The Causes and Consequences of Tropical Deforestation: A Review

Richard J Culas
Abstract: The dynamic nature of global ecosystems makes environmental changes inevitable. These environmental changes are driven by human-made and natural causes. Human activities have always had an impact on the environment. Economic activity and the rate of population growth have now increased to the point where the effects of humanity on the environment can no longer be ignored or viewed in isolation. The quality of many of the basic elements of the natural resource base, such as air, water, soil, etc., is deteriorating, in particular due to the widespread depletion of forest resources. The other concern is emission of pollutants which have long-term and potentially irreversible effects such as climatic modification. This paper therefore provides a description of the consequences of deforestation from the perspectives of different segments of society. This description is followed by a review of the human-induced causes of depletion of forest resources, with reference to tropical deforestation, at different levels of the economy. The role of tropical forests in carbon sequestration has now received increased attention in the proposals for emerging carbon markets for climate change mitigation. This implies that such proposals for climate change mitigation should carefully consider the causes behind and the consequences of the tropical deforestation for the benefits of local land uses and the global communities.

Keywords: Deforestation, Causes, Consequences, Carbon Markets

Introduction

THE DYNAMIC NATURE of global ecosystems makes environmental changes inevitable. These environmental changes are driven by human-made and natural causes. Human activities have always had an impact on environment. Economic activity and the rate of population growth have now increased to the point where the effects of humanity on the environment can no longer be ignored or viewed in isolation. The quality of many of the basic elements of the natural resource base, such as air, water, soil, etc., is deteriorating, in particular due to the widespread depletion of forest resources. The other concern is emission of pollutants that have long-term and potentially irreversible effects, such as the climatic modification (Dembner, 1990).

Forest depletion includes both deforestation and forest degradation. Tropical forest depletion is among the few environmental problems for which good data are available. For example, during the 1980s about 15.4 million hectares of tropical forests were lost annually (FAO, 1992). The annual loss was 12.7 million hectares between 1990 and 1995 (FAO, 1997). The scale of deforestation is such that the externalities, i.e. the unintended and uncom-
Pensated consequences of forest depletion, have gone far beyond the localized effects such as soil erosion and fire risk. The effects of primary forest depletion are global. The major unintended effects associated with global deforestation are the loss of cultural and biological diversity, and the carbon storage capacity.

The world’s forests, in particular the tropical rainforests, are home to over 10 million members of the last surviving intimately resource-based cultures. Forest dwellers around the world have lived with this resource for millennia. The correlation between cultural diversity and biological diversity is that the eco-regions consisting of tropical rainforest, the Amazon Basin in particular, are not only the most species rich but also support the largest number of indigenous populations. Biodiversity is a measurement not only of species diversity but also of biological utility in the form of carbon storage and the development of genetically diverse ecosystem. Biodiversity is the level of difference among living things. It is important to the biological health of the planet and therefore to the human race because diversity contributes to resiliency. Because most ecosystems persist in dynamic equilibrium, a diverse community is more likely to be robust and to withstand large-scale disturbances. Biodiversity happens to be greatest in the world’s primary tropical rainforests. Destruction or fragmentation of these forests therefore contributes directly to a reduction in global biodiversity.

The earth’s atmosphere is an elaborate and delicately balanced cycle of gasses that protects and makes possible life on Earth. Among the gasses present in the atmosphere is carbon dioxide, a gas that contributes an insulating capacity to the atmosphere and moderates heat loss to outer space. Such gasses are called “greenhouse” gasses because their function is much like that of the glass in a greenhouse: they allow solar heat into the system, but discourage its escape. Thus, additional greenhouse gasses in the atmosphere lead to increased temperatures on the surface of the Earth. Increased temperatures have important implications for weather patterns, sea levels, and other natural cycles that directly influence human life on Earth. At the global level, tropical deforestation accounts for about 25 percent of the heat trapping emissions (Houghton, 1993). Deforestation is therefore the hidden cause of climate change.

Over the past decades increased demand for human needs has driven practices of agriculture, logging and ranching, as well as the infrastructures development and re-settlement programs that has proved an inexorable force for deforestation. Forest conservation and/or re-afforestation programs have alrarely matched these human made activities. This situation has now created an urgent call for the immediate inclusion of standing forests in the internationally regulated carbon markets. Proposal for such carbon markets is increasingly being seen as an important and cost-effective component of climate change mitigation (Stern, 2006). Civil society groups and others have however questioned the ability for the poorest and most marginalized in developing countries to participate in, and benefit from, the emerging carbon markets (Peskett et al, 2006). This implies that the proposal for the carbon markets should carefully consider the causes behind and the consequences of the tropical deforestation for the benefits of local land uses and the global communities.

The paper is organised as follows: Section 2 provides a description of the consequences of forest depletion from the perspectives of people from different socio-economic segments.

---

2 One should note that, contrary to widespread myths, a forest in balance (no net growth) has no net absorption of carbon. Old growth (primary) forests do not clean the air of CO₂, however, more carbon is released into the air when the biomass is reduced.
Section 3 reviews and discusses the causes of widespread depletion of forest resources at different levels of the economy. A summary of the paper is given in Section 4.

**Consequences of Forest Depletion**

Forest depletion is often considered as an undesirable phenomenon, although sometimes it is inevitable. Forest depletion due to human interventions may produce both positive and negative impacts. Whether these effects are desirable or undesirable depends on an assessment of their positive and negative impacts on the economy, the environment (and other dimensions of life) and on the importance that various groups in the society attach to these impacts. Deforestation and forest degradation may be desirable to some groups in the society because they result in financial gain. But they may not be desirable to others because of their negative environmental and social impacts. Thus the perspectives and the values of deforestation and forest degradation can vary for different socio-economic segments of the society (Contreras-Hermosilla, 2000).

The status of forests differs sharply in developed countries than in developing countries. Following an era of deforestation the forest area of many developed countries has stabilized and in some cases has even increased during this century. For many of the today’s developed countries the deforestation contributed to their economic growth. In contrast, forests in developing countries have declined by nearly half in this century and the rate of this loss is still increasing. This trend indicates that the deforestation cannot be solved significantly in the developing countries without some sacrifice of short-term economic growth. Because that the deforestation contributes positively for the economic growth by allowing for alternative use of forested land for agriculture, urbanization, and infra-structural investments such as roads and dams, as well for timber production (World Bank, 1991). Several authors have noted the positive and the negative consequences of forest depletion in the deforestation literature. The following are some examples of important consequences from the perspectives of different segments.3

**Consequences for Indigenous, Local and Urban People**

For forest-dwelling indigenous communities there are many positive consequences of forest depletion in the form of provision of food, fuel, fodder, timber and income. An excessive rate of forest depletion may result in a loss of spiritual values and traditional knowledge of how to use and protect forests in sustainable ways. For local communities, especially the poor and landless living outside forests, depletion will make available forest products such as fuel wood, charcoal, fruits, building materials and medicinal products in the short-term. However, it may decrease the availability of such forest products and reduce agricultural productivity (through loss of soil and water protection potential of remnant woodland and on-farm trees), income generation and possibilities to escape from the poverty trap in the long-term.

For urban dwellers, particularly in developing countries, forest depletion will make available many forest products. But an excessive rate of depletion will reduce availability and raise prices of such forest products. For urban dwellers in developed countries forest

---

3 For a detailed description on this issue, see Contreras-Hermosilla (2000).
products supply materials for housing and infrastructure development, but not without a loss of amenity and recreational values of urban forests and parks.

**Consequences for Forest, Mining and Related Industries**

For big commercial industrial companies involved with forests the positive consequence of forest depletion is immediate large profits, but the negative consequence is loss of company business and forced closure of forest operation in the longer term. For forest worker communities the positive consequences are provision of jobs and income, but the negative consequences are adverse social implications of reduced income, social disruption and hardship. For mining, oil exploration and other industrial interests the positive consequences of forest depletion are improved access to potentially profitable mineral, oil or other commercially valuable products located under forests, but it would have a politically negative impact on company operations because of criticism by environmentally concerned groups.

**Consequences for Governments and Global Community**

For national government planners and decision-makers, the positive consequences of forest depletion may be an immediate escape from political pressures when impoverished populations migrate into frontier forest areas. But the negative consequences may be loss of potential source of development revenues with reduced employment opportunities, sustainable trade and economic development. For environmental advocacy groups and conservation agencies the depletion is loss of essential functions of forests, including biodiversity, climate regulation, preservation of water catchments and fishery values. For the global (including the scientific) community, the concern is that continued forest destruction will accelerate global warming with potentially negative consequences for human welfare and survival.

**Causes of Tropical Deforestation**

Deforestation is a complex event of many causes. Following Angelsen and Kaimowitz (1999), these causes can be divided into the underlying, intermediate and direct causes. The direct causes are the prime agents who cut (or burn) the trees. The underlying causes are socioeconomic, cultural and political variables attributed to the macro level. The intermediate causes are closely related to the agriculture and forestry sectors but influenced by the underlying causes. Usually the deforesting agents are influenced by the intermediate causes and the intermediate causes are influenced by the underlying causes (see Figure 1).

Since these causes of forest depletion are many and operate in numerous combinations, an assumption of a single cause-effect relationship may not be valid over time. A discussion of these causes must be selective as they are many and interrelated. There are also natural causes of forest depletion such as natural fires and hurricanes. But it is difficult to deal with these natural causes because they cannot be easily influenced by policy interventions. The same is true for some broad forces such as war, global warming and the distribution of economic and political power.

4 The recent great fires of Indonesian forests (and the frequent bushfires in Australia) are a dramatic example of this type of cause of forest loss.
The Direct Causes

There are two main types of direct causes (also called primary agents or sources of deforestation) involved in deforestation and some have been referred to as "the needy and the greedy". The needy are mainly the farmers who convert forest to agricultural land and commonly practise shifting cultivation (or forest rotation system). The others in this category are the pastoralists and the fuel wood collectors. The greedy refers to commercial agents involved in deforestation by logging (timber harvesting), plantations, commercial agricultural estates, mining or hydropower development. The activities of the greedy are undertaken directly by the state, or by private sector entrepreneurs enjoying favourable treatment by the state. For example, the generous timber concessions that is common in Southeast Asia, or favourable tax rules that stimulated land development in Brazil during the 1980s. The activities of the primary agents differ in intensities and vary from region to region or country to country.

---

5 The two different sources of deforestation (i.e. the needy and the greedy) are by some governments classified as unplanned and planned deforestation. However, this may be misleading as it indicates that all planned deforestation is socially desirable whereas the unplanned is not.
Primary Agents in Latin America

In tropical Latin American countries, landless peasants who convert public forestlands to grow crops for subsistence needs and cattle ranchers who convert forestlands to pasture are the important agents of deforestation. In some cases the cattle ranchers are given incentives by the governments to clear the forests (Contreras-Hermosilla, 2000). Mining cooperatives and individual miners who clear large areas of forests are the main agents in countries like Ecuador, Peru and Venezuela. Commercial farmers have also been significant agents in Brazil, Bolivia and Paraguay where they cleared forests for soybean export. In a country like Guyana shield loggers searching for valuable wood are the main agents (Miranda et al., 1998 cited in Contreras-Hermosilla, 2000).

Primary Agents in Africa

In the African context, peasants as well as fuel wood collectors are the important agents in the dry areas of Sahel. In Sudano-Sahalian and Eastern African sub regions, pastoralists are the main agents and where the remaining trees and woodlands are under the most severe pressure for dry season browse and fodder. Nearly 70 percent of the total energy requirement of the Sub-Saharan African countries is provided by wood and fuel wood collectors account for over 85 percent of the wood removed from the forests and woodlands. Loggers are the primary agents in Central and West Africa. Selective logging degrades the forests in other forest rich African countries and then facilitates the other agents to degrade these forests furthermore (Contreras-Hermosilla, 2000).

Primary Agents in Southeast Asia

There are also critical actors of forest depletion in Southeast Asian countries. In Malaysia and Indonesia, large extents of forestlands have been cleared for agricultural concerns and to establish agro-industrial plantations (Kartodiharjo and Supriono, 2000 cited in Contreras-Hermosilla, 2000). Generous timber concessions are common and favoured by the states to encourage loggers in Southeast Asian countries. The role of fuel wood collectors is also significant in these countries and they deplete the forests around the cities.

The Underlying Causes

The primary agents discussed in the section The direct causes are in turn influenced, or even determined, by many of the underlying causes that originate in quite far distant places or unrelated to the decisions made by those agents. For instance, population growth and density will affect the size of markets and the demand for forest products, thereby they will influence the decisions made by logging companies. The underlying causes may also originate in other countries and transmit their effects through trade. Macroeconomic policy reforms such as Structural Adjustment Program (SAP) contribute to changes in decision parameters of farmers thereby creating changes in land use patterns that may be detrimental to forests. In general, macroeconomic policies contribute to changes in the structure of the economic and

---

6 Loggers also play a major role in the US Pacific, Northwest and Western Canada. Oil companies in North America exploit the extensive oil deposits in Alberta, which are largely under forests.
political power of society. This again creates changes in the relationship between humans and forest resources and the environment. Following are the main underlying causes of deforestation related to the economy, policy, demography and international factors:

**Market Failure and Policy Failure**

The key to understanding excessive tropical deforestation (and other environmental problems) is that it entails large costs that are *not* counted by those who take the decisions. The small-holder (farmer) or commercial logger has little incentive to care about the climate effects of his or her actions. Such costs are labelled externalities in economic theory; they are external to the individual resource user (decision maker), but not to the (global) society. The situation is also referred to as a market failure, because an unregulated market economy will fail to produce an optimal outcome. It can also be viewed as a failure because there is no market for global environmental benefits.

The market failure could *in principle* be corrected by governments, for example by taxing destructive uses of forests, and subsidizing forest uses which are compatible with preservation of the protective functions of the forest. However, government policies often tend to further aggravate the problem. These are referred to as policy (government or intervention) failures, and in this context are loosely defined as government policies that worsen the environmental problems instead of remedying them. There are numerous examples of policy failures. The government of Indonesia and some other Southeast Asian countries only capture about one third of the forest (resource) rent, defined as profit beyond the normal return on capital investments. It is commonly considered that the resource rent *should* belong to the society at large (the state or local communities). Thus, the failure by the state to capture the forest rent makes excessive logging more attractive. Lack of respect for traditional land rights, and other distorted institutional incentives which make property rights to forestland uncertain, could also encourage short-term exploitation rather than long-term use of the resources.

**Poverty and Population Growth**

Poverty, low-income growth and high population growth may further increase the pressure on forest resources. There is, however, no unequivocal relationship between forest clearance and population growth. Among the factors influencing this relationship is the availability of alternative employment opportunities. If a country is able to create new jobs and keep unemployment low, the pressure on natural resources created by high population growth can be reduced or avoided. Malaysia provides an instructive example in this regard, and could be contrasted with neighbouring Philippines. Agricultural expansion in the Philippines is often caused by push-migration from the lowlands, due to lack of employment opportunities, and landlessness partly due to unequal land distribution (World Bank, 1989).

Poverty is often cited as both a cause and an effect of environmental degradation (WCED, 1987). It is unquestionable that environmental degradation in resource dependent economies will create or maintain poverty. The reverse causal link is more complex. Obviously, poverty may lead to short-term thinking and is characterized by lack of resources to invest in long-term conservation of the natural resources. However, case studies of environmental degradation among poor groups often show that the main factor behind reductions in the resource

---

7 Gillis and Repetto (1988) give the most comprehensive overview of such policies.
base has been resource exploitation by outsiders, either by state-sponsored projects, commer-
cial interests, or other migration groups.\(^8\) It is also clear, for instance in Indonesia, that the
area of agricultural expansion grows steadily in relation to population increase, but the
population in this instance can best be viewed as an intermediate variable affected by other
factors and not simply as an independent variable that acts alone (Conteras-Hermosilla,
2000).

**Unmanageable International Debt**

High foreign debt may directly or indirectly affect the costs and the benefits of different land
uses by different economic actors. Debt crises are to a larger extent a symptom of a deeper
economic crisis in many developing countries, but the debt crisis itself further aggravates
the economic crisis. There are different options available to a country in dealing with its
debt problem, such as debt rescheduling, debt repudiation, increased borrowing, devaluation
of the currency, restricting imports, and increasing exports. The actual number of options
available to a country depends on its credit worthiness and export base, and level of devel-
opment (Kahn and McDonald, 1995). A high debt service ratio implies that resources are
extracted out of the economy. Further, it is argued that debt works as a very high marginal
tax on any income increases in the indebted country: a large share of the increase in income
and export value will be used to repay the debt; hence the incentives to adjust and carry the
costs (e.g., investments) will be low. There are three different effects of debt crises that could
be relevant to the rate of deforestation, namely, Structural Adjustment Program (SAP), lower
economic growth and reduced (opportunities for) poverty alleviation, and export orientation
and resource mining (Culas, 2006).

**The Intermediate Causes**

Possible explanations of how the various intermediate causes of deforestation, i.e. the decision
parameters of farmers, which influence agricultural land expansion, logging and timber
production, pasture and ranching, etc., on deforestation may vary with the theoretical ap-
proaches taken and the underlying assumptions considered. The effect on deforestation of
the changes in those decision parameters is discussed below, in particular with respect to
the SAP policy reforms (for details, see Figure 1).

**Removal of Input Subsidies and Decontrol of Output Prices**

Removal or reduction of subsidies on inputs, such as fertilizers and pesticides, results in
higher prices to the farmers. This may partly or fully be compensated for by increases in
output prices as a result of deregulation. To determine the net effect on output prices one
should also take into account the downward pressure resulting from removal of food sub-
sidies.\(^9\) What are the environmental effects of both higher input and output prices? First, the
impact will depend on the changes in profitability (gross margin) of different crops. Assuming
that the profitability of agriculture in general increases, there are two conflicting hypotheses
on what will be the effect of this on agricultural expansion, particularly in the form of cutting

---

\(^8\) Broad (1994) and Reardon and Vosti (1995) provide a discussion of the poverty-environment linkage.

\(^9\) In some instances farmers may be net consumers of a particular agricultural output they produce.
primary forests, i.e. the subsistence and market approaches. Angelsen et al (1999) provide a detailed study on the two approaches for the farmer’s behaviour. Studies also find that subsistence and commercial farmers acted quite differently to new price signals and along the lines suggested by the above two approaches (Reed 1996, p. 329).\textsuperscript{10}

African countries that embraced structural adjustment programmes experienced significant increases in agricultural production. The growth rate in production more than doubled in reforming countries between 1980-1984 and 1985-1987, whereas it stagnated in non-reform countries (Deng and Oshikoya, 1991). The main factor causing the growth in production has been an expansion of agricultural land, rather than intensification of agricultural land by means of subsidized inputs like fertilizers. Evidence shows that fertilizer use by farmers decreases when subsidies are removed. A study from Zambia shows that fertilizer use has decreased in the post-adjustment period as pan-territorial pricing for fertilizer was abandoned. Removal of fertilizer subsidies, including the removal of transport subsidies that reduce the transaction costs associated with the purchasing of the fertilizers, has resulted in an expansion of the traditional shifting cultivation (chitemene) system and deforestation in Zambia (Culas, 1997).

Stabilization Policies and Removal of Credit Subsidies

Tightening the money supply could attain stabilization policies such as inflation control. This is likely to result in higher real interest rates, both because inflation is reduced and because increased nominal interest rates may result. Inflation control may enable the smallholders (i.e. small farmers) to join the formal credit market since it becomes easier for them to save in the form of cash. This is likely to stimulate investment in agricultural production (and conservation). We may expect devaluation to induce a general switch from production for direct consumption or the domestic market, in favour of production for export or import substitution. We may also expect an increase in the profitability of agriculture. However, the environmental effects depend on the structure of agricultural production.

SAP may, on the other hand, also induce cutbacks in credit subsidies and rural credit programs. An increased use of credit may result in intensification of land use, and therefore reduce pressure on forest resources based on the logic of the subsistence approach. However, cash poor smallholders are not likely to have access to formal credit markets, thus the main effect of SAP will be removal of (subsidized) credit through government channels. The result may be expansion on marginal lands and more forest clearing. This effect has been present in Northern Zambia, where traditional shifting cultivation (chitemene) expanded since the SAP was introduced in 1989 (Kakeya et al, 2006; Kapekele, 2006).\textsuperscript{11}

Cutbacks in Government Expenditure on Infrastructure

Adjustment efforts significantly reduce (growth in) current government expenditures in order to reduce budget deficits. Evidence from many countries suggests that social expenditures are hit more severely than others, and it is likely that environmental programmes have received similarly low priority. This appears, for example, to be the case in Mexico, where the envir-

\textsuperscript{10} For detailed country studies, see Reed (1996).

\textsuperscript{11} In Northern Province of Zambia, farmers practice traditional shifting cultivation in which they cut and burn the forests to complement the nutrient requirement that should otherwise be provided by (inorganic) fertilizers.
Environmental budgets tend to be reduced more than overall expenditures (Reed, 1992). Further, a long-standing argument is that investments are cut more easily than current expenses when the budget balance has to be improved. Reduced public investment, for example, rural infrastructure such as roads and public services may have reduced the pace of forestry and agriculture expansion by increasing the effective cost of opening up virgin forest lands (Reed, 1992; Hansen, 1989). This effect may be significant, as evidenced by the reduced “developments” in the Amazon basin in the 1980s due to Brazil’s debt crisis. Generally, road construction is among the most indisputable and unambiguous factors in promoting deforestation. Other and more fundamental forces are more critical for the development than scattered government interventions to protect the forests. Cuts in other government expenditures, such as health and education, may have long-term negative environmental effects (World Bank, 1992).

**Property Rights and Land Reform Policies**

Other policy reforms directed towards the agricultural sector include land reform, commonly in the form of introducing individual land titles. More secure land rights should improve incentives for environmental conservation, since farmers themselves are more likely to harvest the fruits of conservation investments. Experience suggests, however, that land reforms in the form of individualized land titling programmes are difficult to implement and often not successful (see, for example, Angelsen and Fjelstad, 1995; Wachter, 1992). Moreover, in a situation where land rights are allocated based on forest clearing, increased land tenure security may actually increase deforestation as the “deforestation investment” becomes more secure (Angelsen, 1999). Further, in some cases the policies that favour concentration of land ownership may affect the forests. For example, in Latin America, concentration of land ownership is induced by government policies that favour agricultural intensification, the exports of large volumes of agricultural products, the capital-intensive method of production and the access to credit.

Even though these policies are believed to make economic sense in the short term it may be argued that they lead to less employment and to inequity in land distribution in the long run. Consequently large numbers of farmers may lose their jobs or sell their land and other assets to larger and more competitive entrepreneurs. As a result, those farmers without any means may move into the forest areas. Because of these probable effects some governments have also implemented land reforms to provide lands to the displaced farmers. Again these incentives (resettlements) are supposed to have caused clearing of large areas of public forests for subsistence agriculture (Contreras-Hermosilla, 2000). There may also be other consequences due to inequality of land ownership. For instance, increasing inequality often leads to the breakdown of common property management schemes (Dasgupta and Maler, 1994).

Finally, tropical forests in developing countries provide multiple local and global benefits, from timber and non-timber forest products to support local livelihoods, to their role in global biodiversity preservation. The role of tropical forests in carbon sequestration has now received increased attention due to the climate change mitigation. Since deforestation is re-

---

12 The magnitude of the effect of cuts in current spending on environmental protection is not expected to be very large, since in most countries there was not much to cut at all.
sponsible for an estimated 20% of global carbon emissions, proposals such as “avoided de-
forestation” is increasingly being seen as an important and cost-effective component of climate
change mitigation (Stern, 2006). Civil society groups and others have however questioned
the ability for the poorest and most marginalized in developing countries to participate in,
and benefit from, emerging carbon markets (Peskett et al, 2006). This implies that any of
such global conventions or proposals should in fact fully understand the causes behind, and
the consequences of, the tropical deforestation at all levels of the economy, as well as the
society, for the benefits of local land uses and the global communities.

Summary

This paper first discusses the consequences of forest depletion. The consequences can be
either positive or negative depending on the perspectives of different socio-economic segments
in the society. The consequences are viewed for indigenous, local and urban people; forest,
mining and related industries; and governments and global community. Following this the
causes of tropical deforestation are discussed at three different levels: direct causes, interme-
diate causes, and underlying causes. The direct causes are influenced by the intermediate
causes and the intermediate causes are influenced by the underlying causes. The main direct
causes are agricultural expansion, cattle ranching, logging, and infrastructures development
and re-settlement program. The direct causes however differ in intensity and vary across
regions or countries. The underlying causes are related to demographic, socio-economic
and policy-oriented variables at macro level. They originate in quite far distant places or
unrelated to the decisions made by those direct causes. Finally the effects on deforestation
when there are changes in the decision parameters of farmers (i.e. the intermediate causes)
are discussed, mainly with respect to the Structural Adjustment Policy reforms. However,
to understand fully the effects of intermediate causes detailed studies within individual
countries (at micro/regional level) are necessary. A clear understanding of causes and con-
sequences of deforestation at all level of the economy, as well as the society, are therefore
necessary for any convention or proposal aim for the better management of tropical forests
and land-use decisions to the mitigation of climate change and the conservation of biod-
iversity.

References

Angelsen, A and D. Kaimowitz (1999), Rethinking the Causes of Deforestation: Lessons from Eco-
Angelsen, A (1999), Agricultural Expansion and Deforestation: Modelling the Impact of Population,
Economic Approaches, Working Paper, No 3, Chr Michelsen Institute (CMI), Bergen, Nor-
way.
Angelsen, A., E. F. K. Shitindi and J. Aarrestad (1999), Why Do Farmers Expand Their Land into
Forests? - Theories and Evidence from Tanzania, Environment and Development Economics,
822.


Dembner, S. A (1990), Uansylva (forestry and environment), Vol. 41, No. 163.


Food and Agricultural Organization (FAO), (1992), Forest Resources Assessment- Tropical Countries, Forestry Paper No. 112, Rome: FAO.


Reardon, T and S. Vosti (1995), Links between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty, World Development, 23 (9): 1495-1506.


About the Author

Dr. Richard J Culas

Richard is a Lecturer in Agricultural Economics/ Agribusiness at CSU since 2004. His qualifications include PhD (Economics) University of Sydney, CandOecon (MA Economics) Norwegian School of Economics & Business Administration, CandAgric (MSc Agricultural Economics) Norwegian University of Life Sciences, and BSc (Agriculture) University of Peradeniya, Sri Lanka. He has done research projects in Zambia and Norway for his master theses. His PhD thesis is on agribusiness of forestry and deforestation across countries of Latin American, African and Asian regions. Richard worked as consultant, research assistant, agricultural assistant and teacher in Norway and Sri Lanka. Prior to joining CSU he taught economics and econometrics subjects at the University of Sydney. He has published articles in refereed journals and presented papers in conferences. His current research is on farm diversification of Australian farmers, sustainable water management in Punjab (Indo-Pakistan) regions and deforestation in developing countries.
EDITORS
Amareswar Galla, The University of Queensland, Australia.
Bill Cope, University of Illinois, Urbana-Champaign, USA.

EDITORIAL ADVISORY BOARD
Viraal Balsari, Vice President, ABN Amro Bank, Mumbai, India.
Erach Bharucha, Bharati Vidyapeeth Univeristy, Pune, India.
Tapan Chakrabarti, National Environmental Engineering Research Institute (NEERI), Nagpur, India.
Thomas Krafft, Geomed Research Corporation, Bad Honnef, Germany.
Shamita Kumar, Bharati Vidyapeeth Univeristy, Pune, India.
R. Mehta, Ministry of Environment and Forests, Government of India, New Delhi, India.
Kranti Yardi, Bharati Vidyapeeth Univeristy, Pune, India.

<table>
<thead>
<tr>
<th>Journal Title</th>
<th>Description</th>
<th>ISSN</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>The International Journal of the Arts in Society</td>
<td>Creates a space for dialogue on innovative theories and practices in the arts, and their inter-relationships with society.</td>
<td>1833-1866</td>
<td><a href="http://www.Arts-Journal.com">http://www.Arts-Journal.com</a></td>
</tr>
<tr>
<td>Design Principles &amp; Practices</td>
<td>Examines the meaning and purpose of ‘design’ while also speaking in grounded ways about the task of design and the use of designed artefacts and processes.</td>
<td>1833-1874</td>
<td><a href="http://www.Design-Journal.com">http://www.Design-Journal.com</a></td>
</tr>
<tr>
<td>The International Journal of Environmental, Cultural, Economic &amp; Social Sustainability</td>
<td>Draws from the various fields and perspectives through which we can address fundamental questions of sustainability.</td>
<td>1832-2077</td>
<td><a href="http://www.SustainabilityJournal.com">http://www.SustainabilityJournal.com</a></td>
</tr>
<tr>
<td>Ubiquitous Learning</td>
<td>Investigates the affordances for learning in the digital media, in school and throughout everyday life.</td>
<td>1835-2030</td>
<td><a href="http://www.ULJournal.com">http://www.ULJournal.com</a></td>
</tr>
<tr>
<td>The International Journal of the Knowledge, Culture, Climate &amp; Management</td>
<td>Discusses disciplinary and interdisciplinary approaches to knowledge creation within and across the various social sciences and between the social, natural and applied sciences.</td>
<td>1833-1882</td>
<td><a href="http://www.Socialsciences-Journal.com">http://www.Socialsciences-Journal.com</a></td>
</tr>
<tr>
<td>The International Journal of the Technology, Knowledge &amp; Society</td>
<td>Focuses on a range of critically important themes in the various fields that address the complex and subtle relationships between technology, knowledge and society.</td>
<td>1832-3669</td>
<td><a href="http://www.Technology-Journal.com">http://www.Technology-Journal.com</a></td>
</tr>
</tbody>
</table>

**FOR SUBSCRIPTION INFORMATION, PLEASE CONTACT**
subscriptions@commonground.com.au