through the case studies into *general* mechanisms and models. The way to do so, it seems, is not by reverting to the statistical approach, but to build, calibrate and test causal, actor-oriented models, either qualitatively (as in this report) or quantitatively (as we hope to do in the next).

■ *Factor studies*

Factor studies (or: thematic studies) focus on a single element in the background to deforestation, but usually on a large (continental or global) scale. Examples are Jepma (1995) on the workings of the international timber market, Hecht (1993) on the 'logic of cattle' in Latin America and Dorner and Thisenhusen (1992) on the role of tenure in deforestation. The great advantage of these studies is that they aim to elucidate causal relationships. The difficulty remains, of course, that in reality, *all* factors work at the same time in any given place, often in ways much less outspoken than the selected examples on which the single-factor studies are based. In other words, the studies cannot be simply added up to form an

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[8] For instance, if one would look at the map of Paris, the conclusion would be: "A high population density is connected to a low tree cover". If then would look at a map of Paris plus its forest surroundings, one would conclude: "A lower average population density is connected to a much *higher* average forest cover". If then one would take a look at a map comprizing Paris plus the forests plus the agricultural areas around the forests, one would conclude: "A still lower average population density is connected to a *lower* average forest cover". In other words, stepping down on the population density ladder, the forest cover first increases and then decreases! A very complicated and confusing result. In the words of Veldkamp and Fresco (1995), the relation between population density and forest cover is "scale-dependent", and requires multi-scale, "nested" analysis. Would that be true? Or is it something we have done to ourselves because of our way of looking, generating self-imposed artifacts? This appears to be the case. If we would have taken the map of Paris plus its forest plus its agricultural zone, and if we would have been searching for *causal mechanisms*, we would have concluded in a few minutes that going from the power centre (= Paris) outwards, the French obviously prefer a zoning of forest first and agriculture behind the forest, the reason being that it is better (e.g., cheaper) to transport agricultural products to the city through the forest area, than it would be to transport recreationists through the agricultural area to the forest. This economic mechanism of land use pattern has already been elaborated by Von Thünen in 1828.

integrated understanding (model) of deforestation.

■ *Political-economic studies*

Political-economic studies, often of a neo-marxist signature, contribute to the insight in deforestation processes by their focus on the role of elites and financial mechanisms driving deforestation. That way, they are often able to uncover linkages between down-to-earth events and large-scale political structures, and to elucidate what happens to the forest if the roles and powers of the state become to coincide with the interests of private groups. In that sense, these studies have been inspirational for some of the 'actors field' segments that will be described in the coming chapters. On the other hand, the example material of these studies tends to be biased; deforestation also takes place in democracies, forest is protected also in authoritarian states, and local people can deforest their environment also without elites pushing them.

Overseeing this field, it seems that an important role will have to be played by integrative efforts that keep up a non-statistical, causal perspective. An important tool here will be to develop actor-oriented, deductive models that integrate case studies, factor studies and political-economic insights, and connect local actors to wider contexts. The general structure of these models will be that they are 'geo-referenced' (GIS-based), calculating actor's choices per grid cell, but based on factors and actors often to be found outside that grid cell. Several of such models are at present in the making. One example are the land use decision rules in the IMAGE model (Zuidema *et al.*, 1994), e.g. the rule that new agricultural land is opened up adjacent to existing agricultural land. Primitive as such a rule may be (it may even not be true at all in many cases), it does try to simulate logical, causal choices of real actors. The same can be said of, for instance, the CLUE model of Veldkamp and Fresco (1995) and the elegant study of deforestation in Belize by Chomitz and Gray (1995). They are the baby models that have the future, one could say, and also this report, as well as our envisaged follow-up project, aims to belong to this new family.

2.2 *General and specific issues in the deforestation debate*

Many generalist authors on deforestation provide an overview of 'candidate driving forces' of deforestation.[9] Other authors, as we saw in the preceding section, focus on a single type of factor. In order to make a general but real step forward (as we try in this report), we need guidance not so much in terms of candidate factors or single factors, but rather in terms of debates between adherents of one factor competing with another as 'the' driving force. Thus, the search in this section is a search for critical *issues* and *questions*.

General vs proximate factors

The issue of 'general *vs* proximate factors', mentioned already in the previous chapter, appears to permeate much of the deforestation literature, policy proposals and decision-making of organisations. To mention one extreme, a well-known type of reasoning puts all blame on population growth, poverty and inequitable land distribution, pushing poor farmers

[9] Examples are Grainger 1993, Guppy 1984, Hadley 1990 and Plumwood *et al.* 1982.

out of the agricultural core areas and into the forest. Policy proposals to prevent deforestation then logically entail general family planning, poverty alleviation programmes and land reform. On the other extreme, we find authors empathically rejecting this view and stating that for protecting the forest, the only thing that really works is the most proximate of all factors, *i.e.*, on-the-spot enforcement of clear-cut forest protection regulations. Jacobs (1990) and Rijksen (1988) are examples of the latter position; both authors write on a basis of extensive first-hand experience with forest issues.

Overviewing this, it may be clear that both extremes are partly wrong and partly right. We give four arguments.

- If we see in practice that rich people cut trees as eagerly as do the poor, why would we think that poverty alleviation works? Should we give poor people a chainsaw so that they can cut more trees?
- In most of the tropical nations, migration into the forest of only a small fraction of the *present* agricultural population would already be sufficient to finish the forest. Hence, general population control and land reform seem to lack relevance compared to specific measures of forest protection.
- On the other hand, it may be clear that if populations continue to explode and if rural poverty turns into rural despair, even the strictly protected forest reserves eventually can not be upheld.
- It cannot realistically be expected that tropical nations will ever set aside all their forest reserves for purely biodiversity purposes. In other words, crucial as strict protection of the nature reserves surely is, forest conservation policies will have to integrate social aims too in most of the forest areas.

Looking forward at this point to the rest of this report, it appears that we need analytical tools that may encompass both sides of the issue, in order to arrive at policy recommendations that may transcend the contradictions.

Role of the state

The *role of the state* is depicted quite differently in different schools of thought. State policies and state structures are often said to be a root cause of deforestation - and for good reasons. On the other hand, the state is often regarded, for quite logical reasons too, to be the key agency from which effective forest protection can and should be expected. The questions is: how may these facts and these hopes, grounded as they both seem, be reconciled? More specifically with respect to logging, migration and land use, the following may be said.

State actors are often active parties in legal and illegal logging operations. Why do they do so, especially when it runs counter to a country's own official policies? What are the various roles of the different state agencies? Is there a way to prevention, accessible to global actors?

The state is often an active promoter of migration of poor farmers into forest areas. In other cases, the state stands by, caught in ambiguities. Are Third World governments powerless against forest migration? What is the relative relevance of 'push' factors that drive people out of the rural areas versus the 'pull' factors (markets, tenure regulations etc.) that attract people to the forest, and how may these be mitigated?

Often, the debates on migrant farmers focus on the unsustainability of their land use practices and the reasons of this unsustainability. These practices are often implicitly seen as fixed, because poverty is the cause and the migrants are fixedly poor. Field researchers however sometimes observe impressive changes in migrant land use, even to the point of migrants entering into sustainable land use before the forest and the soil are lost. The question, therefore, is: what causes these transitions, and how can they be promoted?

Some specific issues

Besides these general issues, the literature contains a number of more specific questions that lend guidance to further research. We briefly mention them here without analytical treatment, in order not to overlap with the chapters 8 to 11.

- Debates on *logging and timber trade* concern technical issues such as the possibility of really sustainable logging. More important for the present study is the debate on timber certification (the 'green label'), which would result in a price differentiation between unsustainably and sustainably produced timber. Would a green label really make a difference for the tropical forest? If so, how should it be implemented?

- Much hope for the forest is being built at present on the *indigenous forest-dwelling peoples*. They are examples of that having a different culture results in doing different things with the forest. But why, as less romantic observers remark, would indigenous people *remain* to be different from other people?

- Migrants settle along *roads*. The image of 'roads come, forest goes' has reached the status of a truism in the debates between forest conservationists and development agencies. Being largely true indeed, this is quite fortunate. On the other hand, it is hardly conceivable that developing nations will visualize their future without a fair outlay of tarmac. The question, therefore, now is: are roads *intrinsically* the beginning of the end? Or may the road issue be treated more analytically?

- All this has relevance for the global level of policy making. Finally, there are a number of issues more specifically pertaining to the global level. Debt-for-nature swaps, attractive as they might seem for all parties, do not really come off the ground. Why not? The same seems to hold for the possibilities of *global funding* of the tropical forest. Economists calculate that there is a rationality to pay and even a willingness to pay on the part of the industrialized nations, but a reluctancy to pay predominates. On the part of the forest-owning nations, there even seems to be a reluctancy to receive! Could there be a type of global forest funding that may overcome these barriers?

In the coming chapters, we will set out to address these questions to the best of our current knowledge and analytical capabilities.

3. Action-in-Context (AiC) methodology

As discussed in the previous chapter, causal insights demand for an actor-oriented methodology. In order to be relevant for national and global policy making, the methodology should be able to connect the proximate actors and factors ('micro') to the higher-level, contextual actors and factors ('macro'). A full description of the 'Action-in-Context' methodology used in this report to carry out the case studies and analyze the material can be found in De Groot (1992). Annex I provides a somewhat formal summary. Here, therefore, only some essentials will be touched upon.

3.1 The core: action, actor, options, motivations

Being actor-oriented, the Action-in-Context methodology focuses on the concrete decisions of concrete actors, rather than on aggregate relationships between abstract phenomena (population, gross national product etc.). This is not to deny that these 'system characteristics' do have an influence on actors decisions. On the contrary, system characteristics such as regional employment rates, institutional relationships, markets of food products, cultural visions and so on obviously should be present in the models of the decision-making of actors. The actor-oriented contention is, however, that the systems characteristics are causally linked only *through* decisions of actors. Social structures do not make each other, and culture does not change itself. Actors are the active entities that respond to structures and culture, and thus may change structures and culture while doing so. In other words, actor-oriented models are models of social causality, in contrast to statistical methods that only correlate structural and cultural factors (population, roads density, GNP, forest cover, tenure arrangements, knowledge level etc.) with each other.

The core of the Action-in-Context approach is a simple triangular picture, that may be seen repeated four times in Figure 1.

- *Actions* are defined as intentional behaviours. These may directly relate to the environment (e.g., planting maize or cutting trees), or do so indirectly, e.g., the issueing a subsidy on planting maize. When actions have a certain regularity, they can be called *activities*.
- *Actors* are defined as social entities (co-)deciding on the action in question. They may be individual people or organisations (e.g., logging firms). This implies that not all people are actors with respect to a certain activity; they may well be victims instead of actors, or labourers who only carry out a firm's decisions. This also implies a certain strategy for field research. Following the AiC framework, the researcher does not simply go about and interview 'the people'; the researcher first has to define the environmental problem and study the directly problem-relevant action(s), and then identify the corresponding actors, which may well be quite different from the people who happen to live in the area where the action takes place.

After the relevant actors have been identified, the actor's decision-making is studied by focusing first on the actor's options and then on the motivational factors that drive the actor's decisions.

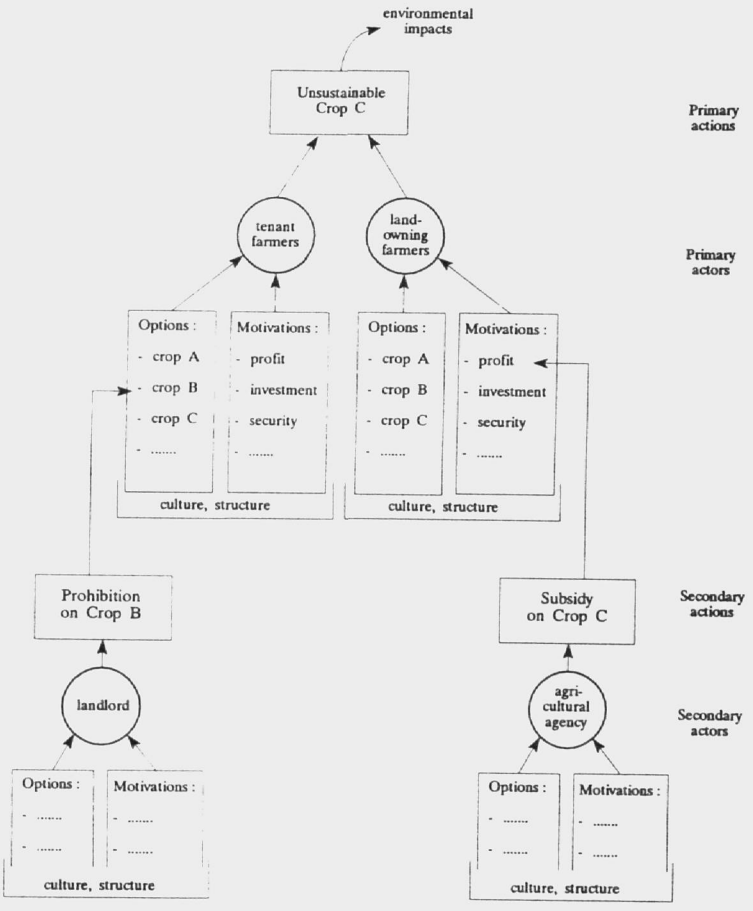

FIGURE 1. The triangular structure (Action/actor/options/motivations) of the Action-in-Context core, and an example of an actors field, with the landlord and the agricultural agency connected to the options and/or motivations of the two farmers actor categories.

- *Options* are defined as the alternative courses of action open to the actor. For a farmer, for instance, the options may be to plant maize, to go logging or to migrate.
- *Motivational factors* (or, *motivations* in short) are the factors that drive the actor's choice between the options. Short-term costs and benefits obviously play an important role here, but other motivations may be the long-term risks involved in an action, the wish to bequeath future generations with a viable environment or the wish to be an esteemed member of the community (e.g., the local community if the actors are individual people, or the global community if the actors are nations).

Options and motivations are proximate elements emerging, one way or another, from underlying layers of the culture and the social structure that the actor is embedded in. These are the 'culture and structure' elements in Figure 1; they are returned to in the next section and section 10.4.

After options and motivations are known, it is still necessary to model, one way or another, the way that the actor combines these elements in order to reach his decision. The AiC framework offers a three-step procedure in this respect.

- The first step is to have no other 'actor model' than the general human logic. In other words, the 'actor model' is to simply *put yourself in the place of the actor,* understanding and explaining the action by seeing the world through his/her eyes. This qualitative procedure is often quite sufficient to reach a satisfactory degree of understanding.
- The second step offers more formal connections to theory without losing scope. This is the *'H-E-C' actor model,* summarized in section 8.1.
- The third step is to focus on the monetary aspect ('homo Economicus', in H-E-C terms) only, and to more or less fully quantify these elements. This, roughly, is the *micro-economic* way of explaining decisions.

We will return to the actor models in Section 3.4.

3.2 The actors field and the 'deeper analysis'

A well-known critique on actor-oriented approaches is that they depict the actor as a free-floating entity, unconnected to culture and other people. The Action-in-Context framework, as the name implies, therefore puts much emphasis on the context in which decisions are made. One element here is the 'actors field' concept, tying the actor to other actors.

The normal social-scientific way to conceptualize inter-actor connections is to search for direct, actor-to-actor linkages. The patterns thus found are called 'social networks'. The explanatory relevance of social networks is highly questionable, however. The social network around a poor farmer, for instance, will consist of his family, his friends and so on, that is to say, usually, a network of other poor farmers. But does *social causality* really run along these lines? Who in fact influence the decisions of the poor farmer? Quite likely, these will be actors that the poor farmer may seldom see or may not even know, for instance, the big landlord who precludes certain land use options, or the agricultural agency issuing the maize subsidy (= influencing a motivational factor).

Thus arises the *actors field* concept, in which actors are connected to each other not by direct

linkages, but through the influences on each other's options and motivations. These linkages, one could say, are the relevant 'lines of social influence' (= the relevant throughcut of the power structure) of a society, which run irrespective of whether these actor actually know each other, see each other, or not. Figure 1 gives an example. It shows a situation in which tenant farmers are driven to growing an unsustainable crop because their landlord has prohibited an other crop that they in fact would be more motivated for, and in which land-owning farmers are motivated towards the same crop by a subsidy on that crop, given by an agricultural agency. The landlord, in his turn, has his own options and motivations for steering his tenants to certain crops and away from others; a well-known example is that landlords may prohibit tree crops because tenants develop informal property rights by planting trees. Likewise the agricultural agency has its own options and motivations for subsidy policies; a motivation may be, for instance, to gain national self-sufficiency with respect to that crop.

In the actors field of Figure 1, the two farmer categories are the primary actors, and the landlord and the agricultural agency are the secondary actors. Tertiary actors may be, for instance, NGOs lobbying for land reform, thereby making the landlord more aware of the tenure risk of tree crops, or the IMF demanding the abolishing of agricultural subsidies. We may note here that the terms of 'primary', 'secondary' etc. actors simply denote a matter of counting, not any indication that primary actors would be more important than the secondary, tertiary or other ones. On the contrary in the example in Figure 1, designing an intervention focusing on the landlords and the agricultural agency may be far more cost-effective than starting a project with the farmers at the village level!

Implicitly, we now have defined also what is the normal research sequence in the Action-in-Context framework; the research sequence runs counter to the direction of social causality ('upstream' in the causal current). First we identify the relevant action that directly influences the environment, then the connected actors, then the connected options and motivations, then the actors who influence these, and so on. This 'progressive contextualization' (Vayda, 1983), going from the relevant action 'outwards', is important for the relevance of the research, because it keeps the research connected all the time with the relevant action, and through that with the environmental problem.[10]

In Figure 1, each actor is connected to its own 'structure and culture'. This illustrates the principle that in order to understand actor's decisions, we have to put ourselves in the place of the actor. Neither the landlord nor the IMF may be actors the researcher identifies with easily, but understanding requires to see the context (the cultural limitations, the structural dilemmas) of these actors through these actors' eyes.

Figure 1 also illustrates the difference between AiC research and the modelling of 'people-environment systems', e.g. regional systems, in which everything is connected to everything else. As has been pointed out by Vayda (1983), the 'systems' approach often amounts to

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[10] A more technical advantage is that it makes the research immune against the well-known problem of unintended consequences of actor decisions. The agricultural agency in Figure 1, for instance, probably never intended to stimulate unsustainability by the subsidy. Coming from the 'downstream' farmers upward, we identify the subsidy as a cause nevertheless.

modelling a mass of irrelevant data, while missing out on many actors and factors that may be of crucial importance, for instance because they lie outside the region or because they have a non-systematic, fleeting character.

Finally, it may be noted that structures such as those of Figure 1, being built up as a structured repetition of the same simple element, are basically quite 'modellable'. Doing so, we may connect local to global processes without having to model 'nested' local, regional, national and global systems.

In policy terms, the actors field analysis identifies who is important in the causation of the action in question and with that, the potential *target groups* for the design of interventions. Policies may focus on one or two actor categories in the actors field or on all of them, depending on the situation.

Besides knowing the potential target groups, we should also know what to *do* with these actors in order to influence their decisions into more sustainable directions. The obvious answer here is, of course, that we should change something in their range of options and/or in the characteristics of these options in terms of the actor's motivational factors. This is exactly what policy instruments such as prohibitions, subsidies and partnerships aim at. An actors field analysis does not go very deep into this question, however, because it typically 'hops over' to a next actor category once options and motivations are identified, in order to first get a full view of the problem causation.

The 'deeper analysis per actor' is an AiC element designed to carry out the identification of options and motivations, as well as their relations to the wider culture and structure, in a more detailed and systematic way. With that, it enables a fuller identification of potential options for interventions. This is done by adding some layers of detail in the as yet unspecified connection between the options and motivations and the 'culture and structure' of the actors. In general terms, the 'deeper analysis' structure generates the full list of policy instruments found in De Groot (1992, p. 369). Because the 'deeper analysis' will be applied only in section 10.4 of this report, we refer to that section for more details.

3.3 The actor model revisited

As said in section 3.1, the micro-economic paradigm can be regarded as a particular, quantitative way of looking at actors within the broader set of possibilities in the Action-in-Context approach. The economic view on actors has some well-known disadvantages, the most important is that it reduces the actor to a kind of profit-hunting calculating machine, grounding his choices only on the monetary cost and benefits of optional actions. The great advantage, however, is the accessibility of this approach to quantitative modelling. We pay special attention to the micro-economic approach here because it will be used in chapter 8 of the present report and because the envisaged follow-up of the project reported in this report intends to go further into the 'multi-actor' (= actors field) modelling of the social causes of deforestation.

In the primary formulation of the AiC framework (section 3.1), the options of an actor are

conceptualized as a listing of mutually exclusive alternatives on a nominal scale. For a farmer, for instance, the options may be: (1) grow maize, (2) start agroforestry, (3) join the loggers, (4) migrate to town, and so on. The motivational factors have the same character, e.g., (1) short-term profit, (2) short-term risk, (3) being a good member of the community, (4) long-term sustainability, and so on. This structure coincides with the starting point of the *Multi-Criteria Analysis (MCA)* method in normative decision-making theory, in which the options are the 'alternatives' and the motivational factors are the 'criteria' in MCA terms.

With this, it is possible to model the actor's decision-making in an MCA structure (i.e., to score the options on the criteria, put relative weights on the criteria, and add the weighted scores to select the option with the maximum combined score). Section 3.1 mentions two more qualitative and less reductive ways of how to proceed from the options-and-motivations starting point onwards:
- to put yourself in the place of the actor and tell his causal story
- to analyze the actor's choice through the qualitative H-E-C model.

The micro-economic way of conceptualizing the actor's decision-making begins with a different conceptualization of the options and motivational factors. First, the number of options is reduced to a very small figure, usually one or two. At the same time, however, the options are not fixed as nominal alternatives, but quantified as a *degree* of doing something. Thus, the picture is not that of an actor choosing between doing A or B or C or D, but of an actor choosing a degree to do A, or a degree to do more of A and proportionally less of B. Secondly, the motivational factors are reduced to monetary terms (costs and benefits), often through a shadow pricing method. And thirdly, the decision of the actor is reduced to a maximization on a single monetary dimension, for instance the short-term profits. All this is the empirical analogue of what is the *Cost-Benefit Analysis (CBA)* method in normative decision-making theory.

Action-in-Context research may use any of these conceptualizations of the actor's decision-making process. The qualitative approach is usually superior in explorative research phase because it can capture the full richness of all the actor's considerations; often, there is no need to go into the more reductionistic and quantitative approaches later. For modelling purposes, however, it is appropriate to move closer to the micro-economic approach. For the analyses in the chapters 8 to 10, two approaches will be used to interpret the case studies:
- one will be relatively general and qualitative, aiming to encompass all relevant options and motivations of the actors, structured by the 'HEC' model of the actor
- the second approach will be a more reduced analysis relatively close to micro-economics, focusing on a few key options and the monetary motivations of the actor.

4. Case study Cagayan Valley, Philippines

This chapter is a summary of the case study report, Kamminga and Van den Top (1994).

The Philippines are one of the world's most serious cases of postwar tropical deforestation. While in 1969 the country was still covered with forest for 50 percent, this figure was less than 21 per cent in 1987. Annual deforestation during the 1970s and 1980s was about 179,000 hectares or 1.6 per cent of the total forest cover per year. Timber exploitation peaked in the mid-seventies at yearly rates of 20 million cubic meters (Cruz *et al.* 1992; De Witte and Wahab 1992).

In 1990, the Philippines had six million hectares of official 'public forest land': one million hectares of primary forest; three to four million hectares of logged-over or second-growth residual forest, and another one or two million hectares of brush, open lands and grasslands (Sajise and Omegan 1990). Large numbers of migrants, driven out of the lowlands by land shortage and lack of employment opportunities, took their refuge into logged-over forest areas. They pushed the 'forest frontier' up into the hill areas, creating a fragmented landscape of farm fields, pastures, fallows and patches of forest. The Philippines upland population (indigenous and migrant) more than tripled between 1950 and 1985 (Cruz *et al.* 1992).

Our case study has concentrated on the second most forested region of the country, the Cagayan Valley Region on North Eastern Luzon. In 1930, the Region still had 2.2 million hectares of forest, situated in the Sierra Madre uplands bordering the Valley proper. Today, there is not more than 1 million hectares left, of which 350,000 ha is classified primary forest (Van den Top and Visorro 1993). With a total population of about 2.3 million inhabitants, the Cagayan Valley Region has the lowest population density in the country. The Region is considered as one of the least developed in the country. Agriculture and forest exploitation are the major economic activities (CVPED 1992).

The uncontrolled exploitation of forest resources in the Region has impacts not only on the environment of the uplands itself, but also on lowland infrastructures and irrigation systems, because of changes in hydrological and sediment regimes in the rivers (CVPED 1992). Following the Action-in-Context principles, our analysis of the social dynamics of deforestation has taken the directly forest-affecting activities as its point of departure.

4.1 Logging

Corporate logging

Large-scale mechanized or 'big time' logging by Manila-based and to a lesser extent foreign companies has been a key factor, not so much because of its direct impact, but because of its indirect effects. Logging changed the accessibility of forest areas and created the preconditions for migrant settlement. Corporate logging may be a legal or an illegal activity,

depending on the presence of a formal 'Timber Licensing Agreement' (TLA) and on the fact if the regulations for exploitation are followed.

Because of the high profits involved and the lack of democratic control over the public forests, the granting of concession rights has always been an important political tool for those in power (Vitug 1993). As a result, the TLA-holders generally belonged to the national elite. Many concession-holders overexploited their resources in order to pursuit he highest immediate benefits possible (Cruz *et al.* 1992, cf. Poore 1989). This 'cut and run' mentality was promoted by several contextual actors and factors. The Department of Environment and Natural Resources (DENR) provided 'annual allowable cuts' of doubtful quality and did not effectively control the implementation of the TLA management plans for various reasons. One of these were the 'peace and order' problems caused by the New People's Army, which made DENR officials reluctant to go deep into the forest. In addition, licenses were provided for only 25 years, a period too short for regeneration of dipterocarp species and thus not providing an incentive for TLA-holders to sustainably manage their concession areas. The financiers of the operations looked at the TLA option as an easy method of building up capital that could then be re-invested in other economic sectors.

Illegal logging was, and to a lesser extent still is, a widespread phenomenon. Removal of trees from logged-over forest areas before the start of the prescribed next cutting cycle can take place both in active as well as in cancelled TLA concessions. The local population usually receives more benefits from illegal logging operations than from official logging, because more local labour is utilized and the extracted wood goes partially to local industries and furniture workshops. The powerful actors behind the illegal operations run very little risk compared to the labourers and drivers who cut the logs and bring them from the site to the buyers. DENR law-enforcement officials often find themselves caught in a trap of wanting to keep their conscience clean on the one hand, and not to get into trouble by hampering illegal operations on the other.

The malfunctioning of the control mechanism has complex political and cultural reasons. The corporate loggers, privileged as they were, were getting the wood practically for free, while the public benefits were minimal. State revenues from royalties, export taxes and other fees, for example, were so low that they could not even cover the costs of forest law enforcement and other DENR activities (Boado 1988, Cruz et al. 1992). Few DENR officials successful resisted the pressure put on them by all those actors in private and government sectors having a direct or indirect interest in the business (Vitug 1993, Kummer 1992). DENR deals with enormous interests and therefore the pressures upon the organization are high. Most of the times DENR succumbs, being unable to effectively resist these influences. "The Secretary of Natural Resources has to give in to Congress, the Regional DENR Director to the Secretary, the Provincial DENR Director to the regional director and the governor, and the local DENR Community Officer to the mayor" (Hoekstra 1992:51).

Corporate logging has diminished significantly during the last decade and it is likely that this trend will continue. This can be partially explained by the fact that the best timber resources have become exhausted, partially by government measures. The number of concessions with cutting-rights has been drastically reduced from 36 in 1985 to 30 in 1988, to 8 in 1993. Early 1992, after years of discussion, DENR established a corporate logging ban for the Region. This decision was based on both environmental and equity arguments. Since March 1993

there exists a 'logging moratorium' for the Region, which means that all transport of unprocessed wood products (from corporate as well as small-scale migrant logging) is forbidden. Although illegal operations have diminished drastically, they are not eliminated.

In order to increase control over the use and management over forest resources, the current government has adopted a new strategy: decentralized management. Forest management responsibility is now delegated to the municipalities and local communities. Not only is expected that benefits will be more equally distributed, also that the exploitation techniques will be smaller scale and therefore less destructive. In 1992 DENR launched the foreign assisted 'Community Forestry Programme' (CFP), which aims to establish community management over 1000 ha plots of secondary forest. An unfortunate constraint is that the upland migrant communities usually are weakly organized.

Another recent initiative is the formation of "Inter-Sectoral Forest Protection Committees" at the municipal, provincial and regional levels. DENR is the lead agency in these committees, while individuals from other government agencies, local government, the army, the National Police, the National Bureau of Investigation, the Judiciary, the university, churches, NGOs and the media participate à titre personnel. Major goals are monitoring of violations of forest regulations and environmental conscientization and education of youth, local administrators etc. Since these Committees are still in their starting-up phase it is too early to evaluate their impact; some optimism seems to be warranted, however.

Small-scale migrant logging

Small-scale logging is an integral part of the migrant household economy, especially during the off-season. The activity, which is mostly illegal, generates 'quick money' and the earnings are good compared to other jobs. This kind of logging is labour intensive, involving local chainsaw operators, helpers and waterbuffalo-transporters.

Some farmers use the income earned for their daily subsistence. Others use their earnings to make investments in permanent agriculture (especially irrigated rice cultivation) or in cash corps, especially bananas. Therefore, logging can assist farmers to make a transition towards more sustainable and permanent forms of land use, but also to convert more land (cf. Fujisaka and Wollenberg 1991).[11]

Although the volume extracted per individual logger is relatively small, the effect of migrant logging on forest ecosystems near settlements can be significant. Trees are basically an open-access public resource, and the loggers are more driven by immediate needs rather than by silvicultural principles. Due to the limited pulling capacity of the water-buffalo, the migrant loggers have a tendency to look for valuable species at the shortest possible distance from their home, and to take out trees of a smaller diameter than is allowed.

Corporate and migrant logging are interrelated activities. Small-scale logging can only take

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[11] In Action-in-Context terms, logging increases the options of farmers to invest in sustainability or in expansion of their land area, but it does not change their motivational factors. The choice, therefore, may go either way.

place in areas which have first been opened up by bulldozers, which made logging tracks. In addition, corporate loggers sometimes hire small-scale loggers to extract timber for them in order to avoid conflicts with law enforcers.

Most of the wood is used as raw materials in the local construction and furniture business. Because corporate logging is phasing out, these sectors increasingly depend on this kind of (illegally) extracted wood. Local furniture-making is flourishing since the export ban on unfinished products of 1986 and the recent prohibition of transport of unprocessed timber out of the Region. Furniture from the rare 'narra' (*Pterocarpus indicus*) is still very popular among the well-to-do in the Philippines.

Migrant loggers depend on local businessmen, who provide them with chainsaws and buy their logs, the 'owners' and 'buyers'. Most local politicians are inclined to permit this illegal activity, because in the prevalent Philippine system of political patronage, the role of politicians is to please their voters with short-term economic benefits. Also DENR officials tend to be tolerant, faced as they are by local people who can always run to the politicians for protection.

Summarizing, the migrant-loggers actors field consists of the loggers themselves, local businessmen ('owners' and 'buyers'); furniture makers and building contractors; local politicians; DENR and sometimes corporate loggers.

The future impact of small scale logging on forest cover depends partially on the development and introduction of community forest management approaches. Participating communities will be only allowed to use their forest resources according management plan approved by DENR, which guarantees sustainable use (and thus maintains forest cover). Decentralisation, however, will not automatically result in sustainable exploitation. The demand for raw materials and final products will remain strong, and furniture makers are becoming a well-organized pressure group. The role of other secondary actors, DENR officials, Local Government, NGOs, is hard to predict. Community members will only be motivated to preserve the nearby forest if they have sufficient confidence in a long-term ownership and feel capable of organising the management aspects. They also need to get access to acceptable alternative sources of income, which compensate eventual temporary losses of income from logging.

4.2 Migrant farming

Currently, clearing of forest for agricultural purposes is the major direct cause of deforestation in the Region. New fields are predominantly made in secondary forest areas. People usually settle within a distance of 3 kilometres from a main logging road. An area of about 2.7 hectares of forest land can support a household of 6 persons. Depending on the condition of the soil, crop rotation and fallow periods of 3-8 years are applied (CVPED, in prep). The impact of the migrant population on the forest cover has been so large, because of their large numbers and because of their unsustainable forms of land use. In contrast to the migrant farmers, the original indigenous upland population has a tradition of hunting, gathering and long-fallow slash-and-burn cultivation, and hardly disturbed the overall forest

cover (cf. Warner 1991; Umans 1993).

Depending on their background, soil conditions, resources and period of residence, migrant farmers practice forms of agriculture which have a more or less lasting effect on tree cover. Many migrant farmers avoid using costly farming inputs and primarily rely on the natural productivity of the soil, which implies continuously clearing new forest land. Our analysis has focused on the non-indigenous upland farmers, within which we distinguished three different categories:

a) *Pioneers*. These are the first settlers, often referred to as the founding families. The very first pioneers came in the late 1960's.
b) *Newcomers*. After the pioneers have established themselves, they invite relatives to follow them. This second wave of migrants can follow within a few months after the pioneers have certified that the area is safe and productive. Lately, there are groups of non-related migrants entering the area as well. The group of new-comers is highly diverse and un-cohesive.
c) *Non-resident farmers*. This category consists of landlords in the lowland municipalities and 'migration workers' who stay in the area for a few months a year to open up new farm fields for others.

Generally, there are few restrictions for settlers on occupying a piece of public forest land. In most cases DENR officials do not exert any effective control. Local politicians, notably the mayors and governors, usually welcome new inhabitants. Accessibility has always been a major determinant. Logging companies provided in many cases not only the roads, but also the transport to the market. Possibilities to commercialize products, a market outlet (buyers of cash crops; food processing industry in Manila etc.). are also an important factor in settlers' decision making.

New settlers always start off with clearing forest land and growing food crops for subsistence. Many of them live at a subsistence level, and do not have the opportunity to switch to more permanent and sustainable land uses, unless they find the essential resources (cf. Belsky 1993). Pioneers have often better opportunities in terms of permanent cultivation, because they can occupy the best land. The longer a migrant has stayed in an area, the more capable he becomes of making incremental investments in developing their farms (cf. Cruz *et al.* 1992); these farmers, especially those of upland origin, are sometimes found investing in permanent, irrigated rice fields and tree crops. Still these families may occasionally open up new forest land for different reasons, such as a crop failure or to claim land for their children.

Most older pioneer communities with unoccupied forest land around them are currently facing a continuous influx of newcomers from nearby communities (land scarcity), the Luzon lowlands (restricted access to land; lack of off-farm employment) and Ifugao Province (natural disasters). Although precise figures are lacking, the impression exists that the arrival of newcomers has increased during the last couple of years due to the increased security after the withdrawal of the New People's Army from the uplands.

The non-resident farmers usually live in nearby municipalities farther away from the forest. They use the new fields for share cropping of annuals or perannuals, or they leave them idle. The motivations of these entrepreneurs are income-earning and/or pure speculation. They

contribute to increasing competition for land and do not always respect informal ownership rules and occupy land that has been claimed by indigenous people or migrants.

At the national policy level, upland farming has received little attention. The only significant government programme for upland farmers has been the Integrated Social Forestry Programme, which has been implemented by DENR since 1982. Very much appreciated were the 25 years tenure arrangements (stewardship contracts) over 5-7 hectares, which provided a feeling of security and collateral for loans. On the whole, the impact of the ISF programme on stabilising or intensifying migrant land use, which was the main objective, seems to have been minimal. The fact that the uplands are considered the territory of the DENR only, has prevented other line agencies, such as Agriculture to give their contribution.

4.3 Conclusion

The 'big time' logging actors used their privileged social, political and economic position to mine public forest resources for their private benefit. The logged-over forest also served as a safety valve to maintain the status quo of skewed patterns of land holding in the lowlands. The influx of migrants is still going on. Because sustainable and more productive forms of land use are not available or possible, many settlers use soils until they are depleted and then clear another field. Since trees outside individual farms are usually not owned by anybody, they can be removed and sold without restrictions. On the whole forest cover is slowly but surely vanishing in those areas which are accessible and not too steep.

Nevertheless, there are some positive signs that deforestation may be stopped before it has totally disappeared. There is an increasing awareness among farmers and non-farmers of the - true or not true- relationship between deforestation and recent natural disasters like droughts and floods). Also the logging-ban is an important event, as well as the fact that road building to the Palanan area of primary forest has been held up. Some farmers indeed succeed in making a transition to more intensive forms of land use, like rice terracing. Rampant mechanized logging being phased out and the new initiatives towards decentralization of forest management are also positive developments. In order to have a really significant positive effect on future forest cover, the following aspects need to be strengthened as well:

- intensified motivations of upland farmers to cross over to permanent land use systems; this implies a more secure and formal tenure on their existing cropland but also a more secure risk in forest intrusion; extension is also an important factor here
- a less ambiguous attitude toward new arrivals, *i.e.*, a better protection of the tenure of settled farmers and better protection of the forest
- stricter control of small-scale logging for the furniture industry, possibly to be complemented by a stimulus for (private or village) plantations of furniture trees
- community forest management, regulated and protected by government.

In all this, the role of the politicians is pivotal. If they side with the local people's short-term interests against DENR, the forest will be lost. If they side with the local and regional people's long-term interest and with DENR, the forest has a future. On the longer run, therefore, it is of great importance that the political culture of the Philippines should change towards more balanced relations between people and their politicians. This does not

necessarily mean that a full abolishment of the patronage system of politics would be necessary. People may also emancipate in the sense that they begin to expect themselves to look after their private short-term interests, and expect a more long-term and collective vision from their political *padres*.

5. Case study North-Eastern Amazon region, Ecuador

This chapter is a summary of the case study report, Kamminga (1994).

Almost half of Ecuador is located in the Amazon basin, the largest remaining rainforest area in the world. Our study has focused on the North-Eastern part of the Ecuador Amazon Region, because this area has been most seriously affected by deforestation. Field visits took place in two districts: Puerto Francisco de Orellana (Western Napo) and Loreto (Eastern Napo).

Although several smaller waves of colonization took place in the Ecuador Amazon since the Spanish conquest, it was not until the 1970s and 1980s that a deforestation rate of no less than 3.3 per cent per year was reached (Little, 1992). In 1990 the Region still had a forest cover of 9,178,000 ha, which is 80 per cent of all forest in Ecuador (ITTO/INEFAN, 1993). About 25 per cent of the forest has a protected status; reforestation outputs are negligible.

Since the beginning of the 1970s the Ecuador Amazon Region has been drawn rapidly into the national and world economy. In fact, the Region became a cornerstone of the national economy because of its production of oil (export product number one) and, to a lesser extent, cash crops and cattle. Deforestation has been caused primarily by the conversion of forest into cropland and grassland, largely following roads constructed for oil exploitation. Logging did not have much impact so far, because timber exploitation is mainly concentrated in Esmeraldas Province.

Agricultural expansion has been a two-step process. First, people settle in the area, then they begin clearing the forest. The next sections follow this sequence.

5.1 The settlement process

In this section, we first give a narrative description of the migration to the forest, and then focus on a more formal, 'pre-modelling' analysis of the migration actors field structure.

During the 1970s and 1980s, the population of the Ecuador Amazon Region has increased with almost 5 per cent per year (compared to 2.5 to 3 per cent national average). In Napo Province the growth rate was as high as 8 per cent per year. The Amazon Region now counts about half a million inhabitants, of which the majority are recent immigrants from the Andes and coastal regions. Pushed by landlessness, land degradation and unemployment in their home areas, prospective settlers were attracted by the availability of land and/or employment in the oil industry. The settlement process was facilitated by the oil companies (and to a lesser extent the government) who opened up large areas of forest land by the construction of roads to serve the oilfields and the booming oil towns. The companies received full government support, because oil rapidly became a major source of national income. Short-

term economic interests (known oil reserves will be finished by end of century) were given precedence over longer term environmental and cultural values. In addition, the government provided the legal framework for the migrants' settlement: (provisional) land titles for standard plots of 45-50 hectares were issued by the local offices of the newly created National Land Settlement Institute.

For almost twenty years the Amazon forest was an open access resource for settlers, speculators and national and foreign oil companies. Traditional landrights of indigenous peoples were, at least initially, not recognized. The National Forestry Department/Institute (now INEFAN), that was given the responsibility to demarcate and manage State forest areas and to protect these areas against colonization and petroleum activities, was not very effective for various reasons, the most structural of which was its lack of authority vis à vis higher ranking departments and the Presidency, who represented more important national economic interests.

The Government and the national elite perceived colonization of the forest as a low-cost national policy to disguise the needs for structural changes elsewhere in the country. Protection of forest and indigenous people was considered of less importance than tapping the 'agricultural potential' of the Amazon. The agricultural potential of the Amazon was greatly overestimated, and a legal bias was established against forest over any other land use. For forest to remain forest, it had to go through a hard to win procedure of demarcation as a State forest), but there were no legal restrictions for turning any forest land into a finca (farm).

Recently, some interesting changes can be observed, the most important of which is that the influx of settlers has slowed down considerably. The role of the National Landsettlement Institute is becoming marginal, because of lack of customers; local land titling offices are expected to close down in the near future. This is neither the result of structural improvements in the areas of origin of the migrants, however, nor of pro-active, coherent government policy making. Rather, it is the outcome of government-external pressures in the actors field of deforestation.

- The role of the oil industry and the impact of roads is changing. Largely because of pressure of western consumers (for example the Texaco boycott in the US) and the environmental and indigenous people movements, the industry has become more inclined to accept stricter environmental regulations. These concern oil pollution but also and even more important for the forest, restrictions on roads construction, e.g., to lay pipelines without a significant road alongside. One road leading through a protected area is even being patrolled at present in order to keep migrants out.
- Since the end of the 1980s, large areas have been adjudicated to indigenous groups. An overview of land adjudications in 1991 shows that colonists received on average 38 hectares per family and indígenas 150 hectares per household. The Huarorani even received more than 3,000 hectares per family (Uquillas, 1993b). Considering the fact that indigenous peoples still make up approximately one-third of the population the in the Amazon region, the potential impact of recognizing traditional land rights of indigenous people on the colonization process may be quite large. The most important actors here have been the organisations for indigenous peoples and environmentalists who promote further land adjudication to indigenous peoples with the argument that this would be positive for forest conservation and tourism.
- Concurrently, the position of the National Forestry Institute (INEFAN), has become stronger. External actors play an crucial role also here, e.g., alliances with environmental

NGOs, indigenous people movements and ecotourism organisations, as well as external funding by donor agencies. As a result, several examples exist of successful opposition against activities of oil companies and planning of roads through conservation areas.

- Quite probably, it has also become wider known among prospective migrants that life in the forest areas is nothing to look forward to. A forest land title is no door to untapped wealth; in fact, hardly any poor migrant escapes from persistent poverty.

Figure 2 gives a more formal ('pre-modelling') representation of the settlement situation, in the form of an actors field (ref. section 3.2). This figure also prepares for the more quantitative treatment of migration in Annex III.

The primary actor in Figure 2 is the prospective migrant in the rural source area. The actor is assumed to consider three basic options: to stay in the home area, to migrate to the cities or to migrate to the forest. The motivational factors, of course, are manifold. They concern expected incomes, risk of failure, the security situation, the social status that might be gained, the general attractions of urban life, and so on. In the figure, these factors have been simplified as 'expected livelihood', and the expected livelihood in the forest has been laid out as (expected) soil quality, tenure security, closeness to markets and the chance to 'make it' in the forest area, that is, to become a real cattle owner (ref. next section).

Important secondary actors are (from right to left in the figure):

- The landed elites in the rural core areas, who hold the key of the expected livelihood of the 'stay at home' option. They do so by obstructing land reform and even by actively expelling tenant farmers from the large estates. This is the 'push' element of motivations to migrate. A non-social factor here is environmental degradation.
- The oil companies that construct the roads, influencing the 'closeness-to-market' factor, which is a key in the expected livelihood of migration to the forest.
- Next, there is what is called 'central government', meaning the powerful agencies close to the presidency, that take the basic decisions on who will have the forest land: the migrants, the indigenous people or government itself (to be used for biodiversity protection, ecotourism and general reserve). Taking 'central government' as the secondary actor, hence skipping the land settlement institute and the forestry institute, implies that we neglect the own decision-making ('discretionary') space of these agencies and regard them as simply carrying out the central orders. This is probably true enough for the our purposes here.
- Finally, we find a category of 'messager actors'. What these actors do is to transform the underlying reality of the forest situation into images relevant to the prospective migrant's decisions. ('Is good land is in fact still available? Or will I be relegated into some corner without future?'). Actors in this category are the press (e.g., selecting a horror stories of perpetual poverty), the government (e.g., selecting the success stories in order to sell the forest to the prospective migrants), indigenous people movements telling the public that the forest is in fact fully occupied, and also the migrant farmers themselves telling their families back home about their lives and prospects. In the figure, the messager actors are connected with the (expected) 'soil quality' and 'succeed as rancher' motivations only, hence implicitly assuming that with respect to titling and roads, there does not exist a significant difference between reality and perceptions.

This being set, the rest of Figure 2 is simple. We see the options and motivations of secondary actors. Motivational factors for the 'central government' actor, for instance, are

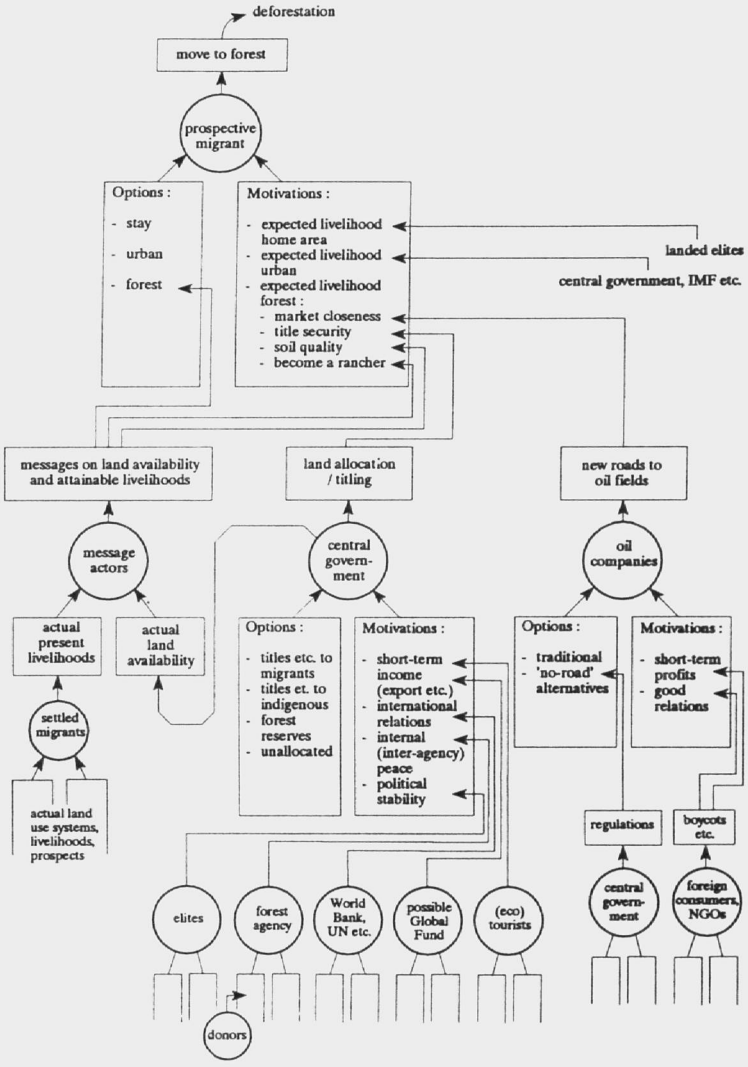

Figure 2.
The actors field of migration to the Amazon forest region in Ecuador. The explanation is in the text. Deviating from the standard prescription, the options and motivations of the 'message actors' are not shown.

assumed to be related to the direct financial benefits (of, for instance, oil, timber and ecotourism), but also to the upkeep of good international relationships, the avoidance of conflicts between agencies and their allied interest groups, and political stability in general. All these factors, in turn, relate to tertiary actors. Large-scale forest burning, for instance, does not help in getting more loans from the World Bank, and too much exploitation of the rural masses may turn out to be a political risk. The figure shows some of the tertiary actors, thought to be the most important in the deforestation process. Many of these converge in trying to influence the motivational factors of the central government's land allocation decisions. This is no coincidence; the central government actor is indeed the most pivotal of all.[12]

Figure 2 also shows one quaternary actor category. These are the donor agencies that have strengthened the National Forestry Institute, giving it more budget (= more options) to gain successes, therewith reinforcing its stature vis à vis the other agencies and central government, therewith influencing its decisions and therewith influencing the migration flow to the forest. This very indirect route has become a real influence in recent years, indicating that work in the background (being 'only' a quaternary actor) can be an efficient strategy, especially when combined with some well-visible successes in projects working with primary actors.

Compared to the narrative description of the first part of this section, Figure 2 is a step forward in terms of precision and overview. Yet it remains a qualitative structure, not indicating the relative contributions of each factor and actor. As said in the narrative description, recent changes in the intensity of migration can be attributed to changes in the actors field. These changes are not visible in Figure 2 because they are essentially quantitative, i.e. pertaining to the relative strength of actors and factors, without changes in the actors field structure. It is especially the relative importance of the tertiary actors that has played a role here: consumers pressing the oil companies, NGOs helping the indigenous people, ecotourists bringing money and opinions to the area, and so on. This did bring about changes in the decisions of the secondary and primary actors, but many of these may have been greatly facilitated by the fact that other factors and actors, such as the attractiveness of urban livelihoods, political stability in the core areas of the country and the urban elites — factors and actors which may undo all others — did not turn against the forest during the past decennia. This will be returned to in section 5.3.

5.2 Land use practices

After arrival, colonists are provided with provisional titles of plots of usually 45 to 50 hectares (250 m wide and 2 km deep), which they are expected to clear progressively. Both on the paper of government policies and in the mind of the colonist himself, the ideal colonist household goes through a transition from a largely subsistence-based system ('establishment phase') to a cash-crop based system ('consolidation phase') to a predominantly cattle-based system ('accomplishment phase'). In reality, only few succeed in becoming ranchers (Pichón

[12] It may be noted that allocating land to urban elites is not taken up in the list of options. Contrary to Brazil, this category is not much interested in forest land (Rudel, 1995).

and Bilsborrow, 1992). The large majority of settlers have to survive in areas which are considered unsuitable for agriculture other than agro-forestry and long fallow shifting cultivation. Conditions are tough and many colonist households find themselves in a downward spiral of degradation, poverty and indebtedness (Little, 1992; Pichón and Bilsborrow, 1991).

Given the prevailing poor quality of the soils and the large size of the fincas the options to increase production are to use external inputs such as fertilizers (intensification), or to bring a larger part of the 'finca' (farm) area in production. Since labour and capital are scarce, and land is relatively plentiful, most settlers will choose to bring more land under cultivation. A survey in Sucumbios Region showed that the average farm had 61 per cent of his finca under forest cover, 31 under pasture and 8 per cent under cultivation (Boese 1992).

An essential characteristic of migrant farming is its market orientation, resulting in high dependency on commodity prices and patron-client relationships. Coffee has long been the major cash crop for most settlers. At the time of our field study, however, low and fluctuating market prices and insect infestations ('broca'). 'Naranjillia', a fast-growing fruit for the urban market, is now rapidly taking over as the leading product. Its revenues are higher, its labour costs are lower, and it provides 'quick money' (coffee takes three years to mature while naranjillia gives fruits within one year).

In order to grow naranjillia in a sustainable manner, farmers would have to apply crop rotation, mixed cropping, and fertilizers (INEFAN/Agrar- und Hydrotechnik, 1993). This requires not only sufficient means, but also skills and organizing capacities. Most farmers, however, do not have access to affordable credit and are not reached by any extension programme. As a result, naranjillia is grown in an unsustainable way; it is planted on burned forest plot and lasts on that field for only a few years, which then has to be abandoned and turns into low-quality grassland that does not regenerate into something better.

The naranjilla actors field largely overlaps with that of coffee, involving the same traders, transporters and urban consumers. Because naranjillia is more perishable than coffee, closeness to roads is crucial for the growers. The whole system is essentially demand driven and the government plays a minor role.

Cattle raising is the most destructive form of land use in the Amazon region, because it uses large amounts of space providing a livelihood for only few people; on average one hectare of forest is lost for each head of cattle. In spite of this low soil productivity, cattle raising is a very attractive option for most Amazon farmers, because land is plentiful and labour is usually scarce. The relatively high labour productivity the is decisive. Livestock provides several additional benefits compared to cash crops; it is a stable investment that lasts and grows over the years, it can use degraded lands where cash crops do not grow anymore and, most importantly in the Latin American context, cattle is the sign of real manhood. As a result of this and of the government policy to provide definite titles only for 'developed' (= deforested) land, pastures can be sold for higher prices than forest land. By the end of the 1980s, the area of pastures in the Noriente was almost seven times larger than the area of cropland (Southgate and Whitaker, 1989).

A minority of the farmers purchases their cattle with a government loan. The majority builds

up their herd one by one. A survey showed that farmers have on average 7 heads (Pichon and Bilsborrow 1992). Information about more sustainable forms of cattle raising (for example silvo-pastoral systems) have not been made available to farmers. As is the case with respect to the cash crops, research and extension services are virtually non-existent.

The land use practices of the settlers have not changed much over the years. The contextual factors influencing the options and motivations of the settlers have remained more or less the same. As a result, due to the market mechanism and the unsustainability of the cash crops, more and more forest land continues to be burned, planted and abandoned to pasture a few years later.

Land use practices of indigenous peoples living in the Ecuador Amazon Region, however, are changing rapidly. They increasingly also grow cash crops, have cattle and sell timber. Modernization and market incorporation are strongest among the two largest groups (about 90 per cent of all indígenas), the Quichua and the Shuar. Growing population pressure due to natural growth and shrinking territories due to occupation by migrants probably also contributes to changing land uses and breaking down of traditional long-fallow forest management systems (Bunyard, 1993; Hicks, 1990; Serrano, 1990; Uquillas, 1989; Uquillas, 1993; Sour, 1993). In line with this pattern, the Quichua and the Shuar increasingly prefer individual land ownership, contrary to the communal ownership that they received and that is still the norm for the NGOs defending the indígenas rights.

5.3 Conclusions, from local to global

Irrespective of what is going to happen with immigration, the existing population of the settlers and increasingly of the indigenous people too, use forest land in ways which are not sustainable and which require continuous clearing. Although most fincas are cleared for less than half of their area at present, the current land use practices will ultimately lead to complete deforestation and will then force people to look for new areas. Active policies are necessary to prevent this scenario, e.g., restoring the attractiveness of coffee relative to unsustainable crops, the development of sustainable and more intensive cattle keeping methods and the development of sustainable exploitation of the forest patches remaining on the finca areas. Intensified (and participatory) research and extension is a necessary condition in this respect because farmers need to have practicable options. This cannot go without providing farmers also with the necessary motivations, however. A mixture of credit schemes, land use regulations and market shifts will be the most efficient. In all this, the national government is the pivotal actor.

Although logging so far was not an important element in deforestation, this is expected to change when resources are depleted in Esmeraldas Province. Timber companies have proven to be willing to construct roads in order to improve resource access. The national forestry agency INEFAN, having strong institutional links with the wood industry, will not be able to effectively control logging activities if left on its own. Therefore, the successful alliances that have been formed between INEFAN, environmental and indigenous movements, ecotourist organisations and foreign donors, will have to be strengthened. This, together with the development of technologies and markets for sustainable forest exploitation, especially of

non-timber products, will also serve to really protect the protected forest areas of the Region, which currently stand at about 25 per cent of the Region's area.

At least for the moment, the influx of migrants has somewhat stagnated. How will the central government react, however, if international donors would decide to finance road construction, if unrest in areas of origin of migrants would rise, if the cities would be flooded with squatters, or if new oil reserves would be discovered? Here we return to an issue already touched upon in section 5.1, namely, the passive role of the central units of the national government.

The central government is the actor that holds the key of the door that leads to the survival of the forest and its people. At the same time, it seems that this key is *turned* only because of tertiary actors that move the government's arm, and are successful only insofar potential counterforces do not wake up. This is a considerable risk for the future. On a more or less intuitive basis, we surmise that the apparent lack of positive political will is connected to the low political value of the forest ecosystem. So far, the forest area seems to have been valued mainly because of its underground mineral resources, its timber resources and its (albeit marginal) value as crop- or grassland. In other words, value is seen as coming into existence when the trees are cleared; the forest ecosystem *itself* does not radiate any positive value. Changing this seems a crucial generic factor for the forest to really have a future.

Several ways exist to better express the value of the forest ecosystem at the level of the central government. One, well-known already, is to better develop the potential economic benefits of the ecosystem, e.g. through sustainable extraction and tourism. A second mechanism may be through global forest funding, that 'internalizes' the global value of the tropical forest at the level of the separate nations. If this mechanism would follow the method of 'output funding' as described in Annex II, that is, a yearly disbursement from the global to the national level for every hectare of standing forest, and assuming an average disbursement rate of $ 10 per hectare per year, the Ecuador government would receive more than $ 100 million per year for its forest, eternally if it would sustain its forest area. Of this amount, it would lose $ 1000 per year for every square kilometre it lets being converted. This may not be overwhelmingly much, but it will be money of the best possible kind: no strings attached, no costs to pay, no risks involved, no interest to pay, and an expression of a honourable role in the global community of climate and biodiversity protection. In other words, it will be money that radiates forest value, right at the centre of power, where it will have the greatest impact.

6. Case study Southern forest region, Cameroon

This chapter is a summary of the case study report, Toornstra *et al.* (1994).

The tropical forest of Cameroon, which covers the Southern third of the country, has remained largely intact. Yet, the relatively low deforestation rate of 0.6 per cent per annum, which corresponds with 122,000 hectares (FAO 1993), is not the result of any deliberate planning or policy making. It is rather the temporary outcome of contingent economic, demographic, cultural and social factors in the forest's context. Current pressures on the Cameroonian rainforest manifest itself more in terms of ecosystem degradation than in pure forest conversion. The Southern Cameroon rainforest, which has been the object of this case study, has an important global value in terms of biodiversity. It is estimated, however, that about 2% of the plant and animal species are lost each year.
In contrast to many other tropical forest countries, such as the Philippines and Ecuador, the opening up of forest by timber companies has not (yet) led to a significant influx of migrants from elsewhere in the country.

6.1 Actions and actors

Timber exploitation

Timber exploitation is currently the activity most seriously affecting the Southern Region's treecover. Timber is of upmost importance for the national economy, since it is the second source of foreign revenues after oil. With a production of 2.3 million cubic metres Cameroon was the world seventh largest wood exporter in 1990-1991 (Gomett 1992). Current government policies aim at increasing timber exploitation in order to compensate for dropping oil and agricultural revenues due to falling world market prices. (Gartlan 1989).

Contrary to in South-East Asia, foreign companies are the main actors in the timber sector. About 80% of the exploited area is in hands of European enterprises. Exploitation practices are wasteful and contribute to unnecessary forest degradation. The political and economic context in which the timber companies operate, provides them incentives for maximizing immediate benefits and minimizing the immediate costs. Basically the timber actors lack the long-term security on returns on their investments to justify sustainable forest management. Concession-rights are provided for periods too short to generate a feeling of real ownership. In addition, the 'gré à gré system' offered companies the opportunity to extract timber outside concession areas as well. The State used to give these licences (covering 2500 ha) to nationals without any exploitation regulations. In general, foreign timber companies consider the government an unreliable partner and therefore avoid as much as possible the risks of loosing investments. All these factors contribute to the mining of the timber resources.

Conflicts between loggers and local people occur regularly. Local people see their traditional

rights ignored, receive none or very few benefits and experience that their resources are being depleted. Companies tend to see local people as obstacles. Over the years several regulations have been made and cancelled again, which obligated the loggers to make certain investments, for example in terms of infrastructures, at the local level or to recruit local labourers as a compensation.

Local people

Due to very low population densities and forest use practices (hunting, gathering and long-fallow cultivation) the permanent impact of the indigenous 'pygmee' people (Baka and Bakola) on the forest cover is negligible.

The net immigration figure during 1976-1987 was 15,599 for the East province, 74,021 for the Littoral province (including Douala), and even negative, - 17,984 people, for the South and Centre provinces together (Soest, 1994). The large majority of immigrants are either labourers working for the logging companies or farmers/poachers, settling along the logging roads. They also practice shifting cultivation and some grow like the Baka and Bakola cash crops at a small scale, especially coffee and cacao. Local markets are little developed. Apart from the large plantations in the coastal zones and the densely populated areas in the neighbourhood of urban centres such as the axes Douala-Edea and Bafia-Yaoundé-Mbalmayo, the forest cover is not much affected by people. On the whole population pressure is low, local markets are hardly developed and livestock is not a common practice in the lowland rainforests.

Many logging roads return to forest without people settling along them. The demand for land is obviously very low. Although the North of Cameroon is suffering regularly from droughts and the large cities are crowded, few people decide to settle in the rain forest. This is not surprising considering the wide cultural and geographical differences between the Northern (moslem; arid and semi-arid) and Southern part of Cameroon which are a constraint not only for migration, but for interchange in general. If economic circumstances would change and the forest would be colonized in a way comparable to Ecuador (50 ha of forest per nuclear family), forest cover would decline very rapidly, however.

Secondary actors

Most of the actors who most directly influence the options and motivations of the above primary actors belong to the government and development organisations which are active in the area.

The formal objective of the administration as a whole vis-à-vis the tropical rainforest is augmenting State income through the intensification of timber extraction. Timber export indeed shows a steady increase over the last years (Van Soest 1994). Nevertheless, state income derived from royalties, taxes, etc. is very limited, partially because of the regulations themselves, partially because of weak law enforcement. The state exerts hardly any control over timber exploitation, because it is not able to (the Forest Service/MINEF lacks personnel and means) and because it is not willing to. Key actors in more influential positions are more interested in their private benefits than in the public good, which leads to much frustration among forestry field personnel who want to do their job but do not get the necessary support.

The 'moral crisis' of the Cameroonian nation, as it is called locally, originates at the top but then penetrates all layers of society.

A small number of organisations try, more or less successfully, to influence the behaviour of the various categories of forest users:

a) Church and volunteer organizations focus on the improvement of indigenous forest people's livelihoods, often including the sustainable exploitation of non-timber forest products.

b) Nature conservation NGOs and international organisations implement conservation programmes, involving also the local people.

c) Other NGOs focus on more effective and sustainable forest exploitation and management systems. They try to introduce such systems in partnership with two different target groups: timber companies and local communities.

Tertiary actors

Tertiary actors are institutions which influence the choices of secondary actors. In this case these are the parliament, large donor agencies and international movements. Not only the parliament, but also large donor agencies like the World Bank and the French development cooperation played an important role in accepting new forestry laws. The World Bank encourages more effective law enforcement and state revenue collection. The French created a fund in which the cancelation of debts is linked with sustainable forest management. Other donors, including the Dutch government, finance conservation programmes.

International environmental organizations have been a force behind the development of 'green label' certificates for sustainably produced timber. Up till now, the effect of the ongoing discussions on timber certification has been negative, because logging companies, expecting a drop of the price of their (unsustainably logged) timber, have intensified their operations in order to take profits now that the price is still good. As will be explained more fully in chapter 8, timber certification is better designed by way of direct partnerships between loggers, NGOs and consumers, outside the GO realm.

6.2 Future perspectives

Cameroon is in a fortunate position not because its forest is safe, but because there is still time and opportunity to save it.

The current situation of Cameroonian forest exploitation is a situation of conflict and contradictions: between sustainability and actual exploitation practices; between logging companies and local people; between short-term national economic crisis and long-term development; between biodiversity and poaching; between public rationality and private interests; between loggers and green label advocates; between droughts in the (semi)-arid zones and high rainfall in the tropical forest area etc. In spite of the fact that most of the Cameroonian rainforest is still standing, a continuation of these conflicts will ultimately result in its gradual devastation.

Nevertheless there are some positive developments. The new forest legislation aims to create an appropriate framework for a more sustainable forest management. First of all it is based on a simple division in permanent and non-permanent forests, laid down in a zonation or land-use plan (Côté, 1993). The new law provides for the crucial condition that concessions given to companies should be large enough and the exploitation rights long enough to permit the amortization of the heavy investment costs for modern and effective equipment. A second fundamental point in the law is the idea of developing management-exploitation contracts, implying exclusive rights on timber exploitation for a longer period under the condition of sustainable management (based on a management plan), respecting the multi-functionality of the forest). Unfortunately, the 15-year period covered by the new contracts is expected to be too short to provide a proper incentive for sustainable management.

Implementation and enforcement of the new legislation is the crucial issue for which no practical instruments have been developed yet.

The development of partnerships between timber companies, local people and NGOs is considered by many as a new and promising option. The acknowledgement of the non-timber and social values of the forest will be stimulated by this approach, but is also conditional for its success. Timber certification should be brought away from the inter-government level and into the partnership structures.

7. Overviewing the case studies

The three case studies have been summarized in the preceding chapters. In this chapter an overview will be given of the collected data and leading issues. These issues then, combined with those taken from the international literature in Chapter 3, will receive their more systematic treatment from Chapter 8 onwards.

Deforestation rates

The three deforestation processes occur in very different cultural, geographic, economic and political contexts. The three cases also vary greatly in terms of the extent and rate of past and current deforestation.

- *The Cagayan Valley Region* in the Philippines has lost about 55 per cent of its treecover within a period of 60 years due to agricultural expansion facilitated by logging roads. It is an example of severe deforestation. The remaining forest is for about 2/3 logged-over secondary forest and 1/3 primary forest (Van den Top and Visorro 1993). A relatively large proportion of the remaining forest has a low agricultural potential because of slopes and distance to markets.

- *The North-Eastern Amazon* in Ecuador lost about 15 per cent of its treecover within a period of 30 years, mainly due to colonization facilitated by roads built by oil producers. (ITTO/INEFAN 1993; Espinosa Garces 1993). The deforestation rate is among the highest in Latin America, but still moderate compared to the Philippines. Remaining forest is for the most part unaccessible (no access roads) or waiting to be converted on people's fincas (farms). Fincas are large, 40-50 ha, and the majority is still covered for more than half with forest. It is expected, however, that most of them will have very little forest left within one or two decades, if no changes take place in current land use patterns.

- *The Southern Forest Region* in Cameroon still has most of its original treecover, although increasing parts are degraded. The major reason of the rather low deforestation rate is that the opening up of the forest by logging companies has not (yet) led to a significant influx of migrants.

Similarities

In spite of these differences in context and process, the three cases share many common elements. In all three cases, for instance, the forest was opened up by road construction with heavy equipment; this was the knife, as it were, that broke the forest's defense against penetration (its vastness, its large trees). The key actors are to a certain extent the same as well. For example, in the Philippine and Cameroon regions, logging companies are the first to penetrate the forest and open it up for landseekers or poachers. In both the Philippines and Ecuador, forest conversion takes place mainly by agricultural expansion due to immigration and unsustainable and extensive land use practices. Below, we mention what we think are the most important of these common elements.

The role of markets

Commodity markets played a crucial role in all case study areas. The high demand and prices for timber, oil, beef and tropical agricultural products created incentives for national and foreign entrepreneurs to exploit forest resources. The multi-functionality of forest areas, as timber, as land, or just as mineral resource, made them attractive for many different actor groups, generally originating from outside the area. For the local indigenous the forest had again other use-values. Not surprising, in all studied areas conflicts in interest existed between the various forest users. These conflicts, however, were not always manifest.

Market factors, especially commodity prices, have also a strong influence on people's land use decisions: what crop to grow, how much cattle to take and how much timber to sell.

Physical accessibility

In each case, physical accessibility was a major precondition for agricultural expansion. Actors responsible for road-construction, however, belonged to different categories: corporate loggers, oil companies and the government. Only in Cameroon, logging roads were found to be overgrown after they had lost their logging function. The awareness of the impact of road-construction, especially roads which provide access to previously unpenetrated forest areas, seemed to be increasing among forest agencies and conservationists in all countries.

Tenure

In the Philippines and Ecuador, the perspective of land tenure attracted millions of poor land seekers who were looking for a living. This 'pull' into the forest has been aggravated by 'push' factors, especially the squeezing out of farmers from large, under-utilized estates of big landowners.

In all three regions, access to forest land was (and still) is easy to obtain. Forest land is basically a public resource, which due to government policies and the denial of the traditional rights of the original indigenous population turned into a free access good. Recently, in the Amazon Region large areas of forest have been adjudicated to indigenous groups. One of the objectives is to prevent further colonization. In the other two countries the legal position of the original forest dwellers remains very weak and most of the time they cannot make a stand against intruders, such as logging companies and migrant-farmers.

Tenure security is often considered an important incentive for more sustainable land use. In the Philippine case, the 'Stewardship Certificates' issued by the Social Forestry Programme is based on this assumption. In Ecuador, the Institute for Landsettlement and Colonisation issues land titles to settlers. Although most of the settlers had only a provisional title (which is cheaper), they were keen on getting one. In neither region, however, there seemed to be a direct relationship between land title and land use practices. A title by itself does not provide sufficient incentives to start investing in more sustainable forms of land use. Other conditions have to be fulfilled as well. Land titles, however, were desired, because they provide other benefits, such as the possibility (although not legally permitted) of selling the land and obtaining subsidized credit.

Government policies

In all regions, forestry as well as non-forestry policies clearly influenced the decisions of people to start activities in the forest and to carry them out in specific ways (more or less destructive for treecover). In none of the countries the national or regional government had coherent and integrated planning concerning the development of the studied regions. Except for an emergent effort in the Philippines, no inter-sectoral approaches existed for the conservation of forest. This was the more remarkable, because also Ecuador and Cameroon are participating in the FAO/UNDP Tropical Forest Action Programme, which promotes such an approach.

In general, the studied forest regions have a marginal position and the governments provides little support for their development in general, and for the improvement of migrant farmers' land use practices and management of natural forest areas in specific.

All three countries have a 'protected area' system which results in a certain protection of a proportion of the public forest. For example, 25 per cent of the Ecuador Amazon Region has a protected status (parks, reserves etc.). Unfortunately, these areas are in practice not always well protected. In general, there is a large discrepancy in all three countries between formal regulations and their implementation.

The case study countries are timber-producing members of the ITTO. ITTO and other donors finance programmes aimed at sustainable forest management. This new concept is not yet well tested and forest agency personnel showed a great deal of scepticism. By and large, the political will towards sustainable forest management is not yet strong enough to cope with the economic machinery of short-term gains to be reaped from forest degradation.

Private use of public resources

One of the mechanisms by which the economic machinery can dominate over public decision-making is the lack of public control over public resources such as the forest as well as over public control functions such as forest agencies. In all three countries, the ever-present forces leading officials into selling the power residing in their functions ('private use of public office') are as yet hardly counterbalanced by democratic control over these functions. In all three countries, for instance, the few public officials who refused to sell out on the corruption market have payed a high price of demotion, molest and other hardships.

Land use practices

Land use practices of migrants in the studied areas tend to be unsustainable and extensive, and as such enhance deforestation. Short-fallow shifting cultivation is very common. In Ecuador, land use is particularly extensive, since cattle raising is a popular activity. More than one hectare of forest land is used for each head of cattle and even then pastures rapidly lose their productivity. In the Philippine case, some households managed to make a transition to more stable and intensive forms of land use, including rice terracing and trees integrated in agriculture (agro-forestry). In Ecuador, however, having a large cattle farm, sustainable or not, is still the cultural ideal of most settlers.

8. Logging in Context

Commercial logging is carried out for domestic and international markets, by large international corporations, by smaller firms and sometimes by local people too, such as the 'carabao loggers' in the Philippines. With that, also the scales of the contexts vary, from international markets and national governments down to regional markets and local government. In this chapter we try to catch the general rationality of all these. In order to avoid too abstract language, we describe the logging rationality in 'firm terms', taking as the implicit model the relatively large firm operating on a relatively large market. Smaller actors are in fact often dependent on the bigger operations, as we saw in the Philippines where local people deliver the logs to corporate loggers, and in Cameroon where corporate loggers cut the 'gré-à-gré' parcels. In section 8.3, we pay some separate attention to the local logging actors.

The most important background fact of this chapter is that only 1 per cent of the exploitable tropical forest areas are logged on a sustainable basis at present, that the far majority of the logging firms are involved in illegal operations (Jepma, 1994), and that although exceptions do exist, the basic attitude of many large logging conglomerates towards Third World governments is not such much to negotiate with them but rather to buy them, invited by governments that appreciate being bought.

8.1 The general picture of commercial logging decision-making

Following the Action-in-Context principles described in Chapter 3, the general image of the decision-making process of the logging actors can be made by first noting down the options they can chose between, and then focus on the motivational factors attached to these options. In this section, we do so in the way coded as 'HEC' in section 3.4; the next section focuses on a narrower description of the short-term element in the general picture.

The logger's options

Logging may take place in different legal categories of forest. These categories come under many different names, but the overall distinction is between (1) *conversion forest*, which is designated to make place for other land use such as mines, lakes or cropland, (2) *production forest*, which is designated to be logged sustainably, that is, to remain forest although the biological forest quality will decline because of the logging, and (3) *protected forest*, which is reserved for nature, indigenous people, ecotourism and other activities supposed not to impinge on the biological forest quality.

In these areas, logging may be either legal or illegal. Often, the same companies are involved in both types, e.g., cutting legally in one place and illegally in another, or cutting a legal portion plus an illegal extra in the same concession area. What is legal or illegal depends on the local forest regulations. For our purpose, the most important type of regulations are those designed to ensure forest sustainability in production forests.

Usually, these regulations have two main components.

- One component regulates the minimum diameters and maximum numbers of logs that is allowed to be taken out, per species; this set of rules is usually summarized under the name of 'allowable annual cut' (AAC). Ideally, an AAC should reflect the carrying capacity of the forest, but AACs are often criticized for that in fact they do not. Sometimes, these criticisms are true in a straightforward manner, in the sense that the AAC regulators have indeed been less concerned with forest sustainability than with being friendly to the logger. In other cases, a controversy on forest quality standards underlies AAC controversies; it is true that AACs should be more strict if one desires some less-than-minimum biological forest quality to be left after the logging operations.[13]
- A second set of logging rules usually concerns the physical aspect of the operations by which the AAC is to be cut and taken out. These rules may concern, for instance, the way to construct logging roads, the obligation to replant the roads and yards after use, the obligation to restock of the area with desirable species after cutting, and the system of establishing shortest routes between the trees that are to be cut.

If a logging corporation is cutting illegally in a protected forest area, it does not make economic sense to follow such sets of sustainability rules. In fact, the only option the corporation is motivated for is to cut as many trees as it can in a short time span, and move the logs out as fast as possible. For a number of reasons to be expounded later, this *'grab-it-and-run'* option is often chosen also in production forest. There, this option stands side by side with the other option open to the logger, which is to comply with the AAC and auxiliary regulations. The two options may often be mixed to a certain extent, and it is not necessarily so that the two options fully coincide with the distinctions between legal and illegal or the distinction between sustainable and unsustainable logging. For the sake of the analysis here, however, it suffices to focus on the production forests, where the distinctions usually are identical enough to merge them, thus defining as the two basic options for the logging firms:

- *grab-it-and-run* (also meaning, illegal and unsustainable)
- *comply with regulations* (also meaning, legal and sustainable).

Loggers of course also have the option to pull out of an area and start elsewhere, or move out of the business altogether; thus, their third option is:

- *move elsewhere.*

The most important secondary actor connected to the logger's options is obviously the national government. This actor decides on the areas to be designated as the three legal forest types, it sets the regulations that will apply to the production forests, and it determines if logging companies have the *de facto* opportunity to cut in protected forest.

The logger's motivations, 'HEC' conceptualization

The 'HEC' model of human decision-making states that actors respond to problems and opportunities through an (unspecified) interplay of three internally consistent 'moral

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[13] This is true even to the extent expressed by nature conservationists, who say that 'sustainable logging is a *contradictio in terminis*', if maximum biodiversity is set as the quality norm of what should be sustainable.

modes of reasoning':

- *E: the 'homo Economicus' mode.* This is the (self-)image of man as the lone hunter of benefits, optimizing his choices by maximizing cost-benefit ratios. In this mode, moral problems are defined and solved in terms of balancing the rights and obligations of conflicting actors, either by the procedures of the system of justice or by the 'calculi of fairness' such as CBA or MCA.
- *H: the 'homo Honoris' mode.* This is the (self-)image of man as the defender of the honour of himself and his allies. In this mode, moral problems are defined and solved in terms of mutual trust and respect, of social order and of the 'noblesse oblige' of the ones at the top.
- *C: the 'ethics of Care' or 'homo Communalis' mode.* This is the (self-)image of man embedded in a web of relationships. In this mode, moral problems are defined as failures of response in these relationships, and solved by activating the moral community, in which the 'contextual' story of the problem situation is told.

These three 'moral modes' are the dominant 'official ethics' of medieval times (H), of modernity (E) and of current 'post-modern philosophy' that claims that the contextual ethics of care (C) has always been the mode of reasoning of women and of daily life. The HEC actor model assumes that the three modes of moral reasoning are present in each actor, although in unspecified degrees. The only specification is that some external 'things' are either culturally defined as demanding a response in one of the moral modes (Goodin, 1982), or psychological triggers of one mode or the other. Examples of the latter are small children (C-triggers) and markets (E-triggers). Empirical evidence is found, for instance in Jack and Jack (1989), Elster (1989) and Bolhuis and Van Der Ploeg (1985). The latter authors will be returned to in Chapter 10.

The environment may be treated in any moral mode. There may hardly be doubt, however, that logging corporations view the forest primarily as a source of economic revenue (E-mode), with profit maximization as the prime motivation. DiMento (1989), reviewing the empirical literature on the compliance and non-compliance of US firms with state regulation, has uncovered other aspects as well, however. From this, and from our own intuitions, the following list of motivational factors of logging firms may be drawn up.

E-mode motivational factors (dominant)

- **Short-term profits.** This obvious factor is built up of the benefits of the logs sales (connected to the timber market prices) and the production cost. The production cost consist not only of the cost of operations (equipment, labour), but also (in the case of legal operations) of the extra cost of taxes and compliance with the rules with respect to roads construction, replanting etc. and (in the case of non-compliance) of the extra cost of bribes necessary to cut the illegal logs and get them through the checkpoints. The next section will be fully dedicated to this factor, with the purpose of further detailing of the relationship between logging and the state.
- **Short-term risk of non-compliance.** In the case of non-compliance, there is always some risk that logs will be confiscated, the company be fined or the concession be cancelled, even if bribes and allied measures normally ensure a smooth running of the illegal operations.
- **Long-term benefit of compliance.** This factor is of special interest because it is the

company-internal motivation to comply with the Allowable Annual Cut and the other sustainability regulations. After all, if companies comply they should find a regrown forest when they return to the logging sites after 30 or so years, within the same concession area. Although a heavy weight is put on this long-term perspective in forestry as an academic discipline, the tropical logging corporations may be expected to work with a more or less normal commercial discount rate, implying that this factor, realizing itself after 30 years, will never count for really much in the actual decision-making if the motivational weight of the factor is left to the logging firms alone.

For the factor to be able to play any role at all, *security of the concession* is crucial, as stressed, for instance, by Poore (1989). In practice, this condition is satisfied hardly anywhere. One major reason is that in many places (such as the Philippines), migrant farmers encroach into the forest (induced by the logger's own roads, ref. Annex I), without the government being willing or able to effectively protect the concession. A second major reason is that governments are usually regarded as an unreliable partners anyway, never really willing to give concessions on a 30-year basis (ref. case study Cameroon, where parliament decreased the leases to 12 years), and always prone to give in to the pressures of the lobbies for nature conservation, tribal people or any political whim.

Other important factors influencing the long-term benefit of compliance are the expected price of timber in the future and the general inflation rate. The first is a well-known issue in resource economics, stating that the "optimal" rates of depletion are lower if expected resource scarcity will result price increases. For the timber industry, this factor will not have this positive effect, however, because timber prices are expected to remain more or less stable (Jepma, 1982).[14] We will return to this factor when discussing the 'perverse' effect of the proposals for timber certification in section 8.3.

The general inflation rate in the surrounding society works such that the higher this rate, the stronger will be the industry's emphasis on short-term gains. Generally then, the usually high inflation rates in the tropical countries work against the tropical forest.

H-mode motivational factors

DiMento's and others have found several motivational factors for compliance that are characteristic of the *honoris* mode of reasoning. High-level corporate managers, for instance, do not want to be commanded by low-level, faceless bureaucrats; irrespective of the 'E-content' of a regulation, they are more inclined to comply if the compliance is negotiated as a honourable peace with a respectable opponent. Another example is that criminal sanctions are feared by (respectable) firms irrespective of the 'E-content' such as the level of the criminal fine; at the same time, criminal sanctions run the risk of evoking fierce emotions and result in firms struggling themselves to death to beat the state agency.

In our interpretation, *honoris* factors such as these do not explain much of the present behaviour of logging companies. They do seem to hold potentials to induce logging companies to take more responsibility for the forest, however. One example may be to install them more explicitly as the real guardians of the concession, controlled but also honoured and defended by the state.

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[14] As explained by Vincent (1994), the reason is that the world market is dominated by the timber from the temperate countries, and forest areas are on a slight increase there. Hence, no effect is to be expected of the growing scarcity of tropical timber.

C-mode motivational factors
Motivations from the 'ethics of care' mode of reasoning could of course be of great value to the forest, this being the prime source of notions of responsibility for nature and future generations. At present, nothing much in the outside world invites the logging companies to this type of responses. Forestry regulations, timber certification, NGOs and consumers do of course put pressure on loggers to treat the forest in a sustainable way, but they approach the companies in the 'E-mode' of markets, rights and obligations, hence remaining basically external to the firms. In section 8.3, we will explore some possibilities to enhance 'ethics of care' attitudes in commercial forestry.

8.2 *Logging and the state*

In this section, we will focus on the what is the currently dominant determinant of logging firms' decisions, the 'short-term profits' factor in the E-mode of reasoning. This micro-economic analysis of (legal and illegal) logging will be used especially to clarify the relations between logging and the state as secondary actor. Consequently, as explained in section 3.4, the options will be simplified but quantified on a ratio scale, and the merits of the options will be expressed in monetary terms only.

The visual analysis is in the two pictures of Figure 3. The horizontal axes represent the numbers of logs cut and sold, the vertical axes the monetary terms of the cost and benefits. The benefits (B) are determined by a market price that is supposed to be fixed; hence B is a straight line. The cost curves (C) begin with a substantial fixed cost, representing the necessary investments in the equipment and the other cost incurred even when no logs are cut. The cost curves are bent upwards because the logs are farther away from the main road and the lumber yard the more of them are cut.[15] The un-interrupted cost curve (Cl) represents the cost of a technologically fully legal operation. It is composed of the firm's basic cost of equipment, transport, labour etc., plus the cost of compliance to the rules with regard to replanting, logging roads etc. (ref. section 8.1).[16] Below the curve of legal cost lies the curve of the cost that would be incurred if these rules were not complied with, the illegal cost (Ci). Furthermore, there is the maximum number of legally permitted logs to be cut, the Allowable Annual Cut (AAC). All logs up to the AAC are legal logs and the excess are illegal logs, by definition. The result of all this are two different profit margins. The first is that of a fully legal operation (Pl), where the logger takes the difference of benefits and legal cost at the AAC level. The second is that of a profit-maximizing operation (Pi), composed of a legal (up to AAC) and an illegal component, supposing the latter is possible without extra cost. This illegal profit is determined by the point where the benefit and illegal cost curves run parallel (= equal marginal cost and benefits).

The difference between the legal and illegal profits (Pl and Pi) is a key determinant of the logger's inclination to comply with the sustainability rules. If the difference is

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[15] This distance factor is a major reason why logging is not prevalent yet in remote areas such as the South-East of Cameroon.

[16] We neglect taxes here; they do not make a significant difference in the analysis.

large, the company will go to great lengths to escape; if the difference is small, the company needs only small additional (E, H and C) motivations to comply.

In the same top picture of Figure 3, the dotted lines aim to represent the effects of timber price changes.

Bh is the benefits line associated with *higher timber prices*. For the same logging company depicted already with the un-interrupted cost curve, higher prices result in higher profits, both legal and illegal; they are shown as the dotted vertical lines in the figure. Then, what will the company do? If it is cutting at present at the legal AAC level, will it begin to add illegal operations and cut more trees? Strictly economically speaking, it will have this inclination indeed, because the difference between legal and illegal profits has grown; going illegal pays off more. On the other hand - and we say this on a more intuitive basis of understanding logger's minds - the situation has also become more relaxed. The company can make a decent profit now also if it complies to the regulations, hence it will be more open to the 'non-profits' motivations to be a sustainable logger (the E, H and C arguments of long-term benefits, guardianship, care for indigenous people and nature, and so on). Depending on the decency of the corporation and the contextual details of markets, government, NGOs etc., the company may therefore also move to more sustainable behaviour. The first conclusion then is that for companies that are already present in the area, higher timber prices will often not result in stronger tendencies to cut more trees, and that even the reverse may be true if government and NGOs know how to deal with the new situation.

This is not the only effect of higher timber prices, however. This is illustrated by the cost curve Cr in the figure, being the cost curve of a less favourable logging area, e.g., an area more remote from roads, harbour or market, or steeper, or less endowed with commercial species. This cost curve lying above the old benefits line B, the area used to be un-attractive. Now, however, it will attract new companies knocking on the government's door in order to get a concession (or, it will become attractive for high-level politicians and bureaucrats to start an operation themselves, legal or illegal). The degree to which this will take place depends of course on the degree to which government is willing to protect the forest from these new pressures.

Summarizing, higher logging prices may result in more sustainable use of the forest, but only if government and other contextual actors are willing and able to use the opportunities and prevent new logging firms from entering. If not, the result will be the reverse.

The effect of *decreasing timber prices* is roughly the reverse. It is characterized by the lower benefit line in the figure, Bd. It shows that the legally attainable profit has now decreased substantially, but the illegal profit much less so. In such a case, the company will feel driven into illegal operations, because the only other option is to pull out (and lose much of the investments). The company will be largely closed off to long-term and other arguments for sustainable management. In fact, the only options for the government are to either close the eyes for the company's trespassing or to clamp down on the

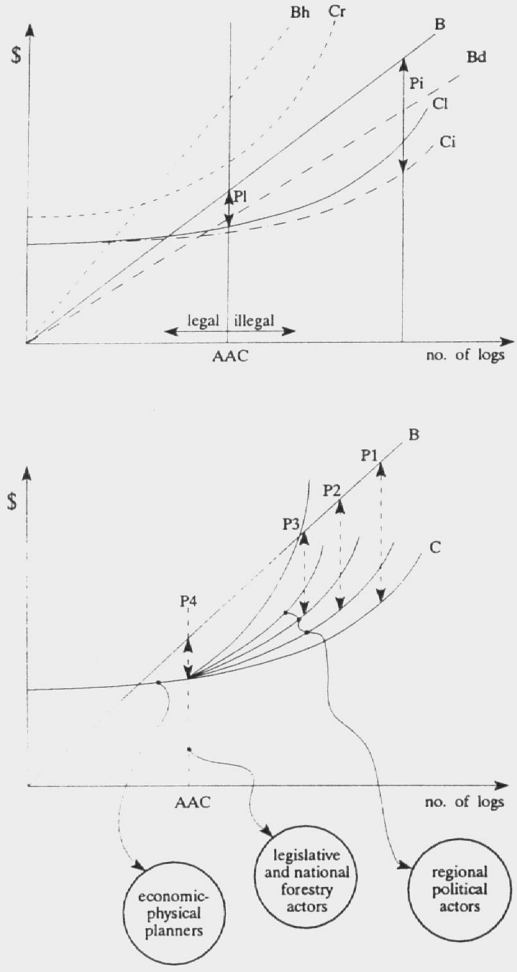

Figure 3. The micro-economy of legal and illegal logging. In the circles are three secondary actors.

regulations and force the company out.[17] As may be seen in the figure, lowering the AAC has the same basic impact.

Summarizing, decreasing timber prices or lowering of the 'allowable cut' permits strongly induce logging companies to increase illegal operations, or to pull out if government withstands the pressure.

This analysis also prepares for understanding the effect of timber certification, 'legalistic style' and 'partnership style'. This will be treated in section 8.3.

The second picture in Figure 3 has the same character as the first, but focuses on a more precise rendering of the legal/illegal distinction. We no longer assume that illegal logs have the same cost as the legal ones. In reality, the basic difference (in E-terms) between a legal and an illegal log is that for the illegal one to reach the place where it can be sold, people in power have to be paid (payments to forge papers, payments to stamp them, payments for promises to be asleep when the logging trucks pass, payments to people who occasionally threaten the courageous few who want to withdraw from the corruption system, and payments to the bosses of these people, who allow the system to run).

All this has much to do, of course, with the basic organisation of society. In the democratic ideal, the public good is vested in government, and government is separate from the economic elite. In such a case, going illegal is not associated with simply paying a 'cost of corruption', but with a risk of being caught and the associated high sanctions. This risk cannot be lowered by private payments to public officials, because these officials will be ousted by the democratic vote if they are caught selling their public office for private gain. In may Third World societies, however, the economic elite has effectively 'appropriated' the public offices, and the public vote is courted and bought by using public funds for promises to constituencies, and private funds to pay off lower-level friends (clients), who then promise to bring in the votes of their clients, and so on, down to the level of peasants and urban labour. For a politician to remain in power in this 'patronage' system, it does not make much sense to write and defend a consistent political program geared towards sustainability of the public good. What he needs is *money*. And in many forested regions and countries, the major thing to sell is the forest.

Thus arises the 'corruption market', on which loggers enter to buy the private use of public office, and the regional elites enter to sell the same. (The extreme of this market is that loggers and politicians merge to become the same persons.) On this market, the cost of corruption is established as the equilibrium price of the loggers' motivations to buy and the politicians motivations to sell.

The demand side of this market is shown in the second picture of Figure 3, shaped as the fan of cost curves originating at the point AAC, where legal logs turn into illegal

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[17] An analoguous situation has been present in the Philippines, where a logging ban confined the companies to cutting in the secondary forest, i.e., areas with few large and valuable trees, hence with a higher cost to reach the same benefits. Since the option to go into large-scale illegal operations was effectively closed off by the forest agency, many companies lost motivation to continue struggling for their concession and pulled out more or less voluntarily. (Smaller scale operations remain, however, working for the regional furniture industry. They are harder to control, and government has less motivations to do so because of the industry's connection to regional employment and regional politics.)

ones. Cost curve C1 is that of a corruption price of zero, coinciding[18] with the cost curve of the first picture. Cost curve C2 results from a relatively low cost of corruption. The loggers will be rather willing to pay this price because, as we can see, the associated profit (P2) is not much lower than the original (P1). This changes at higher price levels. At level C3, the profit P3 does in fact not differ much anymore from the legal profit, and at level C4, the associated profit does not differ anymore from simply going legal at AAC level. We also see that with these steps of C1 to C4, the numbers of trees cut tend to decrease, because the point where the cost and benefit curves run parallel comes closer to the AAC. In other words, a high price of corruption is favourable for the forest.

From the supply side of the politicians, the price asked for being corrupted depends on two basic factors: the price of the votes that have to be bought to stay in power, and the risk involved in being caught. And these, in turn, depend on factors such as the general level of economic development and awareness of the population, and the strength of the alternative, democratic forces (ref. Annex I). In other words, by pushing up the cost of corruption, factors such as general education, equitable development and democratic movements tend to be favourable for the forest.

Somewhat speculatively, this analysis also helps to understand why in many countries the timber taxes are judged to be remarkably low (Repetto, 1990). What would be the rationality of countries to watch their forest being shipped out without taxing this to the economic limit? According to our analysis, the reason is that taxes enter into the public domain and hence are not as easy to appropriate as are direct payments to the private elite pockets. If logging companies are taxed to the limit of public rationality, they have not much left to let flow into the patronage machinery.

All curves and underlying factors in Figure 3 are connected to secondary, tertiary and further actors, most of which are rather obvious. The benefit line, for instance, is connected to global markets and Western consumers but far more importantly, and increasingly so, to *national* timber markets (ref. section 8.3). The cost curves depend on labour markets, regulating agencies and so on and is also determined by physical and technological factors, which in their turn are connected to the designers of forestry techniques, and so on. Figure 1 of Annex I gives an example actors field from the Philippines. The bottom picture of Figure 3 stresses another aspect, namely, the three major government actor categories involved in establishing the economic determinants of the logging operations. First, there are the economic-physical planners, that usually are part of the most central areas of government. They are connected to the cost curve, especially through their decisions concerning major roads; without these, the logging roads have to be too long to make logging a viable undertaking (ref. curve Cr). Second, there are the actors that establish the Allowable Annual Cut (AAC). Roughly, these are the national legislators and the top-level forestry bureaucrats, the former deciding what will be production forest and what will be protected areas (AAC = 0) and setting the general AAC guidelines, and the latter deciding over the actual AACs for the logging concessions (ref. case study Cameroon); these actors also set the forest taxes and the concession periods. And third, there are the members of the corruption community,

[18] In fact, the curve runs off at a slightly different angle because it cannot be expected that loggers will carry out the physical sustainability rules in illegal operations. This does not impinge on the analysis, however.

regulated, by and large, by the political bosses at a somewhat lower, regional level.

A common image of coalitions between these actor categories, visible also in the case studies, is that the economic-physical planners and the regional politicians are united against the forestry executive, with the legislature hovering above the scene in limbo. In such a configuration, the forestry bureaucracy succumbs. Tertiary actors do have some power to influence this outcome, however. NGOs and donor agencies may strengthen the forestry sector vis-à-vis the other actors (ref. case study Ecuador). The World Bank may refuse loans (= options) for major roads to the economic-physical planners, so that they simply cannot do what they are motivated for, or induce the legislators towards better forest laws (ref. case study Cameroon). And finally, a Global Forest Fund such as designed in Annex II and summarized in Chapter 10, may enhance motivations for forest protection right at the economic centres of power of the forest-owning states.

Finally, there is the issue of debt relief to the most impoverished nations, many of which are forest-owning ones. It is often said that the indebted nations are forced to sell out their national resources in order to service their debts. But would that be really true? If a country would partly fail in its servicing and still work to maintain its forest, would then the IMF kindly advice to cut the global good? And reversely, if the debts would indeed be restructured, what difference would that make? Would the factors described in the analysis of this section really change, or is the patronage system in fact insatiable and will it continue to work basically the same way? In this context, it has to be borne in mind that the statistical analyses by Kahn and McDonald (1994), Capistrano (1994) and Shafik (1994) did not find noteworthy correlations between debt burden and deforestation.

The core of debt relief, it seems, is to give back *options* to the impoverished governments. They then will spend the new budgetary space on arms, schools, rural development, forest protection or more roads, depending on what they are *motivated* for. Debt relief makes sense for the forest in the case of governments motivated for the forest but lacking the capacity to implement this option. For governments motivated against the forest, the reverse will be true.[19]

8.3 New developments

Using the material gathered up till now, this section will discuss an number of relatively small-scale developments which are of special importance because they embody relatively new ideas on how to move towards a more sustainable tropical forest. All have as a characteristic that they seek to enhance the motivations of forest actors by inviting also the 'honoris' and 'care' responses to the forest, besides the normal, economic motivational factors.

Community forestry and partnerships

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[19] Conditional debt relief linked to sustainability (ref. case study Cameroon) may be a solution here. For reasons explained in Annex II, a Global Forest Fund seems to be a better way to enhance national-level motivations.

'Community forestry' is a term used for situations in which forest management is not decided upon primarily by government and logging corporations (with or without involvement of the local people), but by local people (with or without involvement of government and loggers). Sometimes, community forestry takes place in reforested areas, where the forest parcels are in the private hands of farmers, who then cooperate with respect to forest management, logging, wood processing and selling; Costa Rica is a well-known example. Most often, the forest is a large natural stand, the ownership of which has been handed over, usually very recently, to the community as a whole. Such communities often consist of tribal people who have struggled for tenure over their ancestral land, as in our case study areas in Ecuador and the Philippines. They may also be communities of more recent migrants; in the Philippines, these communities are invited to organise sustainable logging operations in the (secondary) forest handed over to them. In Southern Mexico, formal community ownership of the forest has been established a long time ago but community forestry is in fact of a much more recent date, after communities had re-asserted their forest exploitation rights vis-à-vis the logging companies and government (Silva, 1995). The 'extractive reserves' recently established in the Amazon region and planned to once cover 25 per cent of the area, have objectives that include more biodiversity preservation than does the concept of sustainable forestry; people are supposed to concentrate on non-timber forest products, but the basic principles have much in common with the community forestry idea. The same may be said of initiatives such as the GEF-sponsored Integrated Protected Areas System (IPAD), in which local boards are set up to bear the responsibility over biodiversity protection areas.

In India, many communities have sustainably managed their forests for ages, and the Chipko movement sprang up from communities defending their forests against government/logger coalitions that moved in to cut them. As asserted by Silva (1995) with respect to the shift in management power from the loggers to the local people in Southern Mexico, this shift makes a real difference not only in terms of participation and economic equity, but also in terms of forest sustainability. Could we then conclude that community forestry really is perspective deserving a global recommendation, or would that be a romantic idealisation based on scattered and selective evidence?

We do not know of systematic research addressing this question. We may use our own little 'HEC theory', however, to find out if there could as least be a *logic* in that community forestry could be systematically different from logger forestry. In order to do so, we go through the list of 'economic', 'honoris' and 'care' motivational factors given already in section 8.1.

The first we may notice then is that the first factor in the E mode (*'short-term profits'*), is in fact largely the *same* for communities and for logging corporations. In the whole analysis of this factor given in section 8.2, the only difference between communities and loggers is that communities cannot *move*; they do not have the option to pull out and start elsewhere if legal forestry profits fall below zero. In such a case, therefore, they may be pressed harder to enter into illegal cutting than are logging companies, especially if they do not have alternative livelihood sources. If they do, however, there may also be a tendency to drop logging for the time being, let the trees grow bigger and wait for better times, which is an option usually not open to logging companies. Concluding on the 'short-term profits' factor as a whole, a prediction of a systematic positive difference between community and logger forestry cannot be grounded in this factor. This is

different with respect to all other factors, however.

The second E factor concerns the *short-term risk of non-compliance*, associated, for instance, with the confiscation of illegal logs, fines and imprisonment. Taken as a whole, communities will tend to be less powerful vis-à-vis the forestry agency than are logging corporations, and hence more vulnerable to this type of sanctions. The NGOs that may be present to support and protect the communities are unlikely to continue putting in good words for them in the regional and national bureaucracies if illegal actions take on a systematic appearance. In other words, this economic factor, which works to protect the forest, will tend to weigh heavier for communities than for logging corporations.

The third E factor is the *long-term benefit of behaving in a legal, sustainable way*. One important aspect here is the long-term security of tenure, and a systematic difference between communities and logging corporations is that contrary to the loggers, the communities know they do not swim against the tide of world opinion; they have no powerful NGO lobbies working against them in high places, and no lawmakers who fix logging permits for periods as short as 12 years. Loggers often have they feeling that they may be ousted from their concession any time irrespective of their behaviour - then why would they behave? For communities on the other hand, especially those that may still feel insecure with respect to their new rights, behaviour does make a difference; it will be hard to attack these rights if the community lives up to the sustainability expectations, but hard to defend them if the forest goes down. A second aspect of this factor of long-term benefits is again connected to the fact that communities cannot move. Contrary to logging companies, they cannot create a wasteland and then roll off that burden to others; if it be a wasteland, it will the community itself that will bear the brunt. On the other hand, communities also have the option to convert the forest into some other sustainable but more profitable land use such as market crops. This tendency is in the background of the attempts of the more market-oriented tribal communities in Ecuador (ref. case study) to introduce private landownership in the communally held forest areas. Concluding on the third E factor as a whole, it can be said that this factor will tend to work towards a better sustainability performance of communities compared to logging corporations, if conversion of the forest into agricultural land, enhanced by a shift from communal to private land ownership, is prevented.

Next, there are the 'honoris' (H) factors in human choices. We intuit these factors to be fairly weak in forest matters, and to create no significant differences between community and logging forestry.

This appears to be different with respect to the 'ethics of care' (C) factors. We ground this in the notion that people and communities are *situated* in a way that companies are not. For communities surrounded by forest over which they have a real tenure, the forest may become more than an economic resource. It may also become home, and home is a place you keep up, based on notions of continuity that have not much to do with discount rates. At a more concrete level, it may be noted also that women play a role in communities even when forest decisions should be an all-male matter, which they often are not. In logging corporations and their immediate context, the female voice is nowhere to be heard. If women are indeed what they are claimed to be by many philosophers and empirical scientist, namely, statistically more inclined to 'ethics of care' responses to the world, then this would generate a real and systematic difference between community and logging forestry.

As said in section 8.1, 'HEC theory' does not only list the various motivational factors

but also predicts, weakly but systematically, which of the three modes of reasoning may predominate in certain circumstances. In that respect, the forest may not be a strong H, E or C trigger, but other people certainly are. Basically, the HEC model mirrors they well-known wisdom that people will treat you in the way you treat them. Putting it in an exaggerated and simplified way, people will want to be trustworthy (H) if you trust them (H); if approached in the language and attitudes of money, rights and obligations (E), people will respond by looking for gains, claim they are too small and start negotiating (E); if approached in a perspective of partnership (C), people will take you up in the web of care, along with what you bring with you (the forest?). We will not discuss here the degree in which this image may explain some remarkable successes of 'soft' approaches in environmental management. Being concerned more here with the systematic difference between community and logger forestry, it is noteworthy that communities seem to 'attract' NGO groups and GO attitudes that themselves more partnership-like than they are with respect to loggers. This in its turn enhances caretaking and continuity responses of communities. Putting this in policy terms, systematic differences between community and logger forestry can be enhanced by approaching communities in a partnership perspective.

Logging companies, radiating as they do the 'economicus' mode of being in the world, do not naturally attract partnership approaches towards them. Although it is probably true that logging corporations cannot do without an 'E-oriented' context of tightly woven profit incentives and legal sustainability obligations, it does not seem fully effective if these attitudes towards them would remain the *only* ones, as they are almost everywhere at present. Also loggers are people, and able to respond in 'honoris' and 'care' modes if approached that way. For both of these, face-to-face contacts are prerequisite. This may explain something of the nature and the success of the APID project, closely linked to a logging corporation in Cameroon (ref. case study), working towards better relationships between the company and the forest, and between the company and the local people at the same time. This theme will return in the next section.

Timber certification, in two styles

Western consumers and government are often under the impression that influencing the international timber trade, for instance through consumer actions or timber certification, contributes essentially to the fate of the tropical forest. This is not the case. The international trade takes up only some 15% of the logged volumes at present; the rest goes to the domestic markets of the countries where the trees are cut. Furthermore, migrant farmers in fact burn more trees than loggers cut. Based on Poore (1989), Repetto (1990) Barbier *et al.* (1994a), and other sources it can be estimated that at maximum, only one out of every twenty trees fall because of the international trade, and hence are susceptible to consumer and certification initiatives. Effective international action for the tropical forest will have to bear on all trees and not only that one in twenty, and hence should be sought first of all in work with national governments and options such as the Global Forest Fund (Chapter 10).

Consumer boycotts and timber certification could be interesting because they could be efficient in spite of their low overall effectiveness. Moreover, they could have an inspirational effect that might also have an influence on domestic markets. This is the

reason we pay some attention to them here.

In his economic model of the world timber market, Jepma (1994) has analyzed the effect of a consumer boycott of unsustainable tropical timber (which amounts to almost the same as all tropical timber), by taking as a model input a halving of the demand of tropical timber on the Western markets. The only effect is a delay of a few years in the deforestation curves; after that, domestic and non-Western markets take over. With respect to Indonesia specifically, the same is said by Barbier *et al.* (1994b). Obviously, consumer energies and funds should be guided in other directions.

Certification of sustainably logged timber (the 'green label') aims to be a lasting incentive for loggers to cut sustainably, and hence could be a better alternative. Certification may be carried out in a large number of ways. The certification may apply to the timber/the company/the concession; it may be carried out by GO or NGO organisations; it may be forced or voluntary, and so on. Overviewing the field, it appears that certification is taking place (or envisaged to take place) in two basic styles:

■1. *Voluntary certification*. Here, logging companies (or communities, as is taking place in Southern Mexico) can apply for certification, which may be granted to them after a thorough check of their operations. The companies or communities will do so only, of course, if they see that a higher price is paid for certified timber, e.g. on a 'green market' in a Western country. Such markets, at present, are small but secure, e.g., formed by a number of municipalities that have promised to permit only the use of certified timber in housing projects, or a special consumer market. The certifying NGO then links supply and demand of the 'green timber'.

■2. *Forced certification*. This style is the reverse in almost all respects. It is envisaged to be organised on a global basis by governments, and will apply to all logging companies.

Although the leading idea is the same for both styles, their impacts are the reverse. Let us have a look at the economic aspect of the 'forced certification' style first. This option, necessary as it is to organise it by inter-governmental negotiations, is only in the discussion stage and will remain there for a long time to come, as asserted by this style's experts (DBB, 1994). What does that mean to the logging companies? The far majority of them is cutting unsustainably at present. So, the ongoing discussion is perceived as a threat, a risk of drastically *lower prices in the near future*. Then, what to do? The logical choice is to cut as much as possible before it happens, in other words, to *intensify* the operations![20]

The reverse is true of the voluntary certification style. It does not radiate a threat of lower prices, but a certainty of higher prices. Furthermore, by creating small-scale and personal linkages, it can carry much more than economic incentives only. In fact, bringing in a possibility of voluntary certification may be a very good tool to establish the long-term partnerships of loggers, local people and NGOs discussed in the previous section - partnerships that invite also 'honoris' and 'care' responses of loggers towards the forest and its people. A nice aspect too is that it is working already. In fact, the only

[20] Ref. the Cameroon case study. The same mechanism is said to be in the background of the logging frenzy of Malaysia.

thing governments have to do in order to cover a very large segment of the imports into their countries is to subsidize the NGOs and applaud their success. Getting used to this may take some time, however.

8.4 *Conclusions*

From the foregoing sections and from the three case studies, a first general conclusion is that national government actors play the key role in the logging of the tropical forest. Even if the logging is carried out by relatively local actors for the domestic market, local forest agencies cannot effectively move without legal and political support from the national level.[21]

The analysis of the present chapter has focused on general mechanisms in the 'logging and state' relationship. With these new insights in hand, it now serves to take a look back at the three case studies, because these are differentiated per country.

A concluding analysis

- With respect to the Philippines, explanatory insights hinge around the distinction between *politicians* and *bureaucracy* within the state actors category; see also Van den Top (1995). This may seem strange at first sight. Shouldn't it be so that politicians and bureaucracy both protect the public good (the forest) against short-term private interests? As discussed in the case study and in Annex I, the key here is in the prevailing 'patronage' system of politics in the Philippines, where politicians can stay in power only by handing out short-term benefits to voters, either directly of by big presents to lower-level political clients who control vote blocks. Among these presents are forest parcels, logging concessions (with low taxes), and money negotiated on the corruption market. This way, the politicians of the forest regions effectively side with the private interests of migrant farmers, local loggers and logging corporations, robbing the forest bureaucracy of the ally it needs to balance these interests. Against this background, it is interesting to note that at the national parliament level, a logging ban and other protective measures were only taken after the Philippines had lost almost all of its forest of high commercial value; there were simply not many politicians left with a private stake in logging.

- In the Ecuador case, the analysis lead to a different distinction within the state actors, namely, between the forest agency and the central bureaucracy units (presidency, economic and physical planning etc.). Politicians and private elites are not interested enough in the forest to have an impact on it. With respect to the central bureaucracy units, is has been remarked that these agencies, primarily interested as they are in economic development defined in the traditional way of short-term economic growth,

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[21] In the Philippines case study region, the regional-level forest agency played a very active role in the cancellation of logging TLAs. It had this opportunity only, however, because national policies and political balances had shifted drastically (Van den Top, 1995).

work against protection of the forest ecosystem because such economic benefits lie in crops, cattle and oil, *i.e.*, in forest conversion. In recent years, forest conversion is said to have slowed down because of a weakening of the traditional focus of the central agencies (e.g., due to political influence of the global level), and a strengthening of the forest agency, helped by NGOs and outside donors.

■ In the case of Cameroon, the situation seems less clear. The politicians, it seems, are more or less neutral, wavering between the kickbacks from logging and the pressures from, among others, the World Bank. The forest agency seems very weak and bought off. Cameroon being the poorest of the three countries, corruption is cheap. For the same reason, it may be surmised that the central government units have a strong tendency to give in to logging pressures, this activity being a crucial export earner. Protection of this logging interest also seems the reason why migration into the forest is not sponsored, while large-scale poaching, which does not decrease the logging quality of the forest on the short term, is left untouched.

Somewhere these shifting patterns must lie a key to more general understanding. The key we hypothesize to be present is found by first making a clear picture of the actors involved, a structure in which all the actor categories discussed in the present chapter and the case studies are visible. Below, we first distinguish between private and state actors. The private actors are then separated into individual actors at two levels of power ('elite' and 'people') and collective actors (corporations, communities). The state actors are first separated into the elected ones (the politicians, individually and collective) and the appointed ones (the executive, the bureaucracy). The bureaucracy is the separated into the central executive units (the presidency, the economic and physical planners, the police etc.) and the sectoral 'line agencies', such as the forestry agency. Thus:

The entities of society, for forest-oriented analysis

- **Private actors**
  - the elite
  - the corporations and communities (among which the logging ones)
  - 'the people', *i.e.*, the non-elite individual actors
- **State agents** ('government')
  - politicians
  - central executive units (presidency etc.)
  - sectoral agencies (among which the forestry bureaucracy)

Formally speaking, what is called 'actors' here are in fact roles. Especially important in this respect is the overlap between the elite and the politicians; 'private use of public office' at the top level of society is that the public good (forest, taxes, World Bank loans) ends up in Swiss bank accounts. This phenomenon gets its chance if the private and the public roles of the elite/politicians are not held in check by democratic structures.

Private actors usually have good intentions and at the same time the tendency to run after their private and short term interest. The usual position is that private actors transfer their good intentions to the government level; we let ourselves be taxed and steered in the

name of the common and long-term good. This works to a certain level only, of course, one of the factors being the degree to which the private actors have internalized the public good, *i.e.*, the degree to which citizenship and community membership counterbalance the profit-hunting tendency; the specific, forest-oriented face of this has been discussed already in terms of the 'HEC' aspects of the logging corporations (section 8.1) and community logging (section 8.3). Some degree of government control over the forest will always remain necessary, however, especially with respect to large areas that also have to serve a biodiversity function.

Our hypothesis now is that **only one of the state actor categories working against forest sustainability is sufficient for the forest to fall**; it does not make a difference which of the categories it is. The situation in the three case study areas illustrate this.

- In Ecuador, the politicians are more or less neutral. The forest agency used to be very weak compared to the central agencies, and the central agencies see the forest only is land that is interesting if mined (for oil), cleared for agriculture (by migration) or logged. Recently, the forest agency has gathered some strength to counterbalance the central agencies, but our hypothesis implies that the next step forward is to involve the central agencies more positively in the forest ecosystem. In view of the primarily economic and political interests of these agencies, then, the key will be to enhance the political value and the economic value of the ecosystem, e.g., by ecotourism, global forest funding and global politics.
- In the Philippines, the central agencies have been more or less neutral with respect to the forest (except where mining or roads were clearly needed for 'development' as defined by these agencies). Here, the politicians category was strongly involved in forest destruction, through the logging operations and the generous attitudes toward migrant farmers. As said, a general lack of forest has now turned the tide at the national level, but in a loosely organized country such as the Philippines, regional powers then still count for much for a significant period of time.
- In Cameroon, the politician category has been more or less neutral. The central units of the bureaucracy, however, continue to be dominated by the national economic interest in logging, and the forestry agency is no match for them.

It may be noted here that, contrary to the other two countries, the Philippines has been the country where deforestation was highly driven by the elites/politicians, and at the same time the country where, contrary to the other two, hesitations with respect to deforestation began to develop only when the forest was almost gone. If this observation might be generalized, it would ring the alarm bell for the large forests of Brazil and Indonesia, two countries where the elites/politicians have a comparable stake in deforestation (Rudel, 1995).

Policy recommendations

On the basis of this analysis, the policy recommendations speak for themselves. Below, the first on focuses on a broadening of the perspectives of the private actors. The second concerns the relationship between the private and the public interest (especially the cost of corruption, ref. section 8.2), and the others focus on the state actors. They are:

(1) Decrease the profit-hunting tendencies of logging actors. Shifting from corporate to

community logging is the first option here. Others are long-term and well-protected concessions, NGO partnerships with loggers that embed loggers more tightly and more personally in the ecosystem and the social context of their work, and voluntary timber certification.

(2) Increase the cost of private use of public office, e.g., by public attention to the mechanisms, the events and the actors, by public awareness of the people's long-term interest in the forest, by funding better control by and of pivotal institutions, by conditional funding and by a general stimulus towards more public control over the public good, *i.e.*, democracy.

(3) Strengthen the forest agencies, especially when these have strong forest protection motivations and stand a chance to make their increased weight felt against the central agencies (ref. below); the capacity building should therefore not only focus on better control over the compliance of loggers in the field. Coalitions with NGOs and indigenous people are important here.

(4) And, maybe most important of all, **BRING THE VALUE OF THE FOREST ECOSYSTEM TO THE POLITICIANS AND THE CENTRAL AGENCIES**, so that they become involved in forest sustainability before there is hardly any forest left. For the global level agents and fora, the normal road of political discussions, personal involvement and international treaties can be walked with greater intensity. Global forest funding (ref. Chapter 11), a mechanism that bring economic value of each hectare of forest right at the doorstep of the central agencies, may be a crucially synergistic economic support for global forest politics.

The latter two strategies will also work for improved migration and land use policies, to be discussed in the next chapters.

9. Migration and its Contextual Factors

In their role of primary actors, the impact of local people on the forest can be expressed as a multiplication of two factors:

- impact of local people = (number of local people) * (impact per person).

The second of these factors coincides with the people's land use system; it will be treated in the next chapter. On the time scale relevant for the forest, the first of the factors is largely determined by *migration* to the forest areas. The present chapter will focus on this migration phenomenon. It is based on the case studies and on Annex III, which gives a quantitative, modelling-oriented exploration; the Annex will be used here to get a general grip on the factors that rule the migration process.

The first section of the chapter aims to build a general image of the primary action and actors of forest migration, i.e., the 'prospective migrants' in the rural areas considering what to do. Built on this general insight, the case studies will then be used in section 9.2 to arrive at two conclusions oriented towards global forest policies. In section 9.3, these conclusions will be illustrated by means of the model, with a special view on the issue of roads construction.

Migration flows go in many directions: from the rural to the urban areas, from the rural areas to the forest, from the forest back again to the rural areas or to the towns, and so on. A general model such as that of Annex III should be able to encompass all these flows. Here however we will focus on what will most probably be the most forest-relevant flows anywhere, that is, rural-to-forest and rural-to-urban. Thus, the basic picture is that of an agricultural heartland where prospective migrants consider the choice between three options: to either (1) stay at home, or (2) try in the cities, or (3) try to start a forest farm.

9.1 Modelling the primary factors

In the words of Mansard and Morgan (1988), migrants to the forest "are not just small groups of young farmers looking for larger farms an fresh lands (...), but also farmers pushed out of their former holdings by the development of large-scale, mechanized agriculture; farmers looking for land on which to develop their own commercial or plantation production; long-distance migratory farmers who specialize in opening up new lands and who are forever moving on; short-distance migrants expanding village lands; commuter farmers moving daily to a local periphery; farmers responding to inducements offered to settle on the frontier; war veterans; and even urban-based labourers and others returning to farming or miners and timber cutters engaged in spare-time cultivation." How, it might be asked, would it be possible to build a general model comprising all these types of migrants? First, by leaving out the people such as the commuter farmers and village land expanders, who do not count as migrants in the statistical data; they have to be dealt with in the land use chapter. Second, by leaving out forced migration such as resettlement schemes; they have to be subtracted from migration data when these are use for testing. Third, by abstracting from land use (slash-and-burn, plantation etc.) and focus

purely on migration. And finally, by modest claims with respect to which any model will be able to capture the complexities of the real world. Thus, the model will be built by imaging the decision-making factors of an individual migrant, but a generalized one, in order to capture migration flows at the *aggregate*, statistical level. Contrary to what has been the case with respect to the logging corporations of the previous chapter, this aggregate level suffices for policy-making purposes at higher than local levels.

The Prodigal Son, just to mention another migrant, did not leave his father's house for economic reasons. In other words, many non-economic factors will play a role in individual migration decisions. At the level of aggregate migration tendencies, however, we may assume more safely that economic factors are the major driving forces, as long as we define these factors with sufficient subtlety and validity. Thus, we follow modern migration theories in including obligations of remittances, perceived risks etc. in the formulations of what prospected migrants are assumed to define as 'expected utility' of migration.

Migration flows then are assumed to be generated by the interplay of three 'expected utilities': (1) the expected utility of staying in the rural home area, (2) the expected utility of migration to the urban areas and (3) the expected utility of moving to the forest areas. A low expected utility of staying home is generally called the 'push' factor, while the other two are 'pull' factors. In Annex III, the utilities are modelled as follows.

The *expected utility of staying in the rural area* depends on such factors as the available space left to expand the farms, the expected market prices for the main crops and so on. In Annex III, all these are lumped into a single determinant:

- **expected rural utility = rural income**

in which the rural income may usually be taken from national or regional statistics.

The *expected utility of urban migration* depends on such factors as the expected urban wage, the probability of acquiring some wage-earning employment, the expected family support and remittance, the time horizon of the decision, the necessary investment to establish oneself, and the general attractiveness of city life. In Annex III, these factors are jointly modeled as:

- **expected urban utility = 1 * (1 — p) * (rural income) + 0.8 * 1 * p * wage**

in which:

- 1 = **h** = decision horizon
- **p** = expected probability of employment
- rural income = expected support allowance from rural home
- 0.8 = expected fraction of wage not remitted to rural home area
- wage = expected migrant's wage

and in which the factor **p** can be modelled as:

- **p = 0.1 + 0.05 * (urban economic growth — 2)**

in which:

- urban economic growth = growth rate of migration-relevant sectors
- 2 = growth rate at which no urban jobs (except the 0.1 prob.) are available to migrants.

The *expected utility of migration to the forest fringe* depends on such factors as the necessary investment to establish a farm, the security of tenure, the drudgery and

isolation of forest farm life, the expected production of a forest farm and the forestry sideline activities, and so on. In Annex III, they are jointly modelled as:

- **expected forest utility = 0.8 * 3 * (1 — E) * (farm prod. + forest prod.) / 2 — 0.75 * (rural income) + 1 * T * (farm prod.)**

in which:

- 0.8 = expected quality of life factor
- 3 = time horizon of the decision
- E = expected probability of being evicted or very heavily fined during the three years
- farm prod. = expected net production of the pioneer forest farm, in monetary terms
- forest prod. = expected additional income through forest products, in monetary terms
- 2 = family size (first three years)
- 0.75 = expected years without income (accounting also for capital investments)
- rural income = expected support (to be paid back) from family
- 1 = income equivalent of the capital value of the forest farm
- T = expected tenure factor (if full title, T = 1; if no title at all, T = 0).

The factors E and T express the nature and strength of forest protection policies. In government-sponsored migration, E = 0 and T =1 (no evictions and a title for everyone). If government is absent (no titles but no evictions either), E = 0 and T = 0. Rigorously implemented forest protection policies express themselves as E = 1 and T = 0; in that case, the expected utility of settling is the forest is negative irrespective of the other factors.

A second important aspect of the forest utility equation is that contrary to its urban counterpart, it is highly sensitive to geographic circumstances. Geography works largely through the 'farm production' factor. At a large effective distance to the place where the farmer can meet the market, the cost of transportation of inputs and outputs will be so large that the forest farm income will remain at the subsistence level. This then being combined at the same time with a low 'quality of life' factor because of the physical and social isolation, the attractiveness of forest migration will compare poorly with expected rural or urban incomes. As a result, forest migration usually confines itself to a band of some three to ten kilometres along market-connected roads. The width of this band is economically determined, hence depending on the steepness of the terrain, the type of crop and suchlike factors. Perishable crops and crops with a low value-to-weight ratio will result in relatively narrow settlement bands. Once this band is settled, the forest is economically (hence effectively) 'full', until a new road is constructed or markets shift. Ranching, if an attainable and profitable operation because of markets or subsidies, is an especially dangerous land use type for the forest not only because of the large areas needed to make a living from it but also because it is less roads-dependent than agriculture; cattle can walk to its own market.

At the level of the individual prospective migrant, the actor can be assumed to choose for the one option with the highest expected utility. At the aggregate level of migration flows, however, all three option are seen to be chosen. This is caused by the fact that the expected utilities are *distributed* across the population. Even if all three expected utilities have the same average, some actors will have relatively good prospects at home, and stay in the rural areas. Other actors may be educated younger sons with a low expectation of a rural income but reasonable chances in the city. Others may already have family in the

forest and expect a reasonable income by following their footsteps. Within the rural heartland population as a whole, therefore, some fraction will consider the forest as the first option. The total number of these people will be:

■ **POPfor = POP * fPOPfor**

in which:

- POPfor = number of rural people for whom the forest has the highest expected utility
- POP = total rural population
- fPOPfor = fraction of total rural population with forest as highest expected utility

and in which fPOPfor depends on:

- the average expected utilities of rural, urban and forest migration
- the distribution of these utilities across the population.

The 'POPfor' equation implies, for instance, that a high attractiveness of the cities, caused by high urban economic growth and wages, will result in less pressure on the forest; this may be the major reason why countries such as Korea can maintain a high forest cover in spite of high population densities. Also, we may note that even if the average rural incomes remain the same, migration to the cities and to the forest will increase if the distribution becomes more unequal; a larger number of people in the lower income strata results an increase in fPOPfor, as well as its urban counterpart fPOPurb.

Will people for whom the (modeled) expected utility of forest life is higher than of the other two options really *all* pack up and go? Practice shows that they do not. For example, we may consider a number of actors for whom the expected utility of forest migration is the best option, characterized by being, say, $ 40 per year better than the other two options. If these people have $ 1000 per year already in the rural home area, nothing much will be stirring. On the other hand, if the improvement is the same $ 40 and the actors have only $ 100, the migration flow will be substantial. In other words, we may assume that within the population fraction fPOPfor, people compare the benefit of moving (= expected utility of forest migration — rural income) with what they already have (= rural income), this factor forming the tendency, the urge to really move. Thus, the migration flow to the forest will be:

■ **MIGRfor = a * POP * fPOPfor * (exp. forest utility — rural inc.) / rural inc.**

in which all factors have been defined previously, except the factor **a**. This (dimensionless) factor stands as the 'basket' for the effects of all non-modeled and poorly proxied factors. In a perfect model, this factor will be 1 over all the modelled flows and years. A more realistic criterion of model quality is that **a** be constant.

In the equation, we see the double effect the factors of rural income and expected forest utility. Declining rural incomes, for instance, will increase the number of people considering to move to the forest (fPOPfor), as well as the urgency with which these people will really come to knock on the forest door.

9.2 Forest migration: case studies and conclusions

The three case study field visits have been too short to enable a quantification of the migration model. The model serves, however, to get a more qualitative grip on the

factors that drive the migration flows.

■ In *Cameroon*, the low number of forest migrants can hardly be caused by high urban or rural incomes, in view of the continuously depressed state of the national economy. A low expected utility of forest migration seems to be the most important factor, therefore. Within this utility (ref. the equation in section 9.1), the major role seems to be played by the expected forest farm income rather than by the 'forest policy factors' E and T. There is no forest migration policy at present in Cameroon (probably because the elite prefers to reserve the forest for its own income through logging), and in the past, forest settlements projects (E = 0, T around 1) have met with little success. This cannot be ascribed to a general reluctancy of Cameroonian rural populations to migrate, because in the semi-arid regions, sponsored migration projects attract considerable numbers of people. In other words, a low expected quality of life in the forest and/or a low expected forest farm income seem to be the keys in Cameroon. No data are available (yet) which could indicate whether this is due to low real farm incomes or to more subjective factors such as what people *expect* to be the case and people's interpretation of the quality of forest life. This difference, of course, is relevant for predicting future migration flows.

■ In the *Philippines*, government actors are constantly busy negotiating the factors E and T with the farmers and among themselves. In the current post-Marcos era, high motivations to protect the last remaining forest clash with just as high motivations to understand the short-term needs poor migrants. The result is a plethora of forest-relevant policies and much confusion at the lowest (migrants and civil servants) level. Migrants may receive a long-term lease from the government, for instance, under certain conditions of forest management and arrival before a certain date; on the ground, however, this date continues to shift and the management conditions remain un-implemented. Farmers may find the forest agency being counter-acted by local politicians in search of short-term popularity and larger constituencies. Compared to Cameroon, the relative expected forest utility is relatively high, because the E and T insecurities do not prevent farmers to settle even at less attractive places (relatively far from roads and on relatively poor soils). Our finding that the little success of government is due to double-hearted motivations of the government rather than to the government's *capacity* to prevent settlement is underpinned by circumstantial evidence. First, the case study of Conelly (1992) from an other part of the Philippines shows that once the forest agency has gathered the internal courage and the external blessings to really go ahead, it can be very effective indeed. Secondly, in our own Sierra Madre case study area during the period of insurrection, migrants have effectively been resettled from the forest to the grasslands at the time this was deemed necessary to subdue the New People's Army, i.e. at the time the resettlement motivation was high and consistent. Thirdly, the newly formed inter-agency forest board in the Sierra Madre region, which aims to coordinate the goals and actions of the various line and local agencies, has shown to make a real difference for the forest.

■ In *Ecuador*, government sponsoring of forest migration (E =0, T =1 and promises of facilities to raise the migrants expected quality of life) has proven to be highly effective in the past, as it has been in other parts of the Amazon region such as Rondônia. The present decline in migrant numbers seems to be due to three factors that co-determine the expected forest utility: (1) real farm incomes are probably lower because the best places are settled already, few new roads have been constructed and large areas are brought

under tenure of indigenous people, (2) probably, also people's expectations are lower because it has become more widely known that forest life is hard and does not offer a real escape from poverty, and (3) government motivations (E, T) have declined, *inter alia* because of outside pressures of groups and donors working for the sustainability of the forest and the rights of indigenous peoples.

The case studies hold two points of general interest for global policy making with respect to the tropical rain forest.

- First, it may be noted that the migration events in the case study regions can be explained fully by the *forest-related* factors, combining into the expected utility of forest migration, without taking recourse to the rural and urban factors that co-determine the forest migration according to the model of the previous section. In the well-known terms of 'push' and 'pull' factors, the forest pull factor appears to play the prominent role. Putting the same phenomenon in policy terms, it shows that *the forest can be saved (or converted) by directly forest-focused policies, largely irrespective of general rural poverty alleviation, population control, urban economic development and so on.* Although the model shows that the latter factors do have an obvious long-term relevance for the forest, and although poverty alleviation and economic development are obviously good for many more intrinsic and instrumental reasons than the forest only, the need for rural and urban development cannot be used as an argument to escape from concrete forest protection policies.

- Secondly, forest migration appears to be a dynamic and variable phenomenon rather than an unstoppable force in the face of which governments are necessarily powerless. If government is motivated and consistent, it can move forest migration flows either way. In other words, *global forest policies should focus primarily on the enhancement of national motivations rather than of national capacities ('institution building').*[22] A Global Forest Fund, conceived as in Annex II with a disbursement for every hectare of high-quality forest, is an option designed for this purpose.

9.3 *Forest migration policies: a model illustration*

The model of section 9.1 allows for a more systematic review of the major factors determining forest migration. The aim of this section is to do so, illustrating the first of the general conclusions we just arrived at. After that, we take a special look at the issue of roads construction.

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[22] Indirectly, institution-building can have a motivational impact, especially when geared towards increasing the negotiation power of a forest-motivated agency vis-à-vis other agencies and central government (ref. case study Ecuador), or towards inter-agency coordination to overcome contradictory motivations (ref. case study Philippines). Such a conceptualization of the aim of institution building is still different, however, from viewing institution building as a general *panacea* without having a critical look at what government is in fact really able to do already if it were motivated.

Ceteris paribus, forest migration will increase proportionally with the size of the population ('POP' in the equation). Primary actors here are obviously the individual women and men deciding on child numbers, but important secondary actors are, for instance, the state and the churches. The range of effects of these decisions and policies varies between, say, a stable population or a doubling in 30 years. This is a *low* dynamic relative to what is necessary and what is actually important to the forest. To start with the former, current deforestation rates are such that the tropical rain forest will basically be gone in 30 years time; the dynamic of deforestation changes will *have to* be much higher than a factor of two in 30 years. Secondly, if we take a look at what is actually happening with respect to migration flows to the forest (and sometimes out of the forest), we note that within the time span of a few decennia, the slow curve of general population growth is overlain by processes of a much more rapidly changing nature. The general cause of that is that through the 'fPOPfor' and '(forest utility — rural income)' factors, migration is generated by utility *differences* rather than by utilities per se. Even if urban wages, rural incomes and forest farm incomes would not vary more rapidly than the population as a whole, their differences will.

The factor 'fPOPfor' is determined by the averages and distributions of the expected rural, urban and forest utilities. We first discuss the urban factor, that is unique to fPOPfor.

It may be noted that the equation of the expected utility of urban migration does not contain factors E (eviction) and T (tenure). This is not to deny that evictions and tenure insecurity do not exist in the rural areas. They only do not occur in the model because it is assumed that these factors do not play a significant role in the prospective migrant's decision. The reason is that contrary to the situation in the forest, these factors do not touch upon the key of the new urban arrival's life, that is, his income from wages, trade or whatever. He does not own more than a bed of the tenure on which to be concerned about and if evicted, he moves to some other squatting area. As a result, urban migration is not very susceptible to direct, physical policies. The factors it does depend on (urban wage, likelihood to be employed etc.), if manipulatable by government at all, are manipulatable only by general economic policies. Seen from the forest perspective, it should be supported that these policies are equitable, supplying the urban migrant with a life as decent as possible.

Rural income plays a role in both the 'fPOPfor' factor as well as the 'tendency factor', (forest utility — rural income)/(rural income), at the end of the model equation. For both, the migration to the forest increases if rural income decreases. Rural incomes depend on factors which are more or less analogous to those of the urban utility, such as markets, exchange rates and the degree to which government investments and subsidies favour the cities or the rural areas (the 'urban bias'). Somewhat hidden in the model because of the simplification of equating expected rural utility to rural income are two important factors. The first is the sustainability of the agricultural environment, especially the soils. Soil erosion and degradation are obvious triggers of rural out-migration, while successful rural development projects may have the reverse effect of spontaneous in-migration. The second factor is the land ownership distribution. Large estates are often managed for profits only (e.g. through cattle), coinciding with low soil productivity and hence low population densities; land reform would shift land use towards small-farm agriculture

resulting in more people being taken up in spite of possibly lower labour productivity. Especially dangerous situations occur if landlords begin to fear that tenure claims of farm hands and tenants might become successful; they then tend to evict these people and shift to even more extensive land uses. In other words, land reform programmes are good for the forest if executed quickly and consistently, but land reform plans which are in fact not implemented may have the reverse impact.

Obviously then, rural development policies can do much to decrease migration pressure on the forest. On the other hand, densely populated rural heartlands will usually continue to display a tendency of net out-migration. Therefore, it will continue to be crucial that the rural outflow will tend towards the cities and not to the forest. In model terms, fPOPurb should be as high as possible relative to fPOPfor, and this in turn means that the expected utility of urban migration should be as high as possible relative to the expected utility of forest migration. The urban utility being hard to influence, forest policies will have to focus on the expected utility of forest migration; fortunately, the previous analysis has shown that this can be successful indeed.

The importance of the factors E (evictions, fines etc.) and T (tenure of forest farm land) has been discussed already. Annex III gives a number of sensitivity exercises relating the necessary levels of E and T to the 'push' factor of urban income, illustrating that if rural incomes are relatively high with respect to forest income, E and T policies may be relatively relaxed without the forest being encroached upon. This changes, however, if rural incomes decrease. Setting the forest (family) income at 3500 and setting the factor T at zero (= no tenure), for instance, the balance of forest migration, rural income (per capita) and E is:

- if rural income = 2000, forest migration = 0 irrespective of E
- if rural income = 1000, forest migration = 0 at $E \geq 0.11$
- if rural income = 700, forest migration = 0 at $E \geq 0.38$
- if rural income = 300, forest migration = 0 at $E \geq 0.73$
- if rural income = 100, forest migration = 0 at $E \geq 0.91$.

A level such as E = 0.91 means that almost every newcomer will have to be harassed, fined, evicted and so on. The level of very deep rural poverty this coincides with will also means that fPOPfor will be very high and with that the numbers of people entering the forest in search of livelihood. The overall picture then is that politically acceptable levels of forest protection policies will fail, and the forest will be overrun, if 'normal' rural poverty turns into rural despair.[23]

The construction of roads connects forest areas to markets. We may use the model of section 9.1 to get a general grip on the impacts of roads. For the sake of the analysis, we assume that at a distance of 10 km from the road, the distance that people have to travel with farm inputs and farm outputs is such that the farm income is effectively zero. Then,

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[23] One example is Rondonia, where the enormous influx of migrants was not only attributable to migration-inducing government policies in the forest area ('pull'), but also to the shift towards mechanized soy bean production in the rural heartland, pushing out large numbers of unemployed rural labourers.

assuming a certain level of rural income (per capita) and forest farm income (per family) at the roadside (distance = 0 km), we can calculate to which distance people will settle depending on the forest protection factors E and T. The picture is, if rural income is 700 and forest farm income is 3500:

- sponsored migration (E = 0, T = 1): people settle up to 7 km from the road
- unregulated migration (E = 0, T = 0): people settle up to 4 km from the road
- slightly counterbalanced migration (E = 0.2, T = 0): people settle up to 2 km from the road
- strictly counterbalanced migration (E = 0.4, T = 0): people settle up to 0 km from the road (= no migration).

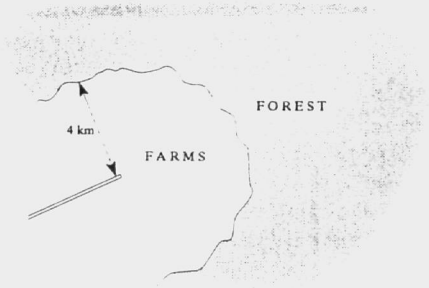
Figure 4 puts this into geographic terms. The picture on top (figure 4A) depicts the initial situation at the head of a tarmac road and no significant forest policies (E = 0, T =0), hence a forest boundary at 4 km from the road head.

In figure 4B, the rural roads are improved so that the settlers are better connected to the tarmac roads and with that, to the markets. This is a significant improvement of rural livelihood and it may in fact induce the settled population to more sustainable land use practices (ref. Chapter 10). At the same time, however, the rural roads will tend to attract new settlers intending to set up their farm behind those of the present settlers. This is because the rural roads have extended the 'profitable distance' from the tarmac road from 4 to, say, 6 km. In other words, a new band of 2 km of forest will tend to be lost. Some forest protection policy will have to be installed to prevent this from happening. What could this policy be? One way to do this is by straightforward, physical forest protection, i.e, fines, evictions and the threats thereof. It is quite likely that such policies will be successful without being harsh (E = 0.1); if prospective migrants are convinced that policies are really implemented, they may not even come.

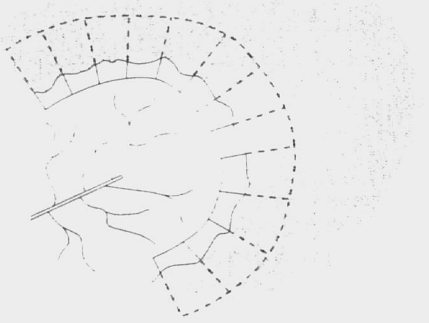
A second way to reach the same result is often called the 'social fencing' principle. In our case, the proceeding would be to give full but regulated tenure of a 2 km forest stretch to the farmers settled closest to the forest fringe. Regulated tenure here means full tenure in the sense that the owner can fully avail of the property (hence sell, split, inherit etc.), but that the *use* of the property is restricted.[24] The restriction of use in this case, of course, would be that the forest remain forest. Figure 4B gives the geographic lay-out of such a closed band of forest properties. The result of this arrangement is that new arrivals can settle only at a distance of 6 km or more, for which they are not motivated even if they would not be evicted (E = 0). In the 'social fencing' case, the task of the government would be to ensure that the forest owners, be they private or collective, comply to the land use restriction. Compliance can easily be monitored from the air; all kinds of activities which are difficult to monitor from the air, such as extracting minor forest products or becoming rich as an ecotourist operator are not prohibited, after all. On the contrary, the more profits the owner extracts from the forest the better will be the compliance.

The bottom picture of the figure (4C) shows the situation after the tarmac road has been extended into the forest. In this case, the new farm sites that become available are not relatively marginal ones between 4 and 6 km from the road, but places right on the

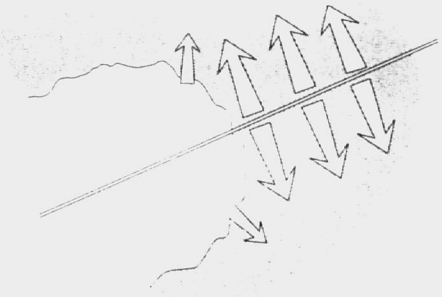
[24] This type of tenure is normal in industrialized countries, where one may own a wetland but not be allowed to drain it, or own a city house but not be allowed to change it in a high-rise hotel.



4A : No forest protection, settlement distance from road is 4 km.



4B : Improved rural roads, settlement distance would increase to 6 km, hence forest protection necessary, e.g. by 'social fencing' as shown, with tenure of settled farmers extending 2 km into the forest. The interrupted lines indicate these forest tenures.



4C : Tarmac road extended through forest, hence high migration pressure (arrows); forest will be lost, except when very strict policies of forest protection are applied, which will usually be impossible.

Figure 4. The migration effects of feeder roads and through-forest roads.

tarmac, hence with a highest possible expected utility. The migration pressure therefore will be much higher. In the aforementioned numerical example, the eviction factor E would have to be 0.4 to prevent settlement. This is certainly not impossible per se, especially if forest-motivated local people are handed over the (collective) tenure of the forest area in question, so that not only government but also they can be involved in settlement prevention. But even then the risks are large. Indigenous people can hardly be blamed, for instance, if they tend to sell out if migrants come to bid a high price for plots near the tarmac. And at the scale of kilometres perpendicular to a road that is many kilometres long, a tropical rainforest needs to be cut and burned only once to be forever lost. The situation of a long road through the rainforest therefore, being inherently unstable, awaits only one severe depression in rural incomes or one political whim to turn into large-scale forest destruction, especially in the longer run when rural populations have increased, even if current forest protection policies may prevent settlements on the short run.[25]

Concluding on the roads issue, it can be said that:

- The improvement of rural roads in a forest fringe area may induce farmers to move toward more sustainable land use. At the same time, they create a tendency for new forest settlements, situated at a larger distance from the main road. It may be expected, however, that this tendency can be averted if government is active, either by way of physical forest protection policies or by way of 'social fencing'. More information follows in section 10.5, after a more thorough discussion of land use changes.
- Roads *through* forests are a large-scale risk, even if indigenous people hold collective tenure over the forest. The risk can be averted only by continuous, vigilant and strict forest protection policies, and it is highly questionable if such policies can be supplied especially at the long run that is needed.

[25] An Environmental Impact Assessment, the obligatory drafting of which is sometimes proposed in cases like these, is capable to highlight the direct physical impact of the road but incapable to grasp the real, indirect and long-term risk.

10. Forest Land Use: Tragedy or Transition

This chapter will not focus on people's decisions of migration to the forest, but on their choice of what to do with the land once they are there. The most important background fact with respect to people's land use in the forest is that overall, it is unsustainable, the cause of vast areas of wasteland where once was the rainforest, and all that without lifting people out of poverty. To start out, a short note is necessary with respect to some core characteristics of land use systems (section 10.1). In section 10.2 we then give some examples of places where the people and forest appear to have escaped from the land use tragedy. In section 10.3, this phenomenon of transitions is given a deeper footing in theory, setting the scene for section 10.4, which comprises a relatively exhaustive treatment of the factors that help communities to leave the road of tragedy. In section 10.6, this is translated into some guidelines for global and national forest policies. Some of these guidelines will be straightforward. Other issues, however, escape a simple judgement because they are focal points of subtle dilemmas, especially when also the aspects of logging and migration are drawn in. Roads and tenure are the prime examples here. With respect to these transition issues, therefore, the conclusions - contrary to those on logging and migration - state that national governments should be stimulated to embark on lower-level (regional, provincial) programmes for land use transition, supported by a globally organized scientific input.

10.1 Land Use Systems

The most typical type of forest land use is called 'slash-and-burn' in this report, and often 'shifting cultivation' or 'swidden agriculture' elsewhere. Slash-and-burn is particularly suited to forest environments because in the forest, the far majority of plant nutrients is tied up in the vegetation, and only very little of it is stored in the forest soil. Cutting and burning the trees then releases these nutrients and makes it possible to grow crops. This lasts for some years until the nutrients are more or less depleted. Then the swidden is left fallow, and the forest usually regrows (first the pioneer species, then the species of the secondary forest, then the species of the primary forest). Contrary to popular belief, slash-and-burn cultivators prefer to make swiddens in secondary, not primary forest. This is simply because the large trees in a primary forest are very hard to cut and burn. Thus, after having established themselves in the primary forest and having cleared a number of swiddens there, slash-and-burn cultivators tend to return to old swiddens that have regrown into secondary forest, if these old swiddens are indeed old enough and not claimed by other immigrants in the meantime. Slash-and-burn cultivators, therefore, are not intrinsically 'shifting cultivators' in the sense that they necessarily continue to eat their way into the primary forest.[26]

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[26] Van den Top (1995) describes a different case in the Sierra Madre mountains (Philippines case study area), where old swiddens that supply enough ash are rare, where the forest is already logged-over and hence easy to attack, where chainsaws are in abundant supply and where farmers

The *sustainability* of slash-and-burn agriculture depends on several factors. (1) The size of the swidden; if swiddens are large, the sun will burn the soil, there will be less forest seeds and it will take more time for the forest to re-establish itself. (2) The length of the period of cultivation; if the farmer leaves after only a few years, sufficient nutrients will be left for the forest to re-establish, but if the farmer truly exhausts the soil, the forest may never return. (3) The length of the fallow period; if the fallow period is long enough (15 to 25 years), soil fertility will have been restored when the farmer comes back; if not, the soil will decline further at each successive cultivation period. Usually, small swiddens, short cultivation periods and long fallows coincide under conditions of relatively abundant land. The system is called *long-fallow* slash-and-burn agriculture.

It is difficult to intensify slash-and-burn systems other than by doing more of the same thing. What usually happens then when population densities rise is that swiddens grow in size, are cultivated longer and are left to a shorter fallow period (2 to 5 years). This system is unsustainable and will leave a grassland or a wasteland on which the forest or any other valuable vegetation will take a long time to return.

The change from long fallow to short fallow farming it not something farmers prefer by themselves. This is because *labour productivity* (roughly, kg of crops per hour of work) is the first concern of the farmer, and the labour productivity of short fallow systems is lower. The only advantage of the system is that initially, before soil degeneration sets in, the system has a higher return to land (kg of crop per ha), and hence serves as a response to population pressure.

Forest land use systems (slash-and-burn, cattle pasture, agroforestry etc.) may be analyzed by means of the three dimensions touched upon above. They are:

- High or low **labour productivity** (= profitability = return to labour = kg of crop per hour of work or other input). This is most often the core factor in the farmers' motivation.[27]
- **Intensive or extensive** system. This may be related to either the input side (labour and capital input per hectare) or to the output side (= return to land = soil productivity = kg of crops per hectare). Input and output intensity are often related, but not necessarily so. As said, the intensity tends to be related to population density. Roughly, the output intensity determines how many people can live off the land, and the input intensity determines how many people are needed to keep the system going. Reversely in forest lands, the intensity factor also determines *how much forest is converted* per forest inhabitant; intensive systems take up less forest per person.
- **Sustainable or unsustainable** system. This is the degree to which a given land use

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are under pressure to claim as much land as they can by clearing it. In that case, farmers prefer to burn the forest instead of old swiddens.

[27] Interestingly, many farmers also see land use intensity as a value in itself, connected to the 'ethics of care' mode of reasoning. In the analysis of Bouma and Van der Ploeg (1985; ref section 10.4), the 'I' type of farmers take pride in high yields as a value in itself, distict from labour productivity.

system can physically continue.[28]

On these dimensions, current forest land use systems may be characterized as follows:
- Long-fallow slash-and-burn: profitable, extensive, sustainable
- Short-fallow slash-and-burn: less profitable, more intensive, unsustainable
- Cattle pastures: profitable (if subsidized), very extensive, unsustainable
- Agroforestry: may be profitable, relatively intensive, sustainable
- 'Naranjilla' as in the Ecuador case : profitable, intensive, unsustainable
- Small-scale irrigated rice, as in the example below: profitable, intensive, sustainable.

What forest protection policies aim at, of course, is the adoption of intensive and sustainable land use systems. Farmers, on the other hand, are driven and bound by the profitability criterion. The question then is, how these criteria relate to each other and how they may be matched.

10.2 The transition phenomenon

If we take a look at the land use systems in the three case study areas, we see unsustainable swiddens, unsustainable *naranjilla*, unsustainable pastures, forest burning .... and people in poverty, moving on when the soil is exhausted. The overall picture of the tropical forest worldwide is that of tragedy for nature, people and world climate. On a smaller scale, however, we may sometimes venture upon a very different sight.[29] The most interesting of these places are those where sustainable land use systems have developed that are intensive at the same time, hence supporting many people without the risk that these people once may turn against the forest. And even more interestingly, many of these systems have been developed by people who arrived as pioneers and started out with slash-and-burn only one or two decades earlier. In this section, some of these

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[28] In model terms, deforestation is determined by these factors as:
DEFO = N*E*U*P*H, in which:
N = number of people
E = extensiveness of the system [ha/kg crop]
U = unsustainability of the system = fraction of land going out of production per year [1/year]
P = labour productivity [$/hour]
H = number of hours available [hours/year per person]
(or alternatively take income in crop equivalent terms for H*P [kg crop per person]).
The outcome of the equation is in ha of deforested land per year.

[29] The surprise of researchers is neatly described by Amanor (1994), writing on the forest frontier area of Ghana. "One research technique during the survey was to ask farmers to assess the number of different species of trees growing on their farms. As we approached the village [coming from the forest area] this exercise became increasingly perplexing: the more open the environment appeared, bereft of a canopy of forest trees, the more species of forest trees, climbing into the hundreds, the farmers claimed to have on their land. But as we carefully looked round farms we began to find innumerable quantities of small trees often less than a meter tall. (...) Farmers are taking steps to combat the savanna with its dreaded bushfires. (...) The major centres of this innovation towards new agroforestry techniques appear to be the most degraded lands."

histories will be focused on.

Conelly (1992) describes a case on Palawan island in the Philippines, where slash-and-burn farmers shifted to more sustainable land use. The area was settled in the 1950s, and the farmers practised slash-and-burn in the coastal zone forest until land scarcity began to be felt in the early 1970s. This scarcity was especially acute because of two factors. First, a 40 km road was constructed that connected the village to Puerta Princesa, the small but booming island capital; this road brought in a new wave of immigrants. Second, the forest agency had begun, with un-Philippine consistency, to protect the surrounding forest. As Conelly puts it: "Local forestry officials started to effectively enforce Philippine legislation prohibiting the clearance of forest land (...). In neighbouring communities, large groups of farmers were arrested and imprisoned in Puerta Princesa for illegal clearing." Thus, it seemed, the farmers were stuck; they were forced to shorten the fallow period of their slash-and-burn plots, and yields plummeted because of the resulting decline of soil fertility. At the same time however, the road also brought the connection to a market for new crops. By 1980, a rapidly growing minority of the farmers had switched to small-scale irrigated rice on the low-lying soils and fruit trees on the slopes. Half of these families had received full land titles at that moment, and the others were applying; in fact, they used their good behaviour on the land to reinforce their tenure claim vis-à-vis the forest agency.

Fox (1993) describes how villagers in the middle hills region of Nepal, who had very severely degraded their forest in the 1970s, organized themselves to rehabilitate this resource. In 1990, the wood volume on the 73 ha of communal forest had increased from 600 to 3400 m^3, and on the 39 ha of government forest from 4000 to 7000 m^3. During the same period, the population rose from 653 to 835 people. The regeneration of the forest had been brought about not by decreasing livestock or firewood use, but by investments in fodder trees on the villagers' private plots and by collectively regulating the forest exploitation. In their turn, these changes were facilitated by four coinciding factors:
(1) A road to town was constructed in 1980. The road brought fertilizer, new ideas and the opportunity to supplement incomes by off-farm activities.
(2) A law was passed at end of the 1970s, that villages could apply for tenure over government land. Although the village never went through the paper work, informal understandings were such that the village felt to have secure *de facto* tenure.
(3) The degradation of the forest had become directly visible to the people and felt in their incomes; moreover, NGOs stimulated the awareness that something should be and could be done.
(4) A traditional, 'top-down', USAID-sponsored forest rehabilitation project effectively prohibited grazing access to the forest for four years; inspired by the results, the village established its own forest management committee after the project was finished in 1984.

Fujisaka and Wollenberg (1991) describe the history of a place in the Philippine uplands relatively close to Manila, where the forest had been logged up to 1980. After that, pioneer settlers moved in (illegally) and further depleted the forest, cutting and selling the remaining small trees and burning it to establish swiddens for subsistence crops (rice) and cash crops (tomatoes). To the farmers' dismay, these crops did not grow well at all, due to a combination of high soil acidity (pH down to 4.2), weeds and pests. The farmers, being of forest region origin, knew the crops that could survive in these situations, and

planted root crops, banana, pineapple, coffee, citrus and cacao - eventually resulting in what are now multi-storey agroforestry plantations. During the meagre years in which the plantations did not produce yet, people made a living from logging, remittances from outside, wage labour and carpentry. All this, as Fujisaka and Wollenberg note, happened *without people acting as a community in any way, and without consistent government or* NGO support. "The most obvious feature of the social landscape in Calimoe were resource-competing factions (...). Resource access was characterized by inter-factional conflict and an 'us-before-them' attitude. Competition and conflict were exacerbated by ambiguous local, provincial and national government policies and jurisdictions."

Although from a semi-arid region, the spectacular transformation of Machakos district in Kenya may be mentioned too (Mortimore *et al.*, 1993). In 1937, it was reported that its 250,000 people were "rapidly drifting to a state of hopeless and miserable poverty, and their land to a parching desert of rocks, stones and sand." In 1990, the population density had tripled, but the average farm incomes *per capita* had tripled as well! In physical terms, this was achieved by a massive investment (mostly by women) in terracing for soil and water conservation, organic matter management, tree and fodder planting, crop experiments and so on. No problems of sustainability are envisaged.

Many factors are supposed to have contributed to this 'miracle of Machakos'. The land shortage, of course, but also remarkable leadership and the spirit of cooperation between Machakos women (De Groot, 1992). One other factor has generally been acknowledged to have been of crucial importance as well, i.e., the connectedness of the region the outside world. Good roads to urban markets provided the crops outlet, and young men who had travelled brought back money and ideas.

These cases are examples of what is usually called *'agricultural transition'*, a concept that draws attention to the fact that people can make rapid changes from unsustainable to sustainable agriculture, even in the face of - and sometimes, researchers claim, ***because*** of - increasing population densities. Because of its obvious relevance for the tropical rainforest, this chapter will focus on the transition phenomenon.

The term 'agricultural transition' is an extension of the well-known concept of demographic transition and belongs to the same field of 'population-environment dynamics' theory (e.g., Ness *et al.*, 1993), that is in fact as old as Malthus. We take a few elements out of it here. Malthus' vision was basically simple; if people are capable of multiplying without limit, and if the land has only a limited capacity to produce food, what can be the escape from disaster? Boserup (1965) has been the most recent advocate of a very straightforward answer to this question: more people! Based on historical and economic analysis of agricultural systems, Boserup asserted that if population densities grow, so do the human capacities and motivations to innovate and find a new level of productivity. The difficulty with this answer is that also the Malthusians command a set of impressive examples of groups, island populations and whole civilisations that fail tragically and then either migrate of vanish from the earth (e.g., Ponting, 1991). It being apparent that both the road to tragedy and the road of transition may be taken, it seems that rather than to continue the debate of 'Malthus *vs* Boserup', it is of more importance to find out which of the roads it will be under what circumstances.

10.3 Transition theory

When population densities in a region rise, more mouths have to be fed and the need arises to increase the *output* intensity (soil productivity) of the land use system. More mouths also mean more hands and more brains, however, and the rising population thus may provide for the solution at the same time, namely, to increase the *input* intensity of the system, putting to work the abundantly available hands, or to innovate towards a new type of land use. In 'Action-in-Context' terms, people then have both the motivation and the option of intensification. What, however, if all labour is in fact tied up to *maintain* the current system, that may require more and more labour because of environmental degradation? And what if innovation requires cash capital to invest, which may simply not be available? And what if the poor farmers are motivated but lack the options, while the rich farmers have the options but are not motivated, because they are safe on their large holdings? Factors such as these will determine which road the region will take.

Blaikie and Brookfield (1987) supply the inspiration to systematize these factors; in fact, we have taken the whole image of 'tragedy or transition', i.e., the point in time that the histories of communities, regions or civilizations may go into either Malthusian of Boserupian directions, from them. They do not draw the full consequence from the distinction between input intensity and output intensity, however, and this seemingly academic detail precludes a clear-cut conceptual framework. The names they attach to the two roads of response to population increase are 'intensification' versus 'innovation'. *All* responses are forms of *output* intensification, however, because there are more mouths to feed. Thus, the major distinction is determined what will happen in terms of *input* intensity.

- The first response is to simply work harder without qualitatively changing the system. This is the case, for instance, with the decreasing fallow period in the forest, and also with the famous 'involution' (Geertz, 1963) of the irrigated rice system of Java. In this case then, input intensity rises in approximately the same degree as does the output intensity (production per hectare) — until some limit is reached, which may be either the collapse of the ecosystem (as in the forest) or the maximum 'photosynthetic' production per hectare, that can not rise anymore irrespective of how much labour is put in (as on Java). During the process, *labour* productivity, being the output intensity divided by the input intensity, does not rise and in fact usually declines slowly, until the limit is reached and incomes drop even further. The crucial thing to note here is that *by the time this happens, people may be too poor and the environment too degraded to enable a cross-over to the second response.* People are stuck in the 'circular tragedy' as Agbo *et al.* (1993) call it.
- The second response is innovation, i.e. the switch-over to a different system, one that provides for an increased output intensity (production per hectare) without requiring the same increase in input intensity. The motivation to do so, of course, is that if the switch is successful, labour productivity has improved along with the output intensity. (This explains why innovations may occur also when population pressure is in fact absent). And the reason not to innovate, apart from lack of knowledge, prohibitions or other less numerous factors, is that *innovations require investment.* In order to go into labour-consuming terrace building, or buy fruit tree seedlings and take care of them before they start producing, or to organize and construct a community irrigation system,

some surplus of resources has to be there, in the form of surplus labour, capital, social cohesion, knowledge or other forms (which usually are mutually exchangeable to a large extent).

Summarizing (and borrowing the term of Geertz), the two basic responses to population pressure are:

- *Involution* (= increased outputs by doing 'more of the same')
- *Transition* (= innovation = increased outputs by a qualitative system change).[30]

In the real world, the basic mechanisms work out in a myriad of different ways. Also, people sometimes find a technology in-between of the two simplified extremes,[31] or they may start transition on one part of their land while continuing the old system on another, thus creating a very gradual transition of land use.[32] Assuming that the basic mechanisms are not fundamentally different in these cases,[33] we leave the general analysis here, however, and turn back to the forest.

It may be noted that the sustainability of a land use system is a variable that cannot be equated to the involution/transition dimension. The short-fallow slash-and-burn system is involuted and unsustainable, but the rice system of Java is involuted and sustainable. In that sense, the title of this chapter, 'Tragedy or Transition', may seem misleading. It is true indeed that at the regional and local levels, forest policy makers should never go blindly for any transition *per se*. At the general level of global policies, however, and specifically for the forest, transition may be seen as to *sufficiently* coincide with sustainability, and involution with unsustainability. The currently predominant land use systems and the transition examples of the previous section may act as sufficient proof for the

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[30] An expansion of the area of land under agricultural use is often also mentioned as a response to rising population. In the conceptual structure of this report, however, this phenomenon is comprised the analysis of *migration*. Conceptually, there is no essential difference between people going to a new area and start a farm there, or stay in the village and open up new land to expand the farm; both imply a spatial speading of the farming system. This implies that a full predictive analysis should always include the migration/expansion component as well as the 'involution *vs* innovation' component, e.g. in a single-step analysis with four simultaneous options of (1) expand on new land, (2) migrate to new land, (3) involute on existing land and (4) innovate on existing land, or in a two-step analysis in which a farmer is assumed to exhaust the expansion option first.

[31] In the forest, the 'planted fallow' is an example; farmers then plant species on the fallow with a low nutrient demand and yet an attractive product, such as rubber or oil palm. The soil then regenerates and delivers crop value at the same time.

[32] See, for instance, Filius (1995) and Wiersum (1994) on the increasing role of trees in upland farming systems in Indonesia.

[33] We may quote, for instance, from the summary of Filius (1995), with our remarks between the [ ] signs: "The expansion of the tree growing component in the farming system in recent decades (...) is explained by an increase in the productivity of staple crops [= 'income during transition' in section 10.4], the government's trade and pricing policy supporting a favourable market trend for tree products [= 'medium-term benefits' in section 10.4], and improvement of physical infrastructure [= roads, again]."

time being. For this reason, we feel free here to simply refer to 'transition' or 'transition towards more intensive and sustainable land use systems', as opposed to the tragedy of unsustainability.

10.4 Transition factors

In this section, the examples of section 10.2 and the general observations of section 10.3 will be joined, aiming to get a more systematic grip on the factors that decide on what will happen at the junction when either the road to tragedy or the road to transition is taken.

Ranching in transition?

First, it has to be noted that all the transition examples of section 10.2 concerned agricultural, not ranching situations. Cattle was present in the Nepali village, but these were a few head per family, integrated in the farm to supply milk, manure and so on. Also in our Cameroon, Philippines and Ecuador case study areas, the few signs of transition that we could note concerned agricultural communities and not, for instance, the farmers in Ecuador who strive to become a rancher and invest all they have in livestock. Therefore, it seems, we have to deal with the ranching problem first.

As described by Hecht (1993), the 'logic of cattle' is its profitability, that is, its high returns to labour, which has often been heavily subsidized as a mechanism to transfer public funds into private elite hands. Although the output intensity is very low and hence very large forest areas have to be cut in order to sustain one family, the input intensity is even lower, requiring (on the large holdings) only a one man per 1000 or so hectares. This feature holds even if the pastures would be sustainable, which they are in exceptional cases only.[34]

Would a transition towards more sustainable and more intensive cattle husbandry be possible? Sanchez *et al.* (1990) report on research and field trials of legume/grass pastures adapted to forest soils, pointing to that sustainable pastures are technically possible. In practice, we just do not see it happen anywhere, however. Ranchers (as yet) reject the sustainable options because the more intense inputs required for such pastures are not offset by sufficiently raised outputs (Hecht, 1993).

For the time being then, the global policy attitude towards ranching in forest areas should not be complicated by hopes of transition. Even if pastures would be sustainable, there is still the difference of intensity. What could be the justification to have 2 cows on a parcel of, say, 5 hectares, instead of either one farming family or the world's most valuable ecosystem? Ranching should be banned from the forest, and the pastures that are there, abandoned or not, should either be reconverted into forest or converted into (sustainable) farming.

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[34] Already in the 1980s, at least 20 per cent of the 4 million hectares of Amazonon ranchland had been abandoned (Filho, 1986), leaving only weeds to grow on the exhausted and compacted soil. Hecht (1993) reports this figure to be as high as 50 per cent. On these soils, a return to forest will take some 300 years (Uhl *et al.*, 1988).

In Conelly's example from Palawan, several factors may be noted that have contributed to the transition. First of all, there were *options*: there was capital and labour to invest, there was knowledge of how to construct small-scale irrigation, there were fruit tree seedlings, and so on. Second, there were *motivations*: the road had connected the village to interesting markets, tenure claims could be strengthened by sustainable behaviour and probably just as importantly, the forest agency was effectively busy to close off the option of forest destruction, which was the pathway the people probably would have chosen because it could be travelled without investments. In an important way then, the community was lucky to face this strict government; it forced them to abandon the involution road before they would have become too poor, and the environment too degraded, to make the switch.

This phenomenon is even more visible in the example of Fujisaka and Wollenberg, be it that the task of closing off the involution option here was performed by the ecosystem itself, 'refusing' the slash-and-burn crops. This force was so strong that people went through the transition without government stimulus, without an easy access to markets, without *de jure* tenure and without community-level action.

In the Nepali village described by Fox, many elements of this pattern return, such as the road that provided the opportunity to earn the necessary capital, and even the stimulus of authoritarian, 'top-down' forest use restrictions. Differences are there as well, however. The forest had to be severely degraded before people took action, for instance. And community-level action, stimulated by NGO work, was necessary to make the transition step.

Also the Machakos case, in its own way, displays these crucial elements. One factor, for instance, was the successful internal mobilisation of the resources of the poor, that is the spirit of cooperative labour, self-help and experimental development of knowledge, supplemented externally by remittances, markets and a large-scale but fairly participatory government programme. The awareness factor certainly played an important role here too; people knew that things could not continue the way they did, even to the extent that they overcame their traditional reluctancy to engage in soil and water conservation work, associated as it had been with forced labour during colonial times.

Building an actor-level transition model is an obviously challenging aim for long-term research. Here, it is possible only to try to arrive at a listing of transition factors that is as systematic and unbiased as possible. We will again take recourse to the 'Action-in-Context' framework for this purpose, because it has been designed expressly to be as systematic and unbiased as possible.[35] The 'Action-in-Context' element we will use is

[35] Making a clear distinction between options and motivations, for instance, the framework is neither 'options biased' (thinking that people, firms or governments will automatically start doing the good things if only they would get rural credit, 'institutional capacity building' or other support), nor 'motivations biased' (thinking that people, firms or governments will automatically do the good things or drop the bad ones if only these are subsidized or levied enough; if people do not

not the 'actors field' concept that has shaped much of the previous analyses, but the 'deeper analysis per actor', designed as a guide to get a better insight in actor's decision-making after the first survey of the actor's options and motivations (De Groot, 1992, p. 331). We will refer especially to what has been called the "third layer of analysis" by De Groot, in which the two simple concepts of 'options' and 'motivations' are separated into four more differentiated ones. All four have a clear-cut connection to the various types of policy options ('policy instruments'; De Groot, 1992, p. 367). Underneath, first come the definitions, then the application to transition of forest land use.

- (1) **Potential and implementable options**. Potential options are defined as all actions the actor could conceivably do, if he availed of all necessary knowledge, power, funds and so on. The implementable options then are the ones he can in fact choose between, given his resources.
- (2) **Autonomy**. Autonomy is defined as precisely what makes this difference between potential and implementable options; it is 'the degree to which you can do what you could do'. Autonomy may be separated into (1) a set of positive resources, which may be summarized as the actor's economic resources, social 'capital', knowledge, moral resources, organizational capacity and so on, and (2) a set of negative restrictions such as prohibitions, taboos, denied access, the conditions set by a permit or a contract, and so on.
- (3) **'Objectified motivations'**. This somewhat ambiguous term refers to the motivational factors in the actor's decision making, 'objectified' in the sense of being put as much as possible in simple quantitative terms such as costs and benefits in monetary units, yields in kg per hectare, working time in hours, and so on.
- (4) **Interpretations and interpretative frames**. Analogous to the relation between autonomy and the two types of options, 'interpretations' make the difference between the objectified motivations and the motivations as they really are for the actor. Work is not simply measured in hours only, for instance; there is 'good work' (e.g., dynamic work, men's work, status-rich work, work that helps the community, convivial work) and bad work, and that makes a lot of difference in the working hours as they really count for the actor. Crops are not just kilograms and calories, but kilograms of things that taste good or bad, that belong to being home, that round off a real meal, and so on. And even money - some of it tastes bad, and some of it counts double. At a somewhat deeper level, interpretations are connected to the 'HEC' domains of reasoning, to self-images and culture; they are called 'interpretative frames' in Action-in-Context terminology.

The transition examples of section 10.2 display many linkages to this enumeration. A more formal and complete listing follows underneath, focusing on what the farmers themselves will find important. The normative perspective of the forest policy makers is briefly referred to in section 10.5.

(1) Potential options

Of the potential transition/involution options, one section is formed by the transition

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have the options, they will do neither). Moreover, the framework tries to capture both the economic and the cultural motivations of people, micro and macro factors, and so on.

options the farmers could conceivably be motivated for, but do not know (yet). The obvious policy instrument connected to this is research into new agroforestry systems and other sustainable forest land use systems, and extension of these systems to the farmers. The transition examples indicate that the role of this strategy of scientific technology development should not be over-estimated, however; in all cases, the farmers went through the transition largely on the basis of their own 'local' knowledge.[36]

Rather, it seems that the options known to farming communities, if needed, may usually be increased more efficiently by simple and direct means, either applying current agronomic knowledge to give site-specific advices to farmers, or building on knowledge generated by farmers elsewhere, e.g. by farmer-to-farmer visits. More intense research may be needed, for instance in a 'participatory technology development' approach, when situations and aims are relatively novel, e.g., when there is a need to transform degraded grasslands into sustainable and viable farms.

(2) Autonomy

In the theory section (10.3) as well as the transition examples, autonomy is a crucial factor, both in its positive aspect of resources and in its negative aspect of restrictions. Transition requires investments, and one way or another, surpluses were present in all transition communities, either internally or externally generated. It may be noted also that all four transitions were basically unsubsidized. Even in the Machakos case, where the government programme did help in some of the heaviest work, people's own labour was unpaid for. This is not to say, of course, that forest policies that aim to help *other* communities to cross the transition threshold do not need budgets to spend. Rural credit schemes, effectively geared to the poor, will often prove to be crucial, for instance.

Noteworthy too is that on the negative side of autonomy, restrictions effectively closed off the involution option. In one case, nature itself did the job, and in two others, relatively 'nasty' forest protection actions by forest agency officials, possibly without realizing this, in fact helped the communities by forcing them on the innovation road before it was too late.

In the Nepali example, the external restriction was later taken over by self-regulation at the community level, managing the forest as a commons. Here again there exists a (positive) autonomy factor: for a commons to be really a commons and not an area of open access, people need the to have a well-developed organizational and cultural capacity at the community level (Ostrom, 1990). In this respect, South Asia with its long-standing traditions of common resource management is much better endowed than, for instance, the migrant and tribal communities in Amazonia.

(3) 'Objectified' motivations

- *Land productivity* ('output intensity', production per hectare) is an obviously important

[36] In his Ghana case study, Amanor (1994) indicates that indigenous agroforestry is superior to the 'Western' alley cropping system.

'objectified' motivational factor for the involution/transition land use decisions. After all, a rising population density implies that more mouths have to be fed from the same acreage of land. Innovations with a relatively low land productivity are typically not those fit to respond to population pressures; they occur because they have favourable characteristics (for the landowners) on the motivational factors underneath. In the Machakos transition example, the drive to increase land productivity concerned all land in a whole region. In the Nepali case, it only concerned the forest land of a single village. In all cases however, the factor is obviously prevalent. It may be noted from the theory section (10.3) however, that land the need for increased land productivity does not determine if the involution or the innovation road is taken. It is the motor, but does not set the direction.

■ *Medium-term (post-investment) labour productivity and risk*

Assuming that a relatively poor forest farmer is not much interested in what will happen after 20 years, but neither is so myopic as to be interested in next year only, the expected land-related income (= labour productivity) in, say, 5 or 10 years of the involution and the innovation option will be a key factor in his choice. For the innovation option, this is the same as the 'post-investment' labour productivity, that is, after the lean year(s) of the transition period (ref. below) have been bridged. This period will usually be long enough for the two options to begin to make a real difference; if they are not, the farmers will not be significantly interested in innovation. The importance of this factor is illustrated by the fact that in all four transition examples, incomes had increased indeed compared to what would have happened without the transition (and often even, as in Machakos, compared to the pre-investment situation).

A shift to a new farming system also involves risk, e.g., when new crops may be more susceptible to drought or connected to less predictable markets. To a certain extent, these yield and market insecurities may be avoided by the farmer. This is not so with respect to what is often the most important 'de-motivational factor' for transition: *tenure* insecurity. What is the use of investments if its fruits cannot be reaped? In transition terms, what is the use of planting trees, terracing the land, protecting the forest and so on, if the land may be taken away any time, by government, by new immigrants or by rich outsiders? The importance of this factor is shown by that in three of the four transition examples, secure *de facto* tenure was present. In the fourth (Conelly's) case, farmers felt that they would not be evicted from cropland if this land was invested in; in fact, they used this to get *de jure* titles as well, which worked as an extra incentive for transition.

Most of the policy instruments connected to the medium-term motivational factor are fairly obvious. One set of possible actions focuses on people's awareness (as in the Nepali village), informing people on the consequences of involution and non-action, on interesting markets that may be reached with new crops, etc. Other actions may focus on community-level organizational support, e.g., helping people to organize a cooperative aiming to get better prices for transitional inputs and outputs. Such actions may be carried out in local-level projects, but may also focus on more generic measures on higher, regional or national levels. Then, there are policy options to reduce the transition risks that farmers may perceive, such as agronomic advice on transition crops and land use practices.

The role of the tenure factor in forest policies is more complicated. For once, there seems to be a 'tenure dilemma', in the sense that for transition, secure tenure is an

obvious good, while at the same time, secure tenure will attract more migrants to the forest (ref. chapter 9). This point will be returned to in the next section. Moreover, the case of the farmers being stimulated towards transition because they may *gain* tenure by doing so seems to suggest that full tenure should not be *given* but rather put before farmers as a carrot. At first sight, this might seem a rather perverse way of using the tenure factor; once farmers have gained the title, the external motivation ceases to exist, and why would then farmers not return to the old, pre-transitional ways? This argument may not hold all the time, however. As the Nepali example shows, even when people may be forced or externally motivated into transition, they may just as well continue on that way once they have crossed the transition threshold and have begun to see the transition benefits.[37] Establishing full tenure on the people's croplands is the normal thing to do in order to help people into transition, but the 'carrot use' of tenure may be a good temporary incentive if locally acceptable.

The necessity of tenure security also holds at the collective level, i.e., the common property of villages or wider communities. Internal regulations are required to avoid the 'tragedy of the commons', that is, a *de facto* free access for community members. *External protection* is necessary as well, however, in order to avoid the historically much more frequent cause of 'tragedies of the commons': its appropriation by outsiders (De Groot *et al.*, 1995). Communities often can and do defend their commons to a certain extent but usually, protection by the state is indispensable. In cases where common property management is a stimulus to transition, therefore, the state should overcome its often very ambiguous attitude to common property arrangements.

■ *The short-term motivational factor: income during investment*

Transition is powered by the medium-term perspective on higher returns to labour, but it is held up by the need to invest, which results in a drop in incomes during one or more years. Conelly, expressing these factors in physical labour productivity terms (kg of rice per hour worked), gives an example of the transition from upland rice in slash-and-burn land use to lowland rice grown in small irrigated valleys in the same Palawan village area. The sequence is:

- pioneer days, long-fallow rice: productivity = 2.0 kg/hr
- on the road of involution, short-fallow rice: productivity = 0.8 kg/hr (unsustainable)
- year of transition (construction of irrigation etc.): productivity = 0.6 kg/hr
- some years later (= medium term), irrigated rice: productivity = 1.2 kg/hr.[38]

From these simple figures, the whole story and theory of transition may be reread in a nutshell. More importantly here, we may note that Conelly assumes the most important factor in the year of transition to be not so much the investment itself (a loss of 0.8 - 0.6 = 0.2 kg/hr), but the remaining income during that year (0.6 kg/hr). This

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[37] An additional factor is that, as the social psychologists say, attitudes often follow behaviour. Even when the behavioral change is forced at first, it is 'internalized' later.

[38] As Conelly rightfully remarks, it is of course possible that the irrigated rice system enters into a new path of involution, for instance because of continuously rising population levels, after its early days of high labour productivity, ending, hypothetically, in the 'Java situation' of very high land productivity (kg/ha) but very low labour productivity (kg/hr). This is not relevant to our case here, however.

seems a logical choice; the same investment of, say, $ 200 may not be felt as prohibitively high by a farmer who has an initial income of $ 600 and envisages a temporary drop to $ 400, but it means death to a farmer who earns only $ 200 per year to begin with (for instance because he has gone down too long along the involution road).

Taking a look now at the four transition examples, we note that all communities survived the transition period without suffering dramatically low incomes. In the first two examples, people were helped by the luck of being forced into early transition. In the last two cases, people had the luck of off-farm incomes from the nearby town (in which the road connections were pivotal). In Machakos in addition, the terracing turned out to have a very short pay-back time, because yields on the terraced places were much higher, especially in dry years; this was because the terraces did not only conserve soil on the long term, but also immediately enhanced the infiltration of water.

Transition in the four examples was fully or almost fully spontaneous. The aim of forest policies should be to help many more forest communities on the transition road, by bringing them in the same transition-inducing circumstances. With respect to the 'income during transition' factor, generic policy options are, for instance, to improve the system of rural credit or to subsidize tree seedlings. At the regional and local levels, many more actions can be considered, such as revolving funds (loans payed back by one village are recycled to help the next), the freeing of internal labour resources, and maybe, to build rural roads (ref. the next section).

(4) Interpretations and interpretative frames

'Interpretations' are relatively specific preferences for one type of crop, one type of activity etc. that may determine the farmer's decisions because they add up to the 'objectified' characteristics of land use options. Of more importance for this report are the underlying 'interpretative frames', that set the farmer's decisions on a certain general course. Typically, these frames are cultural guiding images of what it means to be a good farmer, or what it takes to be a real man.

Some general theories apply to this issue. One of them is the distinction between the 'I' and 'E' styles of farming found by Bolhuis and Van der Ploeg (1985), that may co-exist in the same area. 'E' farmers put the highest value on profits, flexible response to markets etc., coinciding with an External (market) orientation and Extensive land use; 'I' farmers take pride in high yields, craftsmanship and taking care of the soil, coinciding with an Internal (community) orientation and Intensive land use. Obvious connections exist between this and the 'H-E-C' domains of the 'Action-in-Context' framework (ref. section 8.1). Roughly put,

- externally oriented farmers ('E'), coinciding with the 'homo economicus' (E) mode of reasoning in the HEC model, will put an extra value on the mid-term labour productivity (= profitability) factor in their decision-making on transition;
- internally oriented farmers ('I'), coinciding with the 'ethics of care' (C) mode of reasoning in the HEC model, will see value, not only necessity, in the input and output intensity of transition options.

How would this work out in 'involution versus transition' decisions? Environmentalists have a certain liking for 'I'/C farmers, because these are more prone to value the sustainability of their land use. It must be noted, however, that in all but the Machakos

examples of transition there are no indications at all that the transition farmers were anything other than quite market-oriented. It may even be speculated that insofar the farmers in the Palawan and the Nepali cases had an 'I'/C orientation, the roads that connected them to markets changed this and helped them towards transition at the same time! At the root of this may be that 'I'/C farmers, in circumstances of rising population and pressure on the land, will not be inclined to look around (externally) for innovative opportunities, but will be inclined to intensify the strategy they are following already, that is, to simply *work harder*. In other words, although these farmers will pay more attention to the sustainability of what they are doing, they are at the same time more susceptible to follow the road of involution.

With respect to forest policies, therefore, there can be no general recommendation that either the one or the other style of farming should be stimulated in order to enhance transition. Farming styles analysis, in I/E or H/E/C or some mixed form, may be of value in the design of the regional and local level programmes, where much more detail is available and more flexibility is possible than at the global or national level.

Although this discussion with respect to general farming styles has an ambiguous result, this does not imply that *specific* cultural identities can not have an important impact on 'transition versus involution' decisions. In our Ecuador case study region, for instance, a real man is a cattle man. This cultural image is strong enough for every farmer to be committed to become a rancher, with a strength of motivation beyond the 'objective' benefits of cattle as source of income and security. From the Philippine case study region, the following example may be quoted.

In the Sierra Madre mountains, two types of forest migrants are sometimes found almost side by side: (1) immigrants from the adjacent Cagayan Valley lowlands and (2) Ifugao tribespeople, who are upland dwellers by origin, having 'jumped' the Cagayan plains when migrating from their homes in the Cordillera mountains, where making terraces to grow irrigated rice is the basic farming system (the world-famous Banaue terraces, for instance, are made by them). As described in more detail by Doedens *et al.* (1995), Ifugao immigrants may begin making irrigated rice systems and to protect the forest upstream of their terraces only a few years after their arrival, *i.e.*, they invest in the 'transitional thing' long before there is an economic, 'objectified' need for doing so! The latter is proven by the fact that a few miles furtheron, the lowland immigrants are still involved in slash-and-burn farming without showing transition tendencies. What these Ifugao do cannot even be called transition in the strict sense of the term; they do not really switch from one system to another, but after having established themselves by slash-and-burn and having accumulated some food stock and quick money with these crops, immediately start to reproduce the Ifugao image of what is means to be a real farmer.[39]

What does this imply with respect to global and national forest policies? We have seen that cultural identities play a role in local people's choices towards the forest, but also that these tendencies may go either way. In other words, there should be 'cultural policies' with respect to the forest (education and awareness-building, stimulating farmer-to-farmer debate, ridiculizing the macho rancher and Camel trophy spirit, etc.), but it

[39] A nice detail is that they organized and paid the bulldozer of the nearby logging operation to do the rough earth work of the irrigation lay-outs.

makes little sense to 'protect culture' or 'build on indigenous perceptions' in an unqualified way. It may be assumed that the indigenous culture of forest-dwelling and upland people may be generally more tuned-in to sustainable forest use than are the traditions and perceptions of recent migrants from non-forest regions, but substantive policies can only be designed on a case to case basis.

Only one 'case' seems to stand out at a global level; the 'cattle culture' in Latin America should be undermined as much as possible. The case of the attitudes towards smoking in many Western countries show that such things are not impossible; smoking has changed from something real men do into a kind of disease you are pitied for having, and something associated with the lower classes.

10.5 Towards transition policies

The core of forest policies with respect to land use is the inducement of transition to more intensive and sustainable land use systems. The tension here is, of course, that the farmer's motivations for transition (ref. previous section) only partially overlap the motivations (goals) of the policy maker. This is especially the case where the policy maker speaks in the name of supra-local entities, which will be recognized in local value systems only very partially. General examples are the interests of downstream populations in discussions with upstream farmers, the interests of nature and global biodiversity, and the interests of future generations (sustainability). An example more typical for transition matters concerns the labour intensity of land use systems. This is not something pursued at all by individual farmers, but for the policy maker, it is associated with regional employment, equity and the principle that the more intensive a system is, the less forest will fall when populations rise. On the other hand, other values may largely overlap. One example is what is 'medium-term labour productivity' for the farmer, which largely coincides with what is 'development' for the policy maker. The same holds for the positive side of the 'autonomy' factor, which may coincide with the general drive towards participation, democracy and decentralization that the policy maker, at least officially, adheres to.[40] The art of transition policies, therefore, is to design and negotiate a sufficient on-the-spot overlap of the supralocal aims and the local options and motivations.

Can this abstract principle be translated into a number of concrete policy recommendations at the global or national level, as has been the case with the logging and migration subjects of the previous chapters? With respect to ranching, this is easy, as we saw already. With respect to agricultural transition however, matters are more complicated. In order to illustrate this, we first take a look at the issues of tenure and roads.

The tenure issue, combining the transition, migration and logging chapters

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[40] At a more practical level, tensions often continue to exist. Some resistance against empowerment of the poor will always for instance. Can the poor really be trusted? Should they really receive full titles? Will they pay back loans that have been given with their word of honour as the only collateral ('credito de palavra')?

In the chapter 9, we saw that to deny tenure on forest land to local people is an important tool in the prevention of massive migration to forest areas. In the present chapter, tenure was shown to be an important conditional factor for agricultural transition. Against this background, it is not surprising that many researchers (e.g. Dorner and Thiesenhusen, 1992) emphasize the tenure factor in forest questions. On the other hand, it is often very difficult to establish a systematic relationship between tenure security and actual farmer's behaviour. The reason for that may be that tenure is in fact only one factor among the others, so that it may sometimes emerge as decisive, but remains below the surface in other circumstances. A complicating factor for empirical research on the tenure factor may be that tenure is very much an umbrella term overarching so many tenure forms that the relations become confounded. There is the difference between *de jure* and *de facto* tenure security, for instance, between collective and private tenure, and between tenure over forested land or cropland. Moreover, there are 'perverse' tenure arrangement that stimulate forest destruction, such as that farmers can receive tenure over forest land only if they clear it (ref. case study Ecuador). Finding our way in the tenure issue at least require that we make the relevant distictions within the tenure umbrella concept.

As a first step, we may note again that secure tenure contributes to transition motivations, that excluding people from the forest may further help them on the transition road, and that migration to forest areas can be held in check, at least partially, by denying new migrants tenure over forest land. This leads to a simple 'first principle' for forest protection:

- no tenure rights, neither *de facto* nor *de jure*, of local people over forested land
- but full titles over cropland and grassland.

After that, however, we run into a large number of modifications and exceptions, which can be taken from the preceding analyses:

- Sometimes, the promise of tenure on cropland or grassland without giving it yet, can be a strong incentive for transition.
- 'Social fencing' against forest intrusion by new migrants requires strong tenure, private or collective, of settled local people over forest land.
- Secure tenure over forest land is also conditional for the sustainable management of village forests.
- The same holds for the collective management of high-quality rainforest by tribal people. *Private* tenure in this case, however, may induce transformations into cropland or low-quality forest (logged or agroforested).
- No tenure on cropland should be given to people who happen to have migrated to very harmful places, e.g., in the middle of a high-quality forest where they even may attract more people or through-forest roads. But this again may be different if these people could be involved into 'social fencing' forest protection.
- Titles on cropland or grassland should not exceed, say, 5 hectares, in order to induce people into agricultural transition and out of the cattle option. On the other hand, some access (tenure?) over adjacent forest land may be important to help people through the lean years of transition.

Matters become even more confused when we also involve the logging aspects (chapter 8). As has been discussed with respect to the 'community forestry' issue, communities should be relatively well-inclined to log a forest on a sustainable basis — if they have secure tenure of that forest, of course, so that the long-term benefits of investments and restraint will accrue to them. In fact, practice shows that if communities have some *de*

jure or *de facto* tenure they often take up the defense of 'their' forest against outsiders, including logging companies (De Groot *et al.*, 1995).[41] Then why not give full tenure over the forest to the forest dwellers?

One step towards a more or less general statement on these dilemmas is to distinguish between *'insecure'* and *'regulated'* forms of tenure.

'Insecure tenure' means to say that that if the actor does not behave well one way or the other, the tenure will be lost. In the developing countries, insecure tenure currently is the general rule in the relation between the state on the one hand, and logging companies, communities and individual farmers on the other. It is supposed to serve as a stick to force the actor into sustainable behaviour. The dilemma is that tenure insecurity *demotivates* the actor against long-term behaviour at the same time.[42]

'Regulated tenure', on the other hand, cannot be taken except in rare cases of collective necessity (the 'eminent domain'). It is full and (in the case of private tenure) fully alienable ownership, only with state-regulated restrictions in the *use* of the property.[43] As said already in section 9.3, this type of tenure is the rule in the industrialized countries, where farmers can own and use a wetland without being allowed to drain it, where companies can own the factory's land without being allowed to bury their toxic waste there, and city dwellers can own and use a house without being allowed to turn it into a hotel or build it up above three floors. In these cases, the state has sanctions against misbehaviour other than disowning the proprietor; there do not seem compelling reasons why the states of developing countries, if really motivated, would not have these too.

The heaviness of state presence in regulated tenure may vary between wide bounds, from very light monitoring and soft, flexible sanctions to day-to-day checks and a rigid, strict system of immediate sanctions (fines, confiscations, imprisonment etc.). In these terms, for instance, communities with a long-standing tradition of sustainable forest management should be treated differently from the average logging company. Somewhere in-between these two may be the typical small tribal community with tenure over a large area of forest; the fact that these communities may have lived sustainably in their forest since times immemorial is usually attributable to their low numbers, not to that sustainability is embedded in their culture or institutions. All these form of tenure are secure tenure

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[41] We may wonder if communities do so for sustainability reasons; often, they do not. We may also wonder if not the state would be better endowed for taking care of regional interests, global forest functions and future generations; theoretically, it is. In practice, these considerations are overwhelmed by the fact that communities very often treat the forest in a sustainable way while most logging companies, unchecked or even backed up by the state, do not.

[42] One extreme example is of a community in Pakistan, that received tenure over a forest and immediately cut all the trees, thinking that the tenure had been given in one political whim and would be taken away again in the next (pers. comm., F. Wiersum).

[43] In Anglo-Saxon property right terms, regulated tenure is a partial 'unbundling' of the bundle of land property rights, in which some property rights are reserved by the state. These rights may then become the subject of negotiations between the state and the private owner.

without time limits, however.[44]

Underneath, a set of 'general tenure rules' is given which may now more or less speak for itself. State ownership is reserved for areas that are managed for objectives defined on such large scale and long terms (e.g., pure biodiversity protection) that tenur of local people, even if regulated, cannot be expected to make sense (which is not to deny thay thjey cannot be involved in many other ways). The clause 'if necessary' with respect to the logging corporations means to say that lease/tenure of local people is preferable. With respect to the non-forested land, an area of 5 ha has been is mentioned, standing for the area needed by rural families to make a decent living from sustainable agriculture, in a context of sensible government policies. Full and private titles should be the basic arrangement here, irrespective of whether or not this land may have been categorized as 'state land' in the legal land classes system. Transition to sustainable land use will be severely hampered if governments do not give up such 'state land' claims on cropland, which are in fact futile and harm people as well as the forest. It goes without saying taht all tenure forms of all actor types should be protected by the state.

A set of general tenure rules for tropical forest protection

- *State ownership of forest land managed for pure biodiversity or future generations.*

On forested land outside the state reservations:

- *Secure but 'distantly regulated' land tenure for communities with long-standing traditions of forest protection.*
- *Secure but regulated collective land tenure for low-density forest dwelling groups.*
- *If necessary, long-term but strictly regulated leases for logging corporations.*
- *No land tenure or other forest rights for recent immigrants, except where considerations concerning migration (e.g., social fencing), transition (e.g., temporary forest income) or forest regeneration warrant temporary or regulated forest use rights.*

On non-forested land (irrespective of current legal classification):

- Full titles on parcels of ca. 5 ha per household.

These can be applied effectively only on a regional or local basis.

The sentence that the rules "can be applied effectively only on a regional or local basis" has been added to take care of the wide variability of forest management and agricultural transition situations. It will be returned to later.

The roads issue, revisited

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[44] In the case of logging corporations, leases may be of the 'rolling type', *i.e.* specified for, say, 25 years but 'rolled' one year forward after the yearly check on the logger's compliance with the AAC and other regulations. That way, the logger enjoyes the necessary timeless perspective on his concession.

As said in the chapter on logging, government-built tarmac roads into the forest attract logging companies to places that may have been too remote to log profitably before. In the chapter on migration it has been seen that the same through-forest roads, as do logging roads on a smaller scale, also attract prospective settlers with a force that will be hard to counterbalance in the long run, even for motivated governments. With respect to these roads, conclusions need not be subtle.

This is different for rural roads however, that connect forest fringe communities to towns and other rural areas without crossing the forest, as shown in Figure 4B. As indicated already in the migration chapter and worked out more fully in the present chapter on transition, such roads appear to be conditional for communities to cross over from forest-destructive to more sustainable and less space-consuming land use. On the other hand, road connections are also conditional for farmers to grow unsustainable *naranjilla* in the case study area in Ecuador, or unsustainable bananas in the case study area in the Philippines. In somewhat more detail, the following may be said.

As we saw in the transition examples, roads bring ideas, the possibility to lift oneself out of the subsistence level. *i.e.* a general invitation to innovate and go into cash crops. Also, they usually bring the opportunity for off-farm and other supplementary income, which often is crucial for transition. There can be no general prediction, however, if these opportunities will be used for transition or for changes that are negative in terms of sustainability. Farmers may invest in irrigation or fruit trees, but they may also switch from forest-friendly coffee into more perishable crops that are now within the range of options, e.g., *naranjilla* in Ecuador or maize in the Philippines (Van den Top, 1995). Which way it will go depends on the subtle balances within and between the motivational factors discussed in section 10.4.

Roads often also bring new immigrants. As explained in the migration chapter and in section 10.4, the resulting land scarcity may be escaped from by either clearing new forest land, or it may stimulate a community into transition, or it may press the communities further along the road of involution, depending on the degree of forest protection, the availability of surplus capital, the expected medium-term productivity of the available options, and so on. Again, where the land use will go may be predictable at a local or regional level where the necessary details can be known, but nothing much can be said at the higher (national and global) levels.

Finally, roads may bring powerful outsiders who are nor intending to stay, but only to rob the resources and run. These may be logging operators but also charcoal makers waving government permits in the face of the local people, or fishery operators emptying the local lake in a few years - using the same road that the naive designers of the rural development project had planned would be used by the local people to bring their fish to town (De Groot, 1995). This phenomenon is the only roads-related issue for which a general rule of prevention ('tenure first!') exists.[45]

In summary then, rural road improvements may bring:
- new migrants and no transition (Ecuador)
- new migrants and yet (or even because of them) transition (Palawan)

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[45] This rule is a specification of the more general development adage that social structures have to be there physical structures (roads, irrigation schemes, sanitation or whatever) are installed.

- no new migrants and yet transition (Machakos, Nepal)
- no new migrants and no transition
- outsiders robbing the forest and other local resources.

Although some general rules apply (especially the need of tenure and forest protection), what it will really be and what to do about is can be predicted and designed only at the regional or local levels.

Conclusions for national forest policies

The secondary and tertiary actors in the actors field of forest land use are many. Among them, government actors stand out, however. On the ground, local officials have to protect the forest and the tenure of local people; they have to make people aware of the long-terms risk of involution, and inform them on transition options; rural credit has to be organized, and so on. All this local work can only be done, however, if backed up by laws, regulations and commitments at the national levels of the ministries of forestry and agriculture. And these, in turn, will not amount to much without the blessings of the much more powerful central areas of government (presidency, economic planning, interior, physical planning etc.). Here again, national government holds the key.

The role of national government with respect to the transition of forest land use is twofold. One is its 'own-level' task, the other is to organize and stimulate lower government levels; *i.e.*

- (1) Generic measures to create a context favourable to transition.
- (2) The basic design and further support of regional transition programmes.

- **Ad 1: generic measures.**

Although the 'real work' of transition will have to be done at the regional/local level, we have gathered a number of important options for generic, national measures in the course of our case studies and analysis. They entail:

- The *abolishment of ranching* on land that can be under crops or rainforest. This may be combined with 'cultural action' against the idea of ranching as the superior way of living.
- Clear and adequate national land *tenure regulations*, reducing the tenure insecurity for private farmers and communities, *i.e.* the actors who need it to be motivated for transition investment. One example is the new forest law of Cameroon, establishing for the first time the possibility of (regulated) community tenure over forest land. The necessary adequacy implies, for instance, the abolishment of 'perverse' tenure arrangements such as plot sizes that allow for ranching options and regulations that tenure can be secured by clearing the forest.
- National *price and rural credit policies*, favouring sustainable transition crops (e.g. tree crops; Filius, 1994) and discouraging the others, and providing access to capital to the rural poor who need it for transition.
- The consequent backing of *forest protection* actions, even where it runs counter to local people's short-term interest, especially in places where people have transition options (by themselves or through regional programmes).

Ad 2: Basic design and support of regional programmes.

The generic measures will undoubtedly increase the numbers of farmers and communities

that go into transition spontaneously. In order to turn this into the necessary fast and massive process, however, many factors in the list of section 10.4 need further reinforcement or modification. What these are, how they interact with others and how to shape their reinforcement/modifications into practical action can, as said repeatedly already, only be found at the subnational level.

The concept of doing rural development *projects* is basically unfit to reach this aim, however. The typical project is a pre-designed intervention, limited in time and limited in geographic coverage. What is needed is the reverse in many respects, *i.e* regional *programmes* for transitional rural development, that have only a very basic 'central design' in terms of procedures, objectives and so on, but leave the *means* to flexible, 'learning-by-doing' interactions with the farming communities. Such programmes typically have a long-term commitment (up to, say, 20 years), they work with government agencies instead of doing things on their own, and cover whole districts or provinces. Such programmes are beginning to gather an impressive score of successes in the area of agricultural transition in semi-arid regions. The Machakos case is one of them; others are in Zanen and De Groot (1991) on Burkina Faso and Joldersma and Fasé (1994) on Mali. There is no reason why this semi-arid experience could not be the basis for a quantum leap in the rainforest areas.

Regional programmes have an important aspect a (applied) research. Elements here are, for instance:

- to assess the signs of hope in a region
- to assess why the majority of actors follow different courses, through general analysis such as in section 10.4 and through participatory rural appraisals (PRA)
- to identify the basic technical programme elements (trees, crops, soil conservation, water conservation for small-scale irrigation, fallow management etc.)
- to think out the social conditions (tenure, markets, cooperations, roads, credit etc.)
- to try to grasp possible negative surprises
- to monitor and respond to the flexible, learning-by-doing implementation.

The support from the national government for regional programmes does therefore not only comprise the obvious elements of inter-agency coordination, searching for funds and so on, but also the build-up of a national or global expertise (ref. below).

Conclusions for global forest policies

This being said, the global-level policy guidelines are easy to formulate. The first only repeats the national-level conclusion. The second is less important but more unique for the global level. It is a plea for more research (the only one in this report), of a very applied and integrated kind. They are:

(1) To stimulate national governments to work for transition of forest land use, focusing on

- *generic measures with respect to ranching, tenure, rural credit* and so on
- the basic design and support of regional transition programmes.

The incentives for national governments may be what is called 'normal politics' in chapter 12, but also a Global Forest Fund (ref. chapter 11) may play an important role here.

(2) To create and fund a global structure of transition expertise,
renewing, redirecting, combining and drastically expanding the mandates of institutions such as CIFOR, ICRAF and FAO, and building up a World Wide Web with the universities, aiming at the one hand to rapidly build up databases, models and theory on land use changes on forest land and the social factors that determine these changes, and at the same time to supply national governments with a massive number of regional and local transition advices.

11. A Global Forest Fund

The previous chapters have resulted in several indications of keys for successful local, national and global forest policies. They will be summarized in the next chapter. Here, we go into a special topic that lies exclusively at the global policy level, although directed towards the national governments of the forest-owning countries. The matter is discussed extensively in Annex II; here we focus on a more informal summary.

Let us imagine the 'social fencing' option in the case of improvements of rural roads at the forest fringe (figure 4B). Farmers settled at the forest boundary on a plot of, say, 6 hectares may suddenly find themselves in the possession of a full title also of a stretch of 2 km of forest land, hence some 40 hectares, with the restriction that the forest remain forest. The title will certainly motivate the farmer to keep other settlers off the land but at the same time, he will find himself tempted to convert the forest into crops or grassland, assuming that these land uses will deliver more than sustainable forest products extraction. In order to perpetuate the forest, therefore, government is needed to monitor and enforce compliance to the land use restriction, much the same as what an American farmer needs to prevent him from draining an in-farm wetland that he is obliged by law to maintain. In order to do so, the government will have to pay for monitoring equipment, enforcement personnel, and so on. Moreover, by monitoring and enforcement, the government foregoes the benefits of taxing the cropping, ranching or logging operations that would take place if the forest would not be protected. Why then would the government be motivated for forest protection? Only because other, richer governments, governments of nations that destroyed their own forest a long time ago, say it has a global obligation?

This, and countless other but analogous situations, is what a Global Forest Fund is about. The Global Forest Fund discussed in Annex II is financed by the industrialized nations, and disburses to the forest-owning governments yearly amounts for each hectare of tropical forest of sufficient quality, irrespective of any other factor except a certain geographic differentiation of disbursement levels (higher disbursements on places with a high forest conversion pressure).

In the case of the 'social fencing' farmer, the disbursement could be around $ 15 per hectare per year, hence $ 600 per year for the single farm area. From this a mount, the government could pay for the monitoring and enforcement, it could pay an incentive to the farmer if necessary, and probably after that still be left with much more that it could ever hope to tax from crops or cattle.

In somewhat more detail, the characteristics of the Fund designed in Annex II are as follows.

- The Fund's disbursements will not be able to compete with extremely productive forest land conversions, such as mining. For the majority of the world's tropical forests, however, the Fund will have a significant positive impact at a throughput level of $ 15 billion per year, which amounts to an average of $ 10 per hectare of rainforest per year, ranging between $ 2 for relatively unthreatened areas to $ 30 for places under high

pressure. A throughput of $ 15 billion per year is one order of magnitude less than the global transfers proposed for carbon dioxide emission abatement and the global Third World debt servicing.

- A minimum level of forest quality will be the only condition of disbursement from the Fund. Consequently, the disbursements follow from simple, semi-automatic satellite monitoring. In other words, it is the product that is paid for, not the inputs. This is analogous to normal economic transactions, and contrary to the funding of projects and promises, such as in GEF.
- As a result, the Fund leaves the forest-owning nations with the full freedom to dispose over the forest; the (justified) discussions on global obligations are left to other fora. Contrary to debt-for-nature swaps, therefore, receiving nations will not be reluctant to enter the Fund structure for reasons of sovereignty.
- The financing of the Fund is spread over all nations, which may make use of a number of practical ethical keys to arrive at a fair distribution, such as the area of forest converted in the past, the current carbon dioxide emissions and GNP per capita. Nations such as the Netherlands will contribute relatively much; one example set of keys results in a contribution of 0.1% of GNP.
- The Fund is fully geared towards enhancing the key factor for saving the world's tropical forest, i.e., the motivation of the central governments of the forest-owning nations. As indicated in the general conclusions and the example above, governments will be able to translate enhanced motivations into the necessary concrete, local actions.

12. Conclusions

The conclusions of this report are set in a format of policy recommendations for global and national forest policies, and summarize the conclusions of the separate chapters on logging, migration and land use. Being based on an analysis rather than an inventory, the style of the conclusions differs from the usual listing of global policy recommendations such as those of Agenda 21 or the Tropical Forestry Action Plan, that tend to only enumerate a large number of nice things, e.g., that institutions should be built, that logging should be sustainable and that local people should participate. A commentary is added to each conclusion in a smaller cast, in order qualify it and to make it stand out better from common sense.

This style of concluding carries the obvious risk of possibly being too outspoken and simplifying in the face of the subtleties and complexities of the real world. Here it can only be said that we have tried to maintain the appropriate equilibrium between focus and generalness, and that in case of doubt, the text of the report, its annexes and case studies may be consulted. Furthermore, it has to be stated with some emphasis that the conclusions are *global*, hence focusing on what may be true for all nations, and ignoring the additional truths, and maybe also the contradictory truths, for each separate nation, region or locality. Each nation and region therefore requires at least a thorough discussion, in order to combine the global conclusions with the 'local truths'.

General conclusions

(1)

The national governments of the tropical nations, especially their central institutions, hold the keys to the future of the tropical forest. The basic approach for global forest policies therefore should be to stimulate the central government institutions to turn these keys.

> This holds true for the three major 'sectors' of primary forest-relevant activities, which are logging, migration and land use of local people. Only with respect to land use, sub-national programmes also play an important role. This conclusion implies that global-level policies should *not* focus on the international timber trade, and that global actors should restrain the urge of 'doing projects' at the local level; only very urgent actions such as the Integrated Protected Area System may be an exception here. The term 'central institutions' refers to the national power centres such as the presidency, the treasury, the development planning agencies and so on, as well as the key political institutions and families, hence not to the forestry or environmental agencies.

(2)

The focus of global forest policies should not primarily be on capacity building, but on strengthening the *motivation* of the central government institutions to have a sustainable forest. Capacity building (of the forestry sector) can make sense, but only if central government units are not motivated against forest

sustainability.

Discussions at the global level tend to deviate towards non-political policy instruments of 'institution building', as if the governments of developing nations are too poor and powerless to protect the forest. Practice shows, however, that both forest destruction and forest protection get done, and get done only, if governments *want* it. Global and bilateral politics cannot be avoided. They must be set, however, in a context that also includes the obligations of the industrialized nations towards the tropical forest (ref. conclusion 4). The conclusion also implies that international debt relief will only unburden the forest in cases of governments motivated for their protection. Furthermore, the conclusion implies that inter-agency coordination (at national and regional levels) can be an important tool to achieve forest protection goals, if this also includes the central institutions, in a way that involves them not only technically but also at the motivational level.

(3)

The available instruments for such global policies are of two types:

- 'normal politics', *i.e.* the wide array of ongoing bilateral and multilateral debates and negotiations on trade, aid, climate change, global equity, tribal rights, international treaties and so on;
- new mechanisms of global financing for the forest (and/or climate); these mechanisms should not focus primarily on the banking of projects ('input funding' such as in GEF), but on funding the forest itself ('output funding').

New mechanisms of global transfers express the fact that a significant part of the value of the tropical rainforest lies at the global system level. Global forest funding does not pre-empt the basic obligation of all nations to be willing to contribute to the global good, but takes into account that the tropical forest happens to be located in the poorest nations. 'Output funding' is no different from normal economic transactions in which one actor pays for a good produced by another actor.

(4)

A Global Forest Fund as designed in this report could be an effective mechanism for such global transfer, one of the reasons being that it pays out to, and thus motivates, the central institutions of national governments.

The Global Forest Fund is financed by the nations who once converted their own forests and now have the advantage that the tropical forest remained; some auxiliary 'ethical rules' for financing have been designed as well. Disbursements are set each year on the basis of the remote sensing data on acreages of high-quality forest. There being no strings attached and no promises to make, tropical nations will not resist on grounds of sovereignty. Disbursements may be spatially differentiated for efficiency reasons. Explorative calculations show that the Fund will be effective for global climate and biodiversity at a financing level 10 times lower than what has been calculated for global CO2 abatement. Because of its intrinsic simplicity, Fund overheads will be negligible.

Additional conclusions on logging, migration, forest land use and research

Contrary to the global fund, the (bilateral and multilateral) debates and negotiations inherent in 'normal politics' need guidance as to how national governments should act with respect to logging, migration, land use and other forest-relevant activities. The following conclusions focus on these issues.

With respect to *logging*, the general conclusions may be supplemented by the following.

(5)

The profit-hunting tendencies of logging actors can and should be decreased.

Shifting from corporate to community logging is the first option to achieve this. Others are long-term and well-protected concessions, NGO partnerships with loggers that embed loggers more tightly and more personally in the ecosystem and the social context of their work, and voluntary timber certification.

(6)

The cost of private use of public office can and should be increased.

Options here are public attention to the mechanisms, the events and the actors of corruption, public awareness of the people's long-term interest in the forest, funding better control by and of pivotal institutions, conditional funding and a general stimulus towards more public control over the public good.

With respect to the prevention of *migration* to forest areas, the general conclusions may be supplemented by the following.

(7)

On-the-ground forest protection is most urgently needed, and can be effective.

The obvious implication of this conclusion is that government-sponsored migration to the forest should be abolished. The key to prevent spontaneous migration is to avoid expectations that reasonable incomes can be earned by forest conversion. Factors here are to avoid through-forest roads construction, to protect the (collective and non-alienable) tenure of forest communities, to actively implement policies of tenure denial to new immigrants, and 'social fencing' by giving (regulated) forest land tenure to already settled families. Some of these policies have harsh elements, but they avoid greater harm later, and often help settled families to move towards agricultural transition before it is too late for them and for the forest (ref. below).

(8)

Population and development policies with respect to the rural ('push') areas are also important, but effective only on the much longer term. Moreover, they should be part of general, not forest-oriented, policy making.

No forest has a long-term future if rural populations continue to explode and if rural poverty turns into rural despair. On the time scale left now to save the tropical forest, however, population and development processes in the rural areas are largely disconnected from the forest's fate. Forest-oriented policies of forest-oriented actors should

not be burdened (or escaped from) by reference to the need to also address general rural questions which they cannot and need not answer. (The forest land use policies of the conclusions 9 to 11 are 'rural policies' in many ways, but they focus on the forest fringe areas.)

With respect to *land use* in forest areas, the general conclusions can be supplemented by the following.

(9)
The key to land use that protects tree cover is the agricultural transition from extensive and unsustainable land use systems to more intensive and sustainable ones. National governments can and should stimulate a quantum leap with respect to transition processes going on already at a small scale. Two approaches should be adopted simultaneously:
(1) National-level measures to create a context favourable to transition.
(2) The basic design and further support of regional transition programmes.

(10)
The national-level measures entail:
- The prevention and abolishment of ranching on land that can be under crops or rainforest.

  Even if ranching would be sustainable, its extensiveness implies that there is no justification not to have either a large number of agricultural families on the same area, or the world's most valuable ecosystem.
- Clear and adequate national land tenure regulations.

  The prime objective of these policies should be to reduce the tenure insecurities of farmers and (especially) communities. This conclusion also implies the abolishment of 'perverse' tenure arrangements such as plot sizes that allow for ranching options and regulations that tenure can be secured by clearing the forest.
- National price and capital formation policies.

  These should be designed to favour sustainable transition crops and to stimulate the farmers' own collective capacity for savings and credit.
- The consequent backing of forest protection actions.

  This is needed also where it runs counter to local people's short-term economic interest. This harsh element is often essential to induce transition (ref. conclusion 7). The harsh element can be counterbalanced in regional programmes, ref. below.

(11)
Regional programmes for agricultural transition start out from a very basic 'central design' in terms of procedures, objectives and so on, but leave the *means* to flexible, 'learning-by-doing' interactions with the farming communities, involving all relevant government agencies in an integrated way, and set in a long-term time perspective.

The programmatic approach is very different from 'doing projects'. Much can be learned from experiences gathered already by environmental programmes in semi-arid regions.

(12)
A global research effort is especially needed with respect to agricultural transition. On the whole, research paradigms and research budgets of national and international institutions should be shifted from the management of the forest to the management and self-management of people (local and national).

A global research effort on agricultural transition in the forest fringe areas does not only entail a worldwide expansion and analysis of data, but also the building of a worldwide system to *apply* this knowledge in a very large number of local and regional transition advices to national governments, almost free of charge.

Conclusions on some special issues

(13)
With respect to the issue of *roads construction*, the key is that

- through-forest roads are a large-scale risk for the forest, either immediately or in the longer term
- but rural feeder roads that connect forest fringe communities to markets, ideas and off-farm opportunities often play the central role in agricultural transition, and hence in forest sustainability.

Rural roads should be built only after the tenure and cohesion of the community is strong enough to prevent the forest and other resources from being appropriated and exhausted by powerful outsiders coming in by the new road.

(14)
With respect to the (complicated) issue of *land tenure*, a set of tentative rules may be the following.
On forest land managed for pure biodiversity or future generations:

- State (or an analogous non-local) ownership.

On forested land outside the state reservations:

- Secure but 'distantly regulated' land tenure for communities with long-standing traditions of forest protection.
- Secure but regulated collective land tenure for low-density forest dwelling groups.
- If necessary, long-term but strictly regulated leases for logging corporations.
- No land tenure or other forest rights for recent immigrants, except where considerations concerning migration, transition or forest regeneration warrant temporary or regulated forest use rights.

On non-forested land (irrespective of current legal classification):

- Full titles on parcels of ca. 5 ha per household.

These rules can be applied effectively only on a regional or local basis.

(15)
With respect to *timber certification*, the first fact is that only a very small percentage of tropical trees are cut for the international market. Timber certification therefore should not be a global priority. Moreover, the ongoing GO-GO negotiations up till now have had the negative impact that loggers have been induced to intensify their unsustainable

operations in the meantime, expecting as they do a lower price for their timber due to certification. This is different for the 'voluntary style' of timber certification, which is being applied already, and in which logging companies and communities enter into direct partnerships with NGOs. Such partnerships also relate to conclusion no. 5.

References

[In order to also serve more general purposes, this bibliography contains more references than mentioned in the text. The Annexes and the case study reports have their own references lists.]

Agbo, V., N. Sokpon, J. Hough and P.C. West (1993), 'Population-Environment Dynamics in a Constrained Ecosystem in Northern Benin', in: Ness *et al.* (Eds), *op. cit.*, pp. 283-300.

Alcamo, J., G.J.J. Kreileman, M.S. Krol and G. Zuidema (1994), 'Modelling the Global Society-Biosphere-Climate System, Part I: Model Description and Testing', *Water, Air and Soil Pollution* 76, 1, pp. 1-36.

Alpert, P. (1993), 'Conserving Biodiversity in Cameroon', *Ambio* 22, 1, pp 44-49.

Anderson, A.B. (Ed.) (1990), *Alternatives to Deforestation: steps toward sustainable use of the Amazon rain forest*, Colombia University Press, New York

Baker, R. (1993), *Environmental Management in the Tropics: a Historical Perspective*, CRC Press, Tokyo, London.

Bandy, D.E., Garrity, D.P. and Sanchez, P.A. (1993), 'The Worldwide Problem of Slash-and-Burn Agriculture', *Agroforestry Today* 5, 3, pp. 2-6.

Barraclough, S. and K. Ghimire (1990), *The Social Dynamics of Deforestation in Developing Countries: principal issues and research priorities*, Discussion Paper no. 16, UNRISD, Geneva, Switzerland

Barbier, E., J. Burgess, J. Bishop and B. Aylward (1994a), 'Deforestation: The Role of International Trade in Tropical Timber', in: K. Brown and D.W. Pearce (Eds.), *op. cit.*, pp. 271-297.

Barbier, E. N. Bockstael, J. Burgess and I. Strand (1994b), 'The Timber Trade and Tropical Deforestation in Indonesia', in: K. Brown and D.W. Pearce (Eds.), *op. cit.*, pp. 242-270.

Bass, S., D. Poore and B. Romijn (1992), *ITTO and the Future in relation to Sustainable Development*, AIDEnvironment/Netherlands and IIED/UK

De Beer, J.H. and M.J. McDermott (1989), *The Economic Value of Non-Timber Forest Products in South-East Asia*, Netherlands Committee for IUCN, Amsterdam

Bekkering, T.D. (1991), Implications of the Greenhouse Effect for Tropical Forestry Development Policies, in: BOS Nieuwsletter, no. 23, vol. 10 (2), pp. 42-49.

Belsky, J.M. (1993), 'Household Food Security, Farm Trees, and Agroforestry: a Comparative Study in Indonesia and the Philippines', *Human Organization* 52, 2, pp. 130-141.

Besong, F.B. (1992), 'New Directions in National Forestry Policies - Cameroon', Cleaver *et al.* (Eds), *op cit.*

Blaikie, P. (1985), *The Political Economy of Soil Erosion in Developing Countries*, New York

Blaikie, P. and H. Brookfield (1987), *Land Degradation and Society*, Methuen, London.

Blaikie, P. (1988), 'The Explanation of Land Degradation', in: J. Ives and D.C. Pitt (Eds.), *Deforestation: Social Dynamics in Watersheds and Mountain Ecosystems*, Routledge, London and New York

Boado, E.L. (1988), 'Incentive Policies and Forest Use in the Philippines', in: R. Repetto and M. Gillis (Eds.), *Public Policies and the Misuse of Forest Resources*, Cambridge University Press, Cambridge, UK

Boese, E. (1992), *Actividades Agroforestales y Silviculturales en la Región Amazónica Ecuatoriana*, PROFORS, Quito, Ecuador

Bolhuis, E.E. and J.D. van der Ploeg (1985), *Boerenarbeid en stijlen van landbouwbeoefening*, Leiden Development Studies, Leiden Univ., Leiden.

Branford, S. and Glock, O. (1985), *The Last Frontier: fighting over land in the Amazon*, Zed Books, London.

Browder, J.O. (Ed.) (1989), *Fragile Lands of Latin America: strategies for sustainable development*, Westview Press, Boulder, San Francisco & London

Brown, K. and D.W. Pearce (Eds.) (1994), *The Causes of Tropical Deforestation*, UCL Press, London.

Bunker, S.G. (1985), Underdeveloping the Amazon: extraction, unequal exchange and the failure of the modern state, University of Illinois Press, Urbana, US

Bunyard, P. (1992), 'Ecuador', in: *Amazonia: cause and case for international cooperation*, Environment and Development Resource Centre/Netherlands Committee for IUCN, Brussels/Amsterdam

Capistrano, A.D. (1994), 'Tropical Forest Depletion and the Changing Macroeconomy', in: K. Brown and D.W. Pearce (Eds.), *op. cit.*, pp. 68-85.

Chomitz, K.M. and D.A. Gray (1995), *Roads, Lands, Markets and Deforestation: A Spatial Model of Land Use in Belize*, Policy Research Working Paper no. 1444, The World Bank, Washington

Cleaver, K., Munasinghe, M., Dyson, M., Egli, N., Peuker, A., Wencelius, F. (Eds.) (1992), *Conservation of West and Central African Rainforests*, World Bank Environment Paper No. 1, The World bank, Washington.

Colchester, M. (1992), *Sustaining the Forests: the community-based approach in South and South-East Asia*, Discussion Paper no. 35, UNRISD, Geneva.

Colchester, M. and L. Lohmann (1990), *The Tropical Forestry Action Plan: What Progress?*, World Rainforest Movement/the Ecologist

Colchester, M. and L. Lohmann (Eds.) (1993), *The Struggle for Land and the Fate of the Forests*, The Rainforest Movement/ The Ecologist/ Zed Books, Penang.

Conelly, W.T. (1992), 'Agricultural Intensification in a Philippine Border Community', *Human Ecology* 20, 2, pp. 203-223.

Côté, S. (1993), *Plan de Zonage du Cameroun Forestier Méridional*, ACDI/MINEF, Yaoundé.

Cruz, M.C., Meyer, C.A., Repetto, R. and Woodward, R. (1992), *Population Growth, Poverty, and Environmental Stress: Frontier Migration in the Philippines and Costa Rica*, World Resources Institute, US

CVPED (1992), *Forestry for People and Nature: field research and theory on environemnt and development in the Cagayan Valley, Philippines*, Ateneo, Manila

Dalton, J.B. (1989), 'Managing Denuded Watersheds: Proven Approaches, Strategies and Techniques for Community-based Resource Management in the Philippines Timberlands', *Philippine Geographical Journal* 33, 2, pp. 49-61.

DBB (Deskundigenwerkgroep Duurzaam Bosbeheer) (1994), *Evaluating Sustainable Forest Management*, Report to the Ministry of Agriculture, Nature Mangement and Fisheries, The Hague.

De Witte, R.M. and I. Wahab (1992), *De internationale handel in tropisch hardhout en het behoud van het tropisch regenwoud*, Amsterdamse sociaal-geografische studies 43, Univ. van Amsterdam.

De Groot, W.T., *Environmental Science Theory*, Elsevier, Amsterdam, 583 pp.

De Groot, W.T., J.C.J. van Wetten and C.A. Drijver (1995), 'Drawing the Boundary: An explorative model of the defense of the commons'. in: H. van den Breemer, C.A. Drijver and B. Venema (Eds.), *Local Resource Management in Africa*, John Wiley and Sons, in press.

De Witte, R.M. and I. Wahab (1992), *De International Handel in Tropisch Hardhout en het Behoud van het Tropisch Regenwoud: een kwestie van prioriteiten*, Amsterdamse Sociaal-Geografische Studies no. 43, Universiteit van Amsterdam, Netherlands

Diegas, A.C. (1992), *The Social Dynamics of Deforestation in the Brazilian Amazon: an overview*, Discussion Paper no. 36, UNRISD, Geneva.

DiMento, J.F. (1989), 'Can Social Science Explain Organizational Non-Compliance with Environmental Law?', *Journal of Social Issues* 45, 1, pp. 109-132.

Dorner, P. and W.C. Thiesenhusen (1992), *Land Tenure and Deforestation*, Discussion Paper n0. 34, UNRISD, Geneva.

Doedens, A., G.A. Persoon and C. Wedda (1995), 'The Relevance of Ethnicity in the Depletion and Management of Forest Resources', *Sojourn*, in press.

Dorner, P. and Thiesenhusen, W.C. (1992), *Land Tenure and Deforestation: interactions and environmental implications*, Discussion Paper no. 34, UNRISD, Geneva.

Dove, M.R. (1992), 'Foresters' Beliefs about Farmers: a priority for social science research in social forestry', *Agroforestry Systems* 17, pp. 13-41.

FAO (1985), *Tropical Forestry Action Plan*, Committee on Forest Development in the Tropics, FAO, Rome.

Eden, M.J., McGregor, D.F.M. and Vieira, N.A.Q. (1990), 'Pasture Development on Cleared Forest Land in Northern Amazonia', *The Geographical Journal* 156, 3, pp. 283-296.

Elster, J. (1989), *The Cement of Society*, Cambridge Univ. Press, Cambridge.

FAO (1991), *Population, Environment and Sustainable Agriculture and Rural Development*, FAO/Netherlands Conference on Agriculture and the Environment 15-19 april 1991 , Miscellaneous Document no.2, Rome, Italy

Fearnside, P.M. (1986), 'Spatial Concentration of Deforestation in the Brazilian Amazon', *Ambio* 15, 2, pp. 74-81.

Fearnside, P.M. (1989), 'Extractive Reserves in Brazilian Amazonia: an opportunity to maintain tropical rain forest under sustainable use', *BioScience* 39, 6, pp. 387-393.

Filho, J. Meirelles (1986), *Amazonia: O Que Fazer Por Ela?*, Companhia Editora Nacional, Sao Paolo.

Filius, B.M. (1995), 'Resource Endowment, Product Demand and Institutional Factors as Determinants of the Changing Role of the Tree Component in the Upland Farming System of Gunung Kidul (Java, Indonesia)', *Hinkeloord Reprints*, Dpt. of Forestry, Univ. of Wageningen, Wageningen.

Forster, N.R. (1992), 'Protecting Fragile Lands: New Reasons to Tackle Old Problems', *World Development* 20, 4, pp. 571-585.

Fox, J. (1993), 'Forest Resources in a Nepali Village in 1980 and 1990: The Positive Influence of Population Growth', *Mountain Research and Development* 13, 1, pp. 89-98.

Fujisaka, S. and E. Wollenberg (1991), 'From Forest to Agroforest and from Logger to Agroforester: A Case Study', *Agroforestry Systems* 14, 2, pp. 113-129.

Garrity, D.P., Kummer D.M. and Guiang, E.S. (1993), 'The Philippines', in: National Research Council (Ed.), *Sustainable Agriculture and the Environment in the Humid Tropics*, National Academy Press, Washington.

Gartlan, S. (1989), *La Conservation Ecosystèmes Forestiers du Cameroun*, IUCN, Gland.

Gartlan, S. (1992), 'Practical Constraints on Sustainable logging in Cameroon', In: K. Cleaver *et al.* (Eds), *op. cit.*

Geertz, C. (1963), *Agricultural Involution: The Process of Ecological Change in Indonesia*, University of California Press, Berkeley

Ghai, D. (1992), *Conservation, Livelihood and Democracy: Social Dynamics of Environmental Changes in Africa*, Discussion Paper no. 33, UNRISD, Geneva.

Ghimire, K.B. (1993), *Linkages between Population, Environment and Development: case studies from Costa Rica, Pakistan and Uganda*, UNRISD, Geneva, Switzerland

Gilles, M. (1988), 'Indonesia: Public Policies, Resource Management and the Tropical Forest', in: R. Repetto ann M. Gillis (Eds.), *op cit.*, pp. 43-114.

Government of the Netherlands (1991), *Regeringsstandpunt Tropisch Regenwoud*, Staatsuitgeverij, Den Haag

Goodin, R.E. (1982), *Political Theory and Public Policy*, The Univ. of Chicago Press, Chicago.

Grainger, A. (1993), *Controlling Tropical Deforestation*, Earthscan Publications, London, Uk

Guppy, N. (1984), 'Tropical Deforestation: a Global View', *Foreign Affairs*, spring, pp. 928-965.

Hadley, M. (1990), *Rain Forest Transformation: trends, driving forces, effects*, Lecture Notes PHLO-course Agricultural University of Wageningen, Netherlands

Hart, K. (1982), *The Political Economy of West African Agriculture*, Cambridge

Hecht, S.B. (1993), 'The Logic of Livestock and Deforestation in Amazonia', *BioScience* 43, 10, pp. 687-695.

Heijnsbergen, P. (1991), 'De Bescherming van het Tropisch Regenwoud en het Internationale Recht', *Milieu en Recht*, april/4, pp. 200-209.

Hicks, J.F. *et al.* (1990), *Ecuador's Amazon Region: Development Issues and Options*, World Bank Discussion Papers no.75, World Bank, Washington

Hoekstra, S.P. (1992), *Grassroot Politics: the Implementation of Environmental Policies regarding Grasslands in N.E.Luzon, the Philippines*, Environment and Development Student Report no. 11, Leiden

Houghton, R.A. (1990), 'The Future Role of Tropical Forests in Affecting the Carbon Dioxide Concentration of the Atmosphere', *Ambio* 19, 4, pp. 204-209.

Hurst, P. (1990), *Rainforest Politics: ecological destruction in South-East Asia*, Zed Books, London.

INEFAN/Agrar-und Hydrotechnik GMBH (1993), *Proyecto Protección de la Selva Tropical 'Gran Sumaco': estudio de factibilidad*, Quito, Ecuador

Inoue, M. and Lahjie, A.M. (1990), 'Dynamics of Swidden Agriculture in East Kalimantan', *Agroforestry Systems* 12, pp. 269-284.

ITTO/INEFAN (1993), *Programma de la Institución Forestal Estatal para un Manejo Sustentable de los Recursos Forestales en el Ecuador (Proyecto PD 138/91 Rev.2 (F), Informe Final; Documento General del Proyecto*, Quito, Ecuador

ITTO (1992), *ITTO guidelines for the Sustainable Management of Natural Tropicl Forests*, ITTO Policy Development Series no.1, Yokohoma, Japan

Ives, J. and D.C. Pitt, (Eds.) (1988), *Deforestation: Social Dynamics in Watersheds and Mountain Ecosystems*, Routledge, London and New York

Jack, R. and J.C. Jack (1989), *Moral Vision and Professional Decisions*, Cambridge Univ. Press, Cambridge.

Jacobs, M. (1988), *The Tropical Rainforest: A First Encounter*, Springer, Berlin.

Jansen, H.M.A. (1989) 'Schuldenconversie voor duurzame ontwikkeling', *Internationale Spectator*, dec. 1989, pp. 737-743.

Joldersma, R. and N. Fané (1994), 'The Siwaa experience', *ILEIA Newsletter*, July, pp. 22-23

Karremans, J.A.J. (1990), *Alternative Models for Land Use and Land Occupation in Amazonia*, Paper presented at FOREST 90, October 7-13, 1990, Brazil

Kiernan, M., Perl, M., McCaffrey, Buschbacher, R.J. and Batmanian, G. (1992), 'Pilot Natural Forest Management Initiatives in Latin America: lessons and opportunities', *Unasylva* 169, vol.43, pp. 16-23.

Kummer, D.M. (1992), Deforestation in the Postwar Philippines, Ateneo de Manila University Press, Manila, Philippines

Little, P.E. (1992), *Ecologia Politica de Cuyabeno: el desarollo no sostenible de la Amazonia*, ILDIS/Abya-Yala, Quito, Ecuador

Little, P.D., Horowitz, M.M. with Nyerges, A.E. (Eds.) (1987), *Lands at Risk in the Third World: local-level perspectives*, Westview Press, Boulder and London

Luning, H.A. (1987), 'The Need for Tropical Rain Forests and their Products', in: C.F. van Beusekom, C.P. van Goor and P. Schmidt (Eds.), *Wise Utilization of Tropical Rain Forest Lands*, Tropenbos, Ede, Netherlands

Lynch, O.J. (1990), *Whither the People? Demographic, Tenurial and Agricultural Aspects of the Tropical Forestry Action Plan*, WRI, Washinghton

Manshard, W. and W.B. Morgan (1988), 'Introduction', in: W. Manshard and W.B. Morgan, *Agricultural Expansion and Pioneer Settlement in the Humid Tropics*, The United Nations University, Tokyo, pp. 1-6.

Marshall, G. (1991), 'FAO and Tropical Forestry', *The Ecologist* 21, 2, pp. 66-72

Mather, A.S. (1990), *Global Forest Resources*, Belhaven Press, London, UK

Meyer, W.B. and B.L. Turner II (1992), 'Human Population Growth and Global Land-Use/Cover Change', *Annual Review of Ecology and Systematics* 23, pp. 39-61.

Meyer, W.B., Gregory, D., Turner II, B.L. and McDowell, P.F (1992), 'The Local-Global Continuum', in: R.F. Abler, M.G. Marcus and J.M. Olson (Eds.), *Geography's Inner Worlds: pervasive themes in comtemporary american geography*, Rutgers University Press, New Jersey, US

Ministry of Foreign Affairs (1993), *Sustainable Land Use: a policy for sustainable management and use of natural resources in developing countries*, Sectoral Policy Document nr.2, Den Haag, Netherlands

Moonen, E.M.B. (1995), *Land Use Strategies of Migrant Farmers at the Forest Edge of the Sierra Madre Mountain Range, Quirino, Philippines*, paper for the first EUROSEAS conference, Leiden University

Moran, E.F. (1993), 'Deforestation and Land Use in the Brazilian Amazon', *Human Ecology* 21, 1, pp. 1-21.

Mortimore, M., M. Tiffen and F. Gichuki (1993), 'Sustainable Growth in Machakos', *ILEA Newsletter* 9, 4, pp. 6-10.

Myers, N. (1991), Tropical Forests: present status and future outlook, *Climate Change*, no.19, sept., pp. 3-32.

Ness, G.D., W.D. Drake and S.R. Brechin (Eds.) (1993) *Population-Environment Dynamics*, University of Michigan Press, Ann Arbor

Olofson, H. (Ed.) (1981), *Adaptive Strategies and Change in Philippine Swidden-based Societies, Laguna*, Philippines

Orstom, E. (1990), *Governing the Commons: the evolution of institutions for collective action*, Cambridge University Press Cambrigde, Cambridge, US

OTA (Office of Technical Assessment) (1984), *Technologies to Sustain Tropical Forest Resources*, Washington D.C.

Pichòn, F.J. (1993), 'Colonizacion y Deforestacion en la Frontera Agricola de la Region Amazonica Ecuatoriana. Resultados preliminares de una encuesta de hogares en el nor-oriente', in: L.M. Ruiz (Ed.), *Amazonia: escenarios y conflictos*, CEDIME/Abya-Yala, Quito, Ecuador

Pichòn, F.J. and Bilsborrow, R.E. (1992), *Land-use systems, Deforestation and Associated Demographic Factors in the Humid Tropics: farm-level evidence from Ecuador*, paper for IUSSP Seminar on Population and Deforestation, Campinas, 30/11/93-3/12/93

Plumwood, V. and Routley, R. (1982), 'World Rainforest Destruction - the Social Factors', *The Ecologist* 12, 1, pp. 4-22

Poffenberger, M., (Ed.) (1990), *Keepers of the Forest: Land Management Alternatives in Southeast Asia*, Ateneo de Manila University Press, Manila

Ponting, C. (1991), *A Green History of the World*, Sinclair-Stevenson, London.

Poore, D. (1989), *No Timber Without Trees: sustainability in the Tropical Forest*, Earthscan Publications, London, UK

Potter, L. (1987), 'Degradation, innovation and social welfare in the Riam Kiwa Valley, Kalimantan, Indonesia', in: Blaikie, P. and Brookfield, H. (Eds.), *Land Degradation and Society*, Methuen, London

Rambo, A.T. (1993), 'Comment on: Thomas, D.E. (1993), Transformation in the Thai Landscape: an Emerging Role for Social Forestry in Rural Development Programmes', *Regional Development Dialogue* 14, 1, pp. 47-56.

Repetto, R. (1990), 'Deforestation in the Tropics', *Scientific American* 262, 4, pp. 18-24.

Repetto, R. (1988), *The Forests for the Trees? Government policies and the misuse of forest resources*, World Resources Institute, Washington

Richards, P.W. (1977), 'Tropical Forests and Woodlands: an overview', *Agro-ecosystems* 3, pp. 225-238.

Rijksen, H. and A. Rijksen (1988), *Orang Oetangs, de laatste bosmensen?* Natuur en Techniek, Maastricht.

Robles, A. (1993), 'Logging and Political Power', in: Gamalinda, E. and Coronel, S. (Eds.), *Saving the Earth: the Philippine Experience*, Philippine Center for Investigative Journalism, Manilla, Philippines

Rotmensen, G.J. (1988), *A Future for Shifting Cultivation?* A Literature Review on Incorporation and Ecology, Papers on Environment and Development no.11, Leiden University

Rudel, T.K. (forthcoming 1995), 'When Do Property Rights Matter?: Open Access, Informal Social Controls, and Deforestation in the Ecuadorian Amazon', *Human Organization.*

Rudel, T.K. (1983), 'Roads, Speculators, and Colonization in the Ecuadorian Amazon', *Human Ecology* 11, 4, pp. 385-403

Sajise, P.E. and Omegan, E.A. (1990), 'The Changing Upland Landscape of the Northern Philippines', in: M. Poffenberger (Ed.), *op. cit.*

Sanchez, P.A., C.A. Palm and T.J. Smyth (1990), 'Approaches to Mitigate Tropical Deforestation by Sustainable Soil Management Practices', in: H.W. Scharpenseel, M. Schomaker and A. Ayoub (Eds.), *Soils on a Warmer Earth*, Elsevier, Amsterdam, pp. 211-220.

Sargent, C. (1990), *Defining the Issues: some thoughts and recommendations on recent critical comments on TFAP*, IIED, London

Schmithusen, F. (1994), 'Forest Policy Development in an International Perspective', *BOS NiEuWSsletter* no.28, vol.13 no. 1, pp. 16-35)

Schroeder, P.E., Dixon, R.K. and Winjum, J.K. (1993), 'Forest Management and Agroforestry to Sequester and Conserve Atmospheric Carbon Dioxide', *Unasylva* 173, vol.44, pp. 52-60

Schwartzman, S. (1992), *Land Distribution and the Social Costs of Frontier Development in Brazil: Social and Historical Context of Extractive Reserves*, paper Environmental Defense Fund, Washington

Sedjo, R.A. (1992), 'Temperate Forest Ecosystems in the Global Carbon Cycle', *Ambio* 21, 4, pp. 274-277

Serrano, F. (1990), 'Modernization in the Ecuadorian Amazon: Indigenous Peoples' Political Responses to State Modernization Policies', *Latinamericanist* 26, 1, pp. 6-11.

Shafik, N. (1994), 'Macroeconomic Causes of Deforestation: Barking Up the Wrong Tree?', in: K. Brown and D.W. Pearce (Eds.), *op. cit.*, pp. 86-95.

Silva, E., *Community Forestry in a Politicological Perspective*, seminar at CEDLA, University of Amsterdam, 1995

Sips, P. (1993), *Management of Tropical Secondary Rain Forest in Latin America: Today's challenge, tomorrow's accomplished fact?*, Werkdocument IKC-NBLF Nr. 27, Wageningen, Netherlands

Soest, D.P. van (1994), *Tropical rainforest degradation in Cameroon*, University of Groningen.

Sour, A. (1993), 'Natuurpark vol met olie, boeren en jagers', *Internationale Samenwerking*, July/August, pp. 33-35.

Southgate, D. and M. Whitaker (1992), 'Promoting Resource Degradation in Latin America: Tropical Deforestation, Soil Erosion, and Coastal Ecosystem Disturbance in Ecuador', *Economic Development and Cultural Change*, 1992, pp. 787-807.

Swart, R.J. and Rotmans, J. (1990), 'Ontbossing en Broeikaseffect', *Milieu* 4, pp. 104-110.

Tacon, F. and Harley, J.L. (1990), 'Deforestation in the Tropics and Proposals to Arrest it', *Ambio* 19, 8, pp. 372-378

Turner, B.L. II, Moss, R.H. and Skole, D.L. (Eds.) (1993), *Relating Land Use and Global Land-Cover Change: a proposal for and IGBD-HDP Core Project*, IGBP Report No.24/HDP Report No.5, IGBP Programme, Stockholm

Uhl, C., R. Buschbacher and E.A.S. Serrao, 'Abandoned Pasture in Eastern Amazonia: I; Patterns of Plant Succession', *Journal of Ecology* 76, pp. 676-678.

Umans, L. (1993), *Analysis and Typology of Indigenous Forest Management in the Humid Tropics of Asia*, Werkdocument IKC-NBLF nr. 26, Wageningen, Netherlands

UNRISD (1992), *Development, environment and people: Report of the Conference on the Social Dimensions of Environment and Sustainable Development, Valletta, Malta, 22-25 April 1992*, UNRISD, Geneva, Switzerland

Uquillas, J.E. (1989), 'Social Impacts of Modernization and Public Policy, and Prospects for Indigenous Development in Ecuador's Amazonia', in: D. Schuman and W. Patridge (Eds.), *The Human Ecology of Tropical Land Settlement in latin America*, Westview Press, Boulder

Uquillas, J.E. (1993), 'Estructuracion del Espacio y Actividad Productiva Indigena en la Amazonia Ecuatoriana', in: L.M. Ruiz, (Ed.), *op. cit.*

Utting, P. (1993), *Trees, People and Power: Social Dimensions of Deforestation and Forest Protection in Central America*, Earthscan, London

Van den Top, G.M. (1995), *Public Forests, Private Stakes and Government: The Deforestation of the Northern Sierra Madre, Philippines*, Paper for the EUROSEAS Conference, Centre of Environmental Science, Leiden.

Vayda, A.P. (1983), 'Progressive Contextualization: Methods for Research in Human Ecology', *Human Ecology* 11, 3, pp. 265-281.

Veldkamp, A. and L.O. Fresco (1995), *Modelling Land Use Changes and their Temporal and Spatial Variability with CLUE; A Pilot Study for Costa Rica*, Dpt. of Agronomy, Wageningen Agricultural University, Wageningen.

Vitug, M.D. (1993), *Power from the Forest: the Politics of Logging*, Philippine Center for Investigative Journalism, Philippines

Warner, K. (1991), *Shifting Cultivators: local technical knowledge and natural resource management in the humid tropics*, FAO, Rome

Wells, M.P. (1989), *Can Indonesia's Biological Diversity be Protected by Linking Economic Development with National Park Management? Three Cases Studies from the Outer Islands*, a Report for the World Bank, Washington

Wiersum, K.F. (1994), 'Farmer Adoption of Contour Hedgerow Intercropping, A Case Study from East Indonesia', *Agroforestry Systems* 27, pp. 163-182.

Wiersum, K.F. and Ketner, P. (1989), 'Reforestation, a Feasible Contribution to Reducing the Atmospheric Carbon Dioxide Content?', in: P.A. Okken *et al.* (Eds.), *Climate and Energy: the Feasibility of Controling CO2 Emissions*, pp. 107-124.

Winterbottom, R. (1992), 'Tropical Forestry Action Plans and Indigenous People: the case of Cameroon', in: K. Cleaver *et al.* (Eds.), *op. cit.*

World Resources Institute (1990), World Resources 1990-1991, a Guide to the Global Environment, Oxford University Press

Zanen, S. and W.T. de Groot (1991), 'Enhancing Participation of Local People: Some Basic Principles and an Example from Burkina Faso', *Landscape and Urban Planning* 20, 1-3, pp. 151-158.

Zuidema, G. G.J. van den Born, J. Alcamo and G.J.J. Kreileman (1994), 'Simulating Change sin Global Land Cover as Affected by Economic and and Climatic Factors', *Water, Air and Soil Pollution* 76, pp. 163-198.

ANNEX I

Science for the Deforestation Problem:
A Global Review with Special Reference to the Philippines

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Summary. - Tropical deforestation is one of the most urgent problems facing the world at present. This article briefly reviews several types of scientific research aiming to address the deforestation problem, such as statistical studies, causal case studies and political-economic studies. Based on this, an actor-oriented methodology is explained which seeks to combine the strengths of these approaches. The framework is illustrated by a generalized case from the Philippines, in which the causal relationships between actors and the politician's dilemma of 'democracy versus patronage' play pivotal roles. In the conclusion, the importance is stressed of this type of research, able to lay an empirical basis for the necessary 'delinking' of deforestation from the general driving forces such as population growth and per capita incomes.

I.1. INTRODUCTION

With more than 100,000 square kilometres of tropical forest currently being lost every year, tropical deforestation is one of the most pressing problems facing the world today. The loss of protective soil cover results in soil degradation that directly affect millions of local people's livelihoods. On a wider scale, erosion and hydrological impacts cause siltation, floods and droughts with serious consequences for downstream reservoirs, cities, fisheries and coastal nature. At the global level, tropical deforestation accounts for most of the alarming losses of biodiversity and adds substantially to carbon dioxyde emissions.

The rising awareness of these impacts has led to a proliferation of global forest actions and national forest policies. Hyman (1983) reviewed the forest protection policies of the Philippines for the 1980s. In spite of the good will invested in these intentions, results have not been forthcoming; during the decade, the Philippine deforestation rate did not slow down significantly and another 1,800 square kilometres (23 %) of the remaining Philippine forest cover was lost (Kummer, 1992). The Philippines were no exception; worldwide, the deforestation problem still eludes all significant solutions.

Science has played an important role in building the global awareness with respect to the seriousness of the deforestation problem. What counts at present, however, is the design of succesful solutions, and in that respect science cannot be said to stand apart from the ongoing failure. Somehow, the design of solutions for tropical deforestation does not only elude policy making, but scientific paradigms as well. The next section of this article is aimed to explore this phenomenon somewhat further, by briefly discussing a number of existing research approaches. In the sections 3 and 4 we will first outline and then illustrate a research methodology expressly designed to equip researchers to contribute to solutions of environmental problems such as deforestation.

Thus, the objective of this article is both methodological and substantive. We aim to substantiate the framework with the deforestation problem, and to elucidate the deforestation problem by means of the framework. Needless to say, the format of an article necessitates rather far-reaching simplifications of both the methodology and the deforestation dynamics. We have taken much care to be 'true enough' for our purpose of cross-wise illustration, but each real-world problem situation and policy making obviously requires a deeper, site-specific methodological reflection and data analysis.

I.2. RESEARCH TYPES ADDRESSING THE DEFORESTATION PROBLEM

The tropical forest is a major source of data and inspirations for 'pure-science' studies in ecology, human ecology and other disciplines. We will focus here on studies more expressly designed to address deforestation as a problem, *i.e.*, studies with the aim to contribute to the protection of forest ecosystems, cultures or livelihoods. In that respect, five different research types may be distinguished:

- applied-ecological studies, aiming to show the diversity and beauty of the forest and the impact of human interventions
- forest management and land evaluation studies, aiming to indicate appropriate (rational, sustainable) forestry practices and land use
- statistical studies relating deforestation to its possible causes, e.g. logging and population pressure
- social-scientific case studies going into site-specific deforestation processes
- political-economic analyses of deforestation.

Below, the relevance and the weaker points of these study types are briefly discussed.

1. Applied-ecological studies

The applied-ecological studies have played a crucial function in impressing the urgency of the deforestation problem on policy makers and the public at large. In some instances, ecosystem protection can be accomplished without further scientific support being necessary, e.g. through NGO actions responding to the scientific news. With respect to tropical deforestation however, more is obviously needed.

2. Forest management and Land Evaluation studies

Forest management and land evaluation studies can be said to be part of the environmental management paradigm, visible, for instance, in textbooks such as Ortolano (1984) and Baldwin (1985). Generally put, the environmental management approach is to focus attention on the physical-scientific causal chains between problematic activities (e.g. acid emissions or inappropriate logging) and their impacts, and from that derive standards with respect to these problematic activities, e.g., an acceptable acid emission, an allowable cut or a prescription for farmers to adopt a certain agroforestry system. The methodology of land evaluation (e.g. FAO, 1989) is a 'strong version' of this approach, characteristically producing detailed maps prescribing the land use systems that should be applied in a certain region. In most areas where the tropical forest is at stake, however, the fate of these maps seems to be to remain office decoration. In general, environmental management prescriptions may be sufficient in situations where strong governments have the political will to enforce them, but in the case of tropical deforestation, knowledge of how farmers and loggers *should* behave is only a first step. Next, knowledge is needed on why farmers and loggers do not behave that way already, and how improvements may be brought about. The next research types have that focus on human behavior.

3. Statistical studies

The previous two research types comprise the vast majority of studies designed to address the tropical deforestation problem. From 1985 onwards the first results begin to show of the insight that for implementable solutions for tropical deforestation, we should focus less on the forest itself and on prescribing what people should do, and instead come to

grips with the causes of why people do not do so already, *i.e.* the social forces driving the deforestation process. One important approach here are the statistical studies of which Grainger (1986), Rudel (1989a), Southgate *et al.* (1991) and Kummer (1992) are examples, focusing on the global scale, on Ecuador and on the Philippines, respectively. The aim of these studies is to quantify the relationship between the rate of deforestation in a region or country (the dependent variable) and factors assumed to co-determine this deforestation rate. Commonly used factors are population density, density of roads and intensity of logging, with distance to the national capital, GNP per capita and tenure insecurity often in an additional role. They are then combined into a multiple regression formula, searching for the best fit with the deforestation variable.

The statistical studies have the advantage that they work at a regional or national level, which enables them to abstract from incidental local circumstances. At the same time, the difficulties encountered by the statistical studies are deep and varied. To begin with, the studies struggle with validity problems which are virtually inescapable when working with Third World census data. Secondly, the studies usually treat inductively arrived best fits as if they were deductive tests; inductively generated correlation coefficients highly reflect the malleability of data in the hands of creative researchers, however, and are of little value if no separation is made between data used to arrive at a best fit and data set aside and used to test that fit. A third difficulty of the statistical approach is that it often remains unclear if correlations indicate causes. If population density correlates with deforestation, for instance, does this then mean that local people cause deforestation, or do they simply fill the gap made by other, outside actors? And if logging correlates with deforestation, is not that almost as trivial as saying that deforestation correlates with deforestation? A final problem concerns the structure of the regression equations used in the studies. Following statistical tradition, the equations have an additive structure:

DEFORESTATION = a + b*POPULATION + c*ROADS + d*....

Finding a best fit for such an equation amounts to creating the artifact of a built-in proof that as long as there are population, roads and so on, there will always be deforestation. Reality proves otherwise. Kummer (1992), after a thorough review of the statistical studies and trying one for himself, concludes that these studies up till now have been inconclusive. An analoguous conclusion is reached by Turner *et al.* (1993), asserting that "inductive assessments will not be sufficient", and adding that "further insights will follow from deductive tests of theories that specify the processes and relationships in question". The first step in such an approach is to generate a deforestation model (hence a regression equation) with a theory-grounded structure. The Appendix of this article presents an example of such a structure, based on theoretical insights and yet testable through statistical data. Since it is based on the Action-in-Context approach, we will discuss it somewhat further on.

4. Local deforestation studies

Global deforestation models, several of which are in the making in order to be used for global climate policy making (ref. Zuidema *et al.*, 1994, for a state-of-the-art example) share with the statistical regression formula the always-positive relationship between population, economic growth and deforestation, and therewith carry the same artifactual message that as long as there are population increase and economic growth, there can only be more deforestation. Therefore, it serves to take a look at the level where causality really takes place. This is the level of what is research type 4 here, the deforestation case

studies. One characteristic example is Kartawinata and Vayda (1984). They show that deforestation in Kalimantan (Indonesia) was driven not by the presence of loggers and farmers *per se*, but by loggers and farmers making contingent choices between available options, out of which the forest-destructive options happened to be the most attractive. From the Philippines, two case studies deserve special attention. Fujisaka and Wollenberg (1991) describe how two pioneer communities went through a rapid shift from destructive logging almost directly to permanent agroforestry cropping systems, without going through the usual phase of soil-exhaustive annual crops. This took place by a combination of fortunate circumstances. First, the low pH soils 'refused' the annual crops, forcing people to look for something else in a stage before the soils were exhausted. Secondly, the people had an innovative attitude and sufficient basic knowledge about trees, as well as (because of the logging acivities!) enough capital to make the necessary investment in agroforestry. In summarizing terms: agroforestry was attractive, and it was an available option. The study of Conelly (1992) is even more informative in this respect, showing how slash-and-burn farmers went through the transition to permanent agriculture (fruit trees and irrigated rice), *in spite of the fact that forest was still standing all around*. The key here was an interplay of increased cost of forest destruction (caused by tough protective actions by the local forest agency) and the presence of an alternative system that the farmers already knew enough about and that paid off sufficiently in terms of labour productivity. Here again we see a confluence of options and motivations: the permanent agriculture option was available, and it was attractive.

Comparing the statistical studies and the local studies, it shows that a model stucture that does not include the possibility of a reversal of deforestation, in spite of farmers being present, is deeply inadequate. Also, it shows that for really coming to grips with the deforestation process, a first focus on *actors* is needed, *i.e.*, the motivations of people (and logging companies, forest agencies etc.) rather than their numbers only. Contrary to numbers of people, densities of roads and so on, motivational factors can move people into the forest but also out of it, e.g., when logging roads are no longer maintained. Similarly, motivational factors can move people to unsustainable slash-and-burn agriculture but also to investments in sustainable forest land use, e.g., if they can win a tenure title doing so. Obviously, many contextual factors play a role in these actors' choices, but the degree and way they do can be understood only by putting these choices in the centre of the methodology and models.

The local studies approach has one intrinsic weakness, which is its site-specific and actor-specific character. Since we cannot cover the whole world with permanent case studies, also more general lines of reasoning are needed that may show how to lift case study results from the level of localities and actors to the level of regions, nations and actors categories. It it here that the next research type lends a hand.

5. Political-economic studies

Political-economic research (e.g., Repetto and Gillis, 1988; Bunker, 1985; Binswanger, 1991; Colchester and Lohmann, 1993) offers fascinating insights in the linkages between state policies and deforestation. One of the general findings of this type of research is that 'perverse' incentives emanating from non-forest policies often have a far greater influence on the forest than do the usually good intentions of the forestry sector. Obviously, findings such as these are quite relevant to generate ideas for possible linkages between forest actors and macro-phenomena. In Repetto and Gillis, for instance, we find the example of the large-scale ranchers in the Amazon, for whom it would be irrational to

even have a ranch, let alone clear it of its forest cover, were it not for enormous government subsidies (which were in themselves a drain on the nation's economic position). It is remarkable that Bunker, Repetto and Gillis and other political-economic authors suddenly appear to drop their actors perspective when trying to explain why in fact states would be so irrational as to let go of their most valuable resource without it benefiting the nation even on the short run; reasons mentioned are "failures of understanding" and "undervaluation of the forest resource". The real reason is, it seems to us, that the state-level actors were acutely aware of the value of the resource and that it was perfectly rational for them to plunder it. The mechanism here is what Kummer calls the "private use of public office", extensively documented for the Philippines by the journalist Vitug (1993). The economist Boyce (1992) describes the effect of this phenomenon at the national level, refering to it as the "revolving door" set up at the border: in go the public loans, out comes the private capital these loans are converted into (and inside sits the Filipino people, left to repay the debts).

Methodologically, the way to understand these phenomena appears to not regard the state as an abstract entity harbouring a nation-wide rationality, but to conceptualize the state as a collection of concrete actors with their own motivations - which will only very partially coincide with national rationalities if the state is not under democratic control. We will return to this in the 'generalized example' of Section 4.

I.3. ACTION-IN-CONTEXT PRINCIPLES

De Groot (1992) has developed a methodological framework for the analysis, explanation and solution of environmental problems. Central features of this 'Problem-in-Context' approach are the conceptualisation and analysis of environmental problems as empirical/normative discrepancies of facts ('chains of effects') and values ('chains of norms') which identify the problematic human actions, and the explanation of the environmental problem by putting it in its normative, physical and social context. Solutions are then designed on the basis of options identified in the analysis and explanation.

In the Problem-in-Context framework, the determination of carrying capacities is part of the problem analysis. Carrying capacities are defined formally as the normative counterparts of the factual human actions or, less formally, as the content and intensity of these actions as they should be if seen from a normative perspective of sustainability or other goals. In deforestation problems therefore, carrying capacities are matters such as the maximum allowable cut of logging, the minimum tree cover of agroforestry systems and the appropriate crop on a certain slope and soil type. The research types 1 and 2 of the previous section are problem-analytical research types in Problem-in-Context terms. What land evaluation studies typically do, for instance, is to derive carrying capacities from 'higher' norms such as sustainability and economic welfare. In Problem-in-Cotext terms, this is called studying the 'chains of norms' that start out from the higher norms and end at the carrying capacities. In the next section, Figure 1 will visualize this.

The research types 3, 4 and 5 of the previous section are ways of studying the social context of the deforestation problem, *i.e.*, its social-scientific explanation. Based on the work of Vayda (1983) and related to the approach of Blaikie (1989), De Groot has worked out the 'Action-in-Context' methodology for this explanatory research, as part of the overall Problem-in-Context framework. It is on this part that the present section will focus.

Action-in-Context research starts out with the 'primary actions', defined as the actions which directly affect the environment, and identified as a result of the problem analysis. It then proceeds by placing these actions in their wider context, first identifying the primary actors as the ones who decide on the primary actions, and then connecting these decisions to other actors and factors, 'progressively contextualizing', as Vayda puts it, on a route guided by principles of problem relevance.

In somewhat more detail, the Action-in-Context approach may be described as an interconnection of three structures:

- Actions (primary or other) are connected to actors, defined as the decision-making social units, be they individual people or organisations. The decision-making process is led by two matters, (1) the alternative courses of action available to the actor (the actor's *options*) and (2) the choice-relevant characteristics of these options for the actors, called *motivational factors* in the Action-in-Context framework. In the field of deforestation, farmers and logging corporations are typical actors, but landlords and government agencies may also exert a significant influence on the problem. Many of the motivational factors in the deforestation problem will be of the economic kind, but this is certainly not necessarily so; actors may also follow quite different structures of moral reasoning, such as the 'ethics of care'.
- Actors are connected to each other. Refered to as 'social networks' or a similar term, social science usually conceptualizes these actor connections as direct, actor-to-actor, often face-to-face, links. *Causal* actor linkages, however, are of a different kind. Causal social linkages are linkages of power, and having power over other people is not primarily that you often see these people. Primarily, power is that you have an influence on the other people's choices, and that works by somehow having an infuence on the other people's options and/or motivational factors. Some examples from the deforestation field are: government agencies opening up new lands (= creating options for the poor), government agencies issueing subsidies for forest ranching (= influencing motivational factors of the rich), landlords prohibiting tenants to plant trees (= closing off an option), consumers becoming reluctant to buy tropical timber (= influencing motivational factors of logging corporations), and so on. Analogously, the the social-scientific explanation of what actors are doing should follow these 'power lines' between actors and not primarily their social networks. On the progressively contextualizing route, the researcher first identifies the actors physically interacting with the environment (the 'primary actors'), then their options and motivational factors, then the 'secondary' actors influencing these options and motivational factors, and so on. In the Action-in-Context framework, *actors field* is the term given to the structure found this way. Needless to say, the secondary and further actors may hold a much larger sway over a deforestation problem than do the primary (often local) ones in the actors field.
- An actors field analysis typically proceeds by hopping over, as it were, to a next actor category as soon as options and motivational factors of one actor category are identified. For each actor category separately, the options and motivational factors are also connected to more stable and general properties of structure and culture. As an example, the frequency of a bus service is a motivational factor for people's choices betrwwen public and private traffic; this factor is connected to the more general structure of the public transport system and the political priorities of private versus transport. A second examples is that people's preferences for certain actions are connected to 'deeper' ideas of personal achievement, gender roles and so on. Under the name of 'deeper analysis', the Action-in-Context framework supplies a general model through which these connections may be

investigated, applying concepts such as 'potential options', 'autonomy', 'objectified motivational factors' and 'interpretative frames'. An Action-in-Context analysis thus involves the application of this model, focusing on the most relevant actors identified in the actors field.

An Action-in-Context explanation of problematic actions may be rounded off by several types of further analyses. One of them is to search for a possible 'cooperative structures' of actors identified in the actors field. In view of Kummer's notion of "private use of public office" it is quite likely that such a search may yield important insights into the intimate relationships between governments, elites and foreign states and banks. The social network concept re-emerges here.

Action-in-Context research is directly linked to a systematic identification of solutions to the problem the analysis started out with. Generally, the actors field analysis identifies potential *target groups* for policies, and the 'deeper analysis per actor' identifies potential *policy contents*, often refered to as 'policy instruments'. On the basis of the 'deeper analysis' model, De Groot (1992) supplies a general list of policy instruments, comprising all other overviews known to us (e.g., Lutz and Young, 1992).

The Problem-in-Context approach interconnects the research types discussed in the previous section. The problem-analytic research types 1 and 2 identify which (primary) actions are problematic actions, *i.e.* the ones with the largest discrepancy between the empirical action and its normative (carrying capacity) counterpart. This research thus identifies which actions are to be explained, and lends a guidance of relevance to the many choices that have to be made on the progressively contextualizing Action-in-Context route. The primary actors, actors field, 'deeper analysis' and further analyses obviously encompass and interconnect the case study approach (research type 4) and the political-economic studies (research type 5).

The relation between Action-in-Context and the statistical and modeling approaches (research type 3) is less obvious at first sight. In fact, these approaches, focusing as they usually do on generalized phenomena rather than on specific mechanisms, express different paradigm than the actor-oriented principles of Action-in-Context. This theme will be returned to in the concluding section. At the same time, this does not imply that Action-in-Context would be un-modelable or unaccessible to statistical analysis. The Appendix of this article has been designed to show an operationalisation of Action-in-Context principles in modeling and statistical directions. The 'ATTRactiveness' element of the equation is a simplified version of the options and motivational factors of the actor category under study. The 'POPulation' factor stands for the number of actors in the actor category. The conversion factor stands for the deforestation impact of the various options, and the response factor stands for the actor choice components not caught by the simplicity of the ATTRactiveness formula. As explained in the Appendix, a full model of the causes of deforestation can be built up by nested and side-by-side combinations of the DEFOrestation equations, one for each actor category in the actors field.

I.4. A GENERALIZED ILLUSTRATION FROM THE PHILIPPINES

As said in the Introduction, the Philippines is a country with an as yet unresolved deforestation problem, affecting upland soils, lowland river systems and global biodiversity. This section aims to highlight some of the social mechanisms underlying the problem, using some Action-in-Context principles to set up a qualitative structure of these mechanisms. We will do so abstracting from countless details of the local and specific present-day situation, hence a 'generalized example', designed to show what we think constitutes some core features of the deforestation dynamic. Many details and additions may be found, for instance, in CVPED (1992), Kamminga and Van den Top (1994), Aquino (1994), Doedens *et al.* (1994) and Van den Top (1994). The example is summarized in Figure 1, outlining the actors field of the deforestation problem. Thus, it also illustrates this characteristic element of the Action-in-Context approach. Actor fields are identified from the problematic action 'outward'; this is also the sequence in which we will discuss the figure.

At the top of Figure 1, we find the symbolic representation of the deforestation problem itself, expressed by the 'tension flashes' denoting the discrepancies of what should happen for the forest and its functions to be sustainable, versus what is actually happening. In the Figure, the lowest part of the deforestation problem block is simplified as the actual versus the acceptable ('carrying capacity') cutting rate of trees. The arrow emerging upward from the element of 'actual trees cutting' is the beginning of a chain of effects comprising soil degradation, increased silt loads of rivers, decline of yields and so on, ending in 'final impacts' on upland livelihoods, lowland economies and biodiversity. The arrow arriving from higher up at the element of 'acceptable trees cutting' is the end of a chain of norms starting out from values in terms of livelihoods, biodiversity and so on, and runs downward through the normative counterparts of the effect chain (*i.e.*, acceptable river silt loads and so on). Roughly, all environmental problems may be analyzed this way, with chains of impacts and chains of norms running upwards and downwards between human activies and final impacts.

The deadly embrace

One step further down in the Figure, the activity of trees destruction is seen to be composed of two major elements, logging and burning. These, in turn, are connected to two major actor categories, corporate loggers and local people, respectively. In the Philippines as in most other countries, the local people are in fact recent migrants. The loggers and local people are kept separate in the analysis because they have very different options to choose between and different motivations for their choices, embedded in different structural and cultural phenomena. (One of the details we neglect here is that also local people usually are involved in some smaller-scale logging, e.g., for the regional furniture industry. Another neglected factor is that different ethnic groups within the local population, having different agricultural traditions and different cultural outlooks on the forest, may vary with respect to their choices for either slash-and-burn or permanent agriculture. The same holds for first-comers versus more recent immigrants. Finally, we neglect that also the state may be a primary actor, e.g. intervening to establish state plantations.)

At the next lower level of the analysis, we find the options of the local people, summarized here as (short-fallow) 'slash-and-burn', 'permanent agriculture' and 'outmi

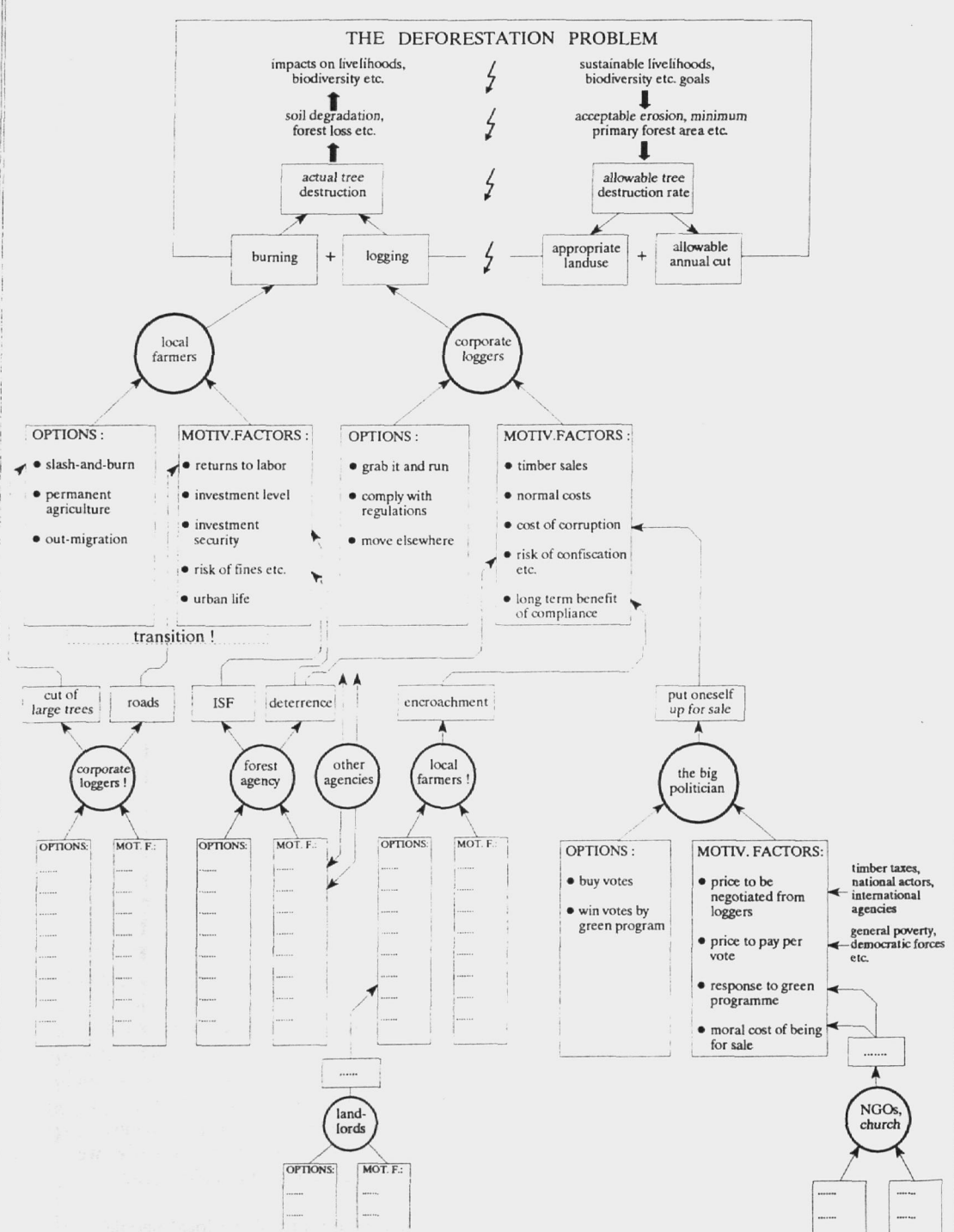

FIGURE 1. A simplified actors field of deforestation in the Philippines
The problem itself is summarized at the top. Local farmers and corporate loggers are the primary actors, but secondary actors with respect to each other at the same time. NGOs and the church are important tertiary actors, acting inter alia through the corruption dilemma of the 'big politician'.

gration'. Next to these, the motivational factors of the farmers are listed as 'returns-to-labor', 'investment level', 'investment security', 'risk of fines etc.' associated with illegal forest conversion and 'urban life', the latter denoting the risks, opportunities and pleasures farmers associate with outmigration. In general, the weights that farmers attach to the various motivational factors will vary with their circumstances. Poor farmers in the forest fringes of the Philippines and Ecuador, for instance, will put much weight on low investment levels, because they are well aware of the risks inherent in debts (Kamminga, 1994). Another important element here is the size of the forest blocs farmers percieve as *de facto* their own; on the national average, this differs with a factor of 10 between Ecuador and the Philippines (Rudel, 1989a). Farmers in circumstances of perceived land shortage will tend to shift away from returns-to-labor to returns-to-land (land productivity) as the prime motivational factor. This often marks the difference between extensive, profit-oriented agriculture and more intensive, stability-oriented agriculture. Sometimes, these two farming styles may be seen to operate side by side consistently in the same region, often depending on the cultural background of farmers (e.g., for a general analysis, Van der Ploeg, 1985, and for the Philippine forest, Doedens *et al.*, 1994). More importantly in our case, the same factors rule the possible transition from unsustainable slash-and-burn to more permanent farming systems; the two Philippine case studies mentioned in section 2 are again enlightening here. A full analysis of transition potential requires, in Action-in-Context terms, a deeper analysis. In Figure 1, the potential is summarized by way of the 'transition!' flag.

Next to the farmers we find the corporate loggers as the second category of primary actors. Their options are simplified here as consisting of only three basic strategies, 'grab-it-and-run', 'comply with regulations' (*i.e.*, sustainable logging) and 'move elsewhere'.[46] In the Figure, the first motivational factors of the logging companies are 'timber sales' and 'normal costs', the latter being the total of the logistics, cutting, replanting, transport, taxes and so on of the logging operations. Of course, the normal cost of the grab-it-and-run option is much lower than in the sustainable use option of compliance to the regulations. This difference may be offset by the next three factors. The 'cost of corruption' denotes the total the logging corporation has to pay to politicians to protect the concession, to government officials to look the other way and to checkpoint officers obliging the passing trucks. Because of the interconnectedness of all these actors, this money may be viewed as a single sum paid into the forestry system and distibuted there between the various actors. The fourth motivational factor, called 'risk of confiscation etc.' is included because this system sometimes fails. In our region of study, for instance, a high officer of the military, who refused to become a member of the corruption community, could not be transferred to a quiet office in Manila quickly enough to prevent him from stopping several illegal operations, temporarily. The final motivational

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[46] In order to keep the analysis as simple and universal as possible, we have neglected here that at present, a logging ban has been laid on the remaining primary forests of the Philippines, officially leaving only less attractive secondary forest to cut. Moreover, many Timber License Agreements have been cancelled due to rising public pressure, the personal courage of some government agents and probably also because of decreased motivations of the companies to fight for their concessions now that the primary forest option has been cut off, so that in fact many loggers are now choosing the 'move elsewhere' option. At the same time, however, smaller logging operations tend to take over, supplying the burgeoning furniture market.

factor of the loggers is called 'long-term benefit of compliance'. This refers to the fact that if a forest is logged sustainably and protected after that, it may be logged again profitably some thirty years later, and again, eternally.

Behind the two categories of primary actors, many secondary actors may be identified that influence the primary actors' decisions by influencing their options or motivational factors. These actors are called 'secondary' because they are identified in the second step of the progressive contextualization and not, of course, because they would be less powerful, intended or unintended, in the causation of the problem. Focusing on the Philippine case, Figure 1 concentrates on four of them.

The first secondary actor is shorthanded as the 'Forest Agency' (in the Philippines, the Department of Environment and Natural Resources). This actor is found behind two different types of actions influencing, although as yet not very strongly, several elements in the primary actors' choices. The first type of action is positive, we could say, aiming to strengthen factors that move people towards sustainable behavior or unburden them from factors that work the other way. In the Philippines, the most important of these actions is called Integrated Social Forestry, 'ISF' in the Figure. Officially ISF is an integrated package that influences farmers in many ways; agroforestry outreach, for instance, influences the permanent agriculture option, and credit schemes influence the investment level factor. In practice, the major and often the only element of ISF is an influence on one motivational factor, investment security. If people promise to behave, many receive a so-called 'Certificate of Stewardship Contract', a 25-year lease on 5 to 7 hectares, in spite of occupying what is officially state land. This removes the farmers' fear that they may in fact be expelled any moment, and thus enables them to view the making of terraces and the planting of tree crops with a new economic eye.[47] The second type of action of the Forest Agency is the reverse of the positive action; it is the deterrence of unsustainable forest use by farmers and loggers, acting on their 'fines etc.' factor, that also includes imprisonement, confiscations and so on. Practice in the Philippines shows that deterrence is hard to implement if not backed up by other agents and that deterrence in itself is not sufficient to protect the forest if the other motivational factors of the primary actors strongly work against it. But as indicated in Section 2, deterrence may certainly work as part of a mixture of other actions and fortunate circumstances helping farmers on the road to transition.

Next to the Forest Agency in Figure 1, 'other agencies' are mentioned as an actor category. Examples are the military, the Ministry of Agriculture, and local government. Their actions are not spelled out in the Figure, but the important thing to note here is many of these actions tend to pre-empt the actions of the Forest Agency, either directly or by undermining the motivations of the Forest Agency. What is the use of forest protection if the provincial planning agency is designing a road right through the area? Why promote agroforestry if the Ministry of Agriculture organises a market only for maize? Why threaten trespassers with jail if they are protected by the governor? What is the use of

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[47] Theoretically and sometimes also in practice, tenure security is a two-pronged matter. Sometimes, farmers invest in terraces, trees and other long-term actions in order to protect a *de facto* claim on land that *de jure* they occupy illegally. Landlords may prohibit tenants to plant trees for the same reason. Theoretically then, people may drop investing in sustainability once they receive an official title. We do not know of any clear-cut example where this has been the case, however.

organising people to protect their area against new immigrants if the mayor embraces every newcomer?

Two other secondary actors are noted in Figure 1 with an exclamation mark, refering to the title of this subsection. The first of them are the loggers, connected as secondary actors to the options and motivational factors of the farmers. Loggers cut trees and make roads in order to enter the forest and move out the timber. Analyzed as primary actions, making roads does have an impact on the forest, but the tree cutting is usually far more important. Analyzed as secondary actions, that is, analyzed for their indirect impact through the decisions of the farmers, the situation is the reverse. The cutting of the large trees is often important because it facilitates the slashing and burning of the remaining stands; cutting the large trees, one could say, breaks a certain capacity of the forest to protect itself. But by and large, it is the roads that do it. Roads connnect the farmers to wider society, out of which markets, especially markets for outputs, are the most important. Without roads, only a very meagre subsistence lifestyle is possible in the forest. In our study region, farmers as a rule do not settle farther out than 2 to 5 km away from a logging road, depending on the terrain.[48]

Farmers moving into the forest,[49] in their turn, have an impact in the logging corporations. Farmers turn into secondary actors with respect to the loggers, making void the logger's expectations to ever be able to return for a second cutting some decades after the first. In terms of Figure 1, the long-term benefit of compliance to sustainable logging regulations becomes zero. As stressed repeatedly by loggging organisations (e.g., Poore *et al.*, 1989), not only farmers but also loggers need secure tenure, that is, long-term concessions and government back-up to protect these, to be motivated for sustainable land use.

The overall picture arising out of this analysis is that of a 'tragedy of the forest'. It is not that farmers or loggers are intrinsically motivated towards forest destruction. Nor does it make much sense to wage discussions, as done all too often, blaming the one or the other category as the main culprit, even if the one happens to bring down more trees than the other. The cause is the interactive *mechanism*, not one actor or the other. The loggers and the farmers, one may say, are locked in a tragic embrace, deadly for the forest and deadly for themselves in the longer run.

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[48] Rudel's (1989b) case study on roads and settlement in Ecuador, Kamminga (1994) and many other studies in Latin America show that farmers there have the same dependence on roads but also that they tend to settle at larger distances from the road, up to 10 or 15 km. In such cases, the major factor seems to be that cattle are the most attractive commercial option. Cattle are the only commodity that can walk to its own market.

[49] As noted in the Figure, large landowners in the valley, closing off the farmers' option to settle on underutilized land, are a (tertiary) actor category behind the farmers' migration. It is not known to which extent this phenomenon really makes a quantitative difference in the Philippines, because it is counteracted by government attempts for land reform in the valley and because the underutilized land is infertile. In Latin America, the phenomenon certainly plays an important role. Many large landowners are actively pushing off labourers and informal *minifundas* from their land, backed up by politicians and resettlement programmes.

Patronage and democracy

The final secondary actor we will consider here is connected to the 'cost of corruption' factor in the loggers' motivational factors, discussed already in the previous subsection.[50] What actors and factors determine the cost of corruption? A full analysis requires viewing the situation as a kind of market, in which the powers of public office and private friendships are sold for the money that loggers have to offer. Such an analysis may well solve a question of Repetto and Gillis (1988), who wonder why timber taxes are so low in many tropical forest countries. It is not rational, they state, to divert so little of the loggers' profits to the public revenues of the state. The corruption market concept, *i.e.*, a focus on the concrete reasons of actors instead of an abstract rationality at the collective level, indicates why low taxes may be rational after all. The lower the taxes, the more the loggers have to offer in the corruption market, and the more can flow into the private hands of the power elite.

Figure 1 concentrates not on details of the corruption market, but on the primal condition for a corruption market to be there at all. The corruption system, as said, is an interconnected whole involving actors at many levels. In the Philippines certainly and in many other countries probably as well, the existence of the system depends on what is basically a single choice of basically a single actor. This choice is noted in Figure 1 as 'to put oneself up for sale'. The actor is called 'the big politician'. As is the case with all elements in the Figure, also this choice and this actor are simplifications. The 'big politician', for instance, may be a single person but may also stand for a tightly knit group of provincial big men with family and patronage linkages to the national level; this does not make much difference for the structure of the dilemma we intend to explain here.

As is the case also with most Latin-American countries, the Philippines has inherited from the Spanish period a tendency to organise politics along personal, 'client-patron' lines, linking the common man all the way to the top in a complex structure through which flow protection, political support and financial aid in times of need. This old structure of patronage is overlain by the more recent practice and ideology of democracy, in which people are asked to think in terms of free casting of votes, of political programmes and of collective rationalities such as economic growth, welfare systems and sustainability. In the Philippines, the Marcos rule completely relied on the patronage machinery but, at present, the Philippine people is thoroughly determined to emancipate itself into a more democratic age, and the old and new systems are intertwined in a complex struggle. This poses a dilemma for the big politician, a dilemma quite relevant for the forest.

First, without implying that patronage systems are intrinsically inequitable or morally bad, it may be obvious that patronage and corruption markets easily go hand in hand, while democracy and corruption markets do not. The essence of democracy, after all, is public control over public office, the very opposite of private use of public office. Secondly, if a politician wishes to remain in power primarily through maintaining the ties of patronage, he needs a lot of money. Votes in the patronage way, especially against an emancipating public, have to be *bought* one way or another. In cases where the forest is

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[50] The section is inspired by studies on the Philippines such as Kummer (1992), Porter and Ganapin (1988) and Vitug (1993), but it must be said the section as a whole is our piecing together of informal information, so that more research is needed to verify the description.

the most readily available source of cash, the logic is inescapable; the politician needs to put himself up for sale on the corruption market, and use the money to buy the necessary votes.

At the same time, triggered by river floods and landslides, Philippine voters are increasingly of the opinion that continuing deforestation runs counter to their interests. As a result, it becomes increasingly expensive to pay off the people through the patronage system. The most obvious strategy for the politician to escape from this problem would seem to install a combinmation af the patronage and democracy systems. The best of both worlds: to pay lip service and initiate a few symbolic actions for forest protection, and continue to receive the loggers' money in the dark. This is not a very realistic option however; the Philippine public has always been quite aware of the workings of the political system.

Faced with this dilemma, the politician may decide to switch over to a strategy that may be more risky but is certainly more 'future-rich' and morally satisfying, that is, to try to win votes the democratic way, through a political programme, backed up by real actions, to protect the remaining forest. Recent events in the Philippines such as the logging ban on the primary forest indicate that this switch is being made at least by some and to some extent.

In Figure 1, the two options of the big politician are summarized as 'buy votes' and 'win votes by green program'. The small list in the 'motivational factors' element spells out some of the factors that determine the decision: (*i*) the 'price to be negotiated from the loggers' (which depends, among others, as said, on the level of the public timber taxes), (*ii*) the 'price to pay per vote' (which depends on the strength of the democratic forces, the poverty of the people etc.), (*iii*) the 'response to green programme' (which depends on the people's awareness, the number of people suffering because of deforestation, the back-up of environmental NGOs etc.) and (*iv*) the 'moral cost of being for sale', referring to the increasing difficulties for politicians to remain respected by their own people and their own church when adhering to the old ways of shady transactions and the destruction of God's creation. Figure 1 mentions a few of the many tertiary actors that influence the politician's choice. One of these may be an international funding agency, which may demand tighter controls and higher timber taxes before being prepared to extend loans and other development support.[51] Another tertiary actor category here are the environmental and farmers' NGOs which, raising awareness and resistance, raise the average price per vote to keep people in the clientele structure, and raise the people's responsiveness to green programs. Another obvious tertiary actor is the church, that plays an influential background role in almost every corner of the Philippines, one of the world's most devout nations (Becker and Vink, 1994); it may not have been coincidental that in our study region, an old governor cancelled a forest road project during the period he knew he should prepare to die soon.

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[51] See for instance Toornstra *et al.* (1994) about the role of the World Bank in the forestry sector of Cameroon.

Concluding: options for action

Generally speaking, every causal linkage identified during the Action-in-Context analysis represents an option that might be taken up in a policies of projects for forest protection, and every actor category identified represents a potential target group for these policies and projects. We will not enumerate here all factors and actors that may be identified this way for the Philippine example. Instead, we may focus on a general principle that seems to arise out of the analysis. It seems that for policies to be successful, they should focus not so much on separate actors and factors, but rather *address packages of factors and interactions between actors*. The four most outstanding of these appear to be the following.

(1) We have seen that the 'deadly embrace' of loggers and farmers drives both of them towards unsustainable forest use. Since roads are the key linkage in this interaction, the obvious policy guideline to escape from the deadly embrace is simply 'No New Roads!' A more detailed understanding of local circumstances may of course generate many more subtle solutions to prevent loggers and farmers becoming locked in unsustainability.[52] In the Philippines, the great good of the primary forest logging ban has been this unlocking. A logging ban cannot be defended by saying that it would be bad to cut any tree in the primary forest. There is only the practical fact that roads are implied in the cutting; in the present market circumstances, loggers cannot afford to cut the tree and take it out by helicopter. It is interesting to note here that in Ecuador, where oil companies largely play the role loggers do in the Philippines, new technologies and regulations invite oil companies to lay pipelines without roads and to fly in their personnel and equipment (Kamminga, 1994).

(2) Helping farmers on their way in the transition from short-fallow slash-and-burn to permanent agriculture requires a consistent package addressing market factors, agricultural extension, cultural factors, tenure factors, community development and so on. Much may be learned in this respect by studying communities and individual farmers who, although being a minority and therefore not yet infuencing the overall picture, are going through this transition already or have completed it. The aim of agricultural transition will lend more strength and consistency to well-willing but usually rather vague project concepts such as Integrated Social Forestry. A stronger emphasis on this aim will also help to move away from the 'project conceptualization' of social forestry; the *aims* are local forest protection and sustainable local livelihoods, but *means* may as well be work at the regional level, work with secondary actors and options not directly involving trees at all.

(3) A third type of policy option is to address the misfit between forestry and non-forestry policies. At the national level, Repetto's concept of 'perverse incentives' helps to identify such misfits through an Action-in-Context analysis. In the Philippine example we have seen the lack of coordination between the forestry agency and the other agencies at the regional level. In our North Luzon study area, this problem has been addressed

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[52] Improving the roads network between markets and a community already settled at the forest edge, for instance, may in fact help the community to shift from unsustainable to sustainable land use. But such roads should end some kilometres before the forest edge, and not go into or through the forest. If they do, the only way left to prevent deforestation is to first strengthen indigenous or other communities inclined to protect the forest, and/or to patrol the road. This is not impossible, as shown for instance by Kamminga (1994) for Ecuador, but a very uncertain bet in most cases.

recently by the establishment of regional and provincial Intersectoral Committees that now work successfully, in spite of their unofficial status, by personally involving the top-ranking officials of the secondary-actor agencies, added to which are some tertiary players such as the church and the universities.

(4) The final set of policy options is generated by the 'patronage versus democracy' theme. Actors to approach here are of course NGOs, the media, the churches and so on. Furthermore, timber taxes and many other issues pertaining to the dilemma of the regional politicians may be addressed at the national level. A crucial factor here, it seems to us, is also the attitude of the researchers and designers of 'patronage versus democracy' actions. Scientifically as well as politically, it will rarely be fertile to go about exposing and attacking the bad guys. Rather, real understanding and subtly effective policies follow Vayda's (1983) rule to put yourself in the place of the actors, and work from there. Consequently, the politicians should be involved to an effective extent in the analysis of their own situation and the design of policies that affect them.

5. GENERAL CONCLUSIONS AND DISCUSSION

In 1967, Hardin wrote his famous essay on the 'tragedy of the commons', proposing it as a social mechanism that lies at the root of the environmental crisis. Many authors since then have rightfully pointed at the confusion raised by the fact that Hardin discussed a 'tragedy of open access' rather than of historical and actual commons (e.g., Cox, 1985; Shepherd, 1989; Ostrom, 1990). The relevance of the tragedy as a social mechanism however, *i.e.*, the assertion that a discrepancy between individual and collective rationalities is a root cause of environmental problems, is virtually undisputed. As a first general conclusion of the present article, we hope to have shown by way of the Philippine example that also understanding deforestation, and hence finding keys to solutions, to a large extent lies in understanding social mechanisms: mechanisms of agricultural transitions, mechanisms of 'deadly embrace' and mechanisms of patronage versus democracy, identifyable as motivational structures working in the field of actors and factors, driving rational actors to forest destruction even if they have nothing against the forest or are even well-disposed towards it.

Next, a few concluding words may be in order with respect to the methodology. We have started this article with an overview of the types of studies designed by scientists in order to somehow alleviate the problem of tropical deforestation. We have indicated that the ecological, hydrological and other physical-science studies serve the important function of impressing upon actors and outsiders the consequences of deforestation, but also that after this is done, social-scientific studies into the causes of deforestation hold a place of primacy when it comes to identifying cost-effective solutions of the problem. The case study of the Philippines has indicated that even when applied in a rough and qualitative manner, the Action-in-Context approach may serve as a framework to identify these causes and solutions, especially because it causally interconnects the local actions of the primary actors to secondary and further actors and factors in the context of the primary events. It combines, in other words, the strengths of the 'case study' and 'political economy' types of studies. In yet other words, it combines the micro to the macro levels

of analysis (without having to assume abstract systems and rationalities at the macro level).

In the Philippine example, the choices of the actors have been simplified to a largely economic type of reasoning. As asserted by Goodin (1982), for instance, even taking up the 'moral cost of being for sale' into the set of motivational factors of an actor is still working in a 'rational choice' perspective of being human, only with moral costs and benefits added to the costs and benefits pantheon. This is not intrinsic to the Action-in-Context analysis, however; see for instance De Groot (1992), following Goodin and feminist authors, about 'moral domains'.

The core of the Action-in-Context approach is the repeated triangular structure of action/actor/options/motivational factors. It may be clear that this structure may be quantified without conceptual problems. One way to do so is to combine the lists of options and motivational factors into a multi-criteria table. (Translated in multicriteria language, the options are the 'alternatives' and the motivational factors are the 'criteria'). If it then further quantified how actions of secondary and further actors influence the options or motivational factors of the primary ones, whole actors field structures, of which Figure 1 is an example, may then be quantified and computerized. Doing so, one arrives at a model with the same basic structure as the formula in the Appendix, which was designed to express Action-in-Context at a level open to statistical and modeling work.

The final issue issue to be discussed here concerns the relationship between the relatively rapid changes necessary to protect the remaining tropical forest, and the overall, long-term processes in society.

Substantively, much of the material discussed in this paper belongs to a larger set of debates and theories often refered to as 'population-environment dynamics', a field of study re-emerging after its inception by Malthus and explorative contributions by Boserup (1965), Duncan (1964) and Ehrlich and Ehrlich (1970). One characteristic of the present state of the art (e.g. Ness *et al.*, 1993) is the emphasis on demographic, agricultural, urban and other transitions (Drake, 1993). The transition of forest fringe farmers, i.e. their shift from slash-and-burn to permanent agriculture, belongs to this family. Another characteristic of the present state of the art is that models are being sought that somehow combine long-term, more or less autonomous processes and trends on the one hand, and more short-term, decision-dependent and policy-dependent factors on the other hand. In terms of research paradigms, this distinction between autonomous processes and amendable factors coincides with traditional 'macro'-approaches versus the traditional actor-oriented research paradigms. The distinction also coincides with the more or less pure 'population approach' of traditional demography versus the problem-oriented, voluntaristic approach of environmental scientists, who have always emphasized the degrees of freedom, and hence the responsibilities, of decision-making agencies in the solution of environmental problems.

Well-documented examples of the present urge to see both sides of the population-environment coin is given by Meyer and Turner (1992) and Bilsborrow and Okoth Okendo (1992). The latter, concluding their study of population-driven changes in land use in developing countries, state that "population growth contributes to, but is not always the agent of catastrophe, which neo-Malthusians have claimed. Public policy and planning can be used to achieve more efficient land-use responses". Elements of public policy may involve, for instance, land tenure systems, tax and subsidy mechanisms, forest and

biodiversity protection regulations, agroforestry extension and the options mentioned in the previous section. The design of such policies is analoguous to what researchers in ther global warming field call the 'delinking' of global driving forces such as population and GNP from actual carbon dioxide emissions.

Methodologically, De Groot (1992) shows that the population-environment model of Duncan (1964), a typical product of the macro-approach, is fully translatable into the Action-in-Context model used in the present paper, which is a typical product of the actor-oriented (micro) paradigm. Combining the two therefore is not an attempt to reconcile two inherently incompatible worlds, but rather a matter of sound practical choices. The equation in the Appendix aims to be an example of the latter. The 'population' and 'forest conversion' factors are policy-dependent but hold many autonomous trends as well, while the 'attractiveness' factor is obviously quite open to policy interventions of the types mentioned above but also holds more autonomous elements such as cultural attitudes towards the forest and macro-economic factors such as energy and fertilizer prices.

We cannot but agree with Meyer and Turner (1992) who are pessimistic with respect to the possibility of building a general theory of deforestation, because of the interactions of general driving forces with more contingent and regionally specific factors. At the same time, this article has aimed to show that quite practical progress may be possible by improved methodologies and a focus on the 'middle-range' level of generalized case studies and regional patterns. We may only hope that these potentials can be realized in the few years that remain before this richest of all ecosystems will vanish from the earth forever.

REFERENCES

Aquino, D., *The Exploitation and Management of Non-Timber Forest Products from the Sierra Madre Forests* (London: School of Oriental and African Studies, papers European Conference of Philippine Studies, 1994).

Baldwin, J.A., *Environmental Planning and Management* (Boulder: Westview Press, 1985).

Becker, J.W. and R. Vink, *Secularisatie in Nederland* (Secularisation in the Netherlands) (The Hague, Sociaal en Cultureel Planbureau, 1994).

Bilsborrow, R.E., and H.W.O. Okoth Ogendo, "Poulation-driven Changes in Land Use in Developing Countries", *Ambio* Vol. 21, No. 1 (1992), pp.37-45.

Binswanger, H.P., "Brazilian Policies that Encourage Deforestation in the Amazon", *World Development*, Vol. 19, No. 7 (1991), pp. 821-829.

Blaikie, P., "Explanation and Policy in Land Degradation and Rehabilitation for Developing Countries", *Land Degradation and Rehabilitation*, Vol. 1, No. 1 (1989), pp. 23-37.

Boserup, E., *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure* (Chicago: Aldine, 1965).

Boyce, J.K., "The Revolving Door? External Debt and Capital Flight: A Philippine Case Study", *World Development*, Vol. 20, No. 3 (1992), pp. 335-349.

Bunker, S.G., *Underdeveloping the Amazon* (Urbana: University of Illinois Press, 1985).

Colchester, M., and L. Lohmann, *The Struggle for Land and the Fate of the Forests* (London: The Ecologist/Zed Books, 1993).

Conelly, W.T., "Agricultural Intensification in a Philippine Frontier Community: Impact on Labour Efficiency and Farm Diversity", *Human Ecology*, Vol. 20 (1992), pp. 203-223.

Cox, S.J., "No Tragedy of the Commons", *Environmental Ethics*, Vol. 7, No. 1 (1985), pp. 49-61.

CVPED, *Forestry for People and Nature* (Manila: Ateneo, 1992).

Drake, W.D., "Towards Building a Theory of Population-Environment Dynamics: A Family of Transitions" in Ness *et al.* (Eds.), *op. cit.*, pp. 305-355.

Ehrlich, P.R., and A.H. Ehrlich, *Population, Resources, Environment* (San Fransisco: Freeman, 1970).

De Groot, W.T., *Environmental Science Theory; Concepts and Methods in a One-World, Problem-Oriented Paradigm* (Amsterdam: Elsevier Science Publishers, 1992).

Doedens, A., G.A. Persoon and C. Wedda, "The Relevance of Ethnicity in the Depletion and Management of Forest Resources in North-East Luzon (Philippines)", *Sojourn*, in press, 1994

Duncan, O.D., "Social Organisation and the Ecosystem" in: R.E.L. Faris (Ed.), *Handbook of Modern Sociology*. (Chicago: Rand-McNally, 1964), pp. 36-82.

Grainger, A., *The Future Role of the Tropical Rainforests in the World Forest Economy*, Ph.D dissertation (Oxford: Oxford University, 1986).

Goodin, R.E., *Political Theory and Public Policy* (Chicago: The University of Chicago Press, 1982).

FAO, *Guidelines for Land Use Planning* (Rome: Food and Agricultural Organisation, 1989).

Fujisaka, S., and E.Wollenberg, "From Forest to Agroforest and Logger to Agroforester: A Case Study", *Agroforestry Systems*, Vol. 14 (1991), pp. 113-129.

Hyman, E.L., "Forestry Adminstration and Policies in the Philippines", *Environmental Management*, Vol. 7 (1983), pp. 511-523.

Kamminga, E.M., *Deforestation in Context: A Case Study from Ecuador* (Leiden: Centre of Environmental Science, Leiden University, 1994).

Kamminga, E.M., and G.M. Van den Top, *Deforestation in Context: A Case Study from the Philippines* (Leiden: Centre of Environmental Science, Leiden University, 1994).

Kartawinata, K., and A.P. Vayda, "Forest Conversion in East Kalimantan, Indonesia: The Activities and Impact of Timber Companies, Shifting Cultivators, Migrant Pepper-farmers, and Others" in F. Di Castri, F.W.G. Baker and M. Hadley (Eds.), *Ecology in Practice, Part I: Ecosystem Management* (Dublin: Tycooly International, 1981).

Kummer, D.M., *Deforestation in the Postwar Philippines* (Manila: Ateneo de Manila University Press, 1992).

Meyer, W.B. and B.L. Turner II, "Human Population Browth and Global Land-Use/Cover Change", *Annual Review of Ecological Systems*, Vol. 23, pp. 39-61.

Lutz, E., and M. Young, "Integration of Environmental Concerns into Agricultural Policies of Industrial and Developing Countries", *World Development*, Vol. 20, No. 2 (1992), pp. 241-253.

Ness, G.D., W.D. Drake, and S.R. Brechin (Eds.), *Population-Environment Dynamics* (Ann Arbor: University of Michigan Press, 1993).

Ortolano, L., *Environmental Planning and Decision Making* (New York: John Wiley and Sons, 1984).

Ostrom, E., *Governing the Commons, The Evolution of Institutions for Collective Action* (Cambridge: Cambridge University Press, 1990).

Poore, D., P. Burgess, J. Palmer, S. Rietbergen and T. Synott, *No Timber Without Trees* (London: Earthscan Publications, 1989).

Porter, G. and D.J. Ganapin, *Resources, Population and the Philippines' Future* (Washington: World Resources Institute, 1988).

Repetto, R., and M. Gillis, *Public Policies and the Misuse of Forest Resources* (Cambridge: Cambridge University Press, 1988).

Rudel, T.K., "Population, Development, and Tropical Deforestation: A Cross-National Study", *Rural Sociology*, Vol. 54 (1989a), pp. 327-338.

Rudel, T.K., "Roads, Speculators and Colonization in the Ecuadorian Amazon", *Human Ecology*, Vol. 11 (1989b), pp. 385-403.

Shepherd, G., "The Reality of the Commons: Answering Hardin from Somalia", *Development Policy Review*, Vol. 7 (1989), pp. 51-63

Southgate, D., R. Sierra, and L. Brown, "The Causes of Tropical Deforestation in Ecuador: A Statistical Analysis", *World Development*, Vol. 19, No. 9 (1991), pp. 1145-1151.

Toornstra, F.H., G.A. Persoon and A. Youmbi, *Deforestation in Context: A Case Study from Cameroon* (Leiden: Centre of Environmental Science, Leiden University, 1994).

Turner II, B.L. R.H. Moss, and D.L. Stoke, *Relating Land Use and Global Land-Cover Change: A Proposal for an IGBP-HDP Core Project* (Stockholm: International Geosphere-Biosphere Programme, PO Box 50005, 1993).

Van den Top, G.M., *The Making of an Environmental Management Plan for the Northern Sierra Madre* (London: School of Oriental and African Studies, papers European Conference of Philippine Studies, 1994).

Van der Ploeg, J.D., "Patterns of Farming Logic, Structurization of Labour and Impact of Externalization", *Sociologica Ruralis* Vol. 25, nr. 1 (1985), pp. 5-25.

Vayda, A.P., "Progressive Contextualization: Methods for Research in Human Ecology", *Human Ecology* Vol. 11 (1983), pp. 265-281.

Vitug, M.D., *Power from the Forest* (Manila: Philippine Center for Investigative Journalism, 1993).

Zuidema, G., G.J. van den Born, J. Alcamo and G.J.J. Kreileman, "Simulating Changes in Global Land Cover as Affected by Economic and Climatic Factors", *Water, Air and Soil Polllution* 76 (1994), pp. 163-198.

APPENDIX

The core structure of a statistically accessible and yet theoretically grounded deforestation equation

$$DEFO = POP*(ATTR_{for} - ATTR_{alt})*rf*cf$$

in which:
DEFO = deforestation [dimension: ha/year]
POP = population [dimension: no. of actors]
for, alt = forest option and alternative option [dimensionless index]
ATTR = attractiveness (= expected net benefit) of the forest/alternative option [dimension: $/year]
rf = response factor = fraction of actors per year moving to the most attractive option if that option is more attactive by 1 $/year [dimension: 1/($/year)]
cf = conversion factor = hectares of forest converted (per actor per year) by the most attractive option [dimension: ha/actor.year]

The basic characteristics of this model are as follows.

- Contrary to current equations, this one is dimensionally sound; e.g. if actors are households: DEFO = [no. of househ.]*[$/year]*[1/($/year)]*[ha/househ.year] = [ha/year].
- Contrary to current equations, this one can express all kinds of relevant transitions in human activities, such as from slash-and-burn to permanent farming (cf = 0), from destructive to sustainable logging and from in-migration to out-migration from the forest. For instance, rural migration is accounted for by taking 'going to the forest' as the forest option and 'staying in the lowlands' as the alternative option, and then comparing the attractiveness of these two options, in the farmers' own terms of assessing costs, benefits and uncertainties.
- Also logging firms may be taken as actors. The options then are, for instance, (1) grab-it-and-run, (2) comply with sustainable forestry regulations and (3) invest capital elsewhere.
- Thus, core equations can be combined to form a comprehensive deforestation model, covering all relevant actors and factors (e.g., Turner *et al.*, 1993). One possible arrangement of equations is additive, e.g., if loggers, migrant farmers and resident farmers all contribute to the deforestation side by side, but through different options and motivational factors. An other arrangement is nested, expressing relations in the 'actors field' (one actor influencing the options or motivational factors of another). This is the case, for instance, with logging roads, influencing the attractiveness for farmers of moving into the forest. Their $ATTR_{for}$ is dependent on transport times and costs of people and market products, and built into this factor is $ATTR_{for}$ of the loggers who make the roads which determine the farmers' times and costs.
- Ideally, the ATTR factor should also incorporate cultural interpretations of the advantages and disadvantages of forest and non-forest options. If ATTR is taken as purely economic (hence, as a cost-benefit or 'maximin' balance of each actor), the 'response factor' rf is burdened with catching most of the cultural influences. Even if cultural factors are built into ATTR, the model still remains an essentially economic one, since culture here can only be a 'modulator', increasing or decreasing response primarily shaped in the economic balance.
- Time lags can be built into the response factor. In modelling research, rf will typically be the factor to calibrate model outcomes on to the empirical data.

ANNEX II

Toward a Global Forest Fund:
Exploring the economics, ethics and politics of a practical design

Wouter T. de Groot

Contents

II.1 The core notion of a Global Forest Fund[53]

Through their positive contribution to biodiversity and climate stability, forests have a global value. Thus, there is an obvious *prima facie* ground for a global sharing of the cost of forest protection and management. Because the world's most important forests happen to be found in the tropics, such global sharing, if cast in an economic frame, would entail a net transfer of funds from the North to the South. As the World Bank (1992) puts it:

> "The international community should transfer additional funds to developing countries to achieve a level of spending that reflects the desire to protect species and habitats there",

to which the desire to protect the global climate could be added. In this Annex, the mechanism through which this transfer takes place is called a Global Forest Fund.[54]

The aim of the Annex is to explore some questions pertaining to such a fund, in a way that we at the same time explore the fund's possible modalities, so that a practical proposal may come into view. It will be tried to do so in an integrated perspective, keeping in touch not only with the economic but also with the ethical and political aspects of the Fund.

Many questions with respect to the fund are quantitative, *i.e.*, refering to *how much* money should be involved. Others are qualitative, refering to what should be the economic and ethical *reasons and structure* for the transfer. In a way, the quantitative questions may be said to hold a place of primacy; if only one dollar per year would be transfered, no-one indeed would bother about justifications, obligations and consistency. We feel, however, that questions of justifications, obligations and consistency become very important if the transfered funds should become substantial. For a global forest fund to really make a difference, its logic should be strong enough to counterbalance understandable reluctancies on the sides of both the net payers and the net receivers. For that reason, the focus of the first sections is qualitative.

By way of example, we may note that the quoted statement of the World Bank, which in spite of its laborious wordings is very basic, already raises an important qualitative issue. We may note that the World Bank grounds a forest fund in the *willingness to pay of the 'consumers'* (the "international community"). On the other hand, we find an article of Tobey (1993), who works with the OECD and who is as much an economist as the World bankers, but who grounds a forest fund in quite something else, namely, the notion that developing countries should be

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[53] For more general aspects of global institutions, ref. the articles of Streeten, Dorfman and Harris in *World Development*, Vol. 19, nr. 1, 1991.

[54] Since biodiversity and climate are the two great and really global environmental issues (Turner *et al.*, 1990), it appears reasonable to think of two separate global transfer facilities, a Global Biodiversity Fund and a Global Climate Fund, working through their own political mechanisms and ethical/economic logic. The natural tropical forest then would be an element in both, but both will take up other elements as well (e.g. wetlands in the biodiversity fund). A Global Forest Fund as a separate entity would not be in line with such an arrangement. On the other hand, if a forest fund would exist before a biodiversity fund and a climate fund would be considered, it could easily be split and then merged with these, so that it will not be a stand in the way for their establishment. Moreover, many of the considerations expounded in this Annex focusing on the forest will also apply for the other funds. We focus on the forest here, then, for reasons of simplicity.

compensated for the expenditures they incur for forest protection. In other words, Tobey relates the forest fund transfer to the *costs made by the 'producers'* of biodiversity and climate protection.

Both ideas appear to be accepted economics. The question remains, however, which of them is better suited to a global forest fund. We may approacg this question by noting that in normal market transactions, e.g., if we consider to buy a Mercedes Benz, we refer to our willingness to pay for it (or not), irrespective of the cost incurred by the Mercedes factory making the vehicle. Irrespective of the factory running at a profit or a loss, the textboooks tell us, the car should fetch the price it is worth; we don't reward an industry for working inefficiently. In other words, textbooks and markets follow the World Bank in that we "transfer funds to Mercedes to achieve a level of spending that reflects our desire" to have the car. In Forest Fund terms, paying for the *product* (= hectares of undegraded forest) is more 'normal economics' than compensating for the inputs used in making the product (= forest projects). Paying for the product will be refered to as *'output funding'* in this paper. As we will see in Section II.3, output funding is also the key to solve the souvereignty dilemma.

Underneath, we will first explore what are the most important qualitative issues pertaining to a global forest fund, using the article of Tobey (1993) as point of reference. Section II.3 then goes into the question already touched upon here, concerning the principles that should rule the 'pay-out side' of the Fund; as we will see, this is closely linked to the sensitive issue of national souvereignty. Section II.4 then discusses the economic and ethical principles for the 'receiving side' of the Fund and summarizes the resulting structure as a whole. On the basis thus built up, Section II.5 provides some first quantitative estimates of possible contributions to and from the fund. Section II.6 then goes into some practicalities such as the negotiations with respect to the Fund disbursements. Section II.7 provides a summary.

II.2 A discussion with Tobey (1993)

Tobey (1993), writing on a "Global Effort to Protect the Earth's Biological Diversity" from a broad mainstream perspective, is a good source to take stock of the relevant questions surrounding the global fund idea. Only the first, rather technical, issue will be dealt with fully here (in the next paragraph). The others prepare for Sections II.3 and II.4.

Tobey makes the usual distinction between private and social (= 'total') value of forests, and goes on to divide the benefits of forest biodiversity preservation into 'use', 'option', 'quasi-option' and 'bequest' values. Ecotourism is one of the 'use values'.[55]

The example of ecotourism shows that Tobey's distinctions are not fully adequate for the purpose of a global forest fund. Ecotourism benefits largely accrue within the boundaries of the nation where the forest is located, and therefore do not require global transfers through a fund. The forest-owning nation is paid already, one could say. Stated more generally, the basis of a global forest fund is not the forests' total value as such, but in *that portion of the*

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[55] A type of classification different from this economic typology are the more ecologically inspired taxonomies of 'functions of the environment', e.g., De Groot (1992, p. 229).

total value of which the benefits arise outside the boundaries of the forest-owning nations.[56,57]

Tobey focuses on biodiversity only, which is not in line with the logic of a forest fund. Global climate stability should obviously be included, as may other extra-national benefits. Thus, the basis of a global forest fund is in *all* types of benefits, but excluding, as said, benefits materializing within the forest-owning nations (firewood supply, watershed protection, ecotourism etc., ref. Wood, 1990) or paid through existing international markets (e.g., logging tax incomes).

Global efficiency in biodiversity and climate protection, Tobey goes on the explain, is reached not when each country separately tries to protect and produce forests on its own territory, but when funds are transfered to the places where forest may be produced and protected at lowest cost, which is, roughly, to the countries who own the 'megadiversity' forests at present. All countries then are better off. Thus, Tobey proceeds,

> "the funding of of the preservation of forests and biological diversity in developing countries can be justified on the basis of the mutual pursuit of national self-interest, and not from any moral obligation on the part of the industrialized countries".

There do not exist real obstacles, therefore, for an international treaty or alliance implementing this economic rationality.

Tobey refrains from explaining why then progress on this front is very slow, in reality. One reason for that may simply be that international processes take more time than has yet been available. It seems, however, that deeper and more substantive obstacles exist as well. We surmise that these arise out of the fact that the world contains more than abstract economic rationality. Whether defined as 'obstacles' or not, psychological, ethical and political consideration also play a role in how states move. The following three examples may be mentioned:

- There is a collective benefit when individual people respect red traffic lights and maintain the front garden of their houses. Yet, individual people do not get paid for doing so. Analogously, why should nations get paid for maintaining forests, even if this has collective (global) benefits?
- As mentioned by Wood (1990), there exists a deep resentment on the part of Third World nations as to why they should now carry the burden of protecting global climate and biodiversity, *after* the Western nations having cut and burned their share of the global forest, "in a period that allowed economic growth without nettlesome complaints about destroyed ecosystems and global warming".
- Wood (1990) also documents that Third World nations are often intensely irritated by what they perceive as international meddling in the national souvereignty over forest resources. Debt-

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[56] This definition is different from 'benefits arising at the global systems level', because they include also private and national-level benefits, but exclude benefits which are paid for already through existing markets. The definition is also different, formally, from the concept of 'externality', because it is unimportant if forests or forest functions are a true collective good.

[57] Following current practice of economic and political discussions on global fund trnasfers, we loosely speak here of 'nations' and 'forest-owning nations', irrespective of the fact that economy as a science deals with owners, not nations, and irrespective of the question whether nations can really 'own' forests. This has the practical consequence that financing and pay-outs of the Global Forest Fund will be a purely government-to-government matter, and that we leave it aside if and how benefitting nations may transfer the contributions from the Fund to citizens and companies.

for-nature swaps, for instance, have the final outcome that an indebted nation sells to the rich the decision-making power over a part of its territory - something it would never have done if it were not indebted. In a formal economic view, debt-for-nature swaps are voluntary contracts between free agents. On the surface, the swaps may even be a good economic deal. Deeper down, they leave a poor country humiliated. We surmise that this may be the reason why the swaps up till now cover only a tiny fraction of both the debts and the forest areas.
These three issues will be addressed in the next sections.

With respect to the practical implementation of the global sharing of biodiversity and climate protection, Tobey first takes stock of existing initiatives such as the World Heritage Trust of the UN and the Global Environmental Facility of WB/UNDP/UNEP. He critizes GEF and other facilities in that they concentrate on once and for all lump-sum payments for specific projects in stead of recurrent compensations for the recurrent cost of forest protection. Tobey then lays down six criteria for an improved international mechanism:

1. The mechanism should provide forest protection at least cost. For that reason, payments should be made on the basis of competitive preservation proposals drawn up by tropical nations.
2. All nations should participate; contributions should be tied to countries' GNP.
3. The system must recognize the souvereignty of tropical countries over their forests.
4. The system must be flexible.
5. Compensation should be paid as recurrent cost financing.
6. There should be monitoring in order to ensure compliance. Tobey here states that

> "this task would be the responsibility of the industrialized nations (...). Tropical countries that do not stick to their preservation contract must face a reduction of their compensation payments."

Tobey does not explain how the souvereignty criterion (nr. 3) should be compatible with the compliance criterion (nr 6). We may note too that Tobey's proposal, as do other existing mechanisms such as GEF, relates back to an issue mentioned in the previous section. As visible in criterion nr. 1, Tobey proposes to pay for preservation commitments and preservation activities (i.e., *inputs*), not for outputs (= actual trees, or, as in the previous section, the actual Mercedes). Why would we do so? The global good of tropical forests is linked only secondarily to activities; primarily, the global good is that there *is forest*! Just like the World Bank's GEF idea, Tobey seems to be caught in a 'banking paradigm', that is, the financing of proposals. His proposal to pay for recurrent costs, which differs from normal World Bank practice, goes one step in the direction of what may be called a 'fund paradigm'. In a full 'fund paradigm' however, what may be financed is the actual global good, so that all nations are under the same simple regime of Fund disbursements related directly to the actual areas of non-degraded forest.

Tobey's article, the quotation from the World Bank as well as current political discussions on global forest funding focus on the tropical rain forest as the 'target entity' of the fund. In this context we may note, however, that for global warming risk aversion, it does not make much difference where a forest is located and what is the biological quality of the forest; it's simply trees that count, one could say. For biodiversity protection, matters are very different; non-degraded tropical rainforest is immensely more important than plantations, taiga forest and all others. For practical reasons, therefore, avoiding a complex calculus of different payments for different kinds of forest, a global forest fund could concentrate payments on the forests that score double, for CO_2 and biodiversity both, *i.e.* humid and wet tropical forest above a certain threshold of non-degradation. Determining the degradation threshold is a matter for further biological research and political debate. Economic considerations may play a role here too; if

the forest category for which countries receive a payment from the Fund includes lightly and sustainably logged forest, for instance, countries may add timber taxes to the income they may use to protect the forest; the same holds for incomes from tourism, non-timber forest products and so on. A practical consideration, furthermore, is that the relevant forest areas should be assessible unambiguously by remote sensing techniques. The formula concluding the next section will therefore refer to 'not significantly degraded, remote-sensable humid and wet tropical forest' as the Fund's target entity.

Tobey's article proceeds with numerical estimates of the payments that could be involved in a Global Forest Fund. As said, we leave these quantifications to the final section. The next sections first go somewhat deeper into the qualitative issues identified up till now.

II.3 *Homo honoris*, autonomy, souvereignty and Fund disbursements

In Buttel *et al.* (1990) we find a quotation of a Brazilian discussing rain forest policy, saying

"I don't accept being transformed into a doorman of a zoo for the Americans."

This, in a nutshell, is the defence of autonomy at the level of individuals, that appears analoguous with the feelings surrounding souvereignty at the level of states. As indicated already in the previous section with respect to the debt-for-nature swaps, obviously more is at stake here than economic, cost-benefit rationality.

Throughout this section, it will be taken as a 'soft model' that individual relate to the collective state level as do states to the collective global level. One analogue then is, as above, between state-level souvereignty and individual-level autonomy.

It is often suggested by states that souvereignty is something sacred *per se*; international actions are alleged to be wrong simply because they impinge on it. This argument does not seem to hold much water, however. Taking individual autonomy as an analogue, we may note that the autonomy of the individual is evidently regarded as a very high good (expressed in declarations of human rights, constitutions and countless cornerstone documents of Western ethics), but at the same time 'negotiatable' with collective-level rationalities. Although not particularly liked, it is universally accepted that taxes exist to pay for the provision of collective goods, that regulations exist to protect collective goods against the free will of private property owners, and so on.[58] We could say that the process of creating and institualionalizing equilibria between individual rights and collective-level ethics and practices, a process that has taken much time and struggles over history, is at present being 'replayed' between states at the global level. Analogous to individual human autonomy, national souvereignty is a high good to defend in this process but at the same time, the process cannot *end* with souvereignty being declared sacred. There is no ground for saying that individuals should give up some of their autonomy in order to attain the collective good, and at the same time maintain that states should not.

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[58] One example are the town development plans prohibiting house owners in inner cities to transform these houses into high-rise hotels. Another example are the US regulations with respect to privately owned wetlands.

If there does not exist a real ethical ground for the souvereignty arguments often fiercely expressed by large developing nations (and felt by the smaller ones that keep quiet for economic reasons), what ground could there be? Political psychology seems to be the key here, analogous to the individual-level psychology expressed in the 'doorman' quotation at the beginning of this section. With respect to that individual level, an increasing number of social scientists (e.g., Kelman, 1993; Elster, 1989; De Groot, 1992, p. 350) state that the decision-making repertoire of people consists of more than the cost-benefit ('*homo economicus*') type of reasoning only; there exist other 'moral domains' through which decisions are made. Elster refers to a domain of 'social norms' in this respect, De Groot to the morality of honour ('*homo honoris*') as opposed to domains of 'economicus' and 'care' types of reasoning. In the '*honoris*' domain, strong emphases are put on norms of prestige, credibility and in-group solidarity.

'*Honoris*' responses to problems of decision-making are found in many environmentally relevant situations. DiMento (1989), for instance, shows that in decisions of whether or not to comply with environmental regulations, executives do not only weigh the economic costs and risks against the gains of (non)compliance, but also respond to if they are treated with respect by the a credible regulating agency, with which a honorable peace can be made.

Closer to the global fund discussion, two examples of behaviour of Dutch farmers are noteworthy, especially because they connect the issues of autonomy/souvereignty to the issue of financing forest protection inputs (project costs) or forest protection outputs (trees).

- Without subsidies, Dutch farming would work at a permanent loss. Yet, farmers have been fiercely opposed against direct income supplements. Instead, they favoured the more hidden subsidies on farm products, even if the income effect of these subsidies is smaller and less secure than direct income supplements. This is because direct supplements brands the farmer as a person in need, and puts him in the low-honour class of dependent wage earners. Product subsidies, on the other hand, even if everybody knows about them, enable the farmer to keep up face as an entrepreneur making his own decisions and inside the 'honour game' of doing better than the neighbours.
- In areas of high natural values potential, farmers can enter into a 'management contract' with the government. Then then promise to carry out specified activities, such as a later mowing date on certain parts of their land, spraying less manure on others, and maintaining the hedgerows. (This is the analogue of financing rainforest project or management activities). Although this situation is not as bad (in '*honoris*' terms) as direct income supplements, is still arouses negative feelings of 'having to work for the bureaucrats' and having lost decision-making freedom ('souvereignty') to outsiders who don't even know how to farm. Currently, a new approach is being tried out, called 'nature production payment', in which farmers get paid not for what they do or refrain from doing, but for the biodiversity they produce. If they do it and how they do it is left to their own decisions. Besides being more cost-effective (because farmers can now use their detailed knowledge of the land as to where and how nature can be 'produced' most efficiently), this approach also removes nature protection activities out of the tensions with the farmers' *honoris* attitudes; it re-installs the entrepreneur working for a new (nature) market. Note too that there is no more such thing as 'compliance' now; government officials do not walk around with binoculars to check if farmers do as they promised, but come a few times per year to assess what has been produced, and to apply the

simple rule of 'no birds, no money'.[59]

In our soft model of analoguousness of relations between individuals and state with the relations between states and the global community, the discussion on '*honoris*' reasoning and the examples of the farmers show that *output financing* may overcome much of the developing nations' reluctancy to enter into global forest fund arrangements, independent of the level of financial compensations.[60]

In the Dutch nature protection case, the 'nature production payment' approach has met with a certain reluctancy not on the part of the farmers, but on the part of the government bureaucrats, who do not like to finance 'in the blind', without having control over what a farmer is actually doing to 'produce' the biodiversity he gets paid for. The biodiversity result may be reached more cost-effectively than in the old management contract way, but the bureaucrat feels less that this result is his own, personal achievement. The farmers now 'own' these events and share in the *honoris* fruit of success. The same applies to an output-funding Forest Fund at the global level; neither the Fund nor the donating countries have control over how receiving nations spend Fund disbursements. They may go into forest management, but may as well go into education, debt servicing, armament or Swiss bank accounts, and most likely into all of these. This phenomenon does not impinge on the effectiveness of the Fund mechanism, however. On the contrary, money without strings attached is the most attractive money there is. With respect to the ethical side of this, it is incorrect to mix understandable worries on the behavior of nations with the Global Fund objectives. Environmental funds aiming to help nations into sustainablity and protection of the global good should not have to carry the additional burden to command nations into good behaviour. There are, or there should be, other mechanisms and institutions to take care of human rights, equity and peace.[61]

It appears that the postulate of an *honoris* mode of reasoning may help us to understand not only receipient nations' reluctancies against foreign agencies prescribing them what to do, but also why these agencies (such as the World Bank) go for exactly these input prescriptions, *i.e.* the funding of promises, projects and compliance.

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[59] Monitoring biodiversity in the Dutch landscape is not easy, and mobile species such as birds may be counted on land of a different farmer from the one who has actually 'produced' them (e.g., by supplying nesting area and taking care to maintain the fledglings' food species). These monitoring difficulties do not present themselves at a Global Forest Fund level, since forest is easy to monitor by remote sensing and cross-boundary effects on biodiversity are negligible.

[60] Roughly, one could say that the *level* of compensations relate to the *economicus* domain of a nation's decision-making, while the *format* of the global transfer mechanisms relates to the *honoris* side.

[61] Going back to the Mercedes Benz analogue of the first section, it is economic rationality as well as accepted practice that I mix my buying of the car neither with prescriptions on how he the car should be produced, nor with demands on what mr. Benz should do with the money. There are *other laws and mechanisms* to take care of family values and national equity. Analogously with respect to the Dutch farmers, environmental policies should not be mixed with income policies and other social objectives. The same type of argument holds against the fact that some lucky nations may become richer (or less poor) simply because they suddenly find themselves possessing a forest resource of great value; the same has happened with respect to US oil, Botswana diamonds and Kenyan wildlife.

Because of the foregoing, output funding is not an option proposed spontaneously by the rich nations and the global banking agencies. Still, it is somewhat amazing that neither is it currently proposed by economic scholars who have no record of uncritically following these agencies. One reason here may be that the global agency tradition (the 'banking paradigm') is so strong that these authors never really consider the issue. A more interesting possibility is that output funding has the intuitive connotation of being *inefficient*, violating the least cost principle of Tobey (1993). Output funding, after all, is funding 'in the blind', without having control that the money is spent on the forests that need it most; the money may even not be spent on forest at all! As will be illustrated in Section II.6, output funding is not very efficient indeed if equal disbursements are paid out for every hectare of standing forest. The way out here is not to return to input funding, however, but to differentiate the output funding.

Logging, ranching and agricultural pressures on forests vary greatly from place to place. So do the benefits of leaving the forest standing. An undifferentiated disbursement scheme therefore, although charming in its straightforwardness, would imply that large forest tracts would be 'overfunded'; they are not likely to be cut even without the fund. Other tracts would be underfunded and hence liable to be cut in spite of the fund. Differentiated output funding therefore, with disbursements per hectare varying with the net cost of not cutting the forest in question, is the key to satisfy all economic and political criteria for global forest funding. As will be shown in Section II.6, the negotiations needed to attain a most effective differentation can be envisaged to run without technical or political difficulties.

The 'disbursements side' of the Fund can now be summarized in formula form:

Disbursements (per large forest block) = a.ARFO
in which:
- **ARFO** = the area of not significantly degraded, remote-sensable humid/wet tropical forest
- **a** = the disbursement from the Fund ($/hectare.year), differentiated per forest block.

II.4 Benefits, costs, obligations and Fund financing

The previous section has focused on the principles of disbursements from the Global Forest Fund. The present section focuses on the qualitative matters pertaining to the other, financing side of the Fund, *i.e.* the reasons and rules of how nations should contribute towards it.

Fund financing logic 1: benefits

For Tobey (1993), discussing the Fund in a strictly cost-benefit perspective, the reason why countries should contribute to the Fund is the benefit they gain from global forest protection. In daily life language, the logic is: *you pay toward the solution of a problem because you benefit from its solution*. The quantitative principle that logically follows is that payments should reflect the degree to which a nation benefits and this, as Tobey puts it, is

> "tied to countries' income and population, on the grounds that the ability to capture the global public good benefits of biological diversity [and CO_2 emission prevention - *deG*]

is correlated to a country's per capita income and its population"

or, worded somewhat shorter, its GNP. The grounds of this principle appearing fairly obvious, we will leave it like this for the time being. It may be noted however, that there appears to also exist another principle for contributions to the Fund, a 'logic nr. 2'.

Fund financing logic 2: causation[62]

As mentioned already in Section II.2, developing nations often voice an obligation to contribute to global funding which is not so much tied to the benefits of problem solution but rather to the actions of problem causation. An example is the quotation from Wood (1990), refering to the Western nations having cut and burned their share of the global forest in a period that allowed economic growth without nettlesome complaints about destroyed ecosystems and global warming. In daily life language, the logic refered to here is: *you pay toward the solution of a problem because you cause(d) it*. For a forest fund with mixed aims of biodiversity and global climate protection, the quantitative principle that logically follows it that payments to the fund should reflect the degree to which countries have deforested their once forested area[63] and the degree to which they contribute to global CO_2 emissions.[64]

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[62] Sedjo (1991) proposes a global system of tradeable forest protection obligations. The Global Fund format put forward here, containing both a benefits and a causation (obligations) component in its financing, thus combines the reasoning of Tobey and Sedjo with respect to the financing side of the fund.

[63] This logic depends much on the perception of who in fact is held responsible. Individual people are held responsible for problems they have caused, but not for the problems caused by their forefathers. This matter shifts when the reasoning concerns nations instead of persons, but not unproblematically so. First, the strictly individualistic view of mainstream Western ethics precludes nations to have rights, obligations and so on grounded in their own system level; collective rights and obligations can only be conceptualized as a sum-total of individuals' rights and obligations. But these, as said, do not transfer backward across the generations! In other words, since no Dutchman can be held responsible for the mistakes of his grandfather, no collection of Dutchmen can and with that, neither the Dutch nation. At the same time, practice shows that this is not the whole truth. Nations, for instance, pay compensations or at least apologize for wars they have caused more than a generation ago. Also, Third World nations are held responsible to repay debts incurred several decades ago. To some extent, therefore, nations are ethically conceptualized as long-living 'moral entities' with their own rights and obligations, especially towards each other. The concept of 'odious debt' (invented and applied by the USA a century ago in order to escape from a debt burden to Spain; ref. Adams, 1991) affirms this general principle. The concept of odious debt is discussed at present in the Philippines, questioning if the nation can be held responsible to repay debts incurred and squandered by the Marcos regime; it is not questioned, however, that *in principle* all debts should be repaid. What we propose here with respect to the Global Forest Fund is that the rich nations accept the principle of 'backward responsibility' for deforestation without implying that this principle applies eternally or indiscriminately.

[64] Strictly speaking, payments should reflect the accumulated causation of the problem, hence the deforested area and the total of still effective emissions of CO_2 and other global warming gases. Since the degree to which past emissions are still adding to global warming depends on complex substance cycling processes, and since the pattern of accumulated CO_2 emissions will correlate to a large extent with the pattern of present CO_2 emissions, we follow current practice of the global CO_2 debates, focusing on present CO_2 emissions as the ground for obligation to contribute to global transfers of funds.

Fund financing logic 3: taxbearing capacity

Finally, there is the generally accepted principle that contributions to collective goods should somehow be related to wealth. The poor pay less, also if they benefit equally. The ethical and practical grounds of this principle are beyond criticism; it counterbalances, for instance, the intrinsic ('Matthew') bias in market transactions by which the rich become richer and the poor become poorer. We think we should be careful not to strongly apply the principle indiscriminately, however. As said already in the previous chapter, environmental policy is not equity policy, or, in global level terms, a global forest fund is not development aid. Separate mechanisms, working through their own economic and ethical logics, should express the separate objectives of global and international policies. If all elements of a global forest fund would be made strongly poverty-dependent, the fund would lose its internal consistency and external appeal. It would become a vaguely defined part of international aid policies, where it might be easy to get a small amount of quick money but from where it would never be able to rise to make a real quantitative impact. Underneath, therefore, the 'taxbearing capacity' principle is attached to only one element of the fund financing.[65]

Fund financing: proposed synthesis

Needless to say, the relative weights on the various factors mentioned above will greatly influence the magnitudes of national expenditures to be transfered to the Fund. A highly deforested country with relatively low CO_2 emissions, for instance, would gain from a strong emphasis on the CO_2 factor, a nation with low GNP per capita will gain from a strong emphasis on the 'taxbearing capacity' factor, and so on. Countries will of course be perfectly aware of this during negotiations on the financing of the Fund, and the outcomes will therefore be partially determined by power rather than by norms and global rationality. From their desinterested position, researchers can bring into this game their asset of clear and unpartial reasoning. In this vein, we will try to formulate an overall principle of the financing mechanism for the Fund.

The relative weights of the 'benefit' and the 'causation' logics (nr. 1 and nr. 2) may require further research and debate. We do not have the philosophical and economic capacity to make a substantive step here, however. Thus, we follow the intuitive practice of giving equal weights in cases of indeciveness, which is, in global fund terms, that **half of the fund incomes should flow in through benefit reasoning and the other half through causation reasoning.** This of course applies to the fund as a whole, not to the separate country contributions.

Following Tobey (1993), the benefit-related financing component can be set at a certain percentage of GNP, hence **b.GNP**, with the factor **b** to be decided later.

The causation-related financing component contains, as said, the degree to which countries have

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[65] Ridgley and Rijsberman (1994) distinguish between two financing logics, or 'accountability rules' as they call them, instead of three as we do here. The first is 'culpability', equal to our logic of causation; the second is 'ability to pay', equal to our taxbearing capacity. Within the two logics, Ridgley and Rijsberman give more variants of quantitative operationalizations ('indices'). See also Hayes and Smith (1993).

deforested once forested land, and the degree to which countries contribute to global warming. The latter may be equited to their net CO_2-equivalents emissions, in which the term 'net' implies that CO_2 sequestration (e.g., in forests) is taken into account and that firewood burning, of which the CO_2 budget is zero, counts for zero. With respect to the relative weight of the deforestation and global warming factors, further discussions may offer material for a substantive weighing, but they are provisionally put at **equal weight** here. Thus, the causation component becomes **c.DEFO + d.CO2**, with the factors **c** and **d** to be decided later, but in such a way that the DEFO and CO2 components carry equal weights at the level of the fund as a whole.

The 'tax reduction for the poor' argument, as said, should not be applied indiscriminately. We may note in this respect that the benefit component **b.GNP** is already poverty-dependent; nations with a poor population already pay less that nations with the same but richer population. Hence, we attach a 'wealth factor' **WF** to the causation component only, which now becomes **(c.DEFO + d.CO2)*WF**. In the same vein, we do not attach a wealth factor to the output side of the fund, in order to avoid double-counting for poverty. The wealth factor should express the average wealth of a country's citizens (national GNP per capita) relative to the global average. In other words, foregoing non-linearities, **WF = (national GNPpercap)/(global GNPpercap)**.

Summarizing, the contributions to the Global Forest Fund are proposed to be built up as follows:

Contribution (of each nation) = b.GNP + (c.DEFO + d.CO2)*WF
in which:
- **GNP** = Gross National Product ($/y)
- **DEFO** = accumulated deforested area (ha)
- **CO2** = global warming gases emission (CO2-equivalents, tons/y)
- **WF** = wealth factor = (GNP per capita)/(global average GNP per capita)

and in which the factors **b**, **c** and **d** are set such that:
- the **c.DEFO** and **d.CO2** components are equal, globally
- **b.GNP** (benefit component) is equal to **(c.DEFO + d.CO2)*WF** (causation component)

II.5 Some numerical estimates

The aim of this section is to gather a very rough notion of the quantitative aspect of a Global Forest Fund, giving some flesh and blood to the abstract structures built up in the two previous sections.

The sequence of the reasoning will be as follows. First, it may be noted that the Fund not being a bank but a transfer mechanism, its financing inputs and its disbursement output are roughly equal every year. Furthermore, the factors **ARFO**, **DEFO**, **GNP**, **CO2** and **WF** are givens that may be infered from remote sensing and macro-economic data. Thus, the flesh and blood of the fund financing is establishing the numerical values of the the factors **a**, **b**, **c** and **d**. Finally,

it must be borne in mind that for efficiency reasons, the factor **a** varies from forest block to forest block, as discussed in Section II.3; the present section will be occupied with the global **average** of the factor.

The factors **a**, **b**, **c** and **d** are tied to each other through the fifty-fifty rules and the input = output principle. Hence, if one factor is set, all the others follow automatically. The average factor **a** (the disbursement from the fund per hectare of non-degraded tropical forest) is used below as the key to set the Fund's size because, as it will show, the level of this factor may be derived from a single, clear-cut criterion. The factors **b**, **c** and **d** (= the financing side of the fund) will then be determined, and held against the light of the criterion that pertains to them.

Finally, a decision has to be made here as to which of the factors are to be held constant over time. If the average disbursement per hectare (**a**) is held constant, for instance, the total disbursement from the Fund will decline when the total forest area (**ARFO**) declines. This effect is not desirable, it seems. When the forests decline, the remaining areas will rise in value, and thus could **a**. It has been chosen here to keep constant (that is to say, rising only with the inflation rate of the dollar) the *throughput* of the Fund, that is, its total disbursements, equalling its total financing. The financing and disbursement formulas of the previous sections then function to distribute the financing and disbursements over the various countries, depending on their GNP, ARFO, DEFO etc.

*The average disbursement per hectare (average **a**)*

As in the previous sections, two perspectives seem to be relevant for the determination of the disbursement per hectare: the economic perspective (thinking in terms of cost-effectiveness, benefits and so on), and the ethical perspective (thinking in terms of rights, obligations, equity, care and so on). We have not been able to find a consistent ethical 'logic' with respect to the disbursement side of the Fund, especially since ethical considerations have already played a significant role on the Fund's financing side, where they seem to find their natural place. It does not seem feasible, for instance, to apply a 'taxpaying capacity' principle also on the disbursement side. In other words, it seems reasonable that all nations receive the same payment per hectare of non-degraded tropical forest irrespective of their GNP per capita, since GNP per capita is already accounted for at the input side (poor nations contribute less). A second ethical argument on the output side of the fund might seem that developing nations somehow would have a right to full compensation of all costs of forest protection (direct cost, indirect cost, opportunity cost). This argument does not seem appropriate here, however. Developing nations do not only have rights but obligations as well. On the level of individual people, an example may be that also the poor do not get paid for stopping for red traffic lights; they also have an obligation to help producing the collective good of traffic safety. There are sound ethical arguments for a global forest fund (alongside to the economic ones, as we have seen), but these arguments cannot be framed in rigid 'rights language'. A global forest fund helps both the industrialized and the developing nations to respond to their common forest protection obligations toward global biodiversity and future generations, but it does not pre-empt that obligations continue to exist (for both parties again) outside the fund mechanism. In other words, developing nations have no ground to deforest a region on the simple ground that Forest Fund contributions are not enough to compensate for all short-term profits of deforestation.

This apparent lack of significant ethical considerations on the output side of the fund leaves us with the freedom to set the factor **a** on purely economic grounds. The obvious criterion then is that the level of disbursement per hectare of forest must be *effective*, in other words, the level of disbursements should *make a difference* in actual decision-making over forest land. Because **a** is variable, two aspects are relevant in this respect, (1) the global average and (2) the variations around the average, established in negotiations. This section will focus on the global average.

A first indication of the average disbursement per hectare is that it should compensate for the *direct protection and maintenance cost* of an 'average' forest protection area. Such a level of compensation may incite an important psychology switch on the part of the forest-owning nations; all forest now becomes an asset instead of a possible protection liability. Furthermore, no nation can claim anymore that it is too poor to effectively protect the forest resources if it wants to.

A second important category of forest protection costs are the opportunity costs, *i.e.*, the benefits foregone by not putting the forest area to some other use such as agriculture or mining. This generates a second estimate of the factor **a**. First of all in the opportunity cost discussion, it should be accepted that no forest fund payment level will ever be able to compensate for extreme opportunity costs. If gold is found under a forested hill, for example, no realistically attainable level of disbursments per hectare exists to prevent the hill from being deforested and mined.[66] A global average, however, may be designed to make a difference in decisions about less profitable and and yet destructive large-scale types of land use. The *opportunity cost of cattle ranching* may be thought of here especially, but a quick look will also be taken below at the opportunity cost of logging.

With respect to the direct management and protection cost, Tobey (1993) mentiones research from Costa Rica, indicating that managing the forest as a preserve costs approximately $ 13 per hectare per year. He quotes the same figure of roughly $ 13 per hectare per year for the management of Korup Park in Cameroon. This figure is not as stable as it may seem, however. From a later source on Korup Park (Ruitenbeek, 1992 - the same author as quoted by Tobey), a direct cost figure of $ 50 per hectare per year may be inferred. On the other hand, a much lower figure of 1 $ per hectare per year may be inferred from the case study of Dixon and Sherman (1991) on Khao Yai Park, Thailand. More research is obviously required here but these first figures may yet be used as a first estimate of the factor **a**. The Costa Rican parks, Korup and Khao Yai lie in relatively densely populated areas, so that there does not seem to exist a danger of gross underestimation of the management and protection cost. Moreover, the figures are exclusive of management and protections benefits, such as income from tourism, the extraction of high-value forest products and so on, all of which may be quite substantial and even higher than the management cost. As a first estimate then, we may say that an average disbursement of $ 10 to 15 per year per hectare of non-degraded forest would certainly make a substantial difference in terms of the direct cost of forest protection and mangement, and probably more than cover it in many cases.

The opportunity cost of cattle ranching is much more difficult to estimate. Opportunity cost

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[66] As said, protection obligations still exist, however, which may be voiced through non-economic mechanisms and possibly even outweigh the gold. Ancestral rights may be an example.

calculations are less 'real' than direct cost calculations to begin with, and the field of cattle ranches is confounded with subsidies, land speculation and other distortions from the real costs and benefits (Hecht, 1993). At the short notice of writing this report, only a quite weak estimate is possible. One source is a World Bank study quoted in Tobey that mentions an NPV opportunity cost of not converting forest of $ 339 for Brazil, where the opportunity cost mainly concerns cattle ranching. Discounting this at 5% per year would yield an opportunity cost of $ 17 per hectare per year. It is not known if this study accounts for distortions, if it really takes a net price, if the assumed ranching is of a sustainable type, and so on. As asserted by Hecht (1993) for Amazonia, cattle ranching in itself often is not an economic undertaking at all (hence would have a negative opportunity cost) but a means to capture subsidies, to seize large tracts of land for free and sell it afterwards, and to invest money in a context of staggering inflation rates and a failing bank system. Our own case study in Ecuador on the other hand (Kamminga, this volume; Nations and Hinojosa, 1989; Boese, 1992; Hicks, 1990), shows small livestock owners produce meat and milk to a value of approximately $ 50 per hectare per year, and it does not seem very likely that these farmers would do so for speculative and investment reasons only; some normal net benefit is likely to exist too. The amount of this added value at the level of the national economy is hard to grasp and to compare with a national income from a Forest Found, also because the ranching is unsustainable while the Fund income is not. Very tentatively put, it would seem that an average Forest Fund disbursement of $ 10 to 15 per hectare per year could make a real difference in forest conversion decisions with respect to cattle ranching. But obviously too, this financial mechanism can only work if the land speculation pressures are lifted off the forest and other, more economic investment opportunities are provided.

It is as yet hard to tell if a Forest Fund disbursement at the level found up till now would also make a real difference in *logging* decisions. The World bank study quoted in Tobey mentiones NPVs in the order of $ 4,000 per hectare here, which, at a rate of 5%, would result in an opportunity cost of not logging of $ 200 per hectare per year. Other sources (e.g. in Tobey, 1993) mention NPVs of $ 1,000 per hectare, hence $ 50 per hectare per year. Ruitenbeek (1992) mentions an opportunity cost of not logging Korup Park of $ 25 per hectare per year. On the other hand, our case study in Cameroon shows that commercial loggers forego logging in isolated areas, because the transport and other cost there do not outweigh the benefits. In other words, the opportunity cost of not logging there is zero, and no disbursements from the Fund would be required to prevent the forest to be lost. By way of a very tentative conclusion, it seems that an average Forest Fund disbursement rate of $ 10 to 15 per hectare per year does lay a basis for more sustainable logging decisions. Being only an average, higher disbursements than $ 10 to 15 are possible for places under high pressure. Furthermore, some degree of light and sustainable logging may continue to be allowed under the Fund mechanism, as specified by the definition of the **ARFO** factor; the benefits of the Fund then do not have to compoete with the benefits of light logging (and, for that matter, light NTFP extraction, sustainable wildlife cropping etc.). And finally, the Fund will of course not be the only factor interplaying with logging decisions; debt-for-nature swaps, NGO pressures, NGO funding, the green label, indigenous rights, watershed protection and so on will continue to play a role.[67]

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[67] As mentioned by Jepma (1993), a figure of $ 1.5 billion per year is mentioned in Agenda 21 to compensate countries for the cost of switching from unsustainable to sustainable logging. This figure might be indicative of the direct cost of replanting after logging, to be disbursed to only the forest areas where replanting actually takes place; this then would explain the low *average* disbursement

The estimates so far have been economically very unsophisticated, focussing as they do on simple cost categories without accounting for, for instance, diffuse benefits and long-term aspects. This has the advantage that the exploration has not been not very sensitive for assumptions with respect to discount rates, shadow prices, sustainability and so on. Also, the results found in this crude fashion may in fact be felt as more 'real', politically, than the results of a sophisticated cost-benefit analysis that takes everything into account. Direct conservation costs, the burden of which are to be carried by a national forest agency, will be felt as more real than, for instance, the benefits of the soil protection function of forests, which are diffuse, long-term, and accruing to the local population. The same holds for the opportunity cost of not logging and not ranching, because it is often the political elite that has to forego of these benefits.

Yet, it is interesting to also take a look at the more sophisticated cost-benefit analyses of forest protection, following the proposals of, for instance, Dixon and Sherman (1990) and McNeely (1988). Ruitenbeek (1992), calculating the net "forest supply price" of the Korup Park in Cameroon with precision and consistency, is the best example here. The end result of the cost-benefit analysis is that Cameroon would be fully compensated for the net disadvantage of protecting and managing the park if the international community would pay $ 12 per hectare per year. This falls in line nicely with the order of magnitude of the above-mentioned crude estimates. It is interesting to note here, however, that the net disadvantage is analytically created by the fact that the internal rate of return of the park is 6.2%, hence positive, only not positive enough to compare with the official Cameroonian standard of 8%! In other words, if a standard of 6.2% would be accepted, there would be no net disadvantage at all and no international compensations would be indicated.

The Fund's throughput

The (constant) throughput of the Fund, *i.e.* the total amount of the yearly global transfer, may now be estimated by multiplying the average **a** by the total forest area **ARFO**. This area, depending on the operational definition of 'not significantly degraded forest', is 1.0 to 1.5 billion hectares. This yields a (constant) *Global Forest Fund throughput of $ 15 billion per year.*

The financing factors

The factors **b**, **c** and **d** may now be estimated, working from the $ 15 billion downwards, using the global figures of GNP, CO2 and so on. At the time of writing this report the up-to-date data were not available yet, so that what follows here are only some figures to get a feel for the orders of magnitude.

From the fifty-fifty rule it follows that b * global GNP = 7.5 billion dollars per year. Hence, with global GNP set at $ 20,000 billion it follows that
- **b = 0.0004** (0.04 % of GNP).

The factor **WF** being 1 at the global level, it follows from the next fifty-fifty rule that c*DEFO

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of $ 1 per hectare per year, if spread equally over the whole world forest area of 1.5 billion hectares. Further study is required at this point.

= 3.75 billion dollars per year. The total deforested area of the world is assessible by substracting the present forest area by the potential forest area under natural conditions. If the latter is put at one third of the earth land area of 15 billion hectares (hence, 5 billion ha), it follows that

- **c = $ 0.75 per deforested hectare.**

The fifty-fifty rule also says that d*CO2 = 3.75 billion dollars per year. With a global CO2 emission at approximately 6 billion tons carbon per year, it follows that

- **d = $ 0.6 per ton carbon emitted (net CO2 equivalents).**

Connected to the calculation of **WF** in the next section, it may be noted that the global GNP per capita is in the order of magnitude of $ 3000 per year.

Fund balances per country

Through the rules and factors specified above, all nations will contribute to the fund, while only the nations with tropical forest will receive disbursments. These flows may now be calculated rather easily using country data on actual and potential forest areas, carbon emissions, GNP and GNP per capita. By way of example, we well do it here for the Netherlands only.

- Fund disbursement = 15*ARFO = 0 (because ARFO counts tropical forest only)
  - GNP = $ 190 billion per year, hence b*GNP = $ 76 million/y
  - DEFO = 3 million hectares, hence c*DEFO = $ 2 million/y
  - CO2 = 50 million tons/y, hence d*CO2 = $ 30 million/y
  - GNP per capita = $ 12,000, hence WF = 4
- Fund financing = 76 + (2 + 30)*4 = $ 204 million per year
  - Fund Balance: net financing of $ 204 billion per year.

This is 0.1% of GNP and approximately 10% of the Official Development Assistance.

The political acceptability of financing

As can be seen from the example of the Netherlands, the contributions expected from the developed countries are substantial. In this section, some aspects of political acceptability will be explored, not country by country but at the global level.

First, it serves to compare the $ 15 billion/year size of the fund with allied global flows. Some of them are, in approximate figures:

- necessary global spending for CO2 emission stabilization: $ 150 billion/year (Tobey, 1993)
- global Official Development Assistance: $ 40 billion per year (World Resources tables)
- global throughput of the international timber trade: $ 5 billion per year (Repetto, 1988)
- global Third World debt servicing: $ 100 billion per year (WB debt tables)
- World Bank lending to poorest countries: $ 10 billion per year (WB ann. report 1991)
- approximate global spending on biodiversity protection: $ 8 billion/year (Tobey, 1993).

Another source for comparisons may be found in willingness-to-pay (WTP) research, e.g., when people are asked what they would be willing to pay for the survival of a certain wildlife species. In spite of the many questions concerning the validity of this type of research (De Groot, 1992), it could be used as an indicator for the public acceptance of a Global Forest Fund. Tobey (1993) quotes WTP figures from the USA of $ 22 per year per household for the

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whooping crane, $ 11 for the bald eagle and $ 24 for the grizzly bear. Given the nature of these species, these figures are indicative for the intrinsic, 'non-use' values of nature in the public eye. Taking $ 30 per household per year for the tropical forest and multiplying this by the approximately 200 million households in the OECD countries results in a total willingness-to-pay for the Global Forest Fund of $ 6 billion per year, as a public perception of intrinsic, non-use value only.

Overviewing these results, an intuitive conclusion may be that a total Forest Fund financing of $ 15 billion per year does not seem politically un-attainable, but seems to represent a certain limit at a same time. Research into the possible effectiveness of lower average disbursements per hectare, somewhere in the range around $ 5 per hectare per year, seems to be quite relevant, therefore. This research should focus on getting a more grounded and spatially differentiated overview (seen both in the 'crude' and the official CBA way) of the costs of not significantly degrading the tropical forest. The possibilities of combining Fund disbursements with sustainable and non-degrading forest use (e.g. some types of logging and non-timber forest product extraction or sustainable wildlife cropping) is of special interest here.

II.6 Some practical aspects

Although the discussions of the sections II.3 and II.4 have been rather abstract, they have already been geared toward quite practical matters. Some of them are:

- Funding the forest instead of the projects solves the problem of souvereignty
- The formulas for the distribution of the financing effort, aiming as they do to be 'formulas of fairness' may help nations to accept their share
- Monitoring the forest itself (by remote sensing) is much easier and un-political than monitoring the performance of forest projects; the Fund may easily establish an essentially automatic system of monitoring (by remote sensing), directly coupled to the yearly disbursements.

This section, therefore, will focus on a matter only briefly touched upon yet in Section II.3, the negotiations necessary in order to set a most efficient disbursement per hectare for the various forest areas. The essence of these negotiations, as we will see, is that the choice for output funding has set the scene of a no-lose situation.

By way of introduction, we may imagine a region with 1,000 ha of forest, differentiated in the following manner:

- for 500 ha, the cost of non-conversion (in formal Fund terms, no significant degradation) for agriculture, ranching, intensive logging or some other activity, is low or maybe even negative (= a net benefit of non-conversion)
- for 200 ha, the cost of non-conversion is $ 10 per ha per year
- for 300 ha, this cost is $ 35.

What would now happen if an average sum of $ 10 per ha of undegraded forest per year would be disbursed from the Fund without spatial differentiation? The area of 500 hectares would be 'overfunded'; it will not be converted, but it also would not have been converted if the disbursement would have been much lower. And the area of 300 hectares would be 'underfunded'; the $ 10 disbursement not really weighing up against the $ 35 per ha per year benefit of conversion, there would be a fair chance the forest in this area would be lost.

Clearly, the efficient distribution of the $ 10,000 total disbursement is as follows:

- some low amount, say $ 2 per ha, for the 500 ha (subtotal $ 1,000)
- $ 10 per ha for the 200 ha (subtotal $ 2,000)
- and the remainder of $ 7,000 spread over the 300 ha, hence $ 23 per hectare.

There will now still be a tendency to convert the most attractive places within the 300 ha area (e.g., convert the valley bottoms into rice agriculture), but this then would be only partial deforestation, and additional considerations and international discussions might in fact safeguard the forest completely.

Obviously, negotiations are the key to reach the desired least-cost solutions. The first step would be to divide the tropical forest into relevant areas; the only technical requirement would be that these areas have clear coordinates so that they can be handled by the Fund's automatic monitor-and-disburse system. The negotiations then will have two parties, the Fund on the one hand and the forest-owning nations on the other. These parties will not be stuck in a rigid win-loose situation, however. The Fund has the aim to reach a least-cost solution and hence a tendency to bid relatively low, but it has no incentive to offer, say, $ 4 per hectare per year for forest areas where $ 10 would be needed to counterbalance forest conversion tendencies.[68] The forest-owning nations will of course begin to bid high and undifferentiated. Lowering the bid is not bound, however, by the cost of certain activities they have to promise to undertake (as is the case with negotiations over projects). Following the principle of output funding, they do not have to promise anything or comply with anything, after all.

Fund disbursements may take place every year, but the disbursement rate negotiations may take place at a lower frequency of, say, every four years. Another way around is to negotiate continuously, covering the global forest area in a four-year cycle. Because of the remote-sensing ease of monitoring and disbursements, and because of the routine character of the negotiations, the Fund could probably handle a number of 1,000 forest areas, in order of magnitude.[69]

Many negotiations will include a forest area category where the net cost of non-conversion is negligible or even negative (= a benefit), if all forest functions are taken into account. It seems important not to exclude these areas from the Fund system, however. Setting these areas at a low but still positive disbursement rate of, say, $ 2 per hectare per year will avoid bickering at the low end of the scale, where the financial stakes are low anyway and the CBA calculations will be relatively vague. Moreover, the psychological advantage will be that all forests now become involved in the Fund mechanism, so that all forests become a national asset and may be viewed with a new eye by the nation.

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[68] It may be envisaged that the Fund staff will prepare its disbursement proposals by making rough economic assessments of the cost (or benefit) of not converting the forest area in question.

[69] The Fund will probably not include all developed nations at the beginning. This might seem to cause the difficulty that the Fund's resources would be smeared out over so many tropical forest nations that the disbursement per hectare would not make any difference in the forest nations' behaviour. Seeing this, why would other developed nations then join? This problem may be averted by limiting the number of participating forest nations. The first developed nations then seek one or more forest nations with a forest size such that the disbursement comes to approximately $ 10 per hectare per year. If this then shows to make a real impact on the forest, other developed countries will join and the number of forest nations will rise accordingly.

As discussed by Dorfman (1991) and exemplified by him with the case of global CFC abatement, a Global Forst Fund should be able to act as a relatively independent body, "insulated from *Weltpolitik*". Such an independent body could work under general UN auspices, and close to UNEP. Care should be taken, it seems, not to connect the Fund too closely with the World Bank system, because Fund's mechanisms of output funding are different in many ways from the 'banking paradigm'.

II.7 Summary: A possible format of a Global Forest Fund

Many natural resources have a relevance at the global system level. This in itself does not generate an obligation of the world community to pay for such resources. In the case of the tropical forest, however, characterized by large and evident global-level value combined with evident financial difficulties of the forest-owning nations to perpetuate it, a global transfer of finances seems warranted. Such a Global Forest Fund does not pre-empt obligations on the side of the developing nations to take a share in the care for the global commons.

Global funding is often conceptualized as a type of input funding, *i.e.* the financing of proposals for projects (of forest protection and management), combined with monitoring of the extent to which proponent countries comply to the terms of the project contracts. This conceptualization lacks a clear-cut economic rationality. Moreover, it stands in opposition to the developing nations' desire to maintain their national souvereignty.

Output funding, *i.e.* fund disbursements simply for hectares of standing non-degraded forest, overcomes these difficulties. The basic economic rationality is analoguous to that of a normal market, in which payments are made for products, not for promises. Since disbursements follow automatically on the basis of a yearly remote sensing of the state of the forest, the Fund can have an impact on the whole of the 1.5 billion hectares of tropical forest area without the need of project proposals covering that area and monitoring compliance; there is nothing to comply with, there is only the simple rule of 'no forest, no disbursement'. This principle also solves the souvereignty dilemma, because the Fund leaves it fully to the forest-owning nations if and how they manage the forest.

In order to avoid that some areas would be 'overfunded' and other areas would receive too little to prevent forest conversion, negotiations are necessary to establish a most effective disbursement rate of separate forest areas. Since there does not exist an intense discrepancy between the interest of the Fund and the interests of the forest-owning nations, no unsurmountable difficulties are envisaged to establish these least-cost solutions. It seems of importance to include in the Fund disbursement system also all areas that theoretically would not need Fund support to remain unconverted. *All* forest will then be involved, and be an asset to the forest-owning nations.

A very rough exploration of the funding flow required to have a substantial impact on the tropical forest's fate indicates an average disbursement of $ 10 to 15 per hectare per year, hence a total flow of approximately $ 15 billion per year. This is a full order of magnitude less than funds proposed to abate global carbon dioxide emissions. At the same time, a comparison with current global flows suggests that a full financing would require a novel committment on the part of the rich nations. Section II.4 provides a number of ethical considerations that may support a fair distribution of the financing effort over (all) nations. Further research is required in order to assess if a lower average disbursement level might also be effective. One aspect here is the degree to which the definition of 'fundable forest' could also include forest under regimes of light logging, NTFP extraction and so on; incomes out of such activities would then combine with the Fund disbursement.

Due to the simple logic of its mechanism, the Fund needs very minor staff overheads.

References

Adams, P., *Odious Debts: Loose Lending, Corruption and the Third World's Environmental Legacy*, Earthscan, London, 1991.

Boese, I.E., *Actividades Agroforestales y Silviculturales en la Region Amazonica Ecuatoriana*, RED, Casilla 17-21-546, Quito, 1992.

Buttel, F.H., A.P. Hawkins and A.G. Power, 'From Limits to Growth to Global Change', *Global Environmental Change* 1 (1), 1990, pp. 57-66.

Elster, J., *The Cement of Society*, Cambridge University Press, New York, 1989.

De Groot, W.T., *Environmental Science Theory*, Elsevier, Amsterdam, 1992.

DiMento, J.F., 'Can Social Science Explain Organizational Noncompliance with Environmental Law?', *Journal of Social Issues* 45 (1), 1989, pp. 109-132.

Dixon, J.A. and P.B. Sherman, *Economics of Protected Areas*, Earthscan, London, 1990.

Dixon, J.A. and P.B. Sherman, 'Economics of Protected Areas', *Ambio* 20 (2), 1991, pp. 69-74.

Dorfman, R., 'Protecting the Global Environment: An Immodest Proposal', *World Development* 19 (1), 1991, pp. 103-110.

Hayes, P. and K. Smith, *The Global Greenhouse Regime: Who Pays?*, United Nations University Press, Tokyo, 1993.

Hecht, S.B., 'The Logic of Livestock and Deforestation in Amazonia', *BioScience* 43 (10), 1993, pp. 687-695.

Hicks, J.F., *Ecuador's Amazone Region*, World Bank Discussion Papers no. 75, The World Bank, Washington, 1990.

Kelman, S., 'Moral Domains, Economic Instrumentalism, and the Roots of Environmental Values', in: J.M. Gillroy (Ed.), *Environmental Risk, Environmental Values and Political Choice*, Westview Press, Boulder, 1993, pp. 35-43.

McNeely, J.A., *Economics and Biological Diversity*, IUCN, Gland, 1988.

Nations, J.D. and F.C. Hinojosa, 'Cuyabeno Wildlife Production Reserve', in: J.O. Browder (Ed.), *Fragile Lands in Latin America*, Westview Press, Boulder, 1989, pp.139-149.

Repetto, R., *The Forest for the Trees?* World Resources Institute, Washington, 1988.

Ridgley, M.A. and F. Rijsberman, *Setting Targets for Climate Policy*, Report of project 668.443.01, Resource Analysis, Delft, 1994.

Ruitenbeek, H.J., 'The Rainforest Supply Price: a tool for evaluating rainforest conservation expenditures', *Ecological Economics* 6, 1992, pp. 57-78.

Sedjo, R., *Toward a World-Wide System of Tradeable Forest Protection and Management Obligations*, Discussion Paper ENR 91-16, Resources for the Future, Washington DC, 1991

Tobey, J.A., 'Toward a Global Effort to Protect the Earth's Biological Diversity', *World Development* 21 (12), 1993, pp. 1931-1945.

Turner, B.L., R.E. Kasperson, W.B. Meyer, K.M. Dow, D. Golding, J.X. Kasperson, R.C. Mitchell and S.J. Ratick, 'Two Types of Global Environmental Change', *Global Environmental Change* 1 (1), 1990, pp. 14-22.

Wood, W.B., 'Tropical Deforestation: Balancing Regional Development Demands and Global Environmental Concerns', *Global Environmental Change* 1 (1), 1990, pp. 23-41.

World Bank, *World Development Report 1992*, Oxford University Press, New York, 1992

ANNEX III

Migration: A Simulation Modeling Example

Wouter T. De Groot

III.1 Introduction

Generally speaking, the impact of actors on their environment can be analyzed as the multiplication of the number of actors with what actors do to the environment, per actor. Simplified in terms of forest conversion by local people:

> forest conversion per year = (number of people) x (forest conversion per person per year).

The latter factor is determined by the land use system. The former, demographic factor is determined by the autonomous growth of the population plus the migration into the area. On the locations and time scales relevant for tropical deforestation, migration usually far outweights the population's autonomous growth rate. It follows that migration usually is a core factor in deforestation.

The aim of this Annex is to construct a model that could explain and predict migration flows. The general type of the model will be simulative (= deductive), that is, trying to capture all relevant causal factors in a structure congruent to the actor's real decision-making structure. In terms of Section 3.2, the model will be of the 'simplified micro-economy' kind, with nominal options but with the motivational factors expressed in one-dimensional, monetary terms.

The focus here is on voluntary, individual migration, hence not the collective and forced movements such as often occur in case of famine or war, or in case of resettlement more or less forced by government.[70] When migration data are used to test the model, such non-modeled migration flows should be subtracted first from the migration data.

It is always possible to construct a model with an almost perfect fit with reality. The way to do so is to build a complicated model structure with a large amount of open, unquantified factors, and then calibrate all these factors on a set of real-world data until the model fits the data. The merit of such inductive work is only to generate a complicated hypothesis, to be tested on another set of data (which usually is forgotten). In this Annex, we try to reach at an almost fully deductive model, with almost all factors quantified and ready for testing. After such testing, all factors may be 'opened' and calibrated.

In chosing proxies, we keep an eye on the availablity of statisical data in developing countries.

Finally, a note on the notation. Wishing to avoid too formal expressions, a factor will be filled-in as soon as it is quantified. In other words, if we assume a family size of pioneer forest farms of 2, we write 2 in the model instead of FS_f or something like that. The various quantified factors will be kept separate, however. If one factor is 2 and anther is 0.7, we continue to write 2 * 0.7 instead of 1.4, so as to keep visible the model structure.

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[70] Government-*induced* but voluntary migration is inside the model, however. If a government issues subsidies, provides titles, constructs infrastructure etc. to attract migrants, it is a secondary actor influencing the migrants' options and/or motivations.

III.2 The overall model structure

To begin with, the overall structure of the model has to be established. Following Todaro we may think of 'expected incomes' as the driving force. More recent authors (ref. Burger, 1994) have pointed out that these expectations should not be taken too simple. In this section we therefore relate migration primarily to a vague factor called 'expected good', someway (but sufficiently subtle) to be defined in monetary terms later. The general core factor then is the difference between the expectation of migration and the expectation of staying at home:

- **expected migration benefit = expected good of moving — expected good of staying**

in which a high expected good of moving (e.g. expected urban income) is the 'pull' factor and a low expected good of staying at home (e.g. expected rural income) is the 'push' factor.

This holds for all migration flows (from the rural heartland to the cities, from the rural heartland to the forest fringe, from the forest to the cities, and so on).[71] Thus, the general equation separates into one for each migration flow. We define the folling convention:

- R→U ≡ from rural to urban areas
- R→F ≡ from rural areas to the forest fringe
- F→U ≡ from the forest fringe to the urban areas
- F→R ≡ from the forest fringe to the rural areas

and so on.

The tendency of people to move to an other place will be positive if the expected migration benefit is positive. Poor people will be more inclined to migrate than rich people, however, given the same expected benefit. This is because the benefit compared with what people have already. If one person earns only $ 100 per year at home and can earn $ 40 per year more by going to the city, This person will be much more likely to migrate than a person who can earn the same $ 40 more but has $ 1000 per year already at home. Thus we may set:

- **migration tendency = expected migration benefit / expected good of staying**[72]

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[71] It does not seem wise to to merge gross migration flows into net migration flows. In other words, we will keep separate the flow, for instance, from the rural areas to the forest and the flow from the forest back to the rural areas. This is because the underlying mechanisms are not symmetrical; to settle in the forest area, an investment has to be made which differs from the investment in a rural area. If settling in the forest would require a higher investment than before (e.g. because agroforestry is the only land use option allowed by the titling agencies), this would influence the rural-to-forest flow, but not the reverse flow. This argument obviously, in spite of always being true, may not always account to much, quantitatively. Therefore, net flows might be taken in exploratory model runs of if the data do not allow for separation into gross flows.

[72] We may note here that this equation 'explodes' if the the expected good of staying at home approaches zero. This relates back to the remark in the introduction, that the analysis is confined to normal cases, that is, cases where staying at home still provides for a some livelihood, hence

or, with the previous equation:

- **migration tendency = (exp. good of moving — exp. good of staying)/(exp. good of staying)**

This equation separates into a set of paralell equations according to the migration flow:

- migration tendency R→U = migration benefit R→U / exp. good of staying rural
- migration tendency R→F = migration benefit R→F / exp. good of staying rural
- migration tendency F→R = migration benefit F→R / exp. good of staying in forest

and so on.

The model so far can be applied to more than one social system level; in Action-in-Context terms, the actor is as yet unspecified. For migration, this generates the question who in fact decides: is it the family that decides to gamble, sending a younger son to town, or is it in fact the younger son who decides to leave? Following Burger (1994) and others, we assume that the migration decision will be taken in a negotiaton process between the individual and the family. We work this into the model by taking the individual as the actor, but add the family-level capacity and rationality by introducing the negotiation results: support from family to migrant, and remittances from migrant to family. The quantification is in section III.4.

At the level of individuals, all prospective migrants will be in different circumstances and will have different non-modeled characteristics. One may be lazy and stay at home ven when the benefit of migration is high. Another may seek adventure, or dislike his mother-in-law, so that he may migrate even against the odds. Younger sons may decide to migrate while elder sons may decide to stay in order to secure the inheritance and status waiting for them. Our interest, however, is at the aggregate level of overall migration streams. Hence we may abstact from the individual circumstances and say that a positive migration benefit sets in motion a migration stream proportional to the migration tendency and the number of people that may migrate. In other words, the overall structure of the model is:

- **migration = a * population * migration tendency**

or, with the previous equation,

- **migration = a * population * (exp. good moving — exp. good staying) / (exp. good staying).**

Again, this equation can be separated for the various migration flows:

- migration R→U = a * rural population * migration tendency R→U
- migration R→F = a * rural population * migration tendency R→F
- migration F→R = a * forest population * migration tendency F→R

and so on.

Guessing the factor **a** seems beyond our grasp; it must be left as an open factor. This is no problem if it remains the only one; testing the model then amounts to a simple (non-

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excluding cases of massive famine, war, exclusion from a national park and so on. The equation may then still hold in the sense that in such cases, migration may 'explode' in reality too. Seen in more detail, however, the decision-making in these cases will not resemble the structure of our model; drought or war fugitives do not consider things like the probability of getting a job in town, for instance.

multiple) regression analysis to estimate **a** as the slope of the curve relating the measure migration and the migration as predicted by the model, with the correlation coefficient R as the model quality parameter. (It may be noted that in the separate flow equations above, we have chosen to for a single factor **a**, hence a constant ratio between real and modelled urban migration, real and modelled rural migration, real and modelled forets migration, and so on. A very good model, *i.e.* a model with all key factors captured in the equations, might prove this to be possible. In practice, we may have to retreat to the more modest option of allowing a different factor **a** for the various migration flows.)

III.3 The 'expected good' of moving and staying

In the preceding section, the 'expected good' of moving and staying has been set as the driving force of migration. This is conceptually trivial; the expected good is implicitly defined as all that is of interest to the actor with respect to the decision under consideration (in Action-in-Context terms, the expected good is the effective sum of all motivatuional factors relating to the migration options). In this section, we will move forward cautiously to operationalize this concept, aiming to define proxies that can be extracted from available statistical datasets.

The most rigourous simplification of the expected good is to equate it with the *incomes* of the actor at home and at the place of migration. In equation terms, e.g. for rural to urban migration:

- *migration tendency* R→U = *urban income* — *rural income*

or, expressing the formula in terms of wages:

- migration tendency R→U = urban wage — rural labour productivity.

Criticisms against this approach are (e.g. Burger, 1994):

- ■1 The expected good encompasses more than financial considerations.
- ■2 Even if only financial, the expected good entails uncertaincies; urban wages may be high, for instance, but what if you do not get employment?
- ■3 And besides that, incomes or wages are not the only matters that count; in order to settle somewhere, there are investments to be made and remittances to be paid, for instance, especially if no other family member is settled already at the same place.

Underneath, we will treat these arguments one by one, in order to arrive at a balanced operationalization with explicit assumptions.

Ad 1. The first argument is certainly right; *any* decision encompasses more than financial considerations. Sometimes this may be quite relevant, for instance as in Annex II, when explaining why nations may be reluctant to enter into from debt-for-nature swaps even if they entail a profitable deal. In many other cases, the relevance may be low. It is true, for instance, that real men don't eat quiche whatever the price; yet, quiches display a perfectly normal demand curve *at the aggregate level*; the lower the price, the more are sold. This micro-economic 'vanishing trick' of non-economic motivations may be assumed to also work with respect to migration. In other words, we neglect non-financial considerations in our model, but then accept that its domain is confined to the explanation and prediction of aggregate migration flows. Expressing this in model terminology, we

may change the term 'expected good' into 'expected utility'.

Ad 2. The argument of uncertaincies is obviously true as well. Again, the question is to which extent it is relevant enough to honour it. In our model, we assume that uncertaincies are significant enough with respect to the places where the actor might migrate to. An example is the employment uncertainty for a prospective migrant in a rural area. With respect to the home area of the prospective migrant, however, we assume that actor envisages a future that is not significantly different from the present situation average in his surroundings. In other words, we take it that the expected utility of staying at home can be proxied by the *average utility of the present.*

Ad 3. The same reasoning applies to the reduction of utility to income. With respect to the staying-at-home option the reduction seems acceptable. With respect to the utility of the migration option, however, it seems we must assume that investments, remittances etc. play a significant role in the decision-making, also at the aggregate level.

Finally, we have to make a decision as to the assumed *time horizon* of the decision-making of the actor. Formal economics assume that people have an unlimited time prespective, but discount costs and benefits in the future, calculating a 'Net Present Value'. This seems a bit too sophisticated of what we may imagine real actors are doing, and it yields unwieldy model equations. Migrants usually are poor people, whom we may assume to work with a very short time perspective of, say, one to three years. What we may assume, then, is that prospective migrants make a picture of the first **h** years of the possible migration only, but do not discount significantly within that short period. This is what the model will do. All utilities, incomes, investments etc. go in 'blocks' of the first **h** years, which is also the period we assume for the pay-back of loans that the migrant may have incurred to establish himself in his new place.

Taking the three arguments and the time horizon decision together, the migration equation may now be rewritten as:

- **migration = a * population * (expected utility of moving — h * income in home area) / (h * income in home area)**

in which:

- **h** = the time horizon of the migration decision
- expected utility of moving = comprizing income plus uncertaincies plus other financial considerations with respect to the place to go to, over the full period of the first **h** years
- income in home area = is a present-day average income (per capita) of the reference group of the actors, *per year.*

This reference group depends on what we take as the 'population' factor (ref. section III.6).

The various migration flows again differentiate. For rural-to-forest migration, for instance, the income in the home area is the rural income. The expected utility of moving comprises an the average forest income but also uncertaincies (e.g. of tenure), investments (e.g. of starting a farm) and so on. For the forest-to-rural reverse flow, the income in the home area is the average forest income, but the expected utility of moving entails uncertainties, investments etc. in the rural area. Also the time horizon **h** may vary per

migration flow. When considering to move to the forest, for instance, we may assume that the actor makes a picture of the whole process of establishing the farm. The time horizon then is about 3 years. For urban migration, the time perspective may be considerably shorter (you get a job or you don't); hence the time horizon may be put at, say, 1 year. Later sections will indicate that *in the present model formulation*, the factor **h** is not important for urban and rural migration. Hence we may say:

- **h** of R→F and U→F = 3 [years]
- **h** of R→U and F→U = 1 [year] but not important for present model formulation
- **h** of F→R and U→R = ? [year] but not important for present model formulation.

We should take care that the utility and income elements of the equation be written in the same 'dimension'. If the utility is written in a wage dimension [$ per working day], then so should the income. Throughout this Annex, the dimension will be in income terms, per person, hence [$ per person per year]. Thus, for instance:

- rural income = (farm production, priced and shadow-priced) / (rural family size)
- urban income = (urban wage * no. of working days per year) / (urban family size).

With respect to the income at the rural, urban or forest *home areas*, we may take the respective incomes directly from statistical income-per-capita lists, or calculate the incomes as above, through farm production and wage data, divided by the *average* rural, urban or forest family size. What, however, should be taken as the family size at the place to go to? Usually, the migrant moves *alone*, and though most of the migrants pay a remittance to the family at home, no migrant shares his new income equally with all these family members. We may assume that the migrant first shares with his immediate dependents (e.g. his wife) and then sends the remittance to satisfy the family at home. Thus, the equation has a different structure:

- individual income at place of migration = (own income of migrant)/(1 + no. of immediate dependents) — remittance to home family.

What will be this number of immediate dependents? Or more precisely, what does the prospective migrant have in mind when the decison to migrate is taken? Here, we assume a relatively short time perspective of, say, three years. Every migrant may hope to start a large family at his new place, but what he really moves on is the image of the first three years. In case of urban migration, this image will be to stay alone (no. of immediate dependents = 0) and pay remittances. In the case of migration to the forest or the rural area, the usual intention will be to start a farm, which is something you don't do alone. Our impression from our Philippine research region is that a wife is brought in quickly, and the first baby may arrive within a few years. Thus, the model would be that the prospective migrant inquires what an average pioneer farm in the area produces (= farm production, priced and shadow-priced) and divides this by approximately 2. But then, starting a family of your own, it does not seem logical to pay remittances.

We are now able to specify the income/utility terms in the migration equation, so that we may calculate the various migration flows.

For the stay-at-home options,

- **income in home area, rural** = **rural farm prod. / rural family size**
  = **rural income per capita**
- **income in home area, forest** = **forest farm prod. / forest family size**

= forest income per capita

- **income in home area, urban** = wage * working days / urban family size
  = urban income per capita.

For the migration options:

- **income part of exp. utility, rural = h * rural farm production / 2**
- **income part of exp. utility, forest = h * forest farm production / 2**
- **income part of exp. utility, urban = h * (wage * working days — remittance)**[73]

In selecting income data or calculating farm production, it should be borne in mind that these may be distorted in the sense that they are highly influence by a small number of high incomes or large ('hacienda') farms. These actors, however, will never make up a significant part of the migration flows. Sophisticated migration models, therefore, could stratify the data in three population layers:

- high-income migration = a * high-income no. of people * high-income migr. tendency
- middle-income migr. = a * middle-income no. of people * middle-income migr. tend.
- low-income migration = a * low-income no. of people * low-income migr. tendency.

Here, as in other models of a more explorative nature, is seems sufficient to simply leave out the high and middle income minorities. In other words:

- **All model parameters (population, incomes, farm sizes, family sizes etc.) of the model are those pertaining to the poor majority of the people.**

Finally, it serves to have a look at the migration equation with an eye on the time scale. The migration equation, being based on a *difference* between two utilities/incomes, is rather sensitive to utility/income changes. For instance (for the rural-to-urban flow), if the expected urban utility is 100 and the rural income is 50, the migration tendency is (100-50)/50 = 1. If then the two factors change with 20% in a certain year, becoming 120 and 40 respectively, the migration tendency becomes (120-40)/40 = 2. Thus, it is modelled the migration would double. This outcome cannot be rejected offhand, but it seems very unlikely that the migration would double *that very same year*. People react upon information, and information only becomes real information when it is repeated. Secondly, it takes time to make up one's mind and arrange for the migration step. Thirdly, migration will only rarely be a decided upon on an incidental basis; actors will try to come to grips with trends rather than incidents. The response to changing utilities/incomes will therefore be delayed, and spread out over more than one year. This seems especially the case with

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[73] As indicated by Burger (1994), there could be a discussion here on which income to take - average/total incomes or the marginal incomes. There is a difference in this respect between the individual and the family level. For the individual, what he foregoes by migration is his (equal) share in the total family pot. And what he may earn by migration is a new total, e.g. his urban income. For the family, what it foregoes by letting the son migrate is the *marginal* contribution of that son to the family income; if the farm may be run just as well without the son, this marginal contribution is zero! On the other hand, the remittances to be expected are again a total, not marginal, sum. This sheds an interesting light on the negotiation space between family and individual, and the level that negotiated remittances will have, dependent on family and farm sizes. In our case, however, it is sufficient to take only the average/total incomes. This is because the model structure focuses on the individual and takes the remittances as fixed (either a fixed sum or a fixed percentage of the urban income). This is because widely available datasets do not allow to relate the level of remittances to these family sizes etc.

respect to the places to migrate to, because events there are harder to interprete than are events in the home area. For these reasons, the migration flows in one year can be modelled as related to home area incomes averaged over the two previous years, and to expected utilities at the migration areas averaged over the three previous years. In equation form:

- $\mathbf{migration_{one\ year} = a * population * (expected\ utility\ of\ moving_{av.\ 3\ previous\ years} - h * income\ home\ area_{av.\ 2\ previous\ years}) / (h * income\ home\ area_{av.\ 2\ previous\ years})}$.

This gives no data problems. We may note that this model structure allows for 'pig cycles', e.g., that the peak of a migration flow to the cities comes after the urban wages have peaked, and may even continue for some time after the wages have dropped below the level where migration is rational. For ease of writing and reading we leave the time indices out underneath.

In coming sections we first focus on the further operationalization of the three 'expected utility' factors (urban, forest, rural). Then we will specify the 'population factor' for the various flows. After that, the various flows wil be formally summarized, forming the resulting total model.

III.3 Expected urban utility

For both migration flows to the city (R→U and F→U), the expected urban utility is a s yet the most important unknown factor. The essence has already been given in the previous section:
'■ income part of expected urban utility = wage * working days — remittance',
but what will it be exactly, also including the uncertaincies, the investment and so on?

Following Burger (1994) and others, we may assume that two elements will play a role in the negotiations and traditions of the relationship between the prospective migrant and his family:
- the family will support the migrant for a certain period
- but in return, the migrant will send remittances if he has secured an income of his own.

The family support is necessary because the migrant will simply not survive without it before the migrant has secured an income of his own. But from the moment he does, the support will stop and the remittances will begin to flow, in the other direction. This gives a basic structure to the 'expected urban utility' formula, which hinges around that moment the income is secured.

We may now define a factor **p** as the proportion of migrants who have secured an income (usually, some employment) after 1 year in the city. At the individual level, this is the expected probability of finding a job within the time horizon. Thus, the one-year period separates, on the average, into:
- period with support from home: 1 * (1 — p) [years]
- period with employment (wages and remittances): 1 * p [years].

This enables us to formulate an 'expected urban utility' that comprises the urban wages, the support, the remittance and the employment uncertainty. Expected urban utility is support from home [$/year] multiplied by the period this support is received, plus the period of emplyment multiplied by (wage — remittance). In formula terms:

■ expected urban utility = 1*(1 — p)*support + 1*p*(wage — remittance),[74]
in which, with the dimensions between [ ]:
- 1 = **h** = decision horizon [years]
- support = support allowance from home [$/year]
- p = fraction of migr. with employment after 1 years = exp. probab. of employment [1]
- wage = expected migrant's wage [$/year]
- remittance = money sent back home if employed [$/year].

The wage can be set at the quantitative level that an average migrant may expect to fetch, that is, the level of formal but low-level urban employment, e.g. as a construction worker. Available data will be no bottleneck here.

This equation can be operationalized one more step by focusing on the support and on the remittance.

Statistical data on support flows will be largely unavailable, and we should therefore make a guess as to its average magnitude. The support, being decided upon primarily by the family, will have a relation to the farm income. It will also be related to the cost of living in the city, in the sense that it should supply the migrant with a survival minimum. A simple choice satisfying both ideas is to say:

□ support = rural income,

in other words, the migrant continues to receive his equal share of the farm income. This will be a bare minimum in the city.

With respect to the remittance, there seem to be two possible assumptions: (1) that it will be a fixed amount and (2) that it will be a fixed percentage of the income. Burger (1994) gives some data on remittances in rural-to-urban migration in Kenya:

Urban income	remittance	remittance as percentage of income
526	146	28
632	84	13
719	115	16
779	99	13
787	187	24
990	125	13
1076	129	12

[74] It may be noted here that implicitly, we have assumed that the actor *multiplies* the probability **p** with the effect of the event that **p** relates to (= getting the urban wage). This is normal modelling practice. On the other hand, we know that in reality, people often do not simply multiply. We happily bring $ 10 to a lottery every month, for instance, also if we know that the multiplication of the chance to win and the prize to win is only $ 4. In 'negative lotteries', we are 'irrational' the other way around. In our model, therefore, we assume that the 'irrationality' is confined to extreme mixtures of probabilities and prizes, and that the migration situation falls in the range of normal cases in which multiplication rules the decision making.

1141	186	16
1144	228	20
1259	403	32
2620	230	9

We may conclude here that neither the fixed amount nor the fixed percentage assumption seems very convincing; on the other hand, the overall picture is that both the list of remittances and the list of percentages are sufficiently stable to allow for an aggregate-level modeling choice. For reasons only of modeling ease, we chose for the percentage option, setting it at 20%. Hence:

- wage — remittance = wage — 0.20 * wage = 0.8 * wage.

With this, the expected urban utility equation simplifies into:

- **expected urban utility = 1*(1 — p)*(rural income) + 0.8*1*p*wage.**[75]

It may be noted that the dimension of both terms of the equation is [years]*[$/year], hence simply [$].

The core of the equation is now set, but it is not fully complete yet. Two elements are still missing. One is the 'settling investment', the other is the 'city lights factor'.

The 'settling investment' is the cost that has to be incurred by the migrant in order to prepare himself, travel, establish himself socially in physically, and find employment. Contrary to the incomes, remittances etc. this investment is a one-time expenditure, in dimension terms, a factor in [$] in stead of [$/year]. As said already in the previous section, one-time and flow expenditures can be brought together by assuming a discount rate and calculating the 'net present value', but the model assumes that the prospective migrant works with a short decison horizon, equal also to the period that loans have to be paid back. Then, the investment in [$] can be compared with the two terms of the equation we have already, and simply be added to them.

The question then remains how high this investment would be. Assuming a general lack on data on this factor, we should at least have a picture of the investment components. The minimum investment is a bus fare and the cost of buying a bed. But of course there is more: the cost of making new friends, of buying city clothing, of applying for jobs and so on. Roughly, we may say:

- settling investment = travel + social investment + physical investment.

Qualitatively, this is nice to know. It explains why, for instance:
- people migrate to places where their family/ethni is already (social investment = 0)
- when one family is settled successfully, other families may follow in a wave (ibidem)
- people take up jobs as family help or labourer (physical investment = 0).

But how to quantify it? We could take a number of investment days and multiply by a wage per day, e.g.:

[75] If the remittance would have been set at a fixed amount, assuming it to be, on the average, the avarage contribution to the rural family income (= rural income), the equation would have been: expected urban utility = 1 * (1-2p) * (rural income) + 1 * p * wage.

▫ settling investment = 100 * daily wage,
or separate the different components. We leave it at this, for the moment.

The 'city lights factor' should capture all the non-monetary advantages of city life over rural life. In the city, there are unknown opportunities; there are rich people who discard all kinds of interesting things; there are women and lights; the future is in the city; just to *be there* is a good in itself. But how to quantify this?

We may escape from this problem (and arrive at a simple model) by assuming that the settling investment and the city lights factor, which act as a migration threshold and a migration premium, respectively, *cancel out each other*. Full-fledged modeling may try to keep them in the equations, each dependent on their own factors, but such an attempt seems too far-fetched for our purposes here. Hence, for our model we keep to the previous 'expected urban utility' equation, with only the rural income, urban wage, remittances and uncertainty components.

Finally, the quantification of the employment probability factor **p** requires some attention. In some cases, statistical data may be good enough to in fact contain **p**, or enable an empirical estimation of this 'proportion of migrants who have found a job after three years'. In most cases, however, we will have to model **p**, using more basic statistics. How would this model element look like? One thing seems certain: if the city economy is booming, the probability of finding a job is high. But if urban economic growth is only 2% per year or so, all jobs may be taken by the people who are urban already and know the way. On the other hand, a migrant may always be lucky irrespective of what, or avail of a powerful uncle who always finds a place for the new arrival; we may set that probability at 0.1. Hence, to begin with:
▫ p = 0.1 + b * (urban economic growth — 2)
with the growth figures in [%/year]. Furthermore, we may estimate the factor b. We could say: in an urban boom situation, with a growth rate of 10% per year, the employment probability is 0.5. It follows that:
■ **p = 0.1 + 0.05 * (urban economic growth — 2).**

Summarizig this section, the equations now are:

■ **expected urban utility = 1 * (1 — p) * (rural income) + 0.8 * 1 * p * wage** [$]
in which:
- 1 = **h** = decision horizon [years]
- p = fraction of migr. with employment after 3 years = exp. probab. of employment [1]
- rural income = support allowance from rural home = farm prod./fam. size [$/year]
- 0.8 = fraction of wage not remitted to rural home area
- wage = expected migrant's wage [$/year]
all pertaining to the poor majority. Hence, for instance, the expected migrant's wage should be taken as the wage of low-level urban job.
The factor **p** can be modelled as:
■ **p = 0.1 + 0.05 * (urban economic growth — 2)**
in which:
- urban economic growth = growth rate of migration-relevant sectors [%/year]
- 2 = growth rate at which no urban jobs (except the 0.1 prob.) are available to migrants.

III.4 The expected forest utility

The expected utility of settling at the forest fringe partly contains elements analoguous to those of urban migration. Other elements are different, however, as well as the overall structure. The elements that play a role in the decision-making of the actor are assumed to be:
- the expected production of the forest fringe farm
- the expected income from forest products
- the investment necessary to set up a farm
- the low quality of life at the forest fringe
- the risk of being expelled because of squatting
- the (lack of) tenure of the farm land.

Building up the equation of the forest utility, we use the assumptions explained in Section III.2, such as the three year time horizon.

With respect to the expected production of the forest farm, the prospective migrant will imagine the farm as it will be in the first three years. Usually, this will be the slash-and-burn stage, even if farms may go through a transition later, e.g. towards cattle as in Ecuador or towards irrigated rice as (sometimes) in the Philippines. Furthermore, the prospective migrant is assumed to imagine what he may earn from selling forest products, such as, in the Philippines, joining a crew cutting logs to be transported out of the forest by carabao; he can do so only for a limited number of days, however, because the farmer will give priority to building up the farm. We assume these figures to be known for the model, either by direct research or by 'guestimates' from figures on the average productivity and market prices. As explained in section II.2, the farm production will be divided by a family size of 2. We take it over the three years. Hence, the first-step formulation of the expected utility equation is:

□ **exp. forest util. = 3 * (farm prod. + forest prod.) / 2.**

An alternative proxy may be the the average income per capita in the forest area (if we manage to distinguish between the farmers part and the part earned in logging, oil or other forest activities).

The investment necessary to set up a forest farm may be substantial, even if the migrant minimizes it by slash-and-burn (= no fertilizer, no hired labour). We take it that the money borrowed for the investment has to be paid back during the three years; hence it can be subtracted from the first element mentioned above. The magnitude of the investment may be approximated in terms of the time the migrant needs to continue to live from support from home, multiplied by the amount per month or per year he needs to sustain himself during that period. The period wil be related to the time needed to prepare and plant the fields and the time it takes for the first crop to grow. Then, adding a bit to proxy also the need to buy seeds, inplements and house construction materials, we may put this period at 9 months (0.75 year). Then we need the subsistence level; the rural income seems to be the appropriate proxy here, in view of the general poverty in most rural areas, and because the family at home will the be most important decision-maker here. Subtracting, we arrive at the second-step formulation of the expected utility

equation:
- **exp. forest util. = 3 * (farm prod. + forest prod.) / 2 — 0.75 * (rural income).**

Life at the forest fringe, far away from any shop, bar or hospital, is hard, dull and risky, even when compared with the rural areas. In terms of equation structure, this works as a kind of continuous drain on the subjective (= real) value of the income. The magnitude is hard to estimate. On the very soft basis of our informal knowledge of the Philippine situation, we set the 'drain' as 20% of the income. Thus, the third-step formulation of the expected utility equation becomes:
- **exp. forest util. = 0.8 * 3 * (farm prod. + forest prod.) / 2 — 0.75 * (rural income).**

We now arrive at the two most difficult factors to model:
- **E**, defined as the likeliness of being Evicted from the area (or very heavily fined) during the three years
- and **T**, defined as the expected Tenure security on the land.

Both factors can be set as varying between 0 and 1. With respect to the tenure, T = 1 then expresses a full and official title, T = 0 expresses a fully non-legal situation and T = ½ expresses some situation in-between, such as the 'Certificate of Stewardship Contract' in the Philippines or the provisional title in Ecuador.

It may be noted that **E** and **T** are related to each other, but only in a loose way:
- in migration without any government stimulus or control, the migrant will not get a title (**T** = 0), but he will not be evicted either (**E** = 0)
- in fully government-lead migration, the migrant will get a full title (**T** = 1), combined with no risk of being evicted (**E** = 0)
- in case of settling in a protected area, the likeliness of getting a title is very low (**T** = 0) and, depending on the perceived motivation of the government to really protect the area, there may be a significant eviction risk (say, **E** = 0.5)
- in the Philippines, the overall situation is that very few people are actually evicted (say, **E** = 0.05), and many get a 'half title' (say, **T** = 0.4).

These examples show that **E** and **T** have a special relevance in that, contrary to all other factors in the migration equations up till now, they are relatively easy to control by government.

The two factors are important for the land use choices of forest fringe people. In the case study of Conelly (1992), for instance, it is described how people changed from slash-and burn in a general situation of government absence (**E** = 0 , **T** = 0), into sustainable agriculture and forest use when the forest became really protected (**E** = 1 , **T** = 0) and the cropland was titled (**E** = 0 , **T** = 1). Other studies such as De Frel (19..) show how intensely farmers struggle to receive a full title (**T** = 1); this struggle is not over after they have received a long-term lease (**T** = ½), in spite of the fact that in both cases, the risk of actually being evicted is zero (**E** = 0). These examples also show that the two factors have a life on their own, so that it is appropriate to keep them separate in the model.

A farmer who is settled already can play on two boards. One concerns the land use,

where he optimizes the yearly cropping and burning pattern. On the other, he struggles for a title. For the prospective migrant, however, the cropping matters (= expected farm income) and the tenure and risk factors have to go into into *one* decision to migrate or not. In other words, we cannot escape from taking up both **E** and **T** in the expected utility equation. The question remaining is how to do so.

With respect to the eviction risk, we take it that the prospective migrant sees this as a risk to lose the farm income (0.8 * 3 * (farm prod. etc.), but not the debt (0.75 * (rural income)). Thus, an eviction risk factor of (1 — **E**) can be attached to the income component, the migrant expecting to lose everything if **E** = 1.

Having separated the tenure from the risk of actual eviction (hence income), we can regard the economic value of tenure in its 'pure' form, that is, its role as *potential monetary capital*. Titled land can be sold at a much higher price price than untitled land, or be used as collateral to incur loans. This is a very important function for poor farmers, who have no other means to insure against disasters.

In normal economic situations, the income derived from a capital good and the capital value of that good relate to each other in an either/or fashion; the income stream stops if the good is sold. This is also the case with respect to the land of a farmer *who is already settled*. This is different for the prospective migrant, however. He is not considering to either sell or to stay, but he considers the possibility to receive a title (that is, the possibility to receive the possibility to sell) as a value *additional to* the expected income.[76] Contrary to the factor **E** therefore, the factor **T** has been taken up in the expected utility equation as working additionally to the expected income:[77]
□ exp. forest util. = (1 — E) * (income parts) — investment + **T** * (....).[78,79]

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[76] This is analogous to a situation that I consider to rent one of two houses that are exactly the same in rent and quality, but differ in that of one house, the landlord likes me so much that, if I rent the house, he may give the house to me. Which house shall I rent? The one with the possible title, of course. In other words, for me in my migrant decision, the possibility that the house may be my own works additional to the rent and the quality.

[77] This will enable us to understand and model also why people may migrate for purely speculative reasons (go there, burn the forest, get a title and sell), even when the income is in fact zero or negative. This 'capital function' of the forest may be further modeled to include also the subsidy-capturing function as described by Repetto and may other authors with respect to Latin America.

[78] Note that in this formulation, the land is supposed to have no capital value if there is no title of any kind (T = 0). In practice, such land can often be sold too, however, be it at low prices, depending on the risk of actual eviction (E). This is neglected in the model, but it is counterbalanced by that a land buying cost is not included in the investment component either.

[79] Having tenure security enables the farmer to plant crops that are less risk-aversive crops and more profitable. In other words, tenure security tends to raise the farm income. This connection is neglected in the model.

What will be the magnitude of the factor between the brackets? In other words, how would the capital value of titled land compare to the income value of that land, in the decision making of the prespective migrant? One element of this will be the selling price of titled land, and this in turn is related to the land productivity.[80] Such land may be sold, for instance, at 5 or 10 times the net value of its yearly production (analoguous to that rented real estate may be sold at, say, 10 times the yearly net rent income from the proprietor). Thus, the capital value of the land is something like:

▫ capital value = T * (5 to 10) * farm production.[81]

It would be wrong to simply add this to the income elements in the equation, however. One way or another, the prospective migrant weights the income elements against the tenure element:

▫ tenure value compared to income value = w * T * (5 to 10) * (farm production).

On purely intuitive grounds, we assume that the weight factor w is such that the capital value of titled land in the prospective migrant's decision equals *one* farm income for a full year. Hence:

▫ **tenure value compared to income value = 1 * T * (farm production).**

The final equation of the expected utility of migration to the forest can now be written as follows:

▫ **expected forest utility = 0.8 * 3 * (1 — E) * (farm prod. + forest prod.) / 2**
— 0.75 * (rural income) + 1 * T * (farm prod.)

in which:

- 0.8 = quality of life factor [1]
- 3 = time horizon [years]
- E = probability of being evicted or very heavily fined during the three years [1]
- farm prod. = net production of the forest farm, in pioneer stage [$/year]
- forest prod. = additional income through forest products [$/year]
- 2 = family size (first three years) [1]
- 0.75 = period without income (accounting also for capital investments) [years]
- rural income = support (to be paid back) from family [$/year]
- 1 = income equivalent of the capital value of the forest farm
- T = tenure factor (if title, T = 1).

III.5 The expected rural utility

The expected rural utility is considered by prospective migrants who may go *to* a rural area. The forest-to-rural and urban-to-rural migration flows usually being small compared to the flows leaving the rural areas, and our model being primarily forest-oriented, there

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[80] In formal economics, assuming perfect markets and long time horizons which are treated by actors through a discounting procedure, the selling price of a property equals the sum of the discounted values of the net income stream generated by the property. Our formula is simplified version of this principle.

[81] If land prices of titled and untitled forest land are known, they may be substituted for this expression.

is not much need to be very subtle here. It may even be considered to leave out all risk, investment, family size etc. considerations, and simply state that:

- **expected rural utility = rural income.**

With section III.2, this implies that the expected rural utility of the prospective rural migrant is modelled to be the same as the income at home and consequently, the rural-to-rural migrations flow is modelled as zero. This is obviously not the case in reality, where migrants move from depressed rural areas to better rural areas. It is acceptable for our model, however; the model may always be expanded to include rural-to-rural migration too, using the same structure as the expected forest utility.

III.6 Forest farm migration

An important variable in the geographic specification of the forest migration is the area taken up by the farms of the forest migrants. Essentially, this variable is easy to calculate, of course:

- **new settled area = no. of migrants * farm size per family / family size**

in which the family size of forest migration may be taken as 2, and the farm size varies between, for instance, 50 hectares in Ecuador and 4 hectares in the Philippines.

We should be aware of one snag here, however. Up till now, forest migration has been assumed, implicitly, to be migration of people intending to start a forest *farm*. A substantial number of people may migrate to the forest for *wage* reasons, however, e.g., because they have secured a job with a logging corporation, an oil firm or a roads construction company. The impact of these corporate actors on the forest cannot be ascribed to these people, because the corporations are the actors, and their impacts have to be accounted for separate from the number of labourers they may employ. Therefore, the flow of wage migration into the forest has to be subtracted from the migration data if the model is tested (or the number of wage migrants has to be added to the modeled farm migration flow to be tested against the total migration data).[82]

What will happen, however, when logging or other companies lay off their labourers? These people wil find themselves inside the forest without income, and may well decide to settle and start a farm, thus adding to number of rural-to-forest farm migrants. This movement may be modeled using the same principles used up till now.

Because the income of the stay-where-you-are option is zero, the migration tendency according to the equations is infinite. In other words, all laid-off laborers will 'migrate', either back to the rural home, or to the city, or to start a forest farm. The 'population' factor in the equations will therefore not be a small percentage of a large population, but 100% of a specific group. The size of this group may be estimated as composed of two parts, (1) the personnel turnover, being a constant outflow of laid-off labourers from a more or less constant number of logging, oil and construction personnel, and (2) larger

[82] There is no need to *model* the wage migration into the forest, because the logging, oil and roads companies may be assumed to simply satisfy their labour needs.

but incidental numbers laid off when a company stops its operations. The latter may be the case, for instance, when a Timber Licence Agreement is cancelled. The personnel turnover rate may be set at, for instance, 10 % per year. Then we get:

- **populationF→F = 0.1 * forest wage personnel + incidental mass lay-offs,**

in which F→F is an index denoting the 'migration' from forest employment to forest farming.

Which fraction of this population will actually settle in the forest? With the model apparatus built upo until now we may say that this fraction will be given by the relative benefit of starting a forest farm, which reduces into utilities and income because the benefit of staying is zero. Hence:

- ***migrationF→F = populationF→F * (expected forest utility) / (expected forest utility + expected urban utility + rural income).***

This implies that if the cities, the rural areas and the forest farm are equally attractive, one-third of the labourers wil stay in the forest and start a farm. If the forestfarm utility is zero, all will move out of the forest, and taken up as insignificant fractions of the large rural and urban flows.

The migration that is of direct influence to the forest is, of course, the total of the two flows:

- **forest farm migration = migrationR→F + migrationF→F**

in which

- migrationR→F = the rural-to-forest migration of pioneers intending to set up a forest farm, ruled by the equation of a * (rural population) * migration tendencyR→F
- migrationF→F = the number of laid-off labourers starting a forest farm, following the equation above.

Both components are ruled by the expected forest utility, discussed in the previous section.

III.7 The population factor

In basic terms, the 'population' factor in the overall model (a * population * .....) is simple to conceptualize. It stands for the number of prospective migrants in the rural source areas, differentiated per migration flow:

- population R→U and R→F = no. of prospective migrants in the rural areas
- population U→R and U→F = no. of prospective migrants in the urban areas
- population F→R and F→R = no. of prospective migrants in the forest areas.

As said in Section III.2, we should relate the numbers of prospective migrants to the population numbers of the poor (urban, rural and forest) majorities. Contrary to the incomes part of the migration equation, however, it will not make much difference if we proxy this by the *total* populations.

Insofar these numbers of prospective migrants would be a *fixed* percentage of the respective total rural, urban and forest populations, this percentage would be accounted

for, implicitly, in the calibration of the factor **a** of the overall model, and we could simply take the total rural, urban and forest populations as proxies. Taking a closer look, it appears that this percentage need not to be constant, however. Some parts of the population have a higher migration propensity than others, even if all factors of the model would be equal for everybody, and these parts may not be constant over time. To take an example, the proportion of men between 20 and 30 years may increase over time, and with that the urban migration propensity of the population as a whole. Therefore, we should focus on the potential migrants category, as closely as the data allow.

Rural-to-urban and rural-to-rural migration differ in the sense that women are active migrators to cities and not to the forest fringe. On the other hand, women usually follow men to the forest fringe one he is established there. We neglect the remaining male/female difference for the time being.

Secondary school leavers tend to migrate to cities, not to the forest fringe. This should be taken into account if secondary school leavers make up a sizeable proportion' e.g., taking all young people in rural-to-urban, and only the non-educated young people in rural-to-rural migration. We neglect this too.

Younger sons and daughters will have a higher migration propensity than oldest sons and daughters. Their proportion can be calculated from the family size at the approximate time they were born, subtracting 4 members from that family size:

- younger children proportion = (family size — 4) / family size.

At the aggregate level, a region will of course generate migrants even if the average family size would be exactly 4. At the aggregate level, we may say that:

- **younger children effect = 0.5 + (family size — 4) / family size.**

This (dimensionless) factor varies between 0.17 if family size is 3, to 1.1 if family size is 10.

A more detailed proxy for the 'population' factor therefore is costructed by taking the migration-prone age bracket, multiplied by the younger children effect:[83]

- **'population' = (20-30 years age bracket) * {0.5 + (fam. size - 4) / fam. size}.**

This formulation will account better for regional and temporal variations, hence result in a more stable factor **a**.

As said, we should ideally take the age brackets and family sizes of the poor majorities, but it will not make much diffrence if proxied by those of the total population. For the respective source areas, the respective data have to be taken.

III.8 Some explorative excercises

The various components of the model are now fully known. In this section, some matters in the behaviour of the model will be explored, with a special view on forest policies. The component of laid-off labourers starting a forest farm (section III.6) will be left out, however. The population factors then are relatively un-interesting for the excercise

[83] For more precision with respect to the family situation of the prospective migrants, the family size of approximately 25 years ago can be taken.

purpose; the model says, basically, that if populations increase and nothing else changes, migration flows will increase proportionally. The exploration will focus, therefore, on what is called the 'migration tendencies' in section III.2, which mediate the population factor and have the general structure of:

- migr. tend. = (exp. utility of moving — income home area)/(income home area).

In view of the forest relevance and the general size of the migration flows, the first focus is on migration from the rural source areas, hence:

- urban migration tendency = (exp. urban utility — rural income)/(rural income)
- forest migration tendency = (exp. forest utility — rural income)/(rural income)

These two equations yield, with the sections III.4 and III.5 and collapsing the numerical values for reasons of brevity:

- **urban migration tendency = p * (0.8 * wage/ruralinc — 1)**

- **forest migration tendency = 0.4 * (1 — E) * (farmpr + forpr) / ruralinc**
  + T * farmpr/(3 * ruralinc)
  — 1.25

in which the new terms such as 'ruralinc' denote the same as the longer versions such as 'rural income', and in which it should be remembered that the farm and forest productions are *family-level* figures, contrary to the wage and rural income figures, that are at the individual level. With respect to the time horizon factor **h**, it may be noted that it has been divided away in the urban migration; this happened because we have negleted the investment and 'city lights' factors. In the forest equation, **h** is still significant, hidden in the various factors of 0.4 etc.

Sensitivities to various factors may now be investigated. The structure of the urban migration equation being basically simple, the sensitivities are too.

Behavior of the urban migration tendency

- We may take a situation of *booming cities*, for instance:
- p = 0.7 (almost everybody finds employment)
- wage = 4000
- ruralinc = 500.

Then, urban migration tendency = **3.78**.

- Alternatively, we may take a *more depressed situation in the cities and somewhat more development in the rural areas*:
- p = 0.3
- wage = 3000
- ruralinc = 700.

Then, urban migration tendency = **0.73**. The combined effect of these not un-imaginable changes is quite outspoken.

Urban migration comes to a standstill (tendency = 0) if 0.8 * wage/ruralinc is less than 1, hence if the urban wages are less than 125% of the rural income. This is hard to imagine in a developing country. Since the factor p will never really be zero (some people will always find a job), urban migration will never really stop. If we set the factor p close to the modelling minimum of 0.1 and take a low level of urban wages over rural income,

- the *intuitive minimum of the urban migration tendency* is:

- p = 0.15
- wage = 2000
- ruralinc = 700

hence, urban migration tendency = **0.19**.[84]

An important aspect of rural-to-urban migration is its determinants (both those visible in the equation and those hidden in the numerical values) are largely un-amendable by specific, migration-oriented government measures. Rural income, urban wages and urban employment are related to the more *fundamental, general policies of development*. 'Style of development' and 'urban bias' are well-known concepts in this respect. The most adequate means to decrease urban migration, it seems, would be to influence the 'push' factor, rural income. Land reform and the stimulation of rural industries are important options here, as well as the adjustment of food prices, which are generally biased in favour of the city dwellers. Such measures will also lay a better basis for agriculture to become more sustainable.

Behavior of the forest migration tendency

1. The influence of the factors E and T

In order to get an impression of the sensitivity of forest migration to the eviction (E) and tenure (T) factors, we may set the rural income at 700 and the forest income (family level) at 3500 (farm production 3000, forest production 500). This implies that we assume that a forest farm produces approximately the same as a rural farm (with family size of 5, 5 * 700 is also 3500). The migration tendency now becomes:

- forest migration tendency = 2*(1-E) + 1.4*T - 1.25.

The different cases now are:

- sponsored migration (no evictions, full titles, hence E = 0, T = 1): migr.tend. = 2.15
- Philippines-type migration (E = 0.05, T = 0.4): migration tendency = 1.21
- unregulated migration (no evictions, no titles, E = 0 and T = 0): migr.tend = 0.75
- implemented forest protection (E = 0.5, T = 0): migration tendency = - 0.25.

The negative figure in the latter case implies that the migration to the forest is zero.

The influence of the eviction and tenure factors is outspoken. This is in line with the case study of Conelly mentioned already in section III.4. Especially the factor E is important

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[84] Here it may be reiterated that the model calculates gross migration flows; the *net* urban migration, with urban-to-rural subtracted, may be zero or negative in the last case.

in this respect, because contrary to T, it is the only measure that subtracts from the migration flow if people are settling spontaneously even without titles, as in the third of the four cases above ('unregulated migration'). At the same time, it is the most difficult of the two factors, politically. Giving titles to poor people is nice, but evicting them is not, even when first taking the lighter measures of fining and jailing. In cases of relatively weak states (such as the Philippines), such measures will only be implementable if local communities are at least partially convinced of their justification (e.g., if it solves their own tragedy of the commons, and if it protects the community against new waves of migrants). Also, it is logical to compensate the comunity by giving full titles to people *who are settled already* at places where they do relatively little harm to the forest. This will also induce more sustainable land use at these sites. The other side of this medal is, of course, that the moment it is rumoured that also *newcomers* have a fair chance to eke some kind of title out of the authorities (say, T = 0.4), in-migration may start again, and more evictions, fines etc. are necessary to counterbalance this.

2. Forest protection: E versus rural income

In model terms, the 'population pressure' on the forest is (rural population) x (forest migration tendency). Of these two factors, the maximum dynamic of the population factor factor is that it may double in, say, 30 years. The maximum dynamic of the migration tendency, however, is one or two orders of magnitude higher, especially because of its sensitivity to the factors E and T. Within the migration tendency, the rural income is the push factor, the forest income the pull factor, while E and T are the mediating factors, expressing the implementation of forest protection policies. The forest migration equation allows for an evaluation of the 'strength' that the factor E should have in order to counterbalance the rural income push. Setting the forest income again at 3500 and setting the factor T = 0, the equation can be reworked to say that:

- *forest migration tendency = 0 if E ≥ 1 - 3.1 * ruralinc / 3500*

expressing the necessary counterpressure of evictions, fines etc. to stop forest migration.

A few cases are:

- if rural income = 2000, then migration = 0 irrespective of E
- if rural income = 1000, then migration = 0 at E ≥ 0.11
- if rural income = 700, then migration = 0 at E ≥ 0.38
- if rural income = 300, then migration = 0 at E ≥ 0.73
- if rural income = 100, then migration = 0 at E ≥ 0.91.

A level such as E = 0.91 means that almost every newcomer will have to be harassed, fined, evicted and so on. The level of very deep rural poverty this coincides with (rural income = 100, compared to the forest income level of 3500) will also mean that the migration tendency will be very high and with that the numbers of people entering the forest in search of livelihood. The overall picture then is that normal levels of forest protection intensities will fail, and the forest will be overrun.

This allows for a number of general conclusions:

- *If rural and forest farm productions lie within the same range* [e.g., rural income per capita = 700 and forest production = 3500], **there will be a significant migration to the forest if the forest is not effectively protected** [migration

tendency = 0.75 if E = 0 and T = 0],

- *but effective protection is then still possible by strictly implemented policies of fining, eviction etc.* [migration tendency = 0 if E ≥ 0.38].
- *If rural poverty turns into rural despair, however* [rural income = 100], *also protected forests will be overrun* [migration tendency = 12.75 if E = 0 and T = 0; E needed to counterbalance = 0.91].

3. The geographic aspect of forest migration

Contrary to urban migration, forest migration is very sensitive to geographic factors, such as the distance from the forest farm to the road. In the model, this mechanism works through the factor 'forest farm plus forestry production'. This (economic) production depends on three major factors: (1) the physical production, (2) the prices at the markets and (3) the transport cost, priced or shadow-priced, from farm to market. Usually, the transport factor is so important in the total production that people do not settle at distances more than 2 to 10 kilometers from roads. This distance of course depends on market prices, topography, type of crop and so on, but also on factors explicit in the model. In order to show this, we may calculate a *settlements band width*, defined as twice the maximum distance from the road where people settle. Below, we assume again a basic farm production of 3500, but confined now to the a narrow stretch just along the road (distance = 0), while the farm production is assumed to be 0 at a distance of 5 km from the road.

In the case of unregulated migration (E = 0, T = 0) the migration tendency equation can be reworked into:

- migration tendency = 0 if forest production = 3.1 * rural income.

From that we can calculate the settlements band width:

- rural income = 1500: settlements band width = 0 km (no migration)
- rural income = 1000: settlements band width = 1 km
- rural income = 700: settlements band width = 4 km
- rural income = 100: settlements band width = 9 km.

Following the same procedure, the effect of forest migration and protection policies may be seen by setting the rural income at 700 and varying the factors E and T:

- sponsored migration (E = 0, T = 1): band width = 7 km
- unregulated migration (E = 0, T = 0): band width = 4 km
- slightly counterbalanced migration (E = 0.2, T = 0): band width = 2 km
- strictly counterbalanced migration (E = 0.4, T = 0): band width = 0 km (no migr.).

We re-discover here, only in geographic terms, what was found before already with respect to the migration determinants. The geographic sensitivity of forest migration has important technical consequences for migration modelling, however. It implies that it will not suffice to know an unspecified, general forest farm production figure; the figure may be right at one place, but the production may be zero a few kilometres away, even if soils, market prices etc. are equal. This implies that a good forest migration model will be geographically referenced, e.g., in a GIS system that specifies a forest production for each grid cell, depending on distance to road as a most important factor. If GIS grid cells

cannot be made small enough, it can be specified for each cell how many hectares it has of one production level category, how many of the next, and so on. This could even be considered on a regional or a national scale; the model is then 'un-GISed' but may require fairly extensive calculations to make the production/hectares table, based on the soils and roads maps. In both cases, the model then will not work with the production of an general forest farm, but calculate for each year what will be the production in the areas *that are still available*, or that have become available by new roads or other projects.

III.9 Accounting for statistical distributions

This section will focus on a special difficulty connected to the use of statistical (aggregate) data to model basically individual decisions. One example of this problem may be found in the modeling of the choices of the laid-off forest labourers, *viz.* section III.5. The model says that if the expected utilities of forest farm, rural migration and urban migration compare as, say, 2 : 1 : 1, the fraction of laid-off labourers that will start a forest farm will be 2 / (2 + 1 + 1) = 0.5. But why would in fact the other half of the laid-off labourers move out of the forest? If the utility of staying in the forest is indeed twice as high as of the other options for all laid-off labourers, *all* will choose for the best option and stay in the forest! The counter-argument is, of course, that the utilities are in fact averages with a certain distribution within the population, so that many will prefer the forest, but others still may go to the rural or urban areas. The model then is an intuitive and implicit compromise between these two truisms. The aim of this section is to explore how these two can be made more explicit in the model.

The relevance of this is not only an improved level of precision, but also a more fundamental improvement of the model. This can be seen in the following two examples.

- Up till now, the urban and forest migration are modeled as unrelated to each other. Urban migration is ruled by expected urban utility, and forest migration by expected forest utility. In case a forest utility would remain constant and an urban utility would rise, would the same number of people go to the forest? Of course not; at the level of individual decision-making, the two utilities are compared and an increased attractiveness of the city will divert people away from the forest.
- If the expected rural utility would be, say, 2000 and the expected forest utility would be, say, 1800, the model predicts that rural-to-forest migration is zero. In reality, the expected rural utility may vary between 1700 and 2300, and the expected forest utility may vary between 1500 and 2100, so that for a substantial minority of the population, the forest utility is higher than the rural utility, and rural-to-forest migration will *not* be zero.

It could be considered to throw all these difficulties on the factor a. We would then end up with a model with a basic structure of:

- migration = population * {a + b * (migration tendency)},

in order to account for the fact that migration is not zero even when the modeled migration tendency is. The most consistent way to deal with the statistical distribution of utilities and incomes, however, is to take up these distributions in the model itself. This can be achieved by splitting the population in categories that combine certain levels of

these utilities and incomes, e.g.,
- category 1: low rural income, low expected urban utility, low expected forest utility
- category 2: medium rural income, low expected urban utility, low expected forest utility
- category 3: high rural income, low expected urban utility, low expected forest utility

and so on. For each category, first the choice can be modeled simply by taking the highest income/utility. This then takes care of the fact that the decisions lie at the individual level, and of the fact that the relevant utilities are relative to each other (= the interaction between urban and forest utilities). Then the migration to the place of choice can be modeled through the equations of the previous sections, for each category separately. The total migration flows follow by addition.

The distribution of incomes/utilities may sometimes be known from the statistical data. In other cases, we will have to assume the distribution, e.g., in three or in five strata:

- Distributed factor A =
  - for 25% of the population: factor = 0.7 * A
  - for 50% of the population: factor = 1 * A
  - for 25% of the population: factor = 1.3 * A
- Or, distributed factor A =
  - for 10% of the population: factor = 0.5 * A
  - for 20% of the population: factor = 0.8 * A
  - for 40% of the population: factor = 1 * A
  - for 20% of the population: factor = 1.2 * A
  - for 10% of the population: factor = 1.5 * A.

In the case of three strata for rural income, expected forest utility and expected urban utility, there will be 27 population categories of which to calculate the migration; this number is 125 if five strata per factor are chosen. Computation times will obviously be increased if this method is followed, but this will probably be not prohibit to apply this more realistic model version, that takes better account of the fact that decisions are made at the individual level of actors and families. For explorative work, the aggregate model formulation, with all factors set at their average, may still be chosen.