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Swidden Change in Southeast Asia: Understanding Causes and Consequences

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Introduction

More than 50 years ago the FAO Staff through its forestry journal *Unasylva* issued an "appeal…to governments, research centers, associations and private persons who are in a position to help". The plea was for information that would help the world overcome "…the greatest obstacle not only to the immediate increase of agricultural production, but also to the conservation of the production potential for the future, in the form of soils and forests… [N]ot only a backward type of agricultural practice…[but] also a backward stage of culture in general" (FAO Staff 1957). That impediment was shifting cultivation, or as we prefer to call it in this special issue, swidden cultivation.

For centuries, swidden cultivation has been one of the most important land use systems in the tropics, including Southeast Asia. Numerous studies, including those of Conklin (1957, 1963), showed that in many situations it is in fact a rational economic and environmental choice for farmers in the humid tropical uplands (Fox 2000; Ickowitz 2006; Mertz 2002). While FAO did not succeed in its proposed research-driven "attack" on swidden cultivation, change in areas formerly dominated by swidden cultivation is now occurring at a rapid pace and, in much of Southeast Asia (and elsewhere), the system is being replaced by or transformed into other land uses. Change from swidden cultivation to other land uses may indeed be desirable for some farmers, but in other cases such factors as prohibitive legislation, land reform, logging, large-scale land development, exclusionary conservation zoning, and resettlement are driving change towards new land use systems with consequences that are still poorly understood. Do they, in all cases, represent an improvement, or is there a continuing rationale for swidden cultivation in the twenty-first century?

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Some farmers seem to maintain some elements of swidden although they live in rapidly developing economies with ample job opportunities and lucrative markets (Hansen and Mertz 2006; Nielsen *et al.* 2006); in other cases, farmers abandon shifting cultivation in favor of more permanent land use (Cramb 2007; Eder 2003; Guo *et al.* 2002). Yet we have little knowledge of the current extent of swidden cultivation in Southeast Asia, and even less of the consequences for livelihoods and environment of the new social, economic, and environmental circumstances that are fast replacing swiddening (Padoch *et al.* 2007).

The nature and consequences of change in swidden have been analyzed locally, but rarely upscaled (Padoch *et al.* 2007) and basic elements of the systems are often not well understood. One reason is that swiddening is often difficult to detect: swidden fields may appear as agricultural land on national land cover maps, yet fallow land at various successional stages of woody regrowth is often categorized as 'unclassified' or 'degraded' land. Swidden is also not captured well in global land use mapping exercises and reviews because of their scale of landscape analysis (Foley *et al.* 2005; Ramankutty and Foley 1999), and its practitioners are rarely identifiable in demographic surveys and censuses. This is partly because swidden is a smallholder category that government authorities find difficult to quantify—swiddens and fallow areas often are mixed with permanent tree plantations and vegetable farming making every smallholding very dynamic and varied (Gleave 1996; Padoch *et al.* 2007). In practice, swidden cultivation has become a component activity in diversified livelihood systems that in many cases are no longer spatially bound or even entirely 'rural'. It is obvious that if such basic information is unavailable, planners and policy-makers have no sound basis for decisions on land use and development in the poorest regions of their countries.

It is often assumed that replacing swidden leads to improvements in environmental services as agriculture becomes intensified and concentrated in limited areas while larger areas are left to forest regrowth. There is some evidence that this is occurring in Vietnam, but this change has resulted in negative consequences for local livelihoods (Jakobsen *et al.* 2007). In other areas forests are converted to plantation or tree crops, not natural forest (Angelsen 1995; Hansen and Mertz 2006). Moreover, many local studies on the effects of swidden systems on biodiversity and soil and water resources point to a sustainable system if a minimum fallow period is retained (Kleinman *et al.* 1996; Szott *et al.* 1999), but an overview of how biodiversity in Southeast Asia is affected by swidden has so far not been available. Finally, the role of swidden cultivation in carbon storage is still poorly understood, partly because the carbon cycle of the soil-vegetation system is not well researched (Leisz *et al.* 2007). In particular, the role of swidden in conserving soil carbon is still not clear, although some studies point to a positive effect of swidden, as compared to alternative land use systems, including forests (Lawrence *et al.* 2005; Sommer *et al.* 2000).

In order to address these knowledge gaps, a workshop and conference was organized in Hanoi, Vietnam, on 3–7 March 2008, which gathered international expertise on swidden in Southeast Asia. The workshop provided an assessment of existing knowledge on change in swidden and identified research gaps that need to be filled to address adequately the development and transformation of swidden communities and their land use systems. The subsequent one-day conference communicated the workshop results to a wider audience that included Vietnamese policy makers, and later these were also presented to Indonesian policy-makers in Jakarta by staff of the World Agroforestry Centre. The keynote address at the conference was delivered by Professor Emeritus Georges Condominas who eloquently pointed out how swidden cultivators are faced with the same constraints today as they were many decades ago and that recognition of their skill and knowledge remains to be seen among governments and farmers not practicing swidden (Condominas 2009). This set the stage for presentations on our current knowledge about swidden and discussions of the need for further research, providing the overall frame and objectives for the articles in this special issue. However, before turning to a presentation of the articles, we briefly define our use of the term 'swidden' in this special issue.

Defining Swidden Cultivation

At a first glance, defining the subject of this special issue seems like a fairly straightforward matter, but the diversity of land and resource management denominated by the term swidden, makes it difficult to provide a widely applicable definition. There is little agreement on the term, although swidden cultivation, shifting cultivation, and slash-and-burn agriculture are often used synonymously, despite the meanings not being identical. Swidden is a word of Scandinavian origin meaning "land cleared by burning", but fire-free, mulch-based systems exist on Pacific Islands and elsewhere and are more appropriately termed shifting cultivation. Slash-and-burn is often used for a wide range of land use practices where no shifting of fields takes place. Swidden cultivation, however, describes well the rice and maize-based systems of much of Southeast Asia.

Many definitions have been published and debated during the past century. The FAO's call to eliminate swidden gave an appropriately negative (and misguided) definition: "Shifting cultivation is the custom of cultivating clearings scattered in the reservoir of natural vegetation

(forest or grass-woodland) and of abandoning them as soon as the soil is exhausted" (FAO Staff 1957). We will review the most common and relevant definitions for Southeast Asia. Pelzer's (1945) definition that "shifting cultivation can be defined by the rotation of fields rather than crops, a short cropping period (1–3 years) succeeded by a long fallow period (5–20 years), and clearing by means of slash and burn" still captures well the traditional subsistence based systems of Southeast Asia, but omits the fact that parts of the fallow areas are often planted with useful tree crops either for subsistence or cash income. While being protected as long as the trees are productive, this land often enters the swidden cycle when trees are cut and upland rice planted again. So is this land fallow or permanently farmed with trees? The more rigid definition by Ruthenberg (1980)—stating that if less than 33% of the land is farmed (or more than 67% fallowed), then the system is defined as 'shifting cultivation'—faces the same problem as it requires a definition of what is meant by 'farmed'. Moreover, this definition will also include areas which after successive cycles of only 2–3 years of fallow have been turned into grassland with no woody component at all and such systems are rarely considered to be 'swidden cultivation' in Southeast Asia.

Some scholars have suggested distinctions between different types of swidden cultivators. Conklin (1957) distinguished between "integral" and "partial" swidden systems. Integral systems are integral, not just to the farmer's subsistence, but to the entire way of life of the farming community. They include "pioneer" swidden farming, in which a significant portion of annual clearing is from climax or old-growth vegetation, and "established" swidden farming, in which little or no climax vegetation is cleared. Partial systems, by contrast, are an adjunct to other forms of land use and livelihood. They include "supplementary" swidden farming, where the farmer practices permanent cultivation but allocates some resources to swidden on a smaller scale, and "incipient" swidden farming, where a farmer moves into a forested area to clear it for permanent farming, whether subsistence or commercial, but is forced to shift because of declining yields. Watters (1971) drew a similar broad distinction between "traditional" swidden agriculture and the adoption of swidden out of necessity by "non-tribal" farmers suffering from land hunger as did Myers (1992) in his distinction between "shifting" and "shifted" cultivators. Spencer (1966) proposed a very detailed classification, including the distinction between linear-shift and cyclic-shift systems that largely correspond to Conklin's pioneer and established categories. In practice, however, these distinctions partly break down in the face of the dynamic nature of swidden systems and the contexts in which they are practiced. In fact, as the papers in this special issue make clear, most swiddeners in Southeast Asia have been engaged in a long-term transition from pioneer to established to partial systems as their livelihood systems are transformed. The increasing speed of change in recent decades has given rise to a diverse array of land use and livelihood systems that defy simple classification.

This development is reflected in more recent definitions. Rambo (1998) defines "composite swiddening" as an agricultural system that integrates permanent wet rice fields and rotating swidden plots into a single household resource system. Other scholars propose broad definitions asserting that swidden cultivation comprises a wide range of farming practices in which fallow is the main source for maintaining productivity (Andriesse 1989; Brookfield *et al.* 1995), presumably regardless of whether the fallow is enhanced with productive species or not. This captures most systems if 'maintaining productivity' includes both main fallow functions of restoring fertility in the soil-vegetation system and suppressing weeds. That farmers in many places today are 'helping' these fallow functions by using fertilizers and herbicides complicates the picture further, but such activities are in principle not excluded from this broad definition. For the purpose of this special issue, we have 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. The staple crop is most often upland rice, but can be maize in some parts of Montane Mainland Southeast Asia. Secondary crops such as cassava, bananas and other annual or perennial crops occur to varying degrees in the swiddens as do cash crops such as ginger, cardamom, etc.

Overview of Articles

The first three articles of this issue deal with the problem of defining and measuring the spatial extent of swidden and review the current (lack of) knowledge on how many people are dependent on swidden cultivation. A country-by-country analysis shows that both the area under swidden (Schmidt-Vogt *et al.* 2009) and the number of people dependent on swidden are largely unknown and the data from each country are highly variable (Mertz *et al.* 2009). For some countries it is not even possible to provide credible estimates, and the regional level presents even graver problems. A review of 151 case studies published in 67 articles reveals that in about two thirds of the cases discussed, swidden is being replaced at a rapid pace by other land uses, whereas in the remaining cases it persists at various levels (Schmidt-Vogt *et al.* 2009). A range of methods are suggested to move forward in understanding the spatial and demographic dimensions of swidden, which

is fundamental for addressing development needs in rural areas of the region (Mertz *et al.* 2009; Schmidt-Vogt *et al.* 2009). The third article provides some methodological answers to questions raised in the second article, and credible data on both the extent of swidden land cover and population for the Lao PDR are presented. A landscape mosaic approach using a 'moving window', wherein pixels are assigned land cover classes based not only on their own information, but also on information in neighboring pixels, is useful in identifying areas dominated by swidden cultivation (Messerli *et al.* 2009).

The following two articles address drivers and impacts of swidden change by analyzing the political economy of swidden and the implications of swidden transformation for rural livelihoods. Based on an analysis of overall political economic trends and a series of case studies, Fox *et al.* (2009) conclude that there are six main factors that have driven the change in swidden systems in Southeast Asia: (1) classification of swiddeners as ethnically different and even primitive; (2) the non-appearance of the swidden agroforestry system on maps showing forests and agriculture; (3) state control and conservation efforts in forested areas where swidden is practiced; (4) resettlement; (5) privatization efforts that contrast with communal and customary forms of land tenure; and (6) the promotion of industrial and market-driven agriculture. The question arises as to how these developments affect—positively or negatively—livelihood outcomes of (former) swiddeners. This question is taken up by Cramb *et al.* (2009), who review both regional trends and a number of specific case studies to analyze the local-level responses to these "drivers" of change (livelihood strategies) and the consequences for livelihood security The authors conclude that swiddeners welcome appropriate forms of development and have themselves sought ways to improve their livelihoods, including changes that involve leaving swidden cultivation behind. But there are also many examples of externally imposed change—often involving shifts in land ownership and large scale land development—that have had negative impacts on livelihoods.

The final set of articles addresses the impacts on the environment of swidden cultivation as well as of the systems that are replacing swidden. These issues have been much debated and widely divergent positions have been taken, partly because some scholars choose to compare swidden environmental impact to that of natural forests rather than to alternative agricultural systems—an unfair comparison because swidden cultivation is essentially an agricultural system that integrates forest use. Swidden cultivation systems composed of fields, fallow in various stages, and often smaller or larger patches of old-growth forest are generally high in plant and crop biodiversity, and Rerkasem *et al.* (2009) illustrate how this diversity is threatened by large scale conversion to plantation agriculture across the region. However, they also show that changes in smallholder systems from swiddening to more permanent agriculture do not necessarily lead to a decline in agrobiodiversity. They present several cases suggesting that some farmers find ways of maintaining and even expanding their diverse assemblages of cultivated, semi-cultivated and wild growing plants even while intensification of land use proceeds.

Ziegler *et al.* (2009) paint a more somber picture of swidden change. They argue that swidden cultivation systems in Montane Mainland Southeast Asia are, in their traditional form, generally very benign in their effects on the physical environment and that almost any type of intensification or conversion to other land use systems results in disruption of stream flow, decline in stream water quality, increased erosion and higher risk of mass failures. Roads and other infrastructure that are more frequent in landscapes with intensified agriculture, play an important role in causing these negative impacts. Changes in hydrology and geomorphology also have direct impacts on soils. Bruun *et al.* (2009) analyze the effects of changes in swidden cultivation on soil carbon and soil quality. They find that alternative land use systems show lower levels of carbon storage and reduced soil quality than swidden cultivation; and that short-fallow versus long-fallow swidden shows a similar pattern. However, data on these issues are scarce and sometimes inconclusive, especially with regard to soil carbon storage, and considerably more research is needed to understand the time-averaged carbon storage in tropical rain forest environments.

Conclusions

The articles in this special issue attempt to settle a number of questions about swidden in Southeast Asia, but also raise a number of other concerns. Despite a relatively large number of case studies from the region, the knowledge of swidden cultivation is still very patchy and many essential elements such as exact areas affected and people involved are still not well documented. The general drivers of swidden change are somewhat better understood, but data on their relative importance in many regions still elude us. Livelihood and environmental consequences of swidden transformations are complex, and while we know that there are positive outcomes, most examples point to negative impacts. This is partly because externally driven changes are often not sensitive to local demands for development and favor macroeconomic development over environmental protection and local welfare.

A number of suggestions for future research are outlined in this special issue. Some involve concrete methods to further our understanding of swidden transitions, such as

the new land cover mosaic classification method proposed by Messerli *et al.* (2009). Further development of this method to include time series information and change detection will be needed to capture changes in the extent of swidden cultivation in the region and thereby develop possible scenarios for future land use change. Within the livelihood and environmental issues addressed in the other articles there is a large body of research that focuses on local scale dynamics of swidden cultivation. The main issue for future research would be to focus more specifically on the impacts of transitions from swidden cultivation to other land use forms and to design the interdisciplinary research approaches in such a way that extrapolation to meso-scale (region, country) becomes possible. Understanding past land use change pathways and their drivers at this scale would make it possible to develop more plausible scenarios for future land use change in Southeast Asia and thereby guide development efforts and predict impacts on livelihoods and environment.

So, more than 50 years after FAO's infamous call to researchers and institutions around the world to participate in a coordinated multidisciplinary program of research to understand swidden cultivation, and thus "overcome" it, we conclude by calling for yet more coordinated and interdisciplinary efforts to understand this complex and evolving form of land use that is undergoing rapid change in ways that are still imperfectly understood.

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