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THE SOCIAL DYNAMICS OF DEFORESTATION IN DEVELOPING COUNTRIES: PRINCIPAL ISSUES AND RESEARCH PRIORITIES

by

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Preface

Work on environment, sustainable development and social change constitutes an important part of UNRISD's medium-term research programme approved by the Institute's Board at its meeting in July 1989. The basic objective of research in this area is to analyse the implications of environmental deterioration for the livelihood and living conditions of the poverty groups in urban and rural areas, evaluate their individual, family and group reactions and strategies to combat the adverse effects of environmental changes, and assess their interaction with other key actors such as the agencies of the state, the modern commercial interests - national and foreign, the non-governmental agencies and grass-roots movements. Another important goal of this research is to suggest feasible policy options which, while preserving and enhancing the environment, would also safeguard the livelihood and interests of the poorer and weaker social groups. It is planned to disseminate the results of research findings through publications, a series of workshops and discussions with policy makers and grass-roots organizations. The work is being phased in a manner that would make it possible to provide inputs to the preparatory process for the 1992 United Nations Conference on Environment and Development.

The work on environment is organized in three projects dealing respectively with people's participation in resource management; women, population and environment; and the social dynamics of deforestation. The last project is being supported by a grant from the Swedish Agency for Research Cooperation with Developing Countries (SAREC). The project comprises a set of country and regional studies, research on some thematic issues which cut across individual countries and regions and a number of workshops at national and international levels.

The present paper was initially prepared as a background document for launching the work on the social dynamics of deforestation. It is being issued now as a Discussion Paper in order to inform interested agencies and individuals about the scope, objectives and contents of the project as also to stimulate dialogue and collaboration with those working in this area. The paper undertakes a broad survey of the extent and rates of deforestation, the underlying processes and mechanisms, the social consequences and the policy implications. This is done with a view to elaborating the Institute's research perspective in this area and to designing a research programme focused on the themes identified above.

The paper questions some of the currently widely used definitions of deforestation. It examines some of the deeper processes behind deforestation which go beyond the conventional explanations of poverty, population growth and modernization. It highlights the critical importance of development policies, land tenure systems and large-scale domestic and foreign commercial interests in

agriculture and livestock in spreading deforestation. The authors argue that effective environment policies are unlikely to be adopted in the absence of organized pressure from those adversely affected by deforestation processes and a corresponding deterioration in the access to natural resources.

The authors of this paper are responsible at UNRISD for the implementation of this project. Solon Barraclough, a previous Director of UNRISD, worked for many years in Latin America and is currently acting as the senior consultant for the project. Krishna Ghimire, who did his doctoral work on deforestation and land tenure in Nepal and has worked in the field of agro-forestry and woodfuel planning in the past, is co-ordinating the project.

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Introduction

International concern about deforestation in developing countries has been increasing during recent years. In the rich industrialized North, this is in part explained by mounting indications that tropical deforestation is accelerating and new evidence about its contribution to global warming. This growing environmental awareness is also partly due to the political influence of 'green movements'. In the South, popular movements by some indigenous groups negatively affected by deforestation processes have played a role. So, too, have the perceptions of many among the intellectual, socio-economic and political élite that rapid deforestation may be prejudicing their countries' possibilities for sustainable development in the future while its short-term benefits accrue mostly to corporate and consumer interests in the North and to a few small minorities in the South.

This growing international concern about deforestation has been articulated through the United Nations system in many ways. The 1972 Stockholm United Nations Conference on Environment and the subsequent creation of the United Nations Environment Programme (UNEP) is one example. In 1977, the United Nations Conference on Desertification held in Nairobi called upon governments and international agencies to bring desertification processes under control by the end of the century. The World Conservation Strategy, emphasizing the interdependence of conservation and sustainable development, was launched in the early 1980s by the International Union for Conservation of Nature and Natural Resources (IUCN) together with the World Wildlife Fund (WWF), UNEP, the United Nations Educational Scientific and Cultural Organization (UNESCO) and the Food and Agriculture Organization of the United Nations (FAO). This was followed by the preparation of global Tropical Forestry Action Plans (TFAPs) in the mid-1980s by FAO and by the World Resources Institute (WRI) with the support of the World Bank and the United Nations Development Programme (UNDP). There have subsequently been numerous internationally inspired and supported national TFAPs as well. The 1987 report of the World Commission on Environment and Development and the follow-up 1988 resolution of the United Nations General Assembly on "Environmental Perspective to the Year 2000 and Beyond" both highlighted deforestation issues. By the late 1980s, there was an almost obligatory mention of environmental issues in nearly all United Nations documents and projects. Most recently, the United Nations system is taking the lead in organizing the Conference on Environment and Development to be held in Brazil in June 1992.

There has been a proliferation of publicly and privately supported organizations engaged in advocacy and research relating to deforestation issues, many of them highly qualified and well funded. Several environmental groups and non-governmental organizations

(NGOs) active in the field are critical of United Nations-supported Tropical Forestry Action Plans and of international environmental efforts more generally. Deforestation is high on the agenda for international and national discussions during the 1990s.

Publications about the extent of deforestation, its causes, its environmental and socio-economic impacts and its possible remedies, have multiplied rapidly. A preliminary review of this literature shows considerable controversy about the rates, causes and social consequences of deforestation. There has been little systematic and comparative analysis of the interactions of deforestation processes at local levels with the associated changes in livelihoods of different social groups, the individual, collective and corporate responses of those involved or affected, and with public policies.

While the effects of public policies on deforestation have been the subject of some recent research, issues related to policy formulation and administration have received less attention. The influence of land tenure systems, and of social structures more broadly defined, has not been addressed systematically at local and wider levels in relation to the social dynamics of deforestation within different ecological and historical contexts. The alternative courses of action open to households, communities, national governments and organizations in order better to confront deforestation problems have apparently not been examined analytically and comparatively.

At the farm operating unit level, competitive, supplementary and complementary relationships of 'social forestry' or 'agro-forestry' receive scant attention in most of the literature. Alternative national and international policies are frequently proposed, but with little analysis of what social forces are capable of bringing them about. The constraints and opportunities imposed by an unstable world system are seldom explicitly taken into account when addressing local and national policy alternatives for dealing with deforestation and its socio-economic impacts.

The primary purpose of this paper is to identify UNRISD's research priorities in studying the social dynamics of deforestation. Such an analysis necessarily implies a review of the major issues suggested by a preliminary and extremely incomplete review of the voluminous literature in this field. This review has been informed by the Institute's experiences in research into the dynamics of social change in other areas, and by consultations with various specialists. It assumes that scholars who have devoted years or lifetimes to the study of environmental problems, or to their solutions, have already unearthed a great deal of information about deforestation and have identified many of the principal issues.

This brief review of the issues concludes that UNRISD could make a useful additional contribution to the ongoing debate about deforestation and its consequences. The Institute's initial research will concentrate on the social dynamics of deforestation at local levels in a few developing countries. Local level situations analysed will be selected to represent broader deforestation processes, ecological

contexts, historical settings and socio-economic structures encountered in wider regions. The local level research will focus on the complex interactions among deforestation processes, the associated changes in livelihoods of different social groups and their individual and collective responses to these changes, corporate interests, and public policies and programmes. Special emphasis will be placed on analysis of alternatives being proposed by different groups, individuals and institutions to ameliorate the negative socio-economic and ecological impacts of deforestation and to use forests more productively on a sustainable basis for the benefit of local people and others.

This approach implies much more than mere local level research. The social dynamics of deforestation at local levels, and the possibilities of changing them for the better, have to be analysed within broader sub-national, national, regional and world contexts. These broader systems largely determine the possibilities and constraints for improving resource use faced by individual households and communities. The research will have to take national and international systems and processes explicitly into account in order to suggest what changes may be possible in policies and institutions so that they become more supportive of sustainable and equitable use of forest-based life-support systems.

Brazil, Central America, Nepal and Tanzania have been selected for detailed case studies within the broader regional context of the Amazon basin, Meso-America and the Caribbean, the Himalayas and SADCC (Southern African Development Co-ordination Conference) respectively. In addition, there will be 6 to 10 studies dealing with particular themes which cut across several countries and regions such as property régimes and land tenure systems, national development strategies and their impacts on deforestation, the recent experiences of 'debt for nature swaps' and the frequently contradictory impacts of creating national parks and forest reserves. The results of these studies, together with a global overview report prepared by UNRISD, will be submitted to the 1992 United Nations Conference on Environment and Development to be held in Brazil.

The central issue is not how to stop deforestation but how to control it in order to meet social goals on a more equitable and sustainable basis. It is how humankind in general, and national and local societies in particular, can best balance the competing and often conflictive interests of different social groups, and of yet unborn generations, in relation to their use of forests.

An even more difficult socio-political question transcends the scope of the research. This is to suggest how necessary changes in perceptions and policies might be brought about in order to promote more equitable and environmentally sound development. What social groups and forces could be capable and motivated at local, national and international levels to bring about desired changes? This, after all, is the crucial question not only for doing something about deforestation issues but for positively influencing the whole process of historical change commonly called 'development'. Good

social research, even when focused primarily on local level interactions, can frequently generate information and insights that in some circumstances may contribute to processes leading to more popularly based sustainable development.

The remainder of this paper is divided into five sections. Firstly, the paper seeks to put the issues of deforestation into global perspective based on a review of estimates of forest areas and rates of deforestation in developing countries, and of the concepts and assumptions behind these data. Secondly, a few of the negative ecological and socio-economic consequences of deforestation are discussed and some of the social benefits of selected deforestation processes are mentioned. Thirdly, the paper attempts to assess some of the interactions of deforestation and its consequences with the social, economic and political processes and structures stimulating it and the social reactions these in turn engender in different contexts and at different levels. Fourthly, it discusses UNRISD's research priorities concerning social dynamics of deforestation and the methodologies proposed for carrying out its research. The last section gives some concluding observations.

Putting the Research into Global Perspective

In order to put the research problem into global perspective, it is logical to begin the discussion by looking at recent estimates of the extent of forest resources and of rates of deforestation. Estimates vary widely, largely depending on definitions and assumptions. A common denominator is that they all dramatize the magnitude of deforestation problems in developing countries.

• Global forest resources

There seems to be some disagreement in the literature as to what constitutes forest area and the extent of current forest resources. In general, natural forests and forest plantations are identified as 'forest' and any woody biomass outside of these areas (such as trees around homesteads and scattered small village woodlots or hedgerows) are not regarded as 'forest'. Similarly, the definitions given for such terms as 'closed' forest, 'open' forest, shrubs, etc. are arguable (see p. 5 for FAO's definitions of different types of forests). Nonetheless, available evidence suggests that about one third of the world's land area is forested (i.e. between 40 and 50 million square kilometres). Some 60 per cent of this forest area is classified as closed forest (about 27 million square kilometres); about half of these closed forests are to be found in the industrialized countries of the North (mostly in USSR, Europe and North America) which account for only about one fifth of world population. The remaining closed forests are in developing countries. Half of them are found in Central and South America with the rest mostly in tropical regions of Asia and Africa. Open woodlands, forest fallows and shrublands comprise over half of Africa's forest area and over one third of that in Asia and Latin America (see table 1). Well over half of the world's population dwells in these mainly tropical regions of the South where deforestation processes are most acute (FAO, 1986; Postel, 1984).

Concepts and Definitions of Different Types of Forests used in the Tropical Forest Resources Assessment by FAO

Forest:

This is an aggregate to indicate what is normally understood as forest, namely natural forest and forest plantation.

Closed forest:

Stands of broadleaved (hardwood) forests which, when not recently cleared by shifting agriculture or heavily exploited, cover with their various storeys and undergrowth, a high proportion of the ground and do not have a continuous grass layer allowing grazing and spreading of fires. They are often, but not always, multistoreyed. They may be evergreen, semi-deciduous or deciduous, wet, moist or dry. As an indication for remote sensing purposes the crown coverage is 40 per cent or more.

Open forest:

This refers to mixed broadleaved forest/grassland formations with a continuous grasslayer in which the tree synusia covers more than 10 per cent of the ground.

The division between closed and open hardwood forests is more of an ecological than a physiognomic type and is not characterized necessarily by the crown cover percentage. In some woodlands the trees may cover the ground completely like in closed forests.

The distinction between closed and open forests has not been made for conifers, since it has not the same ecological importance and is difficult, if not impossible, to apply.

Shrubs:

Any vegetation type where the main woody elements are shrubs (broadleaved or coniferous species) of more than 50 centimetres and less than 7 metres in height. The height limits between trees and shrubs should be interpreted with flexibility, particularly the minimum tree and maximum shrub height which may vary between 5 and 8 metres, approximately.

Forest fallow:

This type stands for all complexes of woody vegetation deriving from the clearing of forest land for shifting agriculture. It consists of a mosaic of various reconstitution phases and includes patches of uncleared forests and agriculture fields which cannot be realistically segregated and accounted for area-wise, especially from satellite imagery. It excludes areas where site degradation is so severe that a reconstitution of the forest is not possible. Such areas should be included under 'shrubs' or outside woody vegetation.

Source: FAO, 1988.

This issue of the extent of global forest resources could in theory be resolved technically. It would require an international consensus on some basic definitions. Remote sensing data (complemented by field observations) covering most of the world, could be analysed to estimate current forest resources and changes since the 1960s. The practical difficulties remain formidable. FAO (which is the leading United Nations agency on forestry matters) does not have sufficient resources even to verify many current national estimates of forest resources with remote sensing data. Moreover, the most sensitive and detailed remote sensing data are not available for analysis for this purpose because they are classified for military reasons. In addition, reaching a consensus about basic definitions is much more difficult than might appear to the casual observer. The problem of estimating forest resources in the decades and centuries before 1970 is much more problematic. A concerted effort by historians, archaeologists, geographers, botanists, palaeontologists and other specialists could lead to improved estimates. The attribution of deforestation or afforestation processes to human interventions in contrast to those accompanying climatic and related 'natural' changes would remain particularly debatable for several time periods in many regions.

Table 1

Distribution of the world's forest lands

(areas in millions of hectares)

Region	Total land area	Total forest and wooded lands		Closed forest		Other wooded areas		
		Area	% of total land area	Area	% of forest and wooded land	Total	Open	Fallow
Temperate	6,417	2,153	34	1,590	74	563	x	na
North America	1,835	734	40	459	63	275	x	na
Europe	472	181	38	145	80	35	x	na
USSR	2,227	930	42	792	85	138	x	na
Other countries	1,883	309	16	194	62	115	x	na
Tropical	4,815	2,346	49	1,202	25	1,144	734	410
Africa	2,190	869	40	217	25	652	486	166
Asia and Pacific	945	410	43	306	10	104	31	73
Latin America	1,680	1,067	64	679	63	388	217	170
World	13,077	4,499	34	2,792	62	1,707	734	410

Source: World Resources Institute, 1988 (based mostly on FAO data).

• **Definitions of 'deforestation'**

Before entering into a discussion of the nature and the extent of deforestation in developing countries, it may be useful briefly to discuss the terminology itself. Although in a technical sense the expression 'deforestation' may denote a simple process of 'depletion of forests', the term can have various meanings.

A predominant view, accepted by FAO, considers deforestation as "a complete clearing of tree formations (closed or open) and their replacement by non-forest land uses" (Singh et al., 1990). Firstly, this definition, does not view as deforestation the removal of plant associations not classified as forest. Secondly, and most fundamentally, serious forest damage caused by excessive logging, wood gathering for both domestic and commercial purposes, fire and livestock grazing is not considered as deforestation unless it results in total conversion of forests to other land uses (FAO, 1988).

On the other hand, biologists, ecologists and conservation agencies tend to consider deforestation as the degradation of "entire forest ecosystems" involving wildlife species, gene-pools, climate and biomass stocks (Myers, 1989). Some of the leading environmental organizations advancing this view are the WWF, the IUCN and the United States National Academy of Sciences.

For the purpose of this paper, deforestation is considered to include:

(a) depletion of forest biomass, not just tree-cover;

(b) degradation of forests in all ecological zones, not only in tropical areas; this is particularly crucial as, in high mountainous and arid regions, large (i.e. timber) trees are scarcely found and the local population often has to use whatever shrubs and forest biomass are available in the area;

(c) conversion of forests to other land uses (both permanent and periodic), as well as the serious deterioration of the quantity and productivity of existing forests.

• **Extent and rates of deforestation**

Widespread evidence indicates that deforestation has been accelerating during recent decades in developing countries. Various sources cite differing rates of deforestation. FAO has indicated that, between 1971 and 1986, the forest area in developing countries declined by 5.4 per cent, with the annual rate of deforestation being about 0.4 per cent (FAO, 1987). But, as indicated earlier, since FAO does not consider logging and forest degradation to be 'deforestation', the actual rate of deforestation is likely to be considerably higher. Some have also questioned the quality and reliability of the data employed by FAO. One critic, for example, has argued that:

> "Official figures produced by FAO are based upon national estimates on forest resources. These are often out-of-date and inaccurate and usually deal mainly with timber resources. The distribution and condition of forests of

importance for conservation purposes is very difficult to determine from such official figures which are not usually supported by maps." (Foschi, 1989)

Another range of slightly higher estimates of deforestation comes from a variety of sources. The WWF, for example, suggested that the actual rate of deforestation was 1.15 per cent each year (Cross, 1988). But these figures are based on different assumptions and definitions rather than on new empirical findings.

Considerably higher rates of deforestation are advanced by Norman Myers. He believes that by 1989 the global rate of tropical deforestation reached 1.8 per cent per year, with an annual loss of 142,000 square kilometres of tropical forests (Myers, 1989). He has frequently been criticized, however, for employing speculative methods (Sedjo and Clawson, 1984).

Given these varying estimates of rates of deforestation, it is impossible to arrive at any definitive figures. Nevertheless, it seems clear that large areas of forests have been destroyed each year in developing countries. There is a wide consensus that by the early 1980s at least 100,000 square kilometres of closed tropical forests were being lost annually.

In the 1960s and the 1970s, rapid losses of forests were experienced in West Africa and South and South-East Asia. Manshard estimated that, between 1930 and 1970, about 25 to 30 per cent of the African rain forest was destroyed (Manshard, 1974). The forests in Sierra Leone, for example, that had covered two thirds of its land surface in the early twentieth century, covered only 5 per cent in the 1970s. During the same period, forest areas had declined from 9.3 to 3.6 million hectares in Liberia, and from 8.2 to 5.2 million hectares in Ghana (Manshard, 1974). In South and South-East Asia, the annual loss of forest was estimated to have been over 15 million hectares (Indonesia, 5.26 million hectares; India, 4.8 million hectares; Myanmar (Burma), 1.15 million hectares and the Philippines, 0.73 million hectares). Moreover, some 2 million hectares of rain forests were destroyed by the use of herbicides by the United States Army during the war in Viet Nam (Manshard, 1974). Most of these countries are still experiencing substantial deforestation.

In West Africa, Côte d'Ivoire and Nigeria have spectacular rates of deforestation. According to Myers' estimates, these countries are currently losing over 14 per cent of their forests every year (Myers, 1989). In East Africa, Madagascar seems to have been losing its forest cover by over 8 per cent per annum. Similarly, Myers estimated that in Central America each year 3.7 per cent of the existing forests were being deforested during the 1970s and 1980s (Myers, 1989). But in terms of the total loss of forest areas, nearly half of the tropical deforestation seems to be taking place in only three large countries with the biggest remaining reserves: Brazil, Indonesia and Zaire (Myers, 1989). As noted above, FAO's estimates of deforestation rates are much more conservative.

Projections by some observers suggest that, if present deforestation trends were to continue, much of the remaining accessible tropical forests would be cleared by the end of this century (Caufield, 1985). Indeed, Bangladesh, Haiti, mainland India, and Sri Lanka have lost nearly all of their primary forests. Even at the rate of FAO estimates, Côte d'Ivoire, Madagascar, peninsular Malaysia, Nepal, Nigeria, the Philippines, Thailand, and most Central American countries would have only little patches of forests by the year 2000. Only big blocks of rain forests in Brazil, Indonesia and Zaire may remain, but these countries are currently losing enormous areas each year. On the other hand, several analysts have argued that the data on which such projections rest are suspect (Sedjo and Clawson, 1984). Also, past trends are not always correct guides to future developments.

In addition to the closed forests, considerable areas of open tropical forests are also destroyed each year. The deforestation rates discussed above do not always take into account these open woodland areas. As a matter of fact, some observers have indicated that as much as 3.8 million hectares of tropical open woodlands (about one third of the area of tropical closed forests lost) in Africa, Asia and Latin America were cleared each year in the early 1980s (Lanly, 1982). Besides, considerable areas of savanna woodlands and open forests in semi-arid regions, high-altitude forests remaining in regions such as the Himalayas, are being rapidly degraded, but these have received relatively less attention.

Consequences of Deforestation

Rapid deforestation is widely believed to be accompanied by many undesirable environmental consequences as well as serious negative socio-economic impacts for important social groups. These negative effects of deforestation are closely interrelated with the socio-economic processes, and in some cases natural ones, leading to forest destruction. They are also interrelated with differing social and environmental contexts. Recognizing that any neat division between ecological and social impacts of deforestation is rather arbitrary and that to speak of causes and effects is a gross oversimplification when dealing with interacting complex dynamic systems, a few of the ecological and social consequences commonly attributed to it are discussed briefly below.

• Environmental degradation associated with deforestation

The environmental damages thought to be caused by deforestation are discussed in a vast literature (Ives and Pitt, 1988; Gradwohl and Greenberg, 1988). While there is considerable controversy and uncertainty concerning the exact nature and degree of many relationships between deforestation and the environment, and about the importance of the ensuing damage for human societies, there is broad agreement that such relationships exist. A few of the most important relationships between environmental degradation and deforestation are mentioned here as part of the general background:

(a) Countless species of forest plants and fauna become extinct, or are endangered, with the destruction of their forest habitats. This diminishes the planet's gene-pool which is invaluable for humanity's future. It also deprives many local people of traditional medicines and food as well as raising many fundamental ethical, aesthetic and philosophical questions. The extent to which preservation of biological diversity may be compatible with different kinds and intensities of human exploitation of forest resources is a much debated issue. A closely related one is how large areas of relatively undisturbed forest have to be maintained in different ecological contexts in order for endangered species to reproduce. Research into these issues is under way in many places but it will require much sustained effort over many decades to provide answers.

(b) Deforested hillsides are associated with increased run-off of rainfall and intensified soil erosion. Ground-water reserves are inadequately replenished and silting of riverbeds, lakes and reservoirs increases rapidly. Increasingly devastating floods in Bangladesh and northern and eastern India are widely believed to be closely connected with deforestation in the Himalayan headwaters of these drainage basins (Rieger, 1976). There is some controversy about the exact nature of these relationships in different circumstances but a general consensus that they exist.

(c) Climatic changes and deforestation are interrelated in complex ways. Many fragile tropical rain forest soils are unsuitable for agriculture and soon become desiccated or otherwise unproductive when cleared. Forests constitute a major factor in carbon exchange with the atmosphere and, after the oceans, are the biggest 'sink' in which atmospheric carbon may be stored. Global climate models predicting a warming trend accompanying increased carbon dioxide emissions remain highly speculative. The central place global climate models give to forests illustrates one of many relations thought to prevail between climate and deforestation, not only locally but also globally, affecting populations in both the North and the South (Schneider, 1989). Deforestation is estimated by several leading authorities to contribute from about 30 per cent of the carbon build-up in the atmosphere (Houghton, 1989), but some analysts suggest that it accounts for less than 15 per cent (Sedjo and Clawson, 1984). Other relationships between climate and deforestation are forest damage from acid rain accompanying atmospheric pollution from careless industrialization and local and regional climatic changes often associated with the clearing of tropical rain forests.

(d) Deforestation in several semi-arid environments is thought by some authorities to be a major cause of desertification (UNEP, 1977). Other specialists distrust the data on which claims of advancing deserts are based and tend to attribute desertification where it occurs more to climatic change and to socio-economic processes other than deforestation (Forse, 1989).

One could expand this list indefinitely, but those consequences mentioned are sufficient to illustrate the kinds of relationships thought to prevail between deforestation and ecological deterioration.

• **Social consequences of deforestation**

Environmental degradation associated with deforestation often affects delicately maintained production and subsistence systems within rural areas. For example, soil erosion, flooding, ground-water depletion and silting as a result of deforestation can directly influence agricultural productivity, thereby affecting household food supply, health and nutrition. Also, deforestation processes are associated with numerous other socio-economic impacts on employment, incomes and social relations. Of course, different social groups and strata are affected differently by deforestation, with some suffering more than others and some benefiting at the expense of others.

Forests in developing countries often serve as 'food banks' for the poor local communities. Numerous types of fruits, nuts, leaves, roots and shoots are periodically collected by these communities' poorer inhabitants. Forests harbour many types of animals, birds and insects which can be hunted and consumed. Similarly, lakes and rivers in forest areas contain fish and other aquatic animals. These are important sources of protein for many households. By selling them in the market, many households can often earn significant amounts of much needed supplementary cash income. Forests are the dominant source of household energy for cooking, heating, construction materials, animal fodder and traditional medicines. Similarly, forests remain an important source of income and employment within rural areas, as a considerable number of households are able to supplement their subsistence requirements by engaging in activities related to the gathering, processing and selling of forest products. "For the poor, and particularly for the women these forest-based activities are often one of their only sources of cash income." (FAO, 1989a)

Over 200 million people currently depend in large part on tropical forests for their livelihoods. It is estimated that about one quarter of these people were the forests' traditional inhabitants (**The Economist**, 1988). For these people, as well as for many poor propertyless migrants practising slash-and-burn cultivation, forest areas remain a central source of subsistence. In the past, many of these communities combined long fallow swidden (slash-and-burn) agriculture with indigenous forest management in ways protective of sustainable life-support systems. As a consequence of the reduction of forest areas, the growing numbers of people in certain forest regions and the diversion of many forests to commercial uses or to protected forest reserves, fallow periods have been shortened drastically. Shorter rotations are accompanied by a decrease in both agricultural and forest productivity. In the process, life-support systems for many of these social groups have become increasingly disrupted. Furthermore, those depending on the forest are often ethnic minorities or other marginal social groups with little or no political influence in national societies.

Where forests are converted to large commercial farms and plantations, to pasture for extensive cattle ranching or to commercial timber operations, employment tends to decrease following an

initial increase in labour requirements during the conversion period. During this initial period, however, poorly paid migrants are frequently brought in to clear the forest and to construct infrastructure. Some usually remain to fill whatever jobs are available later or as unemployed squatters. The result is often a larger poor population in areas where the traditional inhabitants have lost their life-support systems and where there are few possibilities to find either jobs or secure access to agricultural land.

Many other interrelated social impacts of deforestation on local populations could be enumerated. They differ widely from one context to another. The social consequences mentioned above are enough to suggest that the impacts of deforestation are intimately interrelated with the large-scale socio-economic processes engendering it. Both deforestation processes and their negative social consequences are crucially conditioned by local and wider socio-economic structures, of which land tenure relationships are one salient manifestation. Similarly, they are conditioned and constrained by public policies. These policies are in turn influenced to a great degree by socio-economic and political structures, by political pressures, dominant development strategies and world markets.

There are, however, also many social impacts of deforestation that may be positive. These too should be taken into account. After all, most of the crop, pasture and other non-forest lands of Europe, the eastern United States, Canada, Japan and much of China and India were once dense forests. Deforested lands, together with remaining forests, now support half of humanity, some very well and some very poorly. Reservoirs that submerged rich forests have frequently provided reliable water supplies for drinking, hydro-electric power, industrial uses, irrigation and transport for generations. Destroying the forest to make way for other land uses is by no means always socially negative in its consequences.

The same is true of forest degradation resulting from human uses that disturb the habitat, endanger many species and decrease the biomass. Cattle-grazing, hunting, recreational uses, woodfuel extraction, logging and other interventions frequently have this effect but can still be socially desirable for many social groups in some situations.

Much of the rest of this Discussion Paper, and the central focus of the proposed research, has to do with how societies attempt to resolve the central question of reconciling conflicting interests in the use of forests locally, nationally and internationally.

Socio-economic Structures and Processes Associated with Deforestation

There seems to be considerable confusion in much of the literature concerning the 'causes' of deforestation. Immediate micro-level processes or 'mechanisms', such as the clearing and burning of forests by poor migrants, are frequently blamed. They are seldom separated analytically from the larger scale metaprocesses attracting or pushing these poor migrants into forest areas, such as the

expansion of large-scale commercial farming, ranching, logging or mining. These processes commonly occur in a context of highly unequal access to available agricultural land and other resources, an absence of employment alternatives, and of national development strategies that give a low priority to the needs of these low income groups and over which they have no influence. Critics point out that even higher level explanations, such as the accumulation of capital and the division of labour on a world scale are often ignored or treated so superficially that they seem to be indiscriminately lumped together with the micro-processes directly causing deforestation and the metaprocesses behind them (Garcia et al., 1987; Tudela et al., 1990).

• Causes of deforestation

The immediate mechanisms and many of the large-scale processes generating deforestation are fairly well documented. They are socio-economic in nature, although these social processes are sometimes confounded by natural ones such as cyclical and secular climatic or geomorphic changes. Prominent among these processes stimulating rapid deforestation in most Third World contexts are expansion of commercial agriculture and cattle ranching, the growth of industrial mining and timber exploitation, migration to agricultural frontiers and rapid urbanization.

The facile explanations that deforestation is primarily caused by poverty or population growth or wasteful consumption pattern are tautological. Poverty, profligate consumption by the better-off and rapid population growth are all symptoms of unequal exploitive development, as is indiscriminate deforestation itself. To confuse these symptoms of styles of development with causes of deforestation tends to be unhelpful in suggesting practical solutions in concrete situations. To blame poor migrants for destroying the forest is like blaming poor conscripts for the ravages of war (Myers, 1984).

To attribute deforestation to population growth is in a very fundamental sense a mere truism. With no human population, the only sources of damage to forests would be 'natural' ones. A stable population at whatever level should in theory make it easier to solve conflicts more constructively among competing forest users, although whether it actually would have this happy outcome is a moot question. The generalizations about population growth and poverty being the root cause of deforestation distract attention from other issues about which it is often much more possible to do something in a relatively short time. Also they lack rigour.

Presumably the greatest damage to forests is assumed to be caused by growing rural populations. Although increasing urban populations also stimulate demands for agricultural and forest products, especially when urban incomes rise, they are not the source of the 'hordes of slash-and-burn cultivators' destroying the forests. Moreover, in many poor countries, especially in Latin America and Africa, nearly all the increased urban populations have

Table 2

Total and Agricultural Population Changes 1975-1988
Per capita GNP 1987 and Annual Rates of Deforestation 1981-1985
(population in thousands)

Countries by region	Total population 1988	% of change 1975-1988	Agricultural population 1988	% of change 1975-1988	Average per capita GNP 1987* (US$)	Annual rate of deforestation**
A. Tropical Southern Africa						
Tropical Southern Africa	**89,466**	**51**	**69,525**	**41**		**0.3**
Angola	9,458	45	6,678	35	x	0.2
Botswana	1,197	58	773	31	1,050	0.1
Burundi	5,153	37	4,718	35	250	2.7
Malawi	7,878	50	6,060	32	160	3.5
Mozambique	14,851	41	12,212	36	170	0.8
Namibia	1,760	48	645	15	x	0.2
Rwanda	6,754	54	6,186	51	300	2.3
Tanzania	**25,426**	**59**	**20,454**	**47**	**180**	**0.3**
Zambia	7,871	62	5,496	51	250	0.2
Zimbabwe	9,118	48	6,303	36	580	0.4
B. South Asia						
South Asia	**1,080,666**	**35**	**685,616**	**26**		**0.5**
Bangladesh	109,632	43	76,588	28	160	0.9
Bhutan	1,448	26	1,319	23	150	0.1
India	819,482	32	520,112	25	300	0.3
Nepal	**18,237**	**40**	**16,772**	**38**	**160**	**4.0**
Pakistan	115,042	53	62,072	38	350	0.4
Sri Lanka	16,825	23	8,753	18	400	3.5
C. Central America						
Central America	**27,352**	**42**	**12,058**	**19**		**1.5**
Costa Rica	2,866	45	731	0	1,610	3.6
El Salvador	5,031	23	1,937	-6	860	3.2
Guatemala	8,681	44	4,545	27	950	2.0
Honduras	4,830	56	2,804	41	810	2.3
Nicaragua	3,622	50	1,440	22	830	2.7
Panama	2,322	33	601	-5	2,240	0.9
D. Tropical South America						
Tropical South America	**236,169**	**36**	**64,142**	**-3**		**0.6**
Bolivia	6,918	41	2,942	22	580	0.2
Brazil	**144,428**	**33**	**36,994**	**-10**	**2,020**	**0.5**
Colombia	30,567	32	8,825	3	1,240	1.7
Ecuador	10,204	45	3,277	4	1,040	2.3
Paraguay	4,039	50	1,956	39	990	1.1
Peru	21,256	40	8,022	16	1,470	0.4
Venezuela	18,757	48	2,126	17	3,230	0.7

Sources: FAO, 1987; *World Bank, 1989; **FAO, 1988.

been largely fed by food imports and 'food aid' from abroad, not from newly cleared forest areas.

Table 2 shows the growth from 1975 to 1988 of total and rural populations in countries of various important forest regions of Latin America, Africa and South Asia. In the same table, annual rates of deforestation in the 1980s estimated by FAO and average per capita GNP estimated by the World Bank for 1987 are shown.

The absence of any close correspondence between deforestation rates and either rates of total or agricultural population growth or average income levels is striking. Of course, other things being equal, all of these simplistic explanations of deforestation have a certain validity. Population growth, especially in forested areas, often contributes to forest destruction, but not always (in many regions of the industrialized North rapid population growth has been accompanied by expanding forests in these same regions, though it may have indirectly contributed to accelerated deforestation in some areas of the South). The demands for natural resources generated by wasteful mass-produced throw-away consumption puts further pressures on remaining forests, although market demands with higher prices may also help to make sustainable forest management more attractive. Poverty of less fortunate social groups may force them to clear forests for subsistence crops, but poverty in itself certainly does not necessarily lead to forest destruction as the experience of many poor forest dwelling groups living in harmony with their life-support systems during milleniums has illustrated in numerous places. In reality, other things never remain equal. This is why reductionist explanations of deforestation are seldom valid.

Current rates of deforestation can be much better comprehended by assuming that they are the outcome of complex historical processes taking place in interacting social and natural systems and sub-systems than by any simplistic explanations. Recent unsophisticated discussion about this complex issue is one reason why an analysis of deforestation in Africa that appeared in the first number of **Unasylva** in 1947 reads much more convincingly than most later treatments of the same topic (Aubréville, 1947).

FAO has estimated that 70 per cent of recent disappearance of closed forests in Africa, 50 per cent in tropical Africa and 35 per cent in Latin America can be attributed to its conversion to agricultural uses (FAO, 1982). These data, however, obscure the different processes generating this conversion. In Africa, the expansion of cash crops for export has been prominent, such as groundnuts and cotton in Burkina Faso and Senegal, and cotton, coffee and cocoa in Côte d'Ivoire. This cash crop expansion has sometimes directly displaced forests, but more often it has done so indirectly by leaving reduced areas of agricultural land available for food crops, thus accelerating encroachment on forest lands by subsistence farmers and shortening fallow periods. Moreover, conversion of forests to tree crops such as coffee and cocoa often has different social and ecological implications than conversion to other land uses. The expansion of large-scale

commercial agriculture has been an important factor behind deforestation nearly everywhere. Poor peasants are pushed off their lands and become landless migrants, many of whom settle in new forest areas.

In Latin America, the clearing of forests for pasture in order to expand commercial cattle production (and also for reasons of land speculation) has been a major cause of deforestation. UNRISD's research on food systems in Tabasco, Mexico, for example, suggested that 90 per cent of this region's tropical rain forests were destroyed during the last four decades. Most of this deforestation could be attributed to clearing for pastures destined to support cattle sold for meat in expanding national urban markets, and indirectly in foreign markets. Small peasant producers and landless labourers actually cleared the land but not to increase their own subsistence crops. They merely provided low-cost labour for medium and large cattle ranchers. These ranchers were in turn encouraged by government-subsidized infrastructure and credits. Lesser forest areas in Tabasco were cleared to make way for ambitious state- and international agency-supported, commercially oriented land settlement projects. These, in the event, proved to be very costly, both for their sponsors and the peasants. Meanwhile, the peasant population hardly increased at all, but the livelihoods of sizeable rural groups, who lost access to formerly forested lands, actually deteriorated in spite of rapid economic growth (as conventionally measured) for the state of Tabasco as a whole (Tudela et al., 1990).

Similarly, in Brazil, nearly two thirds of the deforestation in the Amazon basin since 1960 was to make way for pastures controlled by large ranchers and land speculators. Poor peasants and labourers cleared the land, but often in return for a sub-minimum wage or the right to harvest one or two years' subsistence crops before being forced to move on. Most of this deforestation would not have been feasible without hefty government subsidies, often augmented by support from international agencies. Most other deforestation in the Amazon could be traced to commercial logging, mining, the expansion of commercial plantation crops and land speculation. Population pressures by small peasant agriculturists clearing land for their own farms accounted for only about 10 per cent of the deforestation (Browder, 1988 and 1989; Hecht, 1985). Even these peasants usually had insecure tenure and were subject to eviction. Meanwhile, the agricultural population in Brazil actually decreased because of rapid rural-urban migration. Vast areas of potentially highly productive but under-used non-forest land remained inaccessible to peasants and landless workers as it was locked up in large estates (Browder, 1989; CIDA, 1966).

In areas of traditional agriculture, grazing pressures combined with the annual burning of pastoral areas (to stimulate germination of fresh grasses) frequently results in failure of forests to regenerate. These phenomena have especially been observed in areas where both human and livestock populations are high and livestock production constitutes a vital part of the household subsistence system such as in the Middle East, South Asia and arid and semi-

arid regions in Africa. It should be noted, however, that when properly used, both grazing and fire can be valuable silvicultural tools in certain contexts.

The excessive or careless exploitation of forests for wood and timber are other proximate causes of deforestation. Half of all the wood harvested in the world is estimated to be used as fuel, primarily in developing countries (Grainger, 1990). In some countries, woodfuel fulfils nearly 90 per cent of the local fuel-energy demands (Eckholm et al., 1984). In order to meet their minimum household energy requirements, in many locations people tend to over-exploit local forest resources. It is believed that about 112 million people in Africa, Asia and Latin America already suffer acute fuelwood shortages (de Montalembert and Clement, 1983).

Commercial exploitation of old-growth forests for high value saw- or veneer-logs accounts for much of the deforestation taking place in Central America, and in Bolivia, Brazil, Côte d'Ivoire, Indonesia, Malaysia, Nigeria, the Philippines and many other countries. Estimates suggest that as much as 4.4 million hectares of tropical forests may be logged each year to supply European, American and Japanese markets (Gregersen et al., 1989). During the 1980s, pressures generated by deteriorating terms of trade and high foreign debt service charges have frequently led to accelerated exploitative forest exports in many developing countries. Logging, when carefully planned and carried out, does not necessarily degrade the forest and may even improve it by economic and some ecological criteria. Much depends on how it is done. Mechanized timber harvesting methods developed for temperate forests have frequently proved particularly damaging when used in tropical rain forests. Also, logging frequently opens the forest for other uses such as conversion to pasture or to tree crops, settlement by poor migrants or grabbing by land speculators.

Other less considered, but equally important, immediate causes of deforestation in developing countries are urban and industrial wood/timber demands. This is especially so in many developing countries where urbanization is rapid and wood and charcoal are the predominant sources of household and industrial energy. Likewise, forest products provide most of the basic raw materials for several local and national industries. In many countries, because of the greater emphasis on industrialization, forest-based industries not only acquire preferential treatment and institutional subsidies but are also allowed or encouraged to extract forest resources carelessly and exploitatively in order to maximize immediate profits.

• Social structure and land tenure

The institutions influencing deforestation processes deserve special attention. Land tenure systems, and the broader agrarian systems and socio-economic structures associated with them, are particularly important. Deforestation processes and their social impacts are likely to exhibit different patterns in regions dominated by large estates and concessions, in areas dominated by clientelistic systems within which most cultivation is carried out by small

cultivators, and in regions in which traditional communal systems still predominate. Numerous variations are found of all these broad types. Particular attention has to be paid to local and broader social systems in attempting to understand the social dynamics of deforestation (Barraclough, forthcoming; García et al., 1987).

Land tenure institutions are among the most obvious outward manifestations of the power relationships that directly affect rural people. Such power relationships are inherent in any social system but are much more equitable in some than in others. In primarily agrarian societies, they crystalize the relations among individuals, social groups and classes in their access to land and labour, and hence to wealth, opportunities and power.

Much is written in the literature on deforestation about the importance of land tenure, but legal forms of property tend to be confused with social realities. 'State' or 'community' ownership in themselves are no more of a guarantee that land will be used for the 'public interest', and especially in the interests of the poorer strata of the population, than is 'private' ownership. Property relationships have to be understood in specific socio-economic, political, cultural and historical contexts. Superficial comparisons among localities, countries or regions can be very misleading.

As mentioned earlier, poor rural people are usually the principal immediate human agents in deforestation processes. Rural landlessness, or near landlessness, is almost synonymous with rural poverty in most developing countries (Barraclough, forthcoming; Sinha, 1984). In Latin America, South and East Asia and countries with bimodal agrarian structures in Africa, such as South Africa and Zimbabwe, from one third to well over half of all rural households have been estimated to be functionally landless and poor (Barraclough, forthcoming). The situation is somewhat different in countries where customary communal tenure still prevails such as in many regions of sub-Saharan Africa. There, poverty in rural areas tends to be more equally shared, although this situation may be changing fast with increased commercialization of agriculture. Customary tenure systems, however, present their own peculiarities and challenges for dealing with deforestation issues.

Similarly, countries that have undergone profound and massive agrarian reforms present different opportunities and problems for dealing with deforestation and rural poverty issues than ones that have not. In all cases, however, social institutions, and especially land tenure shape the framework of incentives and constraints within which modernization and deforestation processes occur. They condition the social impacts of these processes and efforts to deal with them through collective and individual initiatives or public policies. They also determine, to a very great extent, the policies and strategies that are adopted and followed.

• The role of public policies

As was seen in the examples cited earlier, public policies play an important role in stimulating deforestation in most countries. Both state and local government policies are usually contradictory in this respect. They reflect the contradictory interests and influence of different support groups. What counts in assessing the role of public policy is the dominant development strategy responding to the interests of influential social forces upon which governments are most dependent for crucial support in order to survive.

The policies of national governments and international agencies have tended to be rather ineffective in dealing with deforestation problems. In fact, as was noted above, such policies have often made them worse. Ill-conceived or badly executed resettlement, land reclamation and irrigation schemes are legion; and they have been followed, as often as not, by more deforestation and continued poverty. State programmes to promote export crops, commercial livestock production and national forest industries have frequently led to an accelerated rate of deforestation. Sometimes other objectives such as greater rates of economic growth and more self-reliance nationally were met in the short run. This was often done at the expense of deteriorating livelihoods for local populations using the forests, and also of greater economic long-run vulnerability both locally and nationally.

Many poor households have been encouraged to migrate to the forest frontiers through official land colonization programmes, often enticed by construction of roads and other infrastructural facilities. For example, between 1969 and 1977, the Brazilian government set up 16 colonization projects in the Amazon; other countries in the Amazon region followed the same pattern (Browder, 1989). Similarly, a substantial conversion of forest areas to officially backed land development schemes has been experienced in the Asian tropical countries such as India, Indonesia, Malaysia, Nepal, Sri Lanka and Thailand, and in every country in Latin America.

As was seen earlier, public subsidies in the form of cheap credits and infrastructure to promote large-scale commercial ranch and farm expansion have directly contributed to deforestation in numerous countries. Trade, fiscal and other macro-economic policies often do the same. So, too, do state policies concerning land tenure. In many countries, especially in Latin America, clearing the forest is a way for settlers or speculators to claim title to state lands. This encourages uneconomic forest clearing and land speculation by large landholders with capital, legal savvy and political connections, but poor migrant settlers can seldom obtain titles. Legal codes commonly discriminate against traditional common property régimes of indigenous people in forest areas. In fact, the laws were frequently shaped to dispossess such people.

Many public policies and programmes are ostensibly designed to protect forests and halt or reverse deforestation. For this purpose, forest areas are frequently put under state management or control

in the form of national parks or forest reserves. Some of these programmes have been effective in protecting forests while others were façades for gaining control of valuable forest resources to be used for private profit. Such policies, even when honestly administered and effective, have often been accompanied by negative impacts on local people. Indigenous groups have frequently been denied customary access to their forests. This alienation sometimes "forced the peasant to degrade the surroundings he once lived in symbiosis with" (Guha, 1985). It also generates conflicts with forestry and other state officials and apathy or hostility towards state-sponsored forestry programmes. Frequently, local people may have to over-exploit reduced areas of forest that remain accessible in order to survive. Traditional sustainable resource management systems atrophy and deforestation accelerates outside of the reserves (Thompson and Warburton, 1988; Guha, 1989; Ghimire, 1989).

The greater emphasis by some governments, international agencies and NGOs on social forestry and farm forestry in recent decades has met with some success, but frequently such schemes have backfired. Their planners often correctly believed that the rational exploitation of forest resources in suitable areas on a sustained-yield, multiple-use basis, using appropriate technologies, could generate more productive employment and other economic benefits than converting unsuitable land to crops and pastures. Their assumptions about social institutions, local soils and climates, available technologies, future markets and costs, and about real alternatives for those involved, however, were often erroneous. Also, they tended to neglect the importance of market interest rates and of the implicit rates participants used to discount uncertain future costs and benefits to present values (Hosier, 1989). Moreover, as happens with other programmes designed to aid the poor, richer farmers have usually benefited the most (Fernandes and Kulkarni, 1983).

Social forestry programmes are frequently unrealistic from the standpoint of local peasants and communities because they are premised on only superficial knowledge of local social, economic and cultural relationships and constraints. They tend to neglect the extent to which the forestry activities being introduced may compete for the time of the peasant and his family, especially during busy seasons. For example, most of the millions of seedlings distributed to peasant families in the name of social forestry in upland Kenya die. They arrive during the rainy season when everyone is too occupied with their maize and other crops. As a result, the seedlings are usually planted too late to survive. Trees planted along property boundaries of small holdings often generate conflicts with neighbours because they compete with their crops for sunlight and water.

On the other hand, forestry activities that make complementary and supplementary use of peasants' time, land, animals and tools integrated with his agricultural and other activities are usually more readily adopted. This whole matter of integrating farm and forestry activities in ways beneficial to the peasant seems to have received only rather superficial attention in most social forestry programmes.

It requires economic and social analysis of typical households' and communities' whole livelihood systems, and the analysis of alternatives including forestry activities. Making such analyses from the peasant's point of view and not the forester's, official's or extension agent's also helps to bring out the constraints imposed by social structures, markets and public policies more generally.

A recent book analysing the impacts of public policies on the misuse of forest resources presents many dramatic examples of inappropriate policies leading to accelerated and uneconomic deforestation (Repetto and Gillis, 1988). The editors, however, tend to regard competitive free market price relationships and discount rates, and the elimination of 'economic rents' for private actors through wise taxation, as providing sufficient normative criteria for judging the economic success or failure of forestry projects. This issue is hotly debated everywhere. Most indigenous peoples depending on forests in developing countries are only partly incorporated in national and wider markets. Markets everywhere and at all levels are subject to monopolistic manipulations as well as political ones. Market forces are much better at increasing the wealth and power of the strong than of the weak in most socio-political contexts. Poor peasants have little purchasing power, scant assets and little political influence. Taxes as well as monopoly profits or 'economic rents' may be misused. It is illogical to use market interest rates, which fluctuate wildly during business cycles and for other reasons, to discount uncertain benefits and costs that accrue at different times over decades and even centuries. The issue is much more complex than is sometimes assumed.

Public programmes frequently put emphasis almost exclusively on forest plantations as a means of combating deforestation. This emphasis on plantations has tended to relegate other forest management and afforestation practices to a secondary role, even when these could have been more economic and effective in many circumstances. Moreover, plantations of single and sometimes exotic species ill-adapted to local needs often made worse some of the ills they were intended to correct. In any event, plantation programmes are unlikely to meet more than a small fraction of what is required to counter the ravages of deforestation.

In this respect, the importance of food aid administered by the World Food Programme (WFP), the United States Agency for International Development (USAID), NGOs, etc. in financing afforestation projects should be noted. Food aid agencies are probably responsible for more tree planting through food-for-work programmes in developing countries than all other sources combined. A few of these projects seem to have been quite successful both in establishing forests and in providing food to the needy people planting them. Many have been relative failures, however. Programme planners and administrators were often unable to secure the genuine participation of local people in caring for the seedlings after planting. Peasants could see few benefits for themselves when trees grew on institutional lands to which they had little access, or on the lands of large private landowners. When planted on 'community' lands, local social relations

were frequently participatory in name only. Poorer members of the community doing the work did not expect to be able to profit from the trees when they eventually matured. This brings out once again the crucial role of social relations in general and land tenure relations in particular at local, regional and national levels in determining the social dynamics of deforestation and of attempts to control it or to alleviate its negative impacts through public policy or other collective efforts.

The issue of land use planning seems to be largely neglected in the literature reviewed. Most developing countries have land use agencies or commissions, but they are usually ineffective, except as a vehicle for channelling concessions to political allies. The socio-economic and technical criteria used to determine what land should be designated for forest use and what for agricultural and other uses are seldom clear. Moreover, those local social groups most affected because they depend on the forest for their livelihoods are seldom consulted.

Special interest groups, including corporate transnational ones, are very influential in shaping development policies and often more so in their execution. This issue, like its corollary of official corruption, receives relatively little attention in most of the literature on deforestation (Palo, 1990).

These and other issues of public policies unavoidably raise the question of overall development strategies. This is beyond the scope of the present research, but the role of national and international strategies in determining which, of often conflicting, policies are predominant in the social dynamics of deforestation in concrete countries and localities has to be taken into account.

• Popular participation and mobilization

Popular participation can be considered as the "organized efforts to increase control over resources and regulative institutions, in given social situations, on the part of groups and movements of those hitherto excluded from such control" (UNRISD, 1979). Ultimately, popular participation, along with equality of opportunities, accountability of government leaders and officials to the governed, the protection of basic human rights and civil liberties, is the essence of democracy.

Efforts by those individuals and groups most affected by deforestation to cope with its negative impacts have met with varying degrees of success and failure. The same processes resulting in forest destruction have tended to incorporate these groups increasingly into the market economy and broader social systems, frequently on highly unfavourable terms. Traditional social norms that arose over centuries of trial and error to keep local societies in harmony with sustainable life-support systems have often disintegrated. The oft-described 'tragedy of the commons' frequently ensues. Each household or group faced with shrinking resources and mounting external pressures attempts to meet its immediate

basic needs at the expense of the common good. This feeds processes of cumulative causation, generating further ecological destruction and poverty. Where victims try to fight back through social movements and other means, their marginal influence in national societies and international markets often leads to repression and loss of remaining communal rights.

Nonetheless, some popularly based movements of forest dependent poor people have been at least marginally effective. A few have attracted wide attention and influential allies. The alliance of rubber tappers and indigenous groups in the Brazilian Amazon to resist encroachment on their forest habitat by large-scale commercial farmers, ranchers and land speculators is an example. They gained support from many urban environmental groups and others, both in Brazil and internationally (Diegues, 1990). In spite of wide-scale repression, they have become potent political actors influencing government policies, and indirectly also those of multinational banks. The Chipko movement of rural people in northern India, who organized to save their forests, is another example (Shiva and Bandyopadhyay, 1988). Similarly, one may cite the struggle of Penan and other tribal groups in Sarawak, Malaysia, against the destruction of their homelands by commercial loggers. By forming human blockades across logging roads leading into their traditional territories in early 1987, these people brought the logging industry to a total standstill (Friends of the Earth, 1990). Later the Malaysian government intervened by dismantling blockades, arresting and detaining hundreds of tribesmen and imposing heavy fines and long-term imprisonment (Friends of the Earth, 1990). But despite official punitive measures, the Sarawak tribesmen have continued to organize roadblocks and are attracting world-wide attention, albeit with little positive response as yet from the Malaysian government itself.

The literature on deforestation in developing countries cites countless examples of conflicts between local forest users and powerful exploiters of their forest habitats who are ultimately backed by state institutions and policies. Conflicts are also frequent between these local groups and the state officials administering national parks and protected forest reserves.

Depending upon circumstances, many local communities can be found engaged in participatory forest management activities in response to deforestation. The involvement of rural communities in tree planting is not new, but rapid deforestation and the accompanying shortage of wood and other forest products can stimulate rural households to become involved in self-help tree planting and management of village biomass when this really meets their felt needs. A few relatively successful community afforestation programmes are commonly cited. Farmers readiness to protect and incorporate forest resources into farming systems as a result of deforestation is frequently taken for granted. In recent years, increasing numbers of forestry programmes have been introduced to support and encourage these local level initiatives in developing countries. Many of these programmes failed because they were not really participatory. They

often did not fully take into account socio-economic conditions and hence did not coincide with the direct forest management objectives of local people. On the other hand, successful projects achieved genuine local level involvement during project design and implementation.

Ample experience during generations of forest management attempts in Europe, North America, Japan and many other places, indeed, convincingly suggests that sustainable and reasonably equitable forest protection, management and land use planning requires genuine participation of those groups living in or near the forest and who depend on it for their livelihood.

This raises several issues concerning public policies and land tenure systems. Many of these have already been mentioned. There is growing evidence that common property systems can successfully adapt to a changing socio-economic environment, while at the same time retaining (or regaining) many desirable traditional techniques and norms in the equitable and sustainable use of forest resources, if they are only given a chance (Rodriguez et al., 1990; Bromley, 1989). The 'tragedy of the commons' is usually generated by hostile socio-economic and political contexts; it is not inherent in any particular system of property relationships. Like common property resources, state or private property régimes can also be relatively sustainable and equitable or can lead to tragedies for both local people and for the environment. But for any of these property systems to function well in the use of forest resources, there has to be popular participation.

There seems to be little probability of state policies giving real priority either to environmental enhancement or to the needs of those depending on forests for their livelihoods unless political leaders believe that their own positions of power depend crucially on their doing something effectively and immediately about these problems. Leaders are unlikely to see dividends from catering to the needs of the poor, or to the demands of environmentalists, unless these groups are mobilized and capable of exerting organized political pressures. Moreover, unless low income groups depending on forest life-support systems can influence policy implementation, even well intentioned policies will most likely be deformed during execution to the benefit of others.

An equitable and sustainable development strategy in respect to the use and management of forest resources has to be popularly based. It implies democratic popular participation by those social groups most affected by deforestation in the making and execution of the policies most impinging on their lives.

Research Priorities and Methods

UNRISD has acquired a certain competence in investigating the dynamics of social change. This is a crucial comparative advantage for any inquiry into the social dynamics of deforestation. While not competent to make new contributions on technical issues of deforestation, the Institute is able to draw upon and interpret the best technical knowledge and expertise available where this is relevant.

• Research focus

The research should particularly aim at exploring how different social groups living in or near areas undergoing deforestation are affected by this process, how they react individually and collectively, the internal contradictions within the groups and what role is played by the state. The research problem for UNRISD is to analyse comparatively, in different ecological and socio-economic contexts, how deforestation processes interact with government policies, the collective and individual survival strategies, and the strategies of special interest groups, in influencing livelihoods of those social groups most prejudiced by deforestation. The analysis of public policies is fundamental for a number of obvious reasons, not the least of these being that over three fourths of the remaining closed forests in developing countries are under legal state jurisdiction (Lanly, 1982).

An improved understanding of the social dynamics of deforestation can contribute to proposals for more realistic policies to deal with deforestation processes and their impacts at local, national and international levels during the 1990s. It can also contribute information that may be useful for social movements and interest groups attempting to check and control deforestation processes and to achieve more equitable and sustainable development by those groups depending primarily on forests for their livelihoods.

The Institute's earlier research into processes of socio-economic change has generated various tentative conclusions, or hypotheses, that serve as a starting point for its study of the social dynamics of deforestation. These initial hypotheses suggest that the processes leading to deforestation, the social changes associated with it, and the social and ecological relationships conditioning both, are to some extent unique in each concrete situation. Moreover, processes leading to deforestation, social changes accompanying it and policies affecting both, tend to be mutually reinforcing through vicious circles of cumulative causation. Initiatives to check deforestation processes and to ameliorate their social impacts have to be worked out on the ground, in specific contexts, with the participation of those who are adversely affected. Solutions to their problems, however, require supportive national and international contexts. These, in turn, depend upon the mobilization of well-informed social forces locally, nationally and internationally that are interested in, and capable of, changing the public policies and social institutions.

Taking into account these priorities and underlying hypotheses, the research being carried out by UNRISD has the following specific objectives:

(a) To assess, in different ecological and socio-economic contexts, the changes in living levels, employment and income of those groups and strata most affected by deforestation; and to identify the mechanisms linking these changes in livelihoods with the broader socio-economic processes generating deforestation in each situation, and with the constraints imposed by ecological conditions and by land tenure and other social institutions.

(b) To investigate, in these same contexts, the nature and effectiveness of individual and collective responses and strategies by those negatively affected by deforestation, and to do the same concerning the special interest groups and other social actors promoting or benefiting from deforestation processes.

(c) To analyse, in these same selected contexts, the social, economic and institutional incentives and obstacles that would be encountered by typical social groups or individuals who are most affected by deforestation if they were to adopt alternative forest and farm management strategies of the kind being proposed to them by government agencies, NGOs or other outsiders, and also the alternatives they themselves perceive.

(d) To postulate the principal policy issues associated with deforestation processes in developing countries that seem likely to dominate discussions or to emerge during the 1990s.

• Research strategies

The first phase of the Institute's research on the social dynamics of deforestation in developing countries was initiated in April 1990. It consisted primarily of a review of the literature by project staff in Geneva, discussions with specialists, the selection of regions and countries in which case studies would be carried out and the identification of research co-ordinators from developing countries to undertake these studies. This initial phase ended with a three-day workshop in Geneva in late August 1990. This Discussion Paper summarizes major conclusions of this phase of the project.

The second phase of the research is to comprise country and regional studies as well as selected thematic issues. In addition, it will include the preparation of a global overview report by UNRISD.

• Country studies

The six major geographical regions that account for most forested area in developing countries, and for most recent deforestation, are the Amazon basin, Central America, West and Central Africa, East Africa, the Himalayas and South-East Asia. This geographic division is rather arbitrary but it corresponds to many discussions of deforestation issues frequently found in the literature.

The selection of specific countries within these broader geographical regions in which the dynamics of deforestation are to be studied in greater depth was guided by the following criteria:

(a) Availability of a well-qualified senior researcher with a suitable research network or team interested in participating in the project and able to do so within its time and budget constraints.

(b) The range of ecological conditions covered, the extent of remaining forests, recent rates of deforestation, the nature of dominant deforestation processes and the size of forest dependent populations.

(c) The country's socio-economic structure and historical development in relation to others in the region, and the nature of its national development strategy.

Based on these criteria, Brazil, Central America, Nepal and Tanzania have been selected for detailed case studies. Côte d'Ivoire and Viet Nam were also initially selected in order to include case studies in West and Central Africa and South-East Asia respectively. But time and resource constraints indicated that only four country studies were possible. A brief review of Brazil, Central America, Nepal and Tanzania may be useful here:

Brazil: About 69 per cent of the Amazon forest areas (the world's largest tropical moist forest) are located in Brazil. FAO estimated that over 25,000 square kilometres of the Brazilian Amazon was deforested annually in early 1980s (see table 3), although some believe that the actual amount of deforestation was twice this (Myers, 1989). Some environmental groups go as far as to call the current level of deforestation of Amazonian forests "an ecological holocaust" (Friends of the Earth, 1990).

The proximate causes of deforestation in Brazilian Amazon such as slash-and-burn cultivation have often been emphasized while neglecting underlying socio-economic processes and structural problems that are behind them. Browder suggested that in the early 1980s, as much as 72 per cent of deforestation was caused by expansion of cattle ranching (encouraged largely by government fiscal and financial incentives) and only about 9.6 per cent of forest destruction resulted from slash-and-burn cultivation activities (Browder, 1988). Other important factors are believed to be timber exploitation, charcoal production, mining and hydroelectric dams. This indicates that deforestation in the Brazilian Amazon has been stimulated by powerful vested economic and political interests and concomitant environmentally unsuitable development programmes of successive Brazilian governments. For example, one analyst notes:

> "Most of the costs of deforestation will be paid only in the future, while the benefits are immediate. Many of these costs are also distributed over society at large, while the benefits accrue to a select few.... Brazil's national government has the task of balancing the interests of different generations and interest groups." (Fearnside, 1987).

Central America: For the purpose of this research, Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama) is treated as if it were a single country unit. This is justified because of the small geographical and demographic size of each

individual country, the range of ecological zones included, shared historical development leading to similar socio-economic structures, the similar terms of insertion into world markets for each country, and the considerable progress already made in setting up integrated Central American institutions in relation to the Central American Common Market.

Table 3

Estimated rate of deforestation in countries/region selected for case studies (1981-1985)

Country/region	Deforested area (in thousands of hectares)	Annual rate of deforestation (%)
Brazil	2,530	0.5
Central America *	406.5	1.5
Nepal	84	4.0
Tanzania	406.5	0.3

*Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama.
Source: FAO, 1988.

As far as Central America is concerned, much of the recent deforestation in the region seems to be directly connected to the expansion in cattle ranching activities. In response to the high demand for meat in developed countries - especially in the United States and Europe - Nicaragua between 1960 and 1979 (before the 1979 revolution), for example, raised its beef production threefold. This increase was obtained primarily by clearing more forest areas for pastures (Myers, 1984). Likewise, in Costa Rica, at about the same period, beef production rose nearly fourfold (Myers, 1984) - again by converting large areas of forest to pasture. Similar developments were also taking place in Honduras and Guatemala. In fact, between the mid-1950s and the mid-1970s, pasture areas in Central America as a whole (excluding Panama) increased from 3.4 million to 8.1 million hectares (Williams, 1986); and evidence suggests that the share of pasture area has also been steadily increasing in the late 1970s and 1980s (FAO, 1989b).

The growth in cattle ranching combined with the development of commercial agriculture (e.g. the expansion of cotton production in El Salvador and Nicaragua in the 1950s and in Guatemala from the 1960s, and the development of coffee, cocoa, rubber, oil-seed plantations in the region as a whole) not only generated direct pressure on forest land but also dispossessed many small farmers. Substantial numbers of these small farmers moved to forest frontier areas. Also, Central American governments promoted formal settlement schemes, clearing considerable areas of forest in the process.

In the early 1980s, El Salvador and Nicaragua, albeit in entirely different political contexts, introduced comprehensive land reform measures, expropriating land from large estates and granting titles to tenants and landless labourers. These measures seem to have produced some positive impacts in slowing the spread of slash-and-burn cultivation. However, in both countries internal civil wars in the 1980s have overshadowed these earlier processes leading to many contradictory impacts on deforestation (Barraclough and Scott, 1987).

As compared to other countries in the region, Costa Rica has had one of the highest rates of deforestation. Recent government policies, combined with efforts of local farmers, NGOs, and the local and international conservationist groups, seem to have restrained this trend to a limited extent (Simons, 1988). One component of this initiative includes 'debt for nature swaps'. Costa Rica has accounted for over three fourths of the total value world-wide of all 'debt for nature swaps' realized by mid-1989 and this experience should be examined more closely.

Nepal: According to FAO's estimate, Nepal has been losing 4 per cent of its forests each year during the period 1981-1985, which is one of the highest rates of deforestation in Asia (FAO, 1988). In mountain areas, woodfuel gathering, grazing, fodder-lopping combined with swidden cultivation in some locations are considered to be the main factors responsible for deforestation (Bajracharya, 1983; Mahat et al., 1987). In recent years, this process has been further exacerbated by activities related to road construction, dam building and proliferation of administrative centres. Some of these processes (together with the impact of tourism) are also resulting in the rapid commercialization of timber and firewood, thus providing further impetus to deforestation.

In the 'plains' (known as the Tarai), agricultural clearance has been the principal cause of deforestation. Until the early 1980s, the Nepalese government had several resettlement schemes. Also, malaria eradication, construction of a road across the Tarai and greater agricultural wage employment possibilities encouraged the immigration of large numbers of rural poor from the Nepalese mountain areas as well as from the adjacent Indian 'plains'. Where possible, these migrants cleared forest land for growing food crops or sold wood and various other forest products to support household subsistence. Furthermore, until recently, export of round logs to India was one of the chief sources of government revenue (CBS, 1987). The open border between Nepal and India and the higher price of wood in India (between 66 to 100 per cent more than the market price in Nepal) stimulated these exports in spite of a legal ban. A great deal of wood has continued to be exported illegally into India (Ghimire, 1988) - with a considerable impact on deforestation, particularly in areas near the frontier.

Government forestry policies have, in many respects, been directly responsible for causing deforestation in Nepal. All the forests in the country were nationalized in 1957; and in 1961, any

land left fallow for more than two years was declared government forest area (Foley and Barnard, 1984). This seems to have led not only to further tree clearing but also to the rapid disintegration of local resource management practices. Since the late 1970s, the government has been trying to reduce the damage through promoting community forestry programmes, but there is still a deep-rooted suspicion amongst most social groups concerning eventual benefits for themselves.

Similarly, in areas where the government has established national parks and wildlife reserves, little attention has been given to the forest needs of local inhabitants. Consequently, people living in and around these areas are often forced to over-exploit reduced areas of forests that remain relatively 'open'. Likewise, in many areas where the Forest Department has taken responsibility for forest protection, there is often no significant forest cover, nor are the local people permitted to bring these areas under food production. Concurrently, in many cases, forest guards vigorously patrol the treeless areas (to prevent illegal land settlement); productive land remains unused whilst hungry people in the area multiply" (Ghimire, 1989). Thus, changing land use emphasis from an exclusive forest plantation system to combining forestry with food production activities are seen as one of the critical policy issues for Nepal in the 1990s (Ghimire, 1989).

Tanzania: Evidence indicates that, even though the forest and woodlands in Tanzania covered nearly two thirds of its national territories in the mid-1980s and the annual rate of deforestation was below the average for the region, the country has been losing large areas of forest (130,000 hectares per annum; see table 3). This deforestation occurs even though Tanzania has for many years given high priority to forestry, emphasizing an integrated sustainable approach (FTPP, 1989). Critics of the Tanzanian forestry programme, however, argue that a major source of current deforestation lies in the government's earlier 'villagization' programmes, as this led to an increased concentration of both human and livestock populations in certain locations. This has changed man-land ratios in these areas. Households with smaller holdings reduced fallow periods, and also brought ecologically vulnerable marginal areas under cultivation. Similarly, the increased number of livestock in certain locations exerted further pressure on adjacent forests (Christiansson, 1981). Another interrelated consequence of 'villagization' and population increase is that traditional pastoralists have been forced to use smaller areas, resulting in the over-grazing of forests and rangeland areas (Rigby, 1985).

The government's recent National Forestry Action Programme has been criticized for giving a high priority to the commercial aspect of forests. According to some, "this heavy emphasis on commercial forestry in a country with so little forest as Tanzania gives rise to considerable concern that social and environmental considerations are being subordinated to national economic goals" (Colchester and Lohmann, 1990).

• **Research methodology for case studies**

Research methodology often has different meanings for different people. For some, it is a detailed plan of how to proceed with a study, how to collect data, and then how to analyse and present them. For others, methodology is the general conceptual framework outlining the issues to be investigated, the concepts used, the research objectives and the general procedures to be followed. The Institute has found this second approach to be the most useful one for guiding comparative research involving different countries and regions. Without a common conceptual framework and agreement on the central research questions and the general procedure, the research findings are likely to be non-comparable. A overly rigid research guide to be applied in very different socio-economic and historical contexts, however, frequently leads to trivial results. This Discussion Paper was initially designed to provide a common conceptual framework for the research.

It is proposed that the country/regional case studies consist of four major components. First, the research co-ordinators will prepare overview papers examining the effects of principal deforestation processes and policy measures on different social groups. They will also look at the alternatives being proposed. These papers should also identify research sites, research teams, indicate research methods and specify the hypotheses to be tested in the field. These overview papers will be based mainly on secondary sources, consultations with key informants and reconnaissance visits to the proposed research sites. Second, a few carefully designed short case studies will be carried out in areas representing different ecological, socio-economic and development contexts within which important processes are occurring. Owing to the time constraint, these case studies should aim particularly at collecting qualitative information. Third, a few special reports by qualified specialists may be commissioned in each country on specific themes or issues. Fourth, research co-ordinators will prepare synthesis reports integrating the country background papers, thematic papers and the findings of case studies.

Local level case studies are extremely important if one hopes to understand how socio-economic and environmental processes and systems interact in generating deforestation and its associated consequences. Analysis of local situations helps to clarify how these processes in turn affect the livelihoods of those living in and around the forest, what types of 'coping mechanisms' different social groups adopt and how various social groups are influenced by public policies. Field inquiries are also crucial for identifying power structures in different socio-economic, environmental and policy contexts.

When setting up local level field appraisals in particular localities, it is important to attempt to look at entire livelihood systems of individual households and of their communities and not only at those aspects most directly connected with deforestation processes. Otherwise it will be virtually impossible to analyse realistically what the alternatives are. Such analyses require taking

into account competitive, complementary and supplementary relationships in peasant activities, in the context of local social relationships, affecting the feasibility of alternatives proposed to achieve more equitable and sustainable use of forest resources. It is also necessary to identify those constraints, emanating from outside households and local communities, that would have to be removed.

Among many other things, this will involve gaining some idea about input-output relationships if data do not already exist. The distribution of family work time throughout the year and labour time per unit of output for the peasant's various 'economic' activities is crucial. So, too, are other input-output relationships such as crop yields per unit of area, growth rates of forest species used or proposed for agro- or social forestry projects, etc. Also, information is needed concerning customary subsistence requirements, and cash outlays and incomes normally incurred. Proposed social forestry activities usually imply changes in labour and production patterns. What would their implications be for the peasant's time and that of his family, and for his subsistence and cash flows? Are there markets for proposed increases in production and sales of crops or forest products? What are the aspirations and perceptions of local people in different social strata? Without such information, the peasant has little basis for deciding whether the alternatives discussed are beneficial or detrimental from his standpoint. The same is true if he does not take into account local social relationships such as land tenure, market monopolies, fees and taxes, etc. There is no reason for a peasant to change his or her land use practices if, on balance, his or her livelihood is not improved as a result.

When looking at the policy context in study countries, it is also essential to examine Tropical Forestry Action Plans (if they exist). Reading the WRI and FAO global TFAPs gives the impression that they are much less statements of policy than lists of desiderata. The WRI TFAP pays considerable attention to ecological and social issues in its statement of the problem but the suggestions for action do not seem to take these issues much into account as they are primarily oriented towards urging additional investments in commercial and farm forestry. FAO's TFAP is much the same with the difference that it pays less attention to social and ecological issues in its summary of the deforestation problem.

• Thematic studies cutting across several countries and regions

The country/regional case studies described above should cover the principal issues associated with deforestation. However, given their specific geographical locations and limited empirical scope, many issues are unlikely to be covered adequately. Furthermore, it would be desirable to bring together readily available information and analyses from regions where no case studies are planned (e.g. Côte d'Ivoire/West and Central Africa and Viet Nam/South-East Asia). Thus, the preparation of a few reports on selected topics by qualified specialists could be useful. These thematic studies could largely be based on secondary sources, but may require a limited

degree of field research in some cases. The issues not yet investigated systematically in the literature but suitable for thematic studies could include: comparative analyses of property régimes and land tenure systems in relation to deforestation; development strategies and their impacts on deforestation; debt burden and deforestation with emphasis on 'debt for nature swap' experiences; bio-diversities and human welfare issues; socio-economic and environmental impacts of creating national parks and forest reserves; forestry intervention measures and rural social conflicts; examination of farm forestry projects with regard to employment, subsistence and cash income; etc.

- **Global overview report**

Besides country case studies and those on theme-specific issues, an overview report, reflecting a macro-level global perspective focused on the project's objectives, would be essential in presenting a more comprehensive picture of the social dynamics of deforestation in developing countries. This overview report will be prepared based upon secondary information, consultations with experts and the findings of the case study and theme specific research.

Concluding Observations

A main conclusion of this preliminary review of the literature is that the central issue in the social dynamics of deforestation in developing countries is not how to halt deforestation but rather how to control it in order better to meet the social goals of more equitable and sustainable development. Some deforestation is inevitable if the historical process called 'development' proceeds. 'Development' implies economic growth and higher average incomes with increasing demands for renewable and non-renewable forest resources. It will be accompanied by expanding populations in most regions during the foreseeable future, which puts further pressures on forests. The issue is how humankind in general and national and local societies in particular can resolve the competing and other conflicting interests and aspirations of different social classes and groups, and of yet unborn generations, with less damaging ecological and social consequences in the future than in the past.

This issue is primarily political; the resolution of conflicting interests is the essence of politics. It raises fundamental ethical/philosophical questions as well as many thorny technical ones. How these questions are answered may influence, or rationalize, the political decisions that are eventually taken.

Whether the preservation of the environment should be regarded as an objective of human existence or merely as a means for human enjoyment and survival has been an ethical concern in many cultures since time immemorial. It remains very much a live issue today. Differences of opinion about this issue have even split environmental movements in some industrialized countries. Are we stewards of 'nature', or its masters? Should the maintenance of biodiversity and the protection of the environment more generally be

treated as an end in itself or only as a means to promote economic growth towards richer and more sustainable human societies? This is not a question that can be answered by empirical research.

Within the tradition of scientific rationality, that has increasingly dominated intellectual life nearly everywhere since the 'enlightenment', there has never been complete agreement that commodity prices should be taken as an ultimate guide in determining the value of natural resources to society. After the formulation of the laws of thermodynamics over a century and a half ago (recognizing the 'law of entropy'), many scientists from diverse disciplines have argued that it would be more rational to evaluate the efficiency of natural resource management systems in terms of their energy yields per unit of energy input instead of in terms of costs and benefits measured by commodity prices. Even Jevons, a leading founder of modern neoclassical economics, was alarmed by the depletion of high quality British coal reserves being rapidly exploited in response to market signals. By an energy balance calculus, peasant farming systems are much more efficient than modern high-input capital intensive ones. Also, traditional forest use systems are much more efficient than modern ones by this criterion. The ethical implications of the energy flow approach, like those of the economistic one, are inherently ambiguous, but they could be interpreted to require more equalitarian social relations as it posits proximate 'limits to growth'. The economistic approach is currently dominant, but it is not a foregone conclusion that it will remain so in the future (Martinez Alier, 1989). While this is not an issue for the present research, the energy flow implications of deforestation processes and of proposed alternatives should be considered.

If one accepts the economic calculus of monetary costs and benefits as being the best tool available for evaluating alternative uses of forests and other natural resources, the difficult questions multiply. How should one value externalities such as the effects on climate of greenhouse gases generated by burning tropical forests? More down to earth, what value should be placed on the livelihoods, and often on the lives, lost by indigenous peoples uprooted by deforestation? How valid historically are the 'individualistic assumptions' that lie behind neoclassical economic theory? What practical use are economic theorems that 'prove' secure property rights, no matter to whom they pertain, would assure an optimum use of resources in a dream world of benevolent government with 'perfect markets', assuming perfect information, perfect competition and no 'transaction costs'? (Nalebuff, 1990). How should the demands of unborn generations be adequately taken into account in present-day decisions affecting the environment? Should tropical forests be treated as renewable or non-renewable resources? In the final analysis costs and benefits accrue to real people, classes and institutions. Who pays and who benefits is the key question?

A recent IMF paper on environmental issues begins by saying that "...market failure, policy failures, and population pressures are major sources of environmental degradation...."(Muzondo et al., 1990). This formulation has the merit of calling attention to the

frequently destructive role of two (but only two) very important human institutions, the market and the state, although to attribute their environmentally destructive roles to 'failures' suggests a somewhat utopian vision of their realities and potentials. Markets and policies have contributed in no small way to the environmental disasters now confronting societies everywhere as well as to present-day social systems that have left one quarter of the world's population in dire poverty, many living on the brink of starvation. They have stimulated the slave trade, colonialism, countless wars and disastrous economic depressions with mass unemployment in addition to many much more positive developments. Given this history of the last five centuries, what should one expect from states and markets? To call their contributions to environmental degradation 'failures' instead of regarding them as normal occurrences is charitable at best and Orwelian doublespeak at worst.

Blaming human institutions for deforestation is a significant analytical advance over reducing its final causes to population growth, poverty or sumptuous consumption. But one must go much further in order to produce information useful for social groups negatively affected by deforestation and potentially capable of influencing the state, markets and other relevant institutions.

This is why UNRISD proposes to include country/regional case studies involving local level appraisals and thematic studies in its research on the social dynamics of deforestation. Analysing how real societies resolve (or fail to resolve) conflicting interests in their use of forest resources in concrete situation, what the consequences of their solutions are, and what the alternatives seem to be, have to be studied in specific contexts. The results of such research can possibly generate some of the information required for these societies to reconcile such conflicting interests in the use of forests (locally, nationally and internationally) in more equitable and sustainable ways in the future.

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