Shifting the Blame?

Southeast Asia's Indigenous Peoples and Shifting Cultivation in the Age of Climate Change

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by Christian Erni, IWGIA

Fire has been an integral part of indigenous peoples' management of land and natural resources all over the world. In the savannas of Africa, for example, pastoralists and hunters-gatherers have used fire to maintain the productivity of the ecosystem for livestock and game since millennia (McClanahan and Young 1996: 289f). In North America as well, indigenous peoples have greatly modified the environment in pre-colonial times, creating and maintaining grasslands and open forest savannahs through controlled burning (Pyne 1982, cited in: Schneider 2000, p. 26). By regularly burning parts of the ecosystems they promoted diversity of habitats, which gave them greater security and stability (Jackson and Moore 1999: 76). This was the opposite of what European settlers did: they burned to create greater uniformity in ecosystems (ibid.). The Gagadju in Australia's Northwestern Territory, like other Aborigines, have developed and passed on to younger generations a detailed knowledge on the use of fire as a tool to manage diverse ecosystems (Lewis 1989). And fire is the key technology in agricultural systems commonly called shifting cultivation or swidden agriculture, a farming method practiced by indigenous peoples throughout the tropics and sub-topics.

Indigenous peoples' use of fire, just like many other aspects of their resource management systems have however often not been properly understood by outsiders, above all not by foresters, park rangers and other state agents in charge of the management and conservation of biodiversity and natural resources. As a result, such practices have been discouraged, or, in most cases, declared illegal. Very few are the exceptions in which traditional resource management practices, including controlled burning, have been incorporated in established management systems.[1]

In the age of global climate change resource use and management practices that rely on the use of fire are coming under increased pressure. This is particularly the case with shifting cultivation. In the name of forest conservation and development, colonial and post-colonial governments in Asia have since more than a century devised policies and laws seeking to eradicate shifting cultivation.[2] Many of the arguments brought forward against this form of land use – that it is an economically inefficient and ecologically harmful practice – have been proven inaccurate or outright wrong.[3] Notwithstanding all evidence, however, attitudes by decision makers and, consequently, state policies have hardly changed. The current climate change discourse has taken the debate on shifting cultivation to another, a global level, reinforcing existing prejudices, laws and programs with little concern for the people affected by them. Now, shifting cultivation is bad because it causes carbon emission and thus contributes to climate change. The UK based Forest Peoples Programme (FPP) and FERN have studied nine concepts for government programs on "Reducing Emissions from Deforestation and Forest Degradation" (REDD). Eight of these "identify 'traditional agriculture' or 'shifting cultivation' as a major cause of forest loss" (Griffiths 2008" 20). Again, it is the shifting cultivators who have to take the blame.

In Asia, the majority of the people practicing shifting cultivation belong to ethnic groups that are generally subsumed under categories like ethnic minorities, tribal people, hill tribes, aboriginal people or indigenous peoples.[4] The popular prejudices against shifting cultivation common in these countries are conflated with other negative attributes ascribed to indigenous peoples throughout the region: that they are backward, primitive, a hindrance to national progress, disloyal to and a security problem for the state etc.[5]

Even though it has been shown (see e.g. FAO, UNDP, UNEP 2008: 3) that the main causes of deforestation and thus carbon emission in Asia has been intensification of agriculture and large-scale direct conversion of forest for small-scale and industrial plantations (like oil palm, rubber etc.), shifting cultivators still ranks prominently on the priority list of decision makers for corrective intervention in their forest conservation programs. That so much attention has been paid to them by government in their REDD concepts therefore does not come as a surprise.

But how much does shifting cultivation really contribute to global warming? How much do we actually know what is happening?

In the following I will try to take stock of what is known - and what not – about shifting cultivation's contribution to deforestation, the resulting carbon emission and thus climate change. Research on shifting cultivation have been conducted by scholars from a broad range of disciplines - foresters, agronomists, biologists, social scientists –over the past several decades which resulted in a vast body of literature. While some of this research has produced data relevant to the topic of interest to us here, there are still considerable – and in light of the prominence of the issue on the agenda of both national and international development and conservation agencies surprising – gaps in our knowledge about a range of key aspects of shifting cultivation and the people who are engaged in it. Our focus will be on Southeast Asia, where the issue has been debate particularly prominent and where research on shifting cultivation has a long tradition.

Any assessment of current policies on shifting cultivation in the context of climate change needs to see shifting cultivation in comparison with other forms of land use. Equally important is to keep in mind that shifting cultivation, as practiced by indigenous communities, has always been a dynamic and flexible system of land use, and is presently undergoing rapid changes. In the last part of this article I will therefore briefly review some of the findings of recent research relevant to these questions. A more detailed discussion of the impact of climate change mitigations schemes such as REDD – including restrictions on or the ban of shifting cultivation – on indigenous communities will not be possible within the confines of this paper. In concluding this paper I will therefore give only brief reference to the main issues of concern of indigenous peoples with respect to climate change mitigation, and how taking their concerns and rights into account when designing climate change mitigations schemes will also allow to tap the yet unappreciated contributions of indigenous peoples land use to this endeavor.

Shifting cultivation and climate change: What we know and what not

17% of global greenhouse gas emissions are believed to result from deforestation, making it the second largest source (FAO, UNDP, UNEP 2008: 1). According to the UN-REDD Framework Document (ibid.), "in many developing countries, deforestation, forest degradation, forest fires and slash and burn practices make up the majority of carbon dioxide emissions". It is generally believed that about half of the deforestation in the tropics is the result of expansion of traditional agriculture, above all shifting cultivation (Geist and Lambin 2001: 85). Geist and Lambin (ibid.) however point at the need to differentiate between the different forms of land use commonly lumped together under the broad category of "shifting cultivation" or "slash and burn agriculture", such as between traditional rotational shifting cultivation and the opening up of land by migrant settlers. And they conclude (ibid.: 95):

> *While the expansion of cropped land and pasture is clearly the most important proximate cause of tropical deforestation, shifting cultivators are not always the key agents of deforestation: shifting cultivation is often associated with timber logging and road construction as concomitant causes; traditional shifting cultivation (swidden-fallow farming) mainly characterises upland and foothill Asian cases, while colonist shifting cultivation (slash-and-burn agriculture by in-migrants) is limited mostly to humid lowland cases in Latin America, with many of the latter cases driven by conditions of poverty. Rather than shifting cultivation, the expansion of permanently cropped land for food by smallholders dominates agricultural expansion leading to deforestation.*

The distinction between "traditional shifting cultivation" and the "slash and burn agriculture" of migrant settler colonization is crucial. They not only constitute fundamentally different forms of land use but are also practiced by different people. Indigenous peoples in Southeast Asia-Asia, which we are mainly concerned with here, are practicing what Geist and Lambin call traditional shifting cultivation. The concrete manifestations of traditional shifting cultivation however are as diverse as the people who practice it, and it is therefore not easy to define. For the purpose of this article, I am following Mertz et. al. (2009: 261) who "decided to define swidden cultivation in Southeast Asia as a land use system that employs a natural or improved fallow phase, which is longer than the cultivation phase of annual crops, sufficiently long to be dominated by woody vegetation, and cleared by means of fire".

In order to assess the impact of shifting cultivation on land cover, its contribution to deforestation and thus carbon emission we first have to know how many people are engaged in shifting cultivation and the area under this form of land use.

How many shifting cultivators are there?

Padoch et. al. (2007: 32f) identified three reasons for the difficulties to measure the extent of shifting cultivation in Southeast Asia: 1. Shifting cultivation is "a diverse, complex, and dynamic land use that data gatherers have difficulty seeing and defining, much less measuring"; 2. It is a "smallholder category, and government agents find adding up what is happening in all those temporarily and spatially divergent and dynamic smallholdings far more difficult than summing up a few hundred monoculture plantations"; 3. "the very existence of shifting cultivation is and long has been a politically contentious issue [ ] Most countries in the region have subjected swidden to limitations and controls with widely varying levels of enforcement. Classifying and measuring the extent of swiddening involves not only an admission of its existence but also a prediction than lands will continue to be used for swiddening, often reflecting great differences in 'landscape visions' between government officials and shifting cultivators".

Mertz et. al. (2009: 282) in their assessment of existing data on the numbers of swidden cultivators at the global level and in Southeast Asia point at similar difficulties. According to them, the best estimate of the global population of shifting cultivators was done in a UNEP/FAO study in 1982 (ibid.). The figure of 500 million is a very rough approximation only, and the actual numbers must have changed considerably over the past 27 years. Other numbers found in the literature range from 40 million to 1 billion people, but most lack the empirical data needed to substantiate the claim (ibid.). The same problem is found at the regional level, where estimates range from 50 million people making a living from shifting cultivation in Southeast Asia, to "400 million forest dependent people in Asia most of whom practice some form of swidden cultivation" (ibid: 283). Mertz et.al. conclude that regional estimates found in the literature are not very useful, and proceed to look for country-level data (ibid.: 284). They however found that reliable data allowing a reasonable assessment at that level is also not available, and conclude that the "real" number of swidden cultivators in Southeast Asia lies within the range of 14 to 34 million people (ibid.: 286).

How much land is under shifting cultivation?

With this rather sobering conclusion regarding population figures for shifting cultivators, is there a possibility to estimate the land area under shifting cultivation? Schmidt-Vogt et.al. (2009: 277) in an attempt to assess the trend in the extent of shifting cultivation in Southeast Asia concluded that "there is a surprising lack of conclusive data on the extent of swidden systems in Southeast Asia". While modern remote sending based techniques are available for assessment of local level change in land cover and potentially the extent of shifting cultivation, "the complexity and dynamic nature of swidden makes assessments on a wider scale more complicated" (ibid.) and they suggest that such data needs to be combined with "demographic data, ethnographic studies and spatial information databases to obtain a better picture of the current area under swidden as well as the number of people depending fully or partially on this system for their livelihoods" (ibid.).

What we can draw from these recent assessments of available population figures and land cover data for Southeast Asia is that any attempt at quantifying the contribution of shifting cultivation in the region to green house gas emissions is destined to fail. If we cannot assess the global or regional extent of shifting cultivation and therefore its overall share in the emission of greenhouse gases, do we at least know what happens to carbon stocks in land under shifting cultivation at the field level? And how does this compare with other forms of land use?

Does shifting cultivation cause deforestation?

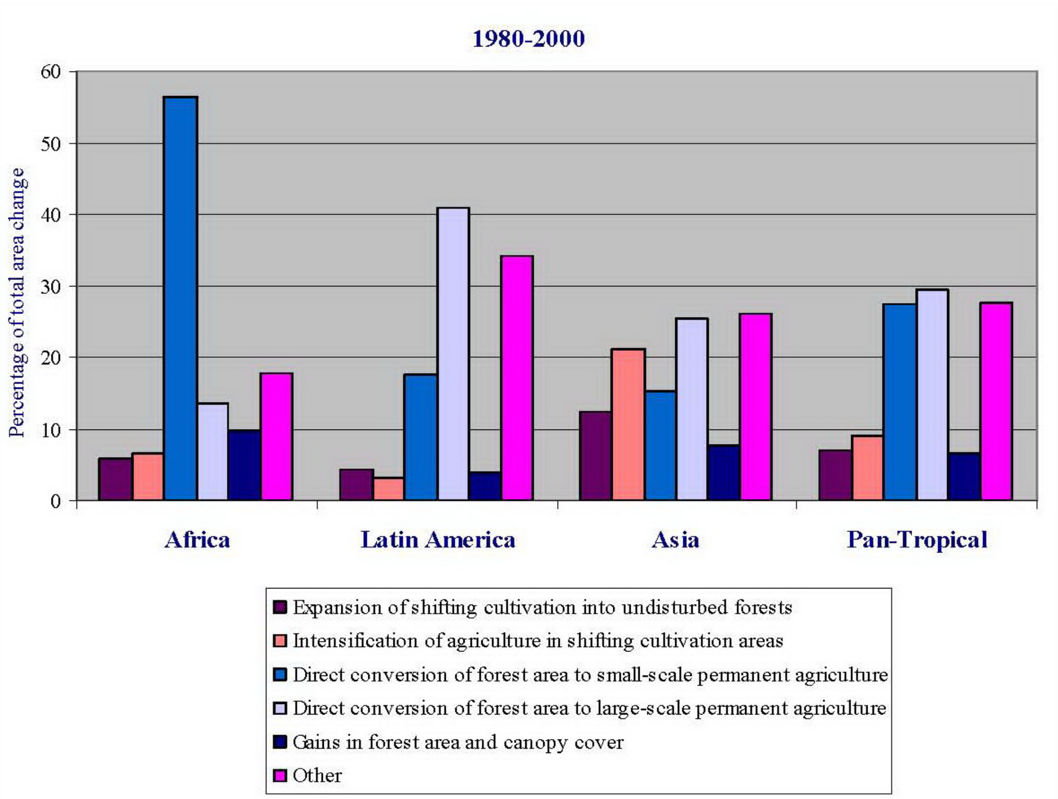
One of the basic distinctions that has to be made in the discussion on shifting cultivation and deforestation is that between established, rotational systems in secondary forest and the pioneer systems which open up primary forest. If we focus our reflection on the form of shifting cultivation traditionally most commonly practiced by indigenous peoples in Asia – the rotational system of short cultivation and long fallow – and, if, as Van Noordwijk et. al. (2008: 11) argue, we take the commonly used FAO's definition of "forest" as point of departure this form of shifting cultivation actually does not cause "deforestation".

> *The internationally accepted definition of forest has two components: one that specifies canopy cover and tree height, and one that refers to the institutional framework of forestry, as it includes 'areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but w h i c h a r e e x p e c t e d t o r e v e r t t o f o r e s t''. (UNFCCC/CP/2001/13/Add.1 as quoted in van Noordwijk et al., 2008a). The''temporarily unstocked' part of the definition is intended to allow clear-felling and replanting as normal forest management, but the definition implies that shifting cultivation and fallow rotations are not deforestation, as long as trees achieve the specified height and canopy cover. Clear-felling for developing fastwood or oil palm plantations is possible within the forest definition, but so is land clearing followed by assisted*

regrowth of woody fallow vegetation. The usual listing of shifting cultivation as a driver of deforestation is thus not aligned with the internationally accepted definition of forest.

The UN REDD Framework Document (FAO, UNDP, UNEP 2008: 3), in its overview graph on causes of deforestation, makes a distinction between “expansion of shifting cultivation into undisturbed forests” (corresponding to what is called pioneer shifting cultivation), “intensification of agriculture in shifting cultivation areas” and “direct conversion of forest area” to either small-scale or large-scale permanent agriculture. Important to note is that conversion of shifting cultivation into more intensive form of agriculture is considered deforestation. So it seems that shifting cultivation itself is not included, i.e. that clearing of land as part of shifting cultivation is not considered “deforestation”, which would be in line with the FAO definition. But if that was the case, the expansion of shifting cultivation into “undisturbed forest” with the purpose of continuing rotational shifting cultivation could also not be called “deforestation”. It could be considered “forest modification” – just like temporary clear-cutting of forest by logging companies is according to the FAO definition not considered deforestation. Obviously, there is still a certain inconsistency between the definition of forests and the data presented, which is probably partly due to the lack of a clear definition of and the distinction of different forms of shifting cultivation.

Figure 1: Causes of Deforestation in Developing Countries, by region (Source: FAO, UNDP, UNEP 2008: p.3)



But even so, let us assume that "expansion of shifting cultivation into undisturbed forest" can be considered deforestation. According to the graph, its estimated contribution to deforestation globally is around 8%. If 17% of carbon emission results from deforestation and if 8% of deforestation is due to shifting cultivation, its share in global carbon emission would be 1.36%. And this would be the case if forest was completely destroyed in the process. In shifting cultivation, however, this is not happening since the re-growth of forest during the fallow period is an integral, in fact, the crucial element of the system.

That shifting cultivation does not cause deforestation, or at least not to the extent commonly proclaimed, appears to be increasingly recognized by international organizations like the FAO, UNDP or UNEP, and in the global discourse on climate change shifting cultivation has come to be associated with forest degradation rather than deforestation (op.cit.).

What happens to all the carbon?

Since sequestration of atmospheric carbon dioxide in vegetation and soil organic matter is an important factor affecting greenhouse gas concentration in the atmosphere changes in vegetation cover, and especially deforestation and forest degradation, are watched with increasing concern by the global community, and are therefore being addressed by mitigations schemes such as REDD programs. Undeniably, burning a swidden field, whether it has been cut in primary or secondary forest, does release carbon, and this, after all, is what such climate change mitigation schemes are trying to prevent. But what actually happens throughout a full cycle of shifting cultivation? Is there a way to assess how much carbon is actually released?

Van Noordwijk et. al. have compiled data for below and above ground carbon stock, i.e. soil organic matter (humus, roots etc.) and vegetation, in different types of land cover.

With respect to carbon stock in soils they conclude:

> *The transition from forest to swidden and to continuous cropping has the tendency to lower the organic matter content of the soil. Bruun et al. (2006) found in Sarawak, Malaysia, a slight decrease in soil carbon as forest is converted to swidden. However, further transition of swidden into permanent agriculture depleted soil carbon by nearly 30 [tons per hectare], from 56 to 29 (op.cit., p. 32).*

In other words, when a primary forest is opened for shifting cultivation only little carbon is emitted to the atmosphere due to decomposing soil carbon, while a much larger amount is emitted when shifting cultivation is converted to permanent agriculture.

With respect to carbon stock above ground, they found that the trend "is similar to that below ground, except that the magnitude of the decrease is much higher as forest is converted to swidden and swidden converted to permanent cropping" (op.cit., p. 32). According to their measurements above-ground carbon stock in primary forest was 254 tons per hectare, that of an 8-year old swidden fallow was 74 and a field under cultivation was between 2 (for vegetable) to 4 (for cassava) (ibid.).[6]

These figures reveal that conversion of primary forest to secondary forest fallow under shifting cultivation does imply a considerable release of carbon into the atmosphere. We however have to remember that most shifting cultivation systems practiced by indigenous peoples are rotational systems. So in trying to at least get an idea of the contribution of shifting cultivation to global carbon emission we again have to distinguish between these established and the pioneer systems. Of course, also rotational shifting cultivators at one point had to open virgin forest, which has a much higher carbon stock than any other kind of land cover. But so did most other forms of agriculture as well. Nobody would seriously demand to include the removal of the original virgin forest, which may have happened hundreds or thousands of years ago, in the overall assessment of carbon emissions in present-day agriculture in Europe, or the alluvial plains of Asia. The crux of the problem here is that shifting cultivation is not recognized as an established form of agricultural land use, or agroforestry. In order to treat it equally to other agricultural systems we need to de-link it from the original conversion of primary forest into secondary forest and confine our analysis to what is happening in the course of the productive cycle in rotational shifting cultivation, and in the longer term, during several such cycles.

Research over the past decades has shown that if fallow periods are long enough rotational shifting cultivation is a stable system in which soil fertility can be maintained (Nye and Greenland 1960; Ruthenberg 1971; van Noordwijk et.al. op.cit.: 20). This implies that, once established (i.e. as primary forest has been converted into secondary fallow forest) rotational shifting cultivation can be expected to be *carbon neutral.* Whatever above-ground and soil carbon is released through burning and decomposition during the preparation of the field and the cropping period is sequestered again by plant growth above ground and by formation of humus in secondary fallow forests.

Quantitative data providing proofs for this assumption, i.e. documenting the changes in carbon over several cycles of shifting cultivation, is however scarce. According to Lawrence (2005: 26) only two researches, conducted in Brazil and Bolivia have studied the effect or repeated clearing on forest regrowth and productivity of the land. Both studies did not find any differences in biomass accumulation or productivity of the land after several cycles over two to three decades (ibid.). Lawrence herself wanted to know what happens over an even longer period. In her research she tried to assess the effect of repeated long-fallow shifting cultivation on the above-ground biomass accumulation capacity in a long-fallow system of shifting cultivation in a rainforest environment in West Kalimantan. Research was done in 9 to 12 years old fallow secondary forests that had experienced between 1 and 10 or more cycles, thus covering a time-span of up to 200 years. While controlling for differences in inherent soil fertility between the different sites, it was found that the aboveground live biomass increment (the biomass accumulation rate) of secondary forests changes over time. It is lowest after 2 cycles, highest after 1 or 4 cycles, and intermediate after 6 to 10 cycles. The decline from the highest rate to the intermediate rate after 6 to 10 cycles was found to be 11%.

This, she concludes, “could substantially alter the carbon-sequestration value of secondary tropical forests as they enter their second century of persistent human disturbances” (ibid: 26).

According to Lawrence, the most likely reason for the decline of regenerative capacity of fallow secondary forest is the change from regeneration dominated by re-sprouting species to regeneration from seeds, which implies slower re-growth (ibid.: 30ff). The cleared fields in which the research was conducted do however not contain any standing trees (ibid: 27), and it is not clear to what extent measure were taken to enhance the regeneration of secondary forest, like e.g. the common practice to cut trees in a way that increase the survival rate of tree stumps, thus enhancing re-sprouting. Shifting cultivators are very much aware of the need to maintain good and rapid recovery of secondary forest on their fallowed fields. Many forms of active fallow management have been documented (IFAD et.al 2001), and under conditions of sufficient land, fallow forest are cut not after a fixed number of years, but when they have recovered well. This helps maintaining the regenerating capacity of secondary forests.

But even with a decreased carbon sequestration rate of fallow forests after many decades of land use as compared to the initial years, if sustainability at that level is maintained land under shifting cultivation still sequesters considerably more carbon than many other forms of land use.

The Intergovernmental Panel on Climate Change in its discussion of land use change as a source of greenhouse gas (IPCC 2006, paragraph 1.4.1) acknowledges one crucial and often overlooked aspect of shifting cultivation: the fallow. “Forest clearing for shifting cultivation (2) releases less carbon than permanent forest clearing because the fallow period allows some forest regrowth”. Again, the crucial question when discussion shifting cultivation and climate change is what we compare it with.

How does shifting cultivation compare with other forms of land use?

Most commonly, the point of reference are undisturbed forests. As pointed out earlier, underlying such a view is the still widespread lack of recognition of shifting cultivation as a form of agriculture, or agroforestry. For Brech Bruu et.al. (2009: 377) comparing environmental aspects of shifting cultivation with those of primary forests is problematic “most fundamentally because a primary forest is not a production system, thus for the farmers forests to not represent an alternative to swidden cultivation”.

We have already briefly referred to research by Van Noordwijk et. al. (2008) in Indonesia, who documented the loss of soil and above-ground carbon stocks during transition from primary forests to shifting cultivation, and a considerably higher loss when shifting cultivation is transformed to permanent agriculture.

In trying to assess the consequences of a change from traditional long-fallow shifting cultivation to other forms of land use for carbon storage and soil quality Bech Brun et.al. (2009: 375) come to similar conclusions:

When the fallow period is reduced to 4 years, time-averaged aboveground carbon stock was found to decline by 88-90%, soil organic carbon by 0-27%. A change to continuous annual cropping implied a reduction of 95-99% aboveground carbon and 13-40% of soil carbon.

The establishment of rubber plantation lead to a loss of 10-40% aboveground and 0-30% soil carbon, and that of oil palm plantations 60% and 0-40% respectively (ibid.: 383).

The authors however stress that there are only very few studies reporting the aboveground carbon storage of different systems of shifting cultivation as time-averaged carbon storage, i.e. including the complete cycle, and that the data presented are only rough estimates (ibid.).

The table below summarizes data on carbon stocks in vegetation under different forms of land use provided by Bruun et.al. (2009) and from van Noordwijk et.al. (1995). Only the former's refer to time-averaged carbon stocks (i.e. the average over a full cycle).

Figure 2: Above-ground carbon stock in vegetation under different forms of land use (tons/ha)

Shifting cultivation		
Long fallow-systems (>10 years)	80 (24-160)	Bruun et.al. 2009
8-years fallow forest	74	van Noordwijk et.al. 1995
4-years fallow system	8-9	Bruun et.al. 2009
Agroforests		
Rubber agroforest (Indonesia)	90	Bruun et.al. 2009
Rubber (agro)forest (Indonesia)	116	van Noordwijk et.al. 1995
Permanent agriculture seasonal crops		
Continuous annual cropping	1-4	Bruun et.al. 2009
Annual cropping vegetables	2	van Noordwijk et.al. 1995
Annual cropping cassava	4	van Noordwijk et.al. 1995
Monoculture tree plantations		
Casuarina tree monoculture plantation	21-55	Bruun et.al. 2009
Rubber plantation	50	Bruun et.al. 2009
Oil palm		
Indonesia, 20-25 years rotation	48-91	Bruun et.al. 2009, van Noordwijk et. al. 1995
Malaysia	36	Bruun et.al. 2009

The conclusions we can draw from this data is that even when soil carbon is not taken into account carbon sequestration in traditional shifting long-fallow cultivation is superior to that of permanent land use, and of most tree plantations, alternatives which governments throughout the region are aggressively promoting and often imposing on indigenous communities. And Padoch et.al. (op.cit.:

32) suggest that “swidden can be considered an important provider of environmental services compared to alternative land use systems”.

This, we have to stress however, applies only to a situation of sufficiently long fallow periods. We do not have any precise criteria for sustainability of shifting cultivation systems. The minimal length of fallow that maintains soil fertility and thus long-term sustainability depends on many factors and thus can vary considerable according to local conditions. In any case, the implication of long fallow periods is that only comparably low population densities are possible. Van Noordwijk et.al. (op.cit.: 41) suggest, “As a simple guideline, a population density of 10 people per km2 in the humid tropics may be a threshold”. They refer to computer modeling which revealed that “at more than 15 people per km2, recovery during the fallow phase becomes deficient and changes are needed to avoid collapse” (ibid.).

Transformations of indigenous peoples’ land use in Southeast Asia

In many parts of the tropics and particularly in Southeast Asia the population-land ratio did reach such critical levels. While natural growth of local populations has contributed to increasing land scarcity, state-sponsored or spontaneous in-migration and resettlement are the more common cause (Cramb et.al. 2009: 325). Population growth is however only one of the factors that lead to a resource crisis in swidden areas. Government restrictions on shifting cultivation and large-scale alienation of indigenous peoples’ land have in many cases been a main cause of land scarcity and consequently a shortening of the fallow period. However, against predictions by concerned policy makers and environmentalists,

> *[ ] rather than collapse, swiddeners around the world are modifying their practices. Many shifting cultivators have developed cultivation cycles that more closely resemble crop rotation systems and agroforestry operations than what has conventionally been called swidden, or they may have always done such things but it was overlooked by researchers who focused on the more dramatic “slash and burn” image (Padoch et.al. op.cit.: 30).*

There are only few cases where shifting cultivation has crossed the critical threshold and lead to serious environmental degradation (Cramb et.al 2009: 326). It happens where alternatives like tree-crops, wet-rice cultivation, off-farm employment or temporary or permanent outmigration are not available. Even where land resources have not yet reached critical levels shifting cultivators have changed their land use systems as they opted to make use of new opportunities offered by expanding market integration. Rubber, for example, has been adopted by indigenous farmers in Indonesia and integrated into their land use systems since the late 19th century (Van Noordwijk et.al. 1995: 86ff, Burgers and Boutin 2001: 149). In fact, such “composite economies”, in which smallholders “cultivate food crops – usually by extensive swidden agricultural technology – to meet their subsistence needs, while gathering or cultivating export commodities like rubber to meet their market-oriented needs” (Dove 1998: 24) have existed there and elsewhere in Southeast Asia since centuries. What is however happening now throughout Southeast Asia is that other forms of land use are not just complementary to, but are rapidly replacing shifting cultivation.

Fox et.al. (2009) have identified six factors that contributed to the replacement or transformation of shifting cultivation:

1. Classifying shifting cultivators as "ethnic minorities" in the course of national building, and the concomitant denial of ownership and land-use rights;

2. Dividing the landscape into forest and permanent agriculture, the claim over the former by forest departments and the transfer of use rights to logging companies and commercial plantations;

3. The expansion of forest departments and the rise of conservation, which have further expanded and strengthened state control over forests;

4. Resettlement of shifting cultivators out of upland and forest areas and the dispossession of their lands as a result of the non-recognition of collective or individual rights over land and forests;

5. Privatization and commoditization of land and land-based production, resulting in dispossession of shifting cultivators and giving rise to commercial agriculture and industrial tree-farming by private companies, state enterprises as well as entrepreneurial farmers and small-holders;

6. Expansion of infrastructure (roads, electricity, telecommunication) and subsidies for investors supporting markets and promoting corporate and private industrial agriculture.

The authors also note "a growing trend toward a transition from rural to urban livelihoods and expanding urban-labour markets" (ibid.: 305). As shifting cultivators are losing their land or for other reasons cannot live from shifting cultivation alone many, particularly the youth are seeking employment in urban centers in the lowlands, along the coast or abroad. Cramb et.al. (2009: 326) also refer to cases where shifting cultivation is disappearing because of population decline as many young people temporarily or permanently leave their villages so seek employment in the cities. This reduces both local demand for as well as the labour force needed for shifting cultivation (ibid.). Modern education contributes in several ways to the abandonment of shifting cultivation. Schooling of children in boarding schools away from their villages prepares the way for outmigration, prevents them from acquiring the necessary skills for and implants negative stereotypes on shifting cultivation (ibid.: 326, 329). Exposure to urban life styles and mass media bring about changes in attitude and aspirations, and conversion to mainstream religions undermines the ritual significance of shifting cultivation (ibid.: 329).

In addition to the various state development, infrastructure or conservation programs, legal reforms, market forces, mainstream education and cultural assimilation impacting on shifting cultivators, some Southeast Asian countries had and still have specific policies and laws that directly seek to reduce or completely this form of land use. In Indonesia, a law banning shifting cultivation on Java was passed by the Dutch colonial government as early as 1874 (Fox et.al 2009: 316). In the Philippines, a similar law, providing for punishment and eviction of shifting cultivators from forests, was enacted by the US Colonial Government in 1901. It was replaced by the so-called "Kaingin Law" in 1963 (Pulhin et.al 2005: 86).[7] The government of Lao has an official policy to stop shifting cultivation and has just recently reiterated its goal to eradicate it by 2010 (IWGIA 2007: 360).[8]

The combined impact of all these factors appears to lead to a rapid decline of shifting cultivation throughout the region. Fox at.al (2009: 319) conclude that "the conditions necessary for swiddening, both the availability of land and the aspirations of people, simply no longer exist in many parts of Southeast Asia", and Padoch et.al (2007: 37) predict: "Indeed, it appears that swidden is gradually disappearing in most parts of Southeast Asia, and only remains stable in few areas. But we do not know precisely how fast, or where these changes occur".

In some areas, like northern Thailand, indigenous shifting cultivators have adopted intensive permanent farming of temperate vegetable and flowers, which have been heavily promoted by government and international development agencies, have transformed the environment into an open landscape, and are maintained by high inputs of agrochemicals (Forsyth and Walker 2008). In far more cases, however, shifting cultivation is evolving into new forms of agroforestry. These are diverse systems that may combine the production of subsistence crops with cash crops, like the example of a "composite economy" based on rubber and swidden rice mentioned above, or rely predominantly permanent crops like fruit trees, rubber, coffee, tea etc.[9] The adoption of cash crops has often increased income, but dependence on the market also lead to more vulnerability, and shifting cultivation can provide "an important buffer or social safety net in the face of market fluctuations" (Cramb et.al 2009: 343).

Indigenous peoples' land use and climate change mitigation: The unappreciated potentials and the obligations

Countries like Malaysia and Indonesia have in recent years launched ambitious land conversion programs for large-scale oil palm plantations, and rubber plantations have been established on a large scale in Southwest China over the past decades(Padoch et.al. 2007:33), and are at present rapidly expanding in Cambodia and Laos (IWGIA 2009: 344, 363). These programs have come under heavy criticism due to their contribution to deforestation, loss of biodiversity, environmental pollution and dispossession of indigenous and local communities.[10] As we can conclude from the data compiled in figure 2 above, recent research shows that the carbon sequestration capacity of industrial tree plantations like oil palm monocultures are generally lower than that of agroforestry systems, including traditional long-fallow shifting cultivation, which are more beneficial to local people[11] and biodiversity.[12]

Especially at the a landscape level, the carbon sequestration capacity of land under indigenous land use systems is by far superior since they usually include not only a mosaic of various anthropogenic vegetations –fields cultivated with annual crops, fallow land, agroforests, home gardens, orchards etc. – but also natural forests, either community forests which cover their needs for various wood and non-wood forest products, or sacred and other protected forests. In response to the growing scarcity of forest resources and declining biodiversity indigenous communities throughout the region have developed or refined existing systems of what has come to be known as community-based forest management (CBFM). The potentials of CBFM are increasingly recognized not only because it has proven to be an effective approach in forest conservation, but because it also provides income to the predominantly poor indigenous and non-indigenous communities living in or near forests. In some countries, like the Philippines, CBFM was adopted as part of the national forest conservation strategy and throughout Asia there is a clear trend toward state forestry policies that formally recognize the rights, roles and responsibilities of communities in forest management [13]

CBFM and indigenous peoples' land use systems are however still not recognized for their potential contribution to carbon sequestration and therefore climate change mitigation. Forest management in general and CBFM in particular are not part of the Clean Development Mechanism (CDM) under the Kyoto protocol. And there are valid reasons for that. First, it was feared that including forest management would offer a cheap possibility for heavy-polluter countries to "compensate" carbon emission at home instead of actively reducing it. Secondly, it was feared that this could encourage destruction of natural forests to be replaced by fast-growing plantation forests (Skutch 2004: 6f). There are also technical problems with respect to carbon measurement that have given an additional reason for the non-inclusion of forest management in the CDM (ibid.). The compromise reached was that only afforestation (on land that has never been covered by forest) and reforestation (of land that hasn't been under forest since 1990) have been included. The improvement of carbon sequestration by sound forest management and natural forest regeneration, as practiced by indigenous and other local communities, remain outside the CDM.

Likewise, forest conservation does so far not qualify for consideration under REDD programs if the respective areas are not under immediate threat of being deforested. This again does not permit the inclusion of indigenous peoples' forest conservation and agroforestry practices.[14] At present, much of the discussion on REDD focuses on the potential negative impact on indigenous and other forest people, since there are good reasons to expect that government controlled REDD programs will lead to further dispossession of indigenous and other forest communities, and new forms of elite appropriation of benefits (Griffiths 2008, CEESP 2009). Furthermore, the expected banning of shifting cultivation, the use of fire in forest and pasture management and other forms of forest use will have significant costs for local people. It is therefore now widely recognized that the implementation of REDD without the recognition of indigenous peoples' and other local communities' rights, and without consideration for their livelihood security will only increase poverty, lead to conflict and may ultimately backfire as people are likely to resist and even sabotage such programs (Van Nordwijk 2008: 42).

The UN Declaration on the Rights of Indigenous Peoples clearly states that indigenous peoples have the right to participate in decision-making processes directly relevant for their lands and territories. So far, however, indigenous peoples and their organizations have not been allowed to participate effectively in the discussion on REDD. During the 13th Conference of the Parties of the Framework Convention on Climate Change (FCCC) in Bali indigenous peoples' delegates repeatedly and vehemently protested their exclusion from the negotiation process. They issued public statements and recommendations on climate change mitigation and adaptation, including REDD, expressing the keen interest of indigenous peoples to help finding effective, just and sustainable solutions to climate change, but also their concerns about the current REDD policies and global finance mechanisms that risk violating human rights and further marginalizing forest dependent peoples (Griffiths 2008:29).

The potential contribution of indigenous peoples' land management systems to REDD and climate change mitigation in general has so far received far too little attention. This despite the fact that in Brazil, for example, it was found that recognizing indigenous peoples' rights over their territories is the most effective policy to prevent deforestation (CEESP 2009: 5). Recognizing indigenous peoples' rights to land, territories and resources, and their land use and management practices in REDD and other climate change mitigation schemes is therefore not only an obligation emanating from the provisions of the UN Declaration on the Rights of Indigenous Peoples, it can substantially contribute to more effective mitigation of climate change. As Cotula and Mayers (2009) point out, the recognition of tenure rights should be a "start-point" rather than an "afterthought" in REDD.

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Notes

[1] An example is the wetland burning by Aborigines in Kakadu National Park in Northern Australia (Australian Government Director of National Parks 2007, Christophersen 2008).

[2] See e.g. Fox et. al 2009, Padoch et. al. 2007 in general, IWGIA 2007 for Laos, Pulhin et. al. 2005 for the Philippines, Laungalamsri 2005 and Forsyth 1999 for Thailand, Phuc 2008 for Vietnam, or Dove 1985 for Indonesia. Another term commonly used for this form of land use is swidden agriculture. It is derived from the Old English term "swidden", meaning "burnt clearing" (IFAD et.al 2001: 24f).

[3] See e.g. Dove 1983, 1985, 1996; Padoch 1985; Forsyth 1999, Laungaramsri 2005, Nielsen et.al. 2006, Forsyth and Walker 2008.

[4] See Erni 2008 for a compilation of articles on the use of the concept of indigenous peoples in Asia, and overviews of common designations and state policies in various countries of the region. In recognition of their increasing self-identification as indigenous peoples I will throughout the article use this term.

[5] See e.g. various contributions in Duncan ed. 2004.

[6] Lal et.al. (2000: 104) give considerably higher average figures for total system carbon (above and below-ground) in secondary vegetation in tropical forests in Amazonia, Southeast Asia and West/Central Africa:

Original forest	305
Bush fallow (average of 4.6 years old)	85
Tree fallow (9.4 years old in average)	136
Secondary forest (19.4 years in average age)	219

[7] Republic Act 3701 of 1963, known as Kaingin Law, provides for severe punishment of "kaingin" (shifting cultivation). The law is not very strictly enforced though.

[8] According to Alton and Rattanavong (2004:32) "the 7th Party Congress 2001 set the targets for the complete elimination of pioneering shifting cultivation and overall reduction of all shifting cultivation by 50 percent (to 29,400 ha) by 2005 and complete eradication of all shifting cultivation by 2010". As part of this plan, large numbers of indigenous communities are being resettled. A recent study estimated that approximately 211,125 people have been included in the national level government resettlement plan for 2001 to 2005. 59,947 people have already been resettled, another 151,178 people still have to be resettled in 2005 and between 2006 and 2010. The study was carried out in 16 districts and 150 villages in 8 provinces. For security reasons, the source of this information cannot be revealed.

[9] The key definitional criteria for agroforestry is that woody perennials (trees, shrubs) are used on the same land either sequentially or simultaneously with annual agricultural crops or domesticated animal. In this sense, shifting cultivation is also considered a form of agroforestry – Garrity and Lai (2001: 3) call shifting cultivation "the first form of agroforestry" – and many of both past and present land use changes among indigenous swidden farmers have been successful because they occurred within the logic of existing livelihood systems, causing little disruption and implying fewer risks when compared to the radical changes implied in many of the rural development programs of state governments and international agencies promoting permanent food crop agriculture or monocrop plantations (see e.g. Van Noordwijk et.al. 1995 (86ff) and Dove 1998 on rubber agroforests in Indonesia, Wand and Long 2001 on swidden farming combined with lacquer trees in Yunnan province of Southwest China, Erni 2001 on the local development of intensified agroforestry in the Philippines, Van Noordwijk et.al. 2008: 34f on rural development programs for shifting cultivators or Sturgeon 2005 on government imposed tea growing in China).

[10] See e.g. Forest Peoples Programme 2005, Colchester et.al. 2006, Perkumpulan Sawit Watch et.al. 2007 on oil palm plantations.

[11] With 34% a considerable share of Indonesia's palm oil is produced by smallholders (Van Noordwijk et.al. 2008: 34). However, unlike with rubber the production of oil palm poses considerable technical constraints which limit the autonomy of smallholders as independent producers [ ] smallholders tend to be

tied, often by debt and by technical constraints, to large palm oil concerns, limiting their ability to negotiate fair prices or manage their lands according to their own inclinations (Colchester et.al. 2006: 39).

12 On biodiversity in different forms of land use see Rarkasem et.al 2009, van Noordwijk et.al 2008 p. 32f

13 See e.g. Poffenberger 2006, RECOFTC 2007.

14 Generally, the problem with REDD is that it does not provide incentives for maintaining good forest management and low deforestation rates, whether at the country of the project level. It has pointed out that this may in fact create perverse incentives, i.e. that it may encourage increasing deforestation in order to be able to access REDD compensation payments for lowering deforestation rates (see e.g. Dooley 2008:9, Angelsen 2008: 52)

not receive incentives to maintain these low rates using methodology based on historical baselines. Incentives are required to maintain these low rates of deforestation, as there is a real risk of international leakage threatening these forests