Afforestation and reforestation in the clean development mechanism of the Kyoto Protocol: implications for forests and forest people

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Abstract: The social and environmental implications of plantations in the CDM are analysed under a hypothetical *laissez faire* approach and a proactive approach to Sustainable Development (SD), bounded by existing COP7 agreements and efficiency and equity considerations. Implications for timber rich, timber depleted and inherently timber poor regions are assessed. The social risks of industrial plantations cannot be fully addressed under COP7 rules and are likely to be highest in timber rich regions under repressive regimes or where politics dominate the forestry sector. Risks could, however, be reduced through minimum standards for stakeholder consultation and favourable legal institutions. Low cost opportunities with multiple benefits exist and require information dissemination, but some opportunities for biodiversity benefits will need financial support. Reduction of transaction costs would increase the participation of small holder plantations but their role is likely to remain limited. Inclusion of assisted natural regeneration opens up opportunities for options with multiple benefits

Keywords: Sustainable development; environmental externalities; social externalities; transaction costs; Kyoto Protocol; clean development mechanism; plantations; afforestation; reforestation.

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1 Introduction

Under the agreement reached at the Seventh Session of the Conference of Parties to the UN Framework Convention on Climate Change in Marrakesh (COP7) industrialised countries will be able to meet a part of their emission reduction commitments under the Kyoto Protocol [1] by financing Reforestation and Afforestation activities (AR) in developing countries through the clean development mechanism [2]. The maximum amount of commitments that can be met through AR activities in developing countries is 1% of the investing country's 1990 emissions times five [2]. The role of forests as a climate change strategy has, however, long been controversial and is believed to be one of the 'crunch issues' that led to the failure to reach agreement at the earlier meeting (COP6) at The Hague [3]. In this paper I focus on one aspect of the controversy: the environmental and social implications of AR in the Clean Development Mechanism (CDM). At COP7, Subsidiary Body for Scientific and Technological Advice (SBSTA) was given the responsibility of developing modalities for addressing socioeconomic and environmental concerns about AR [2]. Therefore, an analysis of the implications for forests and forest peoples could make a timely contribution to the clarity of the debate.

Considerable uncertainty exists about the definition of AR. At COP7, SBSTA was also given the responsibility for developing definitions for AR activities in the CDM [2]. For the purposes of this paper, I assume that the definition agreed at COP7 for AR activities in industrial countries provides a plausible indication of the definition that may eventually be agreed for the CDM. According to this definition, AR comprises human induced conversion of non-forest land through planting, seeding and/or human induced promotion of natural seed sources. Forests are defined as having a tree crown cover greater than 10%. Afforestation and reforestation differ only in that the activity will be afforestation if the land on which it takes place had not been forested for at least 50 years, whereas reforestation refers to land that did not contain forest before 1990 [2].

Activities such as the establishment of mono-specific or multi-species plantations for wood and non-wood products appear to be compatible with this definition, as are both industrial and community-based plantations. The definition also, apparently, is compatible with the establishment of estate crops, such as oil palm. Two points, particularly significant for forests and local communities, should be highlighted. First, plantations established after cutting down forests would not qualify under this definition. Plantations would however qualify if established on grasslands, agricultural lands or degraded forest land with less than 10% canopy cover. Secondly, Assisted Natural Regeneration (ANR) of forests is included. In this aspect the definition differs from the definition of AR put forward by the International Panel on Climate Change [4].

The Kyoto Protocol states that CDM projects should assist developing countries in achieving sustainable development [1]. Indigenous communities have, however, participated actively in COP 6 and COP7 to point out the dangers they face from AR projects [5,6]. A number of studies have also pointed out the social and environmental risks of adopting an unregulated market-based approach to AR activities [7–9]. COP 7 clearly opens the door to addressing these concerns by giving SBSTA the responsibility for developing modalities for taking into account the socioeconomic and environmental impacts of including AR activities in the CDM. COP 7 also lays down specific rules for the sustainable development clause. It specifies that it is the host country's prerogative to confirm whether or nor a project contributes to

sustainable development [2]. Projects are specifically instructed to invite comments from local stakeholders and to report how they plan to address them. Projects will also have to provide documentation on the environmental impact of AR projects, including impact outside project boundaries. If negative impacts are considered to be significant by project participants and the host country, an Environmental Impact Assessment (EIA) will have to be carried out, the results of which will be in the public domain [2]. Procedures for impact assessment will be determined by the host country. SBSTA's recommendations will clearly have to be within the bounds of these rules.

In order to identify the environmental and social issues that need to be addressed, I first analyse implications for forests and forest peoples under a hypothetical *laissez faire* approach to sustainable development, i.e under a scenario where interference in carbon market transactions is minimised. Based on the concerns identified in this analysis, I then put forward certain proactive measures that could be implemented within the bounds of COP7 rules. I refer to this as the 'bounded proactive approach'. Finally, I highlight risks and lost opportunities that will be difficult to address within the bounds of COP7 rules.

2 Categorisation of regions by forest resources

The impact of a *laissez faire* approach, compared to a bounded proactive approach, will clearly be contextual. I analyse, therefore, three broad categories of regions in the developing world: regions with forests rich in timber resources, regions where forests are depleted and degraded and regions where the natural vegetation has little or no commercial timber. In doing so, I draw on the forest use intensification continuum developed by [10].

Forests in most regions in the first category are typically being heavily exploited for timber (such as most *dipterocarp* forests of Indonesia and Malaysia) or are increasingly being subjected to extraction pressures (such as the Amazon and Congo basins). Because these regions are at a relatively early stage of the forest use intensification continuum, land rights are often unclear and overlapping. This combined with the valuable timber in these forests results in a high degree of conflict among stakeholders, such as the logging and plantation industries, local communities and large scale farmers and ranchers.

The second category consists of regions where once rich forests have been depleted of their timber wealth. Typically, the scarcity of forests has induced logging bans in natural forests. In some cases interest in reforestation is beginning to emerge. Population densities are high. Natural forests are no longer of interest to the timber industry. As a result, local communities tend to have greater control of forest resources than in regions with rich forests. A number of examples in this category are found in India and China.

The third category consists of regions where the natural vegetation is inherently low in commercial timber values. Soils are of intermediate or low productivity. Population densities are typically low. Examples of this category are the savannas of Southern Africa and Latin America and the coastal savannas of central Africa.

3 Social and environmental impact under a *laissez faire* approach

I argue in this section that fast growing industrial plantations are likely to dominate under a *laissez faire* approach and that their environmental and social implications are likely to be highly variable.

3.1 Likely dominance of industrial plantations

Forestry plantations. Plantations of fast growing species in developing countries are today achieving quite high rates of growth. Actual yields achieved by eucalyptus species in commercial enterprises in a number of Latin American countries are, for example, conservatively estimated to be 16–25 m^3/ha/year, although yields as high as 45 m^3/ha/year have also been reported [11]. This is also the sector where the most spectacular increases in growth rates have been achieved. For example, genetic improvements are reported to have doubled tree growth rates in some areas of Brazil, such as Aracruz [12].

The area under commercial plantations has increased rapidly in developing countries, with annual rates of plantation establishment estimated to be around 4 million hectares per year [13]. Concerns have been raised that the establishment of industrial plantations may not, therefore, qualify for credits because they are not 'additional', i.e. it may be difficult to justify that planting would not have occurred in the absence of the CDM project. An extremely high proportion of existing plantations have, however, been established by governments or under aid programs or under financial incentives to the private sector [11]. The implication is that in many cases the rate of return (after accounting for risk) is insufficient to initiate planting in the absence of some degree of non-commercial intervention. Additionality, therefore, could be justified in many cases and particularly in degraded lands, where plantation yields are likely to be lower and establishment more difficult. Calculations of the financial profitability of a pulpwood plantation established on *imperata* grasslands in Indonesia show, for example, that the net present value of the first rotation is negative at interest rates of 5% or higher, even when yields are assumed to be as high as 25 m^3/ha/year [14].

Existing estimates of the cost-effectiveness with which industrial forestry plantations could supply carbon sequestration services suffer from a number of methodological difficulties. In particular, few take account of the possibility of leakage (i.e. the possibility of carbon sequestered by plantations within project boundaries being leaked out in carbon releasing activities outside project boundaries). This could occur, for instance, if people displaced by industrial plantations clear forest elsewhere for agriculture or pasture. Nor do most estimates make adjustments for the likelihood that plantations are unlikely to be maintained permanently, while projects in the energy sector, by contrast, reduce emissions permanently. Methodologies for achieving equivalence between non-permanent forestry projects and energy projects, such as tonne years or expiring certificates of emission reduction [15,16] would likely result in forestry credits being earned at a lower rate or being sold at a lower price [4]. Subject to these caveats, results from China, Thailand, India and Brazil [17,18] indicate that the cost of carbon sequestration by fast growing industrial forestry plantations could in many cases be <$5/tC, particularly if carried out in lands with few opportunity costs. Even if the above figures underestimate cost for the reasons given above, they are well below many

of the indicative estimates of the market price of carbon during the first commitment period. Under various assumptions about profit maximising sales of surplus emissions by Economies in Transition and/or banking of credits for the second commitment period in the hope of US ratification, market price estimates fall mainly within the range of about $8/tC to $40/tC [19,20].

Oil palm plantations. Oil palm plantations on agricultural or degraded land offer another carbon sequestration opportunity. In Sumatra, Indonesia for example, the time averaged carbon stock of oil palm plantations is estimated to be 52t/ha higher than that of continuous cassava degrading to *imperata* grasslands [21]. Although oil palm has expanded aggressively in countries like Indonesia and Malaysia, the industry has been supported by incentives. Additionality may also not be difficult to establish at the current time because palm oil prices are at historical lows. In Indonesia, in particular, many firms in the oil palm industry are technically bankrupt because of foreign currency debts. This has reduced rates of expansion in the oil palm sector, which declined by 33% in 1999 compared to 1997 [22].

Renewable energy. One interesting possibility is the potential for synergies between plantation based industries and renewable energy. The Malaysian government, for example, is subsidising the use of palm oil as a renewable source of energy. Another possibility is the gasification of residues from the pulp industry. The gasification process doubles energy output per unit of biomass [18]. Estimates from Brazil indicate that the cost of gasification projects could be <$5/tC, although they may be viable only in remote areas [18]. To the extent that biomass fuel substitutes for fossil fuels, oil palm and pulp plantations which are used to produce renewable energy would reduce emissions permanently and would therefore qualify for credits at rates much closer to projects in the energy sector. This would significantly increase the competitiveness of oil palm and pulp plantations relative to other types of forestry projects.

Attractiveness to host county governments. Industrial forestry and oil palm plantations could be of great interest to some host county governments because of the potential for meeting domestic fibre and edible oil requirements and also for earning export revenues. Renewable energy, for example, would help countries to adopt more sustainable patterns of energy use and reduce their dependence on imported fossil fuels. In Indonesia export earnings from plantations have been substantial. For example, palm oil brought in $1.4 billion in foreign exchange in 1997 [22]. Pulp and paper generated $2.65 billion in export earnings in 1999 [23]. Although, in some cases, subsidies given to these industries may outweigh export revenues, exchange rate pressures and political alliances between government and industry could induce some governments to approve projects that benefit these industries [22,23].

Industrial plantations may therefore receive support from governments in all three categories of regions described above. Opportunities for benefits are particularly great in regions inherently low in timber resources, particularly in regions with low population densities and lands of intermediate productivity that are unsuitable for permanent agriculture but adequate for plantations [24]. Examples are the savannas of Latin America and east and southern Africa and the coastal savannas of central Africa. In areas with depleted forests, although land for large-scale plantations may appear to be scarce because of high population density, large extensions of land are under the control of governments in some countries in this category. Also, because of massive gaps in domestic fibre requirements and supply, reforestation is often a corner stone of government forestry policy. In China, for example, almost 130 million ha of government

controlled 'degraded' land is available for reforestation [25]. In India, 11 million ha of degraded forest land with a crown cover of <10% is under the control of the Forest Department. Almost 94 million ha of non-forest land (including private land) is estimated to be degraded [26]. These lands would provide forest-based industries with opportunities to establish CDM supported industrial plantations to meet raw material requirements. In areas with rich forests, on the other hand, the typical unclear land tenure systems could create land conflicts which would impede successful plantation establishment. As I show later, however, this has not prevented aggressive expansion of plantations in some of these areas, particularly under repressive regimes.

3.2 Highly variable environmental and social implications of industrial plantations

Environmental impact. Most environmental concerns relate to extensive blocks of plantations [27]. Studies show that large blocks of fast growing eucalyptus planted on previously treeless ground may reduce water yield and lower water tables in catchments, particularly in semi-arid areas. In wetter areas, surface run-off and the risk of sheet erosion is greater under eucalyptus compared to shrub land or grassland [27]. The impact on soil fertility is less clear. In general it appears that, although eucalyptus can impoverish soils, it has also been shown to increase soil nutrients and improve soil structure when planted on degraded sites [28]. The impact on biodiversity appears to be site specific. On infertile soils in dry climates eucalyptus plantations tend to have little biodiversity, because often no understory develops [27,28]. On the other hand, in the case of plantations established in the coastal savannas of Central Africa, a range of herbaceous and woody species were found in the understory and fauna were richer than in the savannas they replaced [29].

Many of these concerns may not be addressed in a *laissez faire* approach. Where, however, certification is widely in use as a strategy for maintaining market share (as in the case of export oriented plantations in South Africa), it could be a powerful mechanism for addressing many of these concerns. Certification is unlikely to be an effective tool, however, in the case of plantations producing for domestic markets, such as plantations supplying the charcoal industry in Brazil.

Turning next to the impact on natural forests, CDM forestry plantations could reduce pressure on natural forests for forestry products, particularly pulpwood and Oriented Strand Board (OSB). The significantly higher commercial timber productivity of plantations relative to natural forests implies that a higher proportion of forests could be set aside for environmental, recreational and local uses [12,30]. Globalisation and trade in forest products makes it possible to locate plantations in areas best suited for this purpose, such as savannas with low population densities.

The relationship between industrial forestry plantations and natural forests may, however, be more complex than appears at first glance, particularly in regions with forests rich in timber. In many cases CDM projects, which ostensibly would reduce pressure on natural forests, may in the longer run have the opposite effect. In Indonesia, for example, in 1999 only 8% of the 100 million cubic metres consumed by the processing sector came from plantations [23], most of the rest being obtained by cutting down natural forests. Estimates indicate that, if plantations were established, the amount of forest slated for conversion could be reduced by about one million ha [23]. In theory,

pressures on natural forests, either at home or abroad, could also be reduced if CDM support were used to speed up plantation establishment in other countries, such as Malaysia and China, where pulpwood capacity is increasing rapidly and suitable species are still available in natural forests within the country or abroad, but within economic distance of processing facilities. In practice, however, the extent to which such a strategy would result in genuine long-term reductions in deforestation pressures may be questioned. There is a risk that processing facilities would be supplied from natural forests if CDM-supported plantations were abandoned when the project ends [7,8]. This is particularly likely where raw materials can be obtained more cheaply from natural forests.

It is also highly plausible that CDM support to the pulp industry would increase their political influence and enable them to pressure the government into allowing processing capacity to expand beyond what could be supplied from CDM plantations, resulting in industries being fed once more from natural forests. Examples of the lobbying power of export industries are well documented, for example, in the case of the plywood industry in Indonesia [31] and the soybean industry in Brazil [32]. Although the negative effect of such lobbying on forests should theoretically be captured under leakage and therefore fail to earn credits, in practice it may be difficult to convincingly establish the impact of factors such as these or to take them into consideration in carbon accounting

Social impact. In very marginal agricultural areas, plantations can generate a significant amount of employment for local communities. Forestry plantations, for example, are estimated to require 70 days per ha of establishment labour on grasslands and up to 400 days on steep terrain [33]. Given that CDM plantations are likely to follow rotational harvesting in order to maintain carbon levels, demand for establishment labour is likely to be maintained. Outgrower schemes with local communities in South Africa, Philippines and India have also in many cases injected capital, technical knowledge and access to inputs in marginal areas. Outgrower schemes are, however, opposed by many NGOs and local communities today because marketing only to the sponsoring industry results in lower output prices [34].

The most significant social risk is that industrial plantations supported by CDM funds could exacerbate existing disparities in land distribution and deprive communities of customary land rights and livelihood needs [8]. There are well documented cases in the literature where governments in Asia and Latin America have given plantation concessions on land traditionally held by local people [35,36]. Tenure conflicts are a common feature of plantations in many parts of the world where land has been acquired through intimidation or insufficiently compensated [7,33,37,38]. In many cases, ‘degraded’ areas targeted for CDM plantations may be common property resources used by local people, particularly the poorest households, for a variety of uses such as fuel supplies and grazing, which diversify livelihood strategies [39].

Social risks are probably greatest where rural land tenure is unclear and land conflicts are endemic, a situation commonly found in timber rich regions. Negative social impacts are likely to be even higher when these conditions occur where governments are repressive, governance is poor and strong economic and political alliances exist between the government and the timber industry. However, even where reforms to empower local communities are underway, the prospect of foreign investment, export earnings and tax revenues from industrial plantations may make it difficult for host countries to resist the lobbying power of the industrial plantation sector, at the expense of the welfare of local communities. A high profile case in Indonesia today highlights this dilemma. Under

pressure to prop up the currency and restore investor confidence, the ministry of finance is contemplating authorising the sale of oil palm plantations for $368 million to a foreign company, although the land is disputed by the Indonesian Association of Farmers [40]. This graphically illustrates potential risks to local communities under an unregulated market-based approach to sustainable development.

3.3 Benefits of community plantations

Some of the risks to local communities described above could be reduced if CDM were used to support community plantations on lands of rural small holders. This is primarily because, in these cases, participation by communities would be voluntary and communities would retain ownership of their land.

The Scolel Te pilot carbon project in Mexico has, for example, assisted small scale farmers in planting pines in their fallow lands. The project is notable for strong input by communities into the types of systems established on their farms. Farmer representatives are included in the governing body of the project. The Profafor pilot carbon project in Ecuador, has helped smallholders establish 23,000 ha of plantations of pine, eucalyptus and mixed pine and indigenous species. Plantations were predominantly established on land with few opportunity costs, such as steep slopes and degraded pastures [41].

Both projects appear to have provided significant benefits to local communities so far. In the Scolel Te project, as much as 75% of funds received from investors have gone directly to farmers. In addition to covering cash costs of establishing pines, farmers have used these funds for purchasing food and medicines and improving their houses [42]. In the Profafor project, almost all communities have been able to cover establishment costs from project funding and have used surplus funds for food, credit schemes and livestock [41]. The project also generated 600,000 days of employment and provided communities with 26 nurseries producing 20 million seedlings and capacity building in nursery and plantation management [43].

In the longer term, commercially oriented smallholders are likely to prefer exotic timber species. These species are generally more financially profitable under the high discount rates of smallholders. In the Profafor project, for example, while pine and eucalyptus are estimated to be profitable at discount rates of 15% to 20%, indigenous species give negative returns [41]. In Tigray, Ethiopia, eucalyptus have been shown to give higher returns to local communities than slower growing indigenous species, under certain biophysical and socioeconomic conditions [44]. Significant opportunities also exist for community based eucalyptus plantations producing fuelwood and timber for local products, particularly in regions where natural forests have been depleted [26].

Studies have also identified conditions under which small scale plantations of non-timber forest products could provide significant benefits to local communities [45]. In Anji County, China, for example, bamboo plantations were identified as the best income generating option for middle income farmers [46]. Support from CDM projects may enable poorer farmers to also benefit from bamboo.

Environmental risks of plantations tend to be highest when they occupy extensive blocks [27]. Community plantations may, therefore, pose fewer environmental risks if they occupy smaller areas than industrial plantations and are located within a mosaic of different land uses, such as natural forest patches, forest gardens, pastures and agricultural land. This is the case in the Scolel Te project where project areas of

individual farmers are, in some cases, as small as one ha. In the Profafor project, although plantation plots are larger (46 to 600 ha), under new regulations the area under plantations is being limited to a maximum of 50% of the total property of the participant [41]. Where small scale plantations pose environmental risks, they can often be ameliorated by technical knowledge, such as not planting too close to water sources or crops [44].

3.4 Limited role for community plantations in the CDM

There are, however, several reasons why community plantations are likely to play a relatively small role relative to industrial plantations in the CDM under a *laissez faire* approach.

First, interest in tree planting develops under certain rather limited conditions. Population densities have to be sufficiently high, products from natural forests sufficiently scarce and land tenure sufficiently secure [47]. Even where these conditions exist, for example in many forest depleted regions, government policies often act as a deterrent to tree planting. In parts of China, for example, timber trees have been established by communities on only 20% to 50% of allocated land, in spite of strong land tenure incentives, because of unfavourable policies such as bureaucratic restrictions and monopoly purchases of timber by state owned timber companies [48]. In addition, the poorest households often have no land to plant trees [47].

Secondly, the limited data available indicate that the cost of carbon sequestration by community plantations may be significantly higher than sequestration by industrial plantations. This is partly due to the higher opportunity cost of land on small farms. Estimates from the Scolel Te project area, for example, indicate that farmers may have to be paid more than $30/tC if reforestation were to replace agriculture [49]. Data from Thailand show that, in a year in which Net Present Values (NPV) of industrial eucalyptus plantations were $1169/ha, production of eucalyptus in community woodlots gave a NPV of –$43/ha [50]. Even in the Profafor project, where the opportunity cost of land is relatively low, the cost of carbon sequestration is estimated to be $16/tC [43]. Thus a higher level of compensation may have to be paid to smallholders for establishing plantations.

Another factor is that transaction costs (i.e. the cost of doing business) [51] may be higher on projects with smallholders. This is partly because the size of these projects is expected to be smaller. Thus transaction costs, such as marketing, which vary little with project size, are likely to be higher per unit of emission reduction. Also, the transaction costs of organising and negotiating with large numbers of smallholders may be higher than dealing with one large scale operator. In the Scolel Te project these costs are estimated to range from $52/ha for communities with positive experiences with past projects to as high as $325/ha for communities characterised by social conflict [49]. Other transaction costs, such as carbon monitoring costs, may also be higher in projects with communities. In the Profafor project, monitoring and certification costs are estimated to be $5/ha/year [43]. Although comparable costs are not available from large scale plantation projects, arguably they would be lower than on small dispersed farms with variable land uses.

Table 1 summarises the environmental and social impacts of a *laissez faire* approach.

Table 1 Impacts on forests and forest peoples under a hypothetical *laissez faire* approach to sustainable development

	Timber rich regions	*Timber depleted regions*	*Inherently timber poor regions*
Fast growing industrial plantation			
Potential scale	Extensive under repressive regimes and those under macro economic pressures	Significant areas in government controlled land and under contract farming	Widely applicable Particularly extensive where opportunities for biofuels exist
Contribution to export revenues	High	Low	High
Contribution to domestic requirements	High	High	Low
Impact on biodiversity/soils/water	Risk of erosion and run-off, but could be moderate if certification becomes widespread	Negative in site-specific situations	Negative hydrological and biodiversity impact in dry areas, but could be moderate if certification becomes widespread
Impact on natural forests	Potential for negative impact (increased political power of timber industry)	Neutral to positive	Significant contribution towards reducing pressure on natural forests abroad
Employment for local communities	Increase in marginal agricultural areas		
Impact on equity	Negative: dispossession of traditional lands of local communities and competition with multiple use forestry of local communities, particularly under repressive regimes with unclear property rights	Dispossession less likely than in forest rich regions, but competition with multiple use systems likely	Negative impacts less likely than in timber rich regions.
Community Plantations			
Potential scale	Moderate, but low relative to industrial plantations	Moderate, but low relative to industrial plantations	Limited areas
Environmental impact	Fewer risks than industrial plantations		
Social impact	Positive in most cases particularly for commercially oriented small holders		

4 The bounded proactive approach to sustainable development

Host country sovereignty about the determination of sustainable development is based on the assumption that national governments make decisions based on the interests of the country's inhabitants. Therefore, it is assumed that if a host country chooses to participate in a CDM project it will do so because the full benefits of the project outweigh the full costs, with full benefits and costs interpreted to include economic costs and benefits (net of distortions such as subsidies and taxes), as well as environmental and social benefits and costs, accruing both to project participants and to the inhabitants of the country at large. Proactive measures would be justified if various imperfections exist, as a result of which project choice by host countries may not always be based on assessments of full costs and benefits. For example, it might be costly for host countries to acquire information on the full costs and benefits of projects. This would justify proactive measures to reduce the cost of information and prevent inappropriate choices [51]. In other cases, host countries may choose to ignore global benefits that accrue largely to the world community, particularly if the costs are borne primarily by the host country. In this case interventions would be justified to compensate for 'missing markets' for global environmental services, such as biodiversity conservation [52]. Governments in host countries may not always act in the best interests of their inhabitants, because of power imbalances. Interests of powerful constituencies for example may take priority over the interests of disadvantaged groups [53]. In this situation interventions to protect the interests of the poor would be in accordance with widely supported concepts of sustainable development [54–56]. The existence of transaction costs also justifies proactive measures in the interests of efficiency [57]. Transaction costs reduce the gains from carbon trading and, therefore, the scope for reducing emission reduction costs. If, as I argue earlier, transaction costs are higher for community based projects, reduction of transaction costs would also have beneficial equity implications. I discuss measures to address each of these imperfections below.

4.1 Widespread dissemination of information and capacity building

Widespread dissemination of information could result in more informed choices about project choice, project design and project location. Capacity building would reduce the cost of acquiring new information. These measures need to be directed not only to host governments, potential investors and project partners, but also to civil society at large to enable them to play a 'watch dog' role. Particular attention needs to be given to disadvantaged groups such as local communities and women, for whom the cost of acquiring information is often disproportionately high. I discuss three types of information that could be particularly useful.

Project choice. In the discussion above I highlighted the conditions under which industrial and community plantations pose the fewest risks and are likely to provide the most benefits (Table 1). More specific information of this nature could enable host countries and project participants to make more informed decisions about project choice. For example, social benefits could be increased by prioritising plantations to regions where countries are already creating enabling environments for smallholder plantations. The Joint Forest Management (JFM) program in India, for example, has increased participation of communities in land management decisions, increased stability of tenure and introduced measures to reduce fuelwood demand, through the development of

improved stoves and biogas plants [26]. In some areas of China, stabilisation of policies on land tenure has stimulated farmers to spontaneously develop collaborative institutions to capitalise on economies of scale in marketing timber [48]. If targeted to supportive environments, CDM supported plantations could leverage the proactive efforts of governments and local communities.

Clearly, however, in many situations projects will involve trade-offs, which national governments will have to assess against their priorities for sustainable development. For example, as discussed above, under some conditions industrial plantations may have the potential to contribute to export earnings but may have a high risk of negative environmental and social impacts. Frameworks for assessing the overall contribution of CDM projects with multi-dimensional risks and benefits are, however, available [58] and building capacity for using such methodologies may contribute to better project choice.

Low cost opportunities for multiple benefits. Dissemination of information on low cost opportunities may be particularly fruitful, because they are more likely to be readily adopted. For example, if the definition of AR in the CDM eventually includes assisted natural regeneration, this will present a number of cost-effective opportunities for multiple benefits, because the cost of assisted natural regeneration is often substantially lower than the cost of planting. For example, multispecies forest gardens established by smallholders through both planting and assisted natural regeneration would become eligible for CDM support. Many of the methods used to stimulate natural regeneration are relatively low cost, such as selective weeding of undesirable species to favour naturally regenerated saplings of desired species [59]. Forest gardens established in these ways are in many cases rich in plant species, mammals and birds [60] and contribute to significant benefits for local communities. In Indonesia, for example, forest gardens provide 50% to 80% of the cash incomes of farm households and contribute to a diverse range of livelihood strategies [59,61].

While exotic species are often more financially profitable for commercially oriented farmers, women and poorer sections of the community often prefer multispecies plantations including indigenous species because of their higher potential for providing a range of subsistence products [34]. Benefits would be particularly high in regions with depleted forests. Thus a high degree of involvement of women and the poorest inhabitants may provide opportunities for both equity and biodiversity benefits. As harvesting rates are often lower on subsistence plantations, carbon benefits may also be higher, even though indigenous species are often slower growing. The Profafor project estimates, for example, that the carbon benefits of indigenous species on small farms could be 2.2 times higher than those of exotic species [43].

A number of relatively low cost measures can also make significant contributions to reducing the negative impacts of industrial plantations on biodiversity. For instance, research shows that the conservation value of fragments is surprisingly high, particularly as benchmark habitats or as seed source for future restoration efforts [62]. Thus when establishing plantations, the retention of small areas of natural vegetation, such as riparian strips, could have significant biodiversity gains [62]. Measures such as these could be particularly valuable in savannas and also in regions with depleted forests.

Several countries with depleted forests, such as China, are embarking on massive programs for restoration of degraded forest ecosystems. While in some cases, restoration needs to be primarily based on planted species, in other cases natural vegetation will spontaneously colonise the site when pressures, such as grazing, are removed from

degraded areas [62]. If ANR is included, this could provide a low cost opportunity, but full participation of all legitimate stakeholders will be required to ensure that those who lose out from grazing restrictions are adequately compensated [63].

Project design. COP7 agreements include some rules on project design such as stakeholder consultation and documentation of environmental impact. Whether or not these rules are effective will depend critically on how they are implemented. Stakeholder consultation, for example, could go a long way towards addressing the social risks described earlier, provided appropriate procedures are followed and all legitimate stakeholders are consulted. A useful starting point for developing guidelines could be made by drawing on emerging standards of good practice. The ILO convention 169 [64], for example, puts forward principles on how stakeholder consultation should be carried out. More detailed guidance is also available, for example, on how to identify the most vulnerable stakeholders who are at the greatest risk of being excluded from consultation processes [65].

Considerable progress has also been made in recent years in obtaining broad agreement on principles for sound management of plantations. Forest Stewardship Council (FSC) members, for example, ratified such principles in 1996 [66]. Of particular interest are Codes of Practice that have been developed through collaborative efforts involving the private sector, in order to increase their practicality and relevance. This has been done in Indonesia, for example, by CIFOR (Center for International Forestry Research), national research institutes, local NGOs, the Ecolabelling Institute of Indonesia and a pulp and paper company [67] and by WWF and Shell in Thailand [68]. A code of practice has also been developed for India [69]. More initiatives of this nature and the wide dissemination of their results may induce some national governments to incorporate them as minimum standards for the acceptability of CDM projects. Alternatively they could use them to assess progress towards sound management and terminate projects that do not make adequate progress.

4.2 Financial and technical support for biodiversity conservation

Considerable information exists on ways in which plantations could be compatible with biodiversity conservation. Some of them, however, are unlikely to be adopted without proactive efforts.

Plantations could, for example, be foster ecosystems for regenerating secondary forests on severely degraded forest ecosystems [70]. Examples are the *Imperata* grasslands of South East Asia and the degraded pastures of Latin America. Research results from Puerto Rico demonstrate the need for careful selection of species, plantation design and management practices [70]. In particular, they demonstrate the importance of proximity to natural forests. Given the rarity of natural forests in such degraded ecosystems, this may reduce the scope for establishing large areas and thus reduce the financial attractiveness of such projects [70].

In areas with savannas or rich forests, careful spatial design of industrial plantations could contribute to biodiversity conservation. Plantation companies could for example, set aside corridors connected to larger tracts of natural vegetation as a strategy for conserving biodiversity [62]. While this may provide benefits in terms of pest and disease control, this may not be sufficient to compensate for the area forgone as plantations.

In cases similar to those described above, conservation agencies and multilateral bodies, such as the GEF (Global Environmental Facility), could support such practices by

providing technical assistance and covering the incremental costs of practices such as these that contribute to global environmental values.

4.3 Minimum standards for stakeholder consultation and enabling legal frameworks

While information dissemination and capacity building may be effective in reducing negative social and environmental impacts where politically empowered local communities and civil societies exist, additional measures need to be in place for situations where these conditions are absent.

Mandatory impact assessments with internationally sanctioned and nationally endorsed minimum norms or standards have been proposed as one approach for preventing investments flowing to countries with the most lax standards for sustainable development [71]. This will clearly not be possible for environmental impact assessments, given COP7 rules. However, such an approach is not explicitly excluded for social impact assessments. Given that stakeholder consultations are mandatory under COP7 rules and it is obligatory to report what measures have been taken to address stakeholder concerns, it may, arguably, be politically feasible to require minimum standards for such processes. Publication of the results of stakeholder consultations in the public domain would assist local communities to mobilise the support of watchdog bodies to prevent injustices. In addition, it would enable investors to select projects where social risks are unlikely to jeopardise project success.

Principles of a number of international conventions support local rights. Examples are the ILO Convention 169 [64] and the principles of the Biodiversity Convention's ecosystem approach [72]. While enforcing such principles has been elusive, an encouraging example is the recent ruling by the Inter-American Court of Human Rights that granted financial compensation to a community in Nicaragua whose land had been allocated to a logging company without the consent of the community and, therefore, in violation of international human rights laws [36]. The existence of relevant legislation on indigenous rights within the Organisation of American States and a history of several judgements favourable to the rights of indigenous peoples by the Inter-American Commission of Human Rights created an enabling environment for this outcome. Proactive measures by NGOs and organisations interested in poverty alleviation to create a similar institutional setting in Asia and Africa could help safeguard local rights in other regions as well.

4.4 Measures to reduce transaction costs

As pointed out earlier, reduction of transaction costs would be particularly beneficial to community plantations, because in their case these transaction costs are likely to account for a larger proportion of their total costs than in the case of industrial plantations. Thus, local communities could capture a larger share of the potential revenues from carbon trading and plantation establishment. At COP7 it was agreed that small scale projects (i.e. those whose annual emissions are less than 15,000 t CO_2) would benefit from simplified modalities for determining baselines and monitoring carbon emissions [2]. The development of modalities for achieving this without compromising the integrity of

emission reduction could make a useful contribution towards reducing the transaction costs of projects with small holders.

The share of community plantations is likely to increase most significantly in regions with depleted forests. Instead of CDM plantations being primarily industrial plantations on government controlled land, community plantations could play a greater role in meeting requirements for forest products and, in the process, provide communities with a more diverse set of livelihood options.

Other measures that have been proposed include the establishment of multilateral or national organisations to reduce costs of project development and marketing by providing analysis and advice to potential investors, host governments and private project developers [73]. These would particularly benefit small scale projects. Examples are the World Bank's Prototype Carbon Fund at the multilateral level, OCIC in Costa Rica at the national level and initiatives by independent non-profit organisations, such as the Face Foundation. Carbon projects could also be implemented in areas where development projects with small holders are already in existence. This could lower the costs of learning about the needs and priorities of a large number of small holders. This approach has been used by the Scolel Te project to reduce transaction costs.

Table 2 summarises how a bounded proactive approach could increase environmental and social benefits relative to a *laissez faire* approach.

Table 2 Impacts on forests and forest peoples under a bounded proactive approach to sustainable development: changes relative to *laissez faire* approach

	Timber rich regions	*Timber depleted regions*	*Inherently timber poor regions*
1 Information dissemination and capacity building			
Potential Scale	Reduction of area in industrial plantations highly variable	More multispecies community plantations	Little change
Environmental impact	More forest gardens if assisted natural regeneration included. Decline in negative impact of industrial plantations highly variable	Significant increase in multispecies community plantations. Significant increase in restoration of degraded forest ecosystems if assisted natural regeneration included. Reduction in negative impact of industrial plantations	Reduction in negative impact, particularly for export oriented plantations
Social impact	Decline in dispossession highly variable Communities benefit from forest gardens	Women and poorer sections of communities benefit from multispecies plantations Risks to poorer sections of community from grazing restrictions for restoration of degraded areas	Less impact than in other regions

Table 2 Impacts on forests and forest peoples under a bounded proactive approach to sustainable development: changes relative to *laissez faire* approach (continued)

	Timber rich regions	*Timber depleted regions*	*Inherently timber poor regions*
2 Financial and technical support for biodiversity conservation			
Environmental impact	Improved spatial design of industrial plantations for connectivity of areas of natural vegetation Restoration of degraded lands: plantations as foster ecosystems	Fragments of benchmark habitats and seed sources for future restoration conserved.	Improved spatial design of industrial plantations for connectivity of areas of natural vegetation
3 Reduction of transaction costs (TC)			
Potential scale	Moderate increase in area in community plantations	Major increase in community plantations	Less impact than in other regions
Social and environmental Impact	Communities capture a moderately larger share of carbon and plantation revenues. Some decline in negative environmental impact of industrial plantations	Communities capture a significantly larger share of carbon and plantation revenues	Less impact than in other regions
4 Minimum standards for stakeholder consultation. Enabling legal framework			
Potential scale	Significantly smaller area in industrial plantations. Somewhat larger area in community plantations (if combined with reduction in TC)	Significantly larger area in community plantations (if combined with reduction in TC)	Less impact than in other regions
Social and environmental impact	Significant reduction in social and environmental risks.	Increased likelihood of social benefits	Less impact than in other regions

5 Conclusions

According to the Kyoto Protocol, the CDM is a dual purpose mechanism intended to both enable industrialised countries to reduce emission reduction costs and also to contribute to sustainable development in developing countries. COP7 agreements open the door to proactive measures for promoting sustainable development by giving SBSTA the responsibility for developing modalities for addressing environmental and social implications of reforestation and afforestation projects. However, they also limit the extent to which proactive measures can be taken at the international level, by clarifying

that national governments will decide whether or not a project contributes to sustainable development.

I first identify social and environmental concerns that need to be addressed by analysing implications for forests and forest peoples under a hypothetical *laissez faire* approach to sustainable development. In the absence of any restrictions, industrial plantations are likely to dominate and contribute towards lowering the cost of emission reduction. The most significant social risks that need to be addressed are the risks of industrial plantations dispossessing local communities of their land and livelihoods. These risks are likely to be most serious where land conflicts are endemic and rural land tenure is unclear and overlapping, a situation that prevails in many timber rich regions. The analysis highlights the importance of the political dimension and argues that social risks are magnified where government regimes are repressive, governance is poor and strong economic and political alliances exist between governments and the timber industry. Even where reforms are under way, exchange rate pressures may lead governments to favour export oriented plantations at the expense of the poor. These social risks are unlikely to be fully addressed, given host country sovereignty over the determination of sustainable development. I argue in the paper that minimum standards for stakeholder consultations could go a long way towards addressing social risks and may also be politically feasible, given that stakeholder consultations are mandatory for all CDM projects under COP7 rules. Proactive efforts to create a favourable legal framework and supportive legal institutions at the regional level could also prevent injustices, examples of which are beginning to emerge in Latin America.

Negative environmental externalities are likely to be most serious in the dry savannas, particularly for plantations producing for the domestic market. CDM plantations within economic distance of raw material supplies from natural forests may also, in the longer term, increase pressures on natural forests. While dissemination of knowledge about best practices may address some local externalities, financial and technical support will be required to support global values, such as biodiversity conservation. Given such support, several feasible opportunities for biodiversity conservation are identified. If the SBSTA recommends the inclusion of assisted natural regeneration in the definition of afforestation and reforestation in the CDM, this would also create some low cost opportunities with multiple benefits which, if accompanied by information dissemination, have a good chance of being adopted.

CDM plantations in sparsely populated coastal savannas offer significant opportunities for reducing pressures on timber rich natural forests through trade, and are also likely to result in a relatively low level of both environmental and social externalities.

Social and environmental risks are likely to be significantly lower for community-based plantations. COP7 agreements on simplified baselines and monitoring for small projects will be particularly beneficial to projects with smallholders. Other proactive measures to reduce the transaction costs of projects with local communities are also given in the paper. The eligibility of assisted natural regeneration will also open up opportunities for community projects in areas with both rich and depleted forests. Nevertheless, the role of plantations with smallholders is likely to remain limited because the opportunity cost of their land is high and because of the limited conditions under which tree planting is attractive to smallholders.

The proactive measures discussed in the paper are justified on efficiency grounds, because they either reduce information costs or compensate for missing markets in global

environmental services. Other proposed measures are justified because they contribute to the well-being of the poor, a concept endorsed in international concepts of sustainable development. Many of the measures would require increased financial outlays by multilateral agencies (such as the GEF), national governments, conservation and development agencies and NGOs. They would also be likely to result in a reduction in the volume of transactions, because tradeoffs exist between cost-effectiveness and co-benefits. The merit of the measures is, however, that while they would not guarantee benefits for forests and forest peoples, they are likely to significantly increase the probability of positive outcomes and reduce the risks.

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References

1 UNFCCC (United Nations Framework Convention on Climate Change) (1997) 'The Kyoto Protocol to the Convention on Climate Change', *Climate Change Secretariat, Bonn, Germany.*

2 UNFCCC (United Nations Framework Convention on Climate Change) (2001) *The Marrakesh Accords & The Marrakesh Declaration*, http://www.unfccc.int./

3 IISD. (2000) 'Summary of the Sixth Conference of the Parties to the Framework Convention on Climate Change 13-25 November', *Earth Negotiations Bulletin*, No. 12 (163).

4 IPCC (2000) *Land Use, Land-use Change and Forestry*, Cambridge University Press, Cambridge.

5 Declaration of the First International Forum of Indigenous Peoples on Climate Change. (2000) Lyon, France, September 4–6.

6 Statement of the Indigenous Peoples and Local Communities Caucus to the Seventh Session of the Conference of the Parties, United Nations Framework Convention on Climate Change, Marrakech, Kingdom of Morocco, October 29 to November 9, 2001.

7 Fearnside, P.M. (1996) 'Socioeconomic factors in the management of tropical forests for carbon', in M. Apps and D. Price (Ed.) *Forest Ecosystems, Forest Management and the Global Carbon Cycle*, pp.349-61, NATO ASI Series I, Vol. 40, Berlin: Springer-Verlag.

8 Smith, J., Mulongoy, K., Persson, R. and Sayer, J. (2000) 'Harnessing carbon markets for tropical forest conservation: towards more realistic assessment', *Environmental Conservation*, Vol. 27, No. 3, pp.300–311.

9 Bass, S., Dubois, O., Moura-Costa, P., Pinard, M., Tipper, R. and Wilson, C. (2000) 'Rural livelihoods and carbon management', *IIED Natural Resource Issues Paper No. 1*, International Institute for Environment and Development, London.

10 Chokkalingam, U., Smith, J., de Jong, W. and Sabogal, C. (2001) 'A conceptual framework for the assessment of tropical secondary forest dynamics and sustainable development potential in Asia', *Journal of Tropical Forest Science*, Vol. 13, No. 4, pp.577–600.

11 Brown, C. (2000) 'The global outlook for future wood supply from forest plantations'*, Global forest products outlook study working paper series, Working Paper No: GFPOS/WP/03*, FAO, Forestry Policy and Planning Division, Rome, February.

12 Sedjo, R. (1997) 'The forest sector: important innovations', *Discussion Paper 97-42*, *Resources for the Future.*

13 Pandey, D. (1997) 'Major issues of tropical forest plantations', *Paper presented at the XI World Forestry Congress*, Antalya, Turkey, 13–22 October.

14 Kosonen, M., Otsamo, A. and Kuusipalo, J. (1997) 'Financial, economic and environmental profitability of reforestation of Imperata grasslands in Indonesia', *Forest Ecology and Management*, Vol. 99, pp.247–259.

15 Costa, P.M. and Wilson, C. (1999) 'An equivalence factor between CO_2 avoided emissions and sequestration – description and applications in forestry', *Unpublished Manuscript*.

16 Blanco, J. and Forner, C. (1999) 'Special considerations regarding the 'expiring CERs' proposal', *Paper presented in the International Forum on Enhancement of Japan's Private Sector's Overseas Re-afforestation Cooperation*, *Unpublished Manuscript*.

17 Hardner, J., Frumhof, P.C. and Goetze, D.C. (2000) 'Prospects for mitigating carbon, conserving biodiversity, and promoting socioeconomic development objectives through the clean development mechanism', *Mitigation and Adaptation Strategies for Global Change*, in press.

18 Austin, D., Faeth, P., Da Motta, R.S., Ferraz, C., Young, C.E.F., Ji, Z., Junfeng, L., Pathak, M., Srivastava, L. and Sharma, S. (1999) 'How much sustainable development can we expect from the clean development mechanism?', *World Resources Institute, Climate Notes,* November, Washington, DC.

19 Point Carbon (2001) 'The carbon market: status and prospects', *Presentation at COP7*, Marrakech, 8 November.

20 Grubb, M., Hourcade, J-C. and Oberthur, S. (2001) 'Keeping Kyoto. A study of approaches to maintaining the Kyoto Protocol on Climate Change', *Climate Strategies International Network for Climate Policy Analysis*.

21 Tomich, T.P., van Noordwijk, M., Budidarsono, S., Gillison, A., Kusumanto, T., Murdiyarso, D., Stolle, F. and Fagi, A.M. (Eds.) (1998) 'ASB (alternatives to slash-and-burn) in Indonesia', *Summary Report and Synthesis of Phase II, Report No. 8,* ASB, ICRAF South East Asia

22 Casson, A. (2000) 'The hesitant boom: Indonesia's oil palm sub-sector in an era of economic crisis and political change', *CIFOR Occasional Paper No. 29*.

23 Barr, C. (2000) 'Profits on paper: the political-economy of fiber, finance, and debt in Indonesia's pulp and paper industries', Forthcoming chapter in *Banking on Sustainability: A Critical Assessment of Structural Adjustment in Indonesia's Forest and Estate Crop Industries*, CIFOR and WWF, Macroeconomics Program Office.

24 Sayer, J.A., Vanclay, J.K. and Byron, N. (1997) 'Technologies for sustainable forest management: challenges for the 21st Century', *Commonwealth Forestry Review*, Vol. 76, No. 3, pp.162–170.

25 Deying, X. (1995) 'The potential for reducing atmospheric carbon by large-scale afforestation in China and related cost/benefit analysis', *Biomass and Bioenergy*, Vol. 8, No. 5, pp.337–344.

26 Ravindranath, N.H. and Somashekhar, B.S. (1995) 'Potential and economics of forestry options for carbon sequestration in India', *Biomass and Bioenergy*, Vol. 8, No. 5, pp.323–336.

27 Anon (1992) 'Eucalyptus: curse or cure? The impacts of Australia's 'world tree' in other countries', *ACIAR Bulletin*, Australian Centre for International Agricultural Research.

28 Davidson, J. (1985) 'Setting aside the idea that eucalypts are always bad', *Working Paper No. 10, May 1998, Project FAO/UNDP/BGD/79/017, Assistance to the Forestry Sector*, FAO, Dhaka, Bangladesh.

29 Laumeto, J.J. and Bernhardt-Revesat, F. (1997) 'La biodiversité dans les plantations d'arbres à croissance rapide au Congo', *Bois et Forêt des Tropiques*, Vol. 253, pp.57–61.

30 Victor, D.G. and Ausbel, J.H. (2000)' Restoring the forests', *Foreign Affairs*, Vol. 79, No. 6, pp.127–144.

31 Ascher, W. (1999) *Why Governments Waste Natural Resources: Policy Failures in Developing Countries*, The Johns Hopkins University Press, Baltimore, London.

32 Kaimowitz, D. and Smith, J. (2001) 'Soybean technology and the loss of natural vegetation in Brazil and Bolivia', in A. Angelsen and D. Kaimowitz (Eds.) *Agricultural Technologies and Tropical Deforestation*, CABI, Wallingford, UK, pp.195–211.

33 Morrison, E. and Bass, S.M.J. (1992) 'What about the people?', in C. Sargent and S. Bass (Eds.) *Plantation in Politics Forest Plantations in Development*, Earthscan Publications Ltd, London.

34 Shepherd, G., Arnold, M. and Bass, S. (1999) 'Current understandings, emerging issues and their implications for World Bank Forest Policy and funding priorities: a contribution to the World Bank Forest Policy Review Process', *Forests and Sustainable Livelihoods*, An Issues Paper, World Bank, Washington, D.C.

35 Potter, L. and Lee, J. (1998) 'Tree planting in Indonesia: trends, impacts and directions', *CIFOR Occasional Paper No. 18,* CIFOR, USAID.

36 Colchester, M. (2001) 'Forest industries, indigenous peoples and human rights', *Thematic Paper prepared for a workshop on Indigenous Peoples, Private Sector Natural Resource, Energy and Mining Companies and Human Rights,* Sub-Commission on the Promotion and Protection of Human Rights, UNCTAD, ILO and WTO Room 1X, Palais des Nations, Geneva.

37 Smith, J. and Scherr, S.J. (2002) 'Capturing the value of forest carbon for local livelihoods', *World Development* (in press).

38 FERN (2000) 'Sinking the Kyoto Protocol: the links between forests, plantations and carbon sinks', *FERN Briefing Note in Cooperation with Both Ends*, Fern, October, Moreton-in-Marsh, UK.

39 Jodha, N.S. (1986) 'Common property resources and rural poor in dry regions of India', *Economic and Political Weekly,* Vol. 21, No. 27.

40 Jakarta Post (2001) 21 March, Jakarta, Indonesia.

41 CIFOR (Center for International Forestry Research) (2001) 'Forest carbon, livelihoods and biodiversity', *A Report to the European Commission*, CIFOR & EU.

42 Asquith, N. Unpublished data.

43 Emmer, I. unpublished data.

44 Jagger, P. and Pender, J. (2000) 'The role of trees for sustainable management of less-favored lands: the case of Eucalyptus in Ethiopia', *EPTD Discussion Papers*, International Food Policy Research Institute, Washington, DC.

45 Ruiz-Perez, M.and Byron, N. (1999) 'A methodology to analyse divergent case studies of non-timber forest products and their development potential', *Forest Science*, Vol. 45, No. 1, pp.1–14.

46 Ruiz-Perez, M., Maogong, Z., Belcher, B., Chen, X., Maoyi, F. and Jinzhong, X. (1999) 'The role of bamboo plantation in rural development: the case of Anji County, Zhejian, China', *World Development*, Vol. 27, No. 1, pp.101–114.

47 Hyde, W.F. and Amacher, G.S. (1996) 'Application of environmental accounting and the new household economics: new technical economic issues with a common theme in forestry', *Forest Ecology and Management*, Vol. 83, No. 3, pp.137–148.

48 Dachang, L. (2000) 'Tenure and management of non-state forests in China since 1950: a historical review', *Unpublished Paper*.

49 de Jong, B.H.J., Tipper, R. and Montoya-Gómez, G. (2000) 'An economic analysis of the potential for carbon sequestration by forests: evidence from southern Mexico', *Ecological Economics*, Vol. 33, pp.313–327.

50 Wangwacharakul, V. and Bowonwiwat, R. (1995) 'Economic evaluation of CO_2 response options in the forestry sector: the case of Thailand', *Biomass and Bioenergy*, Vol. 8, No. 5, pp.293–307.

51 North, D.C. (1990) *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, Cambridge.

52 Pearce, D. (1996) 'Global environmental value and the tropical forests: demonstration and capture', in W. Adamowicz, P. Boxall, M. Luckert, W. Phillips and W. White (Eds.) *Forestry, Economics and the Environment*, CAB International, UK, pp.11–49.

53 Peluso, N.L. (1992) *Rich Forest, Poor People. Resource Control and Resistance in Java*, University of California Press, Berkeley, Los Angeles, Oxford.

54 World Commission on Environment and Development (1987) *Our Common Future*, Oxford University Press, Oxford, UK.

55 Agenda 21 (1992) *Earth Summit. Agenda 21, The United Nations Programme of Action from Rio,* United Nations Department of Public Information, New York.

56 World Development Report 2000/2001 (2000) *Attacking Poverty Overview*, World Bank, Washington, DC.

57 Stavins, R.N. (1995) 'Transaction costs and tradable permits', *Journal of Environmental Economics and Management*, Vol. 29, pp.133–148.

58 Pearce, D., Day, B., Newcombe, J., Brunello, T. and Bello, T. (1998) 'The clean development mechanism: benefits of the CDM for developing countries', CSERGE, University of London, *Unpublished Manuscript*.

59 Salafsky, N. (1993) 'The Forest Garden Project. An ecological and economic study of a locally developed land-use system in West Kalimantan, Indonesia', *PhD Thesis*, Duke University, Durham, NC, USA.

60 de Foresta, H. (1992) 'Complex agroforestry systems and conservation of biological diversity', in Y.S. Kheong and L.S. Win (Eds.) *Harmony with Nature: an International Conference on the Conservation of Biological Diversity*, Kuala Lumpur, Malaysia, *The Malayan Nature Journal*, Golden Jubilee Issue, pp.488-500.

61 Joshi, L., van Noordwijk, M., Wibawa, G., Vincent, G., Hardiwinoto, S. and Sukandi, T. (2000) 'Gap replanting – an emerging trend in rejuvenation of jungle rubber agroforests in Jambi', Indonesia, *Paper presented at workshop Evolution and Sustainability of Intermediate Systems of Forest Management*, 28 June–1 July, Lofoten, Norway.

62 Sayer, J., Chokkalingam, U. and Poulsen, J. (2001) 'The restoration of forest biodiversity and ecological values', *International Seminar on Restoration Research on Degraded Forest Ecosystems,* College of Agriculture and Life Sciences, Seoul, Korea, 13–15 April.

63 Saxena, N.C. (1997) *The Saga of Participatory Forest Management in India*, CIFOR Special Publication, CIFOR, Bogor, Indonesia.

64 Rasmussen, H. and Roy, C. (2000) *ILO Convention on Indigenous and Tribal Peoples, 1989*, No. 169, a manual, International Labour Organisation, Geneva.

65 Colfer, C.J.P., Prabhu, R., Günter, M., McDougall, C., Porro, N.M. and Porro, R. (1999) 'Who counts most? Assessing human well-being in sustainable forest management', *The Criteria & Indicators Toolbox Series*, CIFOR, EU, GTZ, USAID.

66 Ervin, J. (1996) 'FSC Members ratify plantation principle', *FSC Notes*, Vol. 1, No. 3. pp.1,11.

67 Poulsen, J. and Applegate, G. (2001) 'Criteria and indicator for sustainable development of industrial tropical tree plantations (with links to a code of practice)', in *Linking C & I to a Code Of Practice for Industrial Tropical Tree Plantations*, CIFOR Monograph, CIFOR, Bogor, Indonesia.

68 Shell/WWF (1993) *Guidelines: Shell/WWF Tree Plantation Review*, Shell International Petroleum Company Limited and World Wide Fund for Nature, London, Vol. 42, pp.52–54.

69 Sankar, S., Anil, P.C. and Amruth, M. (2000) 'Criteria and indicators for sustainable plantation forestry in India', *CIFOR Monograph*, CIFOR, Bogor, Indonesia.

70 Parrotta, J.A. (1993) 'Secondary forest regeneration on degraded tropical lands: the role of plantations as 'foster ecosystems'', in H. Lieth and M. Lohmann (Eds.) *Restoration of Tropical Forest Ecosystems*, pp.63–73, Kluwer Academic Publishers, Netherlands.

71 CIFOR & University of Maryland (2000) *Forest Carbon for Local Livelihoods*, Center for International Forestry Research (CIFOR), Bogor, Indonesia.

72 Convention Biological on Diversity (2000) 'Ecosystem approach', *Decisions Adopted by the Conference of The Parties to the Convention on Biological Diversity at its Fifth Meeting*, Nairobi, 15–26 May.

73 Baumert, K.A., Kete, N. and Fueres, C. (2000) 'Designing the clean development mechanism to meet the needs of a broad range of interests', *World Resources Institute, Climate Energy & Pollution Program*, August, Washington, DC.