A4

INDIGENOUS FALLOW MANAGEMENT

Property rights and other dimensions of official misunderstanding

Malcolm Cairns[*]

Introduction

Indigenous fallow management refers to a wide range of farmer strategies by which the productivity of swidden farming may be intensified and moved towards a form of permanent agroforestry. As its name suggests, indigenous fallow management refers to that part of the shifting cultivation cycle known as 'the fallow', in which land that had been used for one or two years to grow annual crops is rested and the forest is allowed to regrow with the principal aim of rejuvenating the soil and replenishing the plant nutrients lost during cropping. The fallow, which under ideal conditions may last 10 years or longer, occupies by far the largest part of the shifting cultivation cycle. Shifting cultivators are dependent upon the natural processes at play in the regrowing forest as it gathers fitness for future cropping. However, this is also the stage at which policy-makers commonly regard fallow land as abandoned and unproductive; ripe for takeover by industrial plantation operators or in need of innumerable constraints upon its use. 'Outside' observers often concede a swidden farmer's use of land currently under crops, but regard fallows as wasteland in need of development.

Shifting cultivators commonly make many uses of their fallows, which typically spread across a landscape in a mosaic of forest patches ranging in age from new regrowth to mature secondary forest. The non-timber forest products gathered from fallows range from foodstuffs to firewood; wild vegetables, medicinal plants, bush meat from wild animals both large and small, and fruit from maturing trees. All the while, the growing forest is enriching the soil.

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[*] Dr Malcolm Cairns is a freelance researcher who was most recently a Research Fellow at the Centre for Southeast Asian Studies (CSEAS), Kyoto University, Japan. He was earlier an Associate Scientist with the Southeast Asian Regional Research Programme of the World Agroforestry Center (ICRAF) in Bogor, Indonesia.

There are two major courses by which indigenous farmers intensify their fallow management: that which improves the ability of natural fallow processes to rejuvenate the soil, thereby achieving fertility for renewed cropping in a shorter period; and that which improves the commercial productivity of the fallow by planting valuable perennials within the forest regrowth. These are discussed in detail later in this chapter.

Secure property rights as a prerequisite to Indigenous Fallow Management

Probably the obvious starting point to this discussion is the simple observation that swidden farmers are pragmatic, and need to be confident in their security of land tenure before they will invest scarce production resources, such as labour and capital, in intensified management of fallow lands. Conversely, fears that the state will evict them or otherwise refuse to recognize their customary land claims may lead to a 'mining' mentality, in which they exploit the resource base in a predatory manner without concern for long-term consequences. In cases where the state has adopted an overwhelmingly authoritative approach in matters of access to land resources and upland farmers find themselves barred from their traditional swidden lands – and perhaps threatened with resettlement – the consequent insecurity may be an important factor in explaining why some swidden communities have proven to be less agile in adapting to mounting pressures to intensify their farming systems. This has led to the well-documented 'swidden degradation syndrome', in which the natural and beneficial equilibrium of rotational shifting cultivation breaks down under land shortages and a forced acceptance of inadequate fallow periods. Loss of forests and land degradation follow.

Property rights as a precondition of proscribed management

Land-management technologies that are aimed at intensified productivity have often been forced upon farmers by state proscriptions or those of various development projects, rather than being driven by farmer belief in any value inherent in the technology itself. This may create a skewed and unwarranted impression of strong farmer approval. One of the foremost examples of this was the widespread promotion in the uplands of Southeast Asia of contour hedgerows and Sloping Agricultural Land Technology (SALT). The Integrated Social Forestry Program (ISFP) in the Philippines made the adoption of SALT a precondition to farmers being granted 25-year Land Stewardship Certificates. In addition, like many other projects, it paid farmers per linear foot for the establishment of contour hedgerows on sloping lands (Pasicolan, 2007). Project post mortems consistently revealed that hedgerow construction stopped when payments were no longer available, and existing hedgerows were often allowed to revert to fallow (Suson et al., 2007) or, as observed by the author, even completely uprooted.

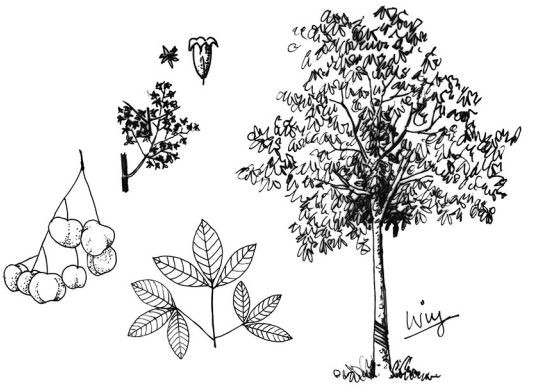
Other farmers have adopted contour hedgerows and other state-approved technologies not for promised gains, but to avoid threatened losses. Several case studies from northern Thailand have documented the significant modification of land management by 'hill tribe' farmers located in protected watershed areas (Durno et al., 2007; Ongprasert and Prinz, 2007) or national reserve forests (Hoare et al., 2007), or having otherwise tenuous legal status, simply to conform with state ideals of proper land stewardship. Their motivations may have had less to do with crop yields or slope stabilization and more with appeasing officialdom and winning land tenure and Thai citizenship by demonstrating sustainable management and conservation of state lands in the eyes of government officials.

Government tree-planting promotions have often been underpinned by promises of disbursement of state lands to participating farmers. Examples have included state-sponsored programmes in the Philippines that released public lands to smallholders under contractual agreement that they plant *Gmelina arborea*, *Swietenia macrophylla* and other fast-growing trees (Pasicolan, 2007). These lands were often 'abandoned' swidden fallows that were considered degraded and in need of rehabilitation. In the Lao PDR, state land-allocation schemes provided an additional one hectare of land per household, strictly conditional upon its use for planting timber or fruit trees. Noncompliance with this stipulation would provoke forfeiture of the land (Hansen et al., 2007). Farmers probably regarded the procurement of land as a more attractive outcome from these programmes than the tree products they grew along the way.

Even in the absence of state-sanctioned programmes, farmers have had a widespread practice of planting economic perennials on state land in the hope of demonstrating permanence of settlement, to enhance their land claims. In northern Thailand, Ongprasert and Prinz (2007) described migrant H'mong, Akha and Lisu villagers planting mango trees on swidden lands in national forest reserves to make their land claims more secure. In Thailand's south, the widespread occurrence of neglected and weed-choked cashew plantations along the coastal zone of Trang province are symptomatic of this same strategy. The trees were planted without any intention of harvesting cashews, but with the express purpose of staking private claim to what were then frontier lands. Land speculation was rampant and interested urban buyers seeking to inspect ownership papers would instead be pointed to the miserable-looking cashews as evidence of ownership (Kurupunya, 1998).

Policies restricting the use of fallow products

New access to remunerative market opportunities has often triggered rapid proliferation of economically-improved fallows. One of the most impressive examples of this was the explosion of 'jungle rubber' in Indonesia in the early part of the last century, in response to the advent of the tyre industry and access to germplasm of the rubber tree, *Hevea brasiliensis* (Penot, 2007). However, state interventions to control fallow products can render them uneconomic by distorting markets, increasing transaction



Hevea brasiliensis (Willd. ex A.Juss.) Müll. Arg. [Euphorbiaceae]

Planting rubber in fallows in Indonesia in the early 20th century resulted in a productive agroforestry system that has been copied in many parts of Southeast Asia, notably in the Lao PDR and southern China, keeping pace with the exploding growth of plantation rubber.

costs and depressing farm-gate prices. This danger is illustrated by the neglect of rattan-based fallows in Kalimantan after Indonesia banned exports of unprocessed or semi-processed rattan canes (Belcher, 2007; Sasaki, 2007). In northeastern India, restrictive state policies reduced the role of non-timber forest products (NTFPs) in farm economies. An auction system awarded monopoly concessions for NTFPs to the highest bidders. Villagers wishing to supplement their farm income by gathering NTFPs had no recourse but to sell to concession-holders at reduced prices. Since these traders were generally outsiders, this system also inhibited the development of value-added processing within villages (Nathan et al., 2007).

Restrictive policy environments have often discouraged the production of timber as a fallow crop by smallholders. Bhutanese farmers, for example, were prohibited from selling timber in markets despite studies that suggested plantations of *Pinus wallichiana* and other quality timber species would be far more lucrative than arable cropping systems (Dukpa et al., 2007). Indonesian farmers had no right to harvest or sell timber trees if their land was officially classified as forest area (Penot, 2007). In the Philippines, small-scale timber production was strongly encouraged, but policy obstacles restricted the menu of species that farmers were allowed to plant. Farmers often expressed an interest in expanding beyond the usual monocultures of *Gmelina arborea*, *Eucalyptus* spp. and *Paraserianthes falcataria,* and experimenting with promising indigenous species. They feared, though, that forestry officials would refuse to recognize alternative timber species as originating from private plantations and instead accuse them of poaching the logs from state forests. Such uncertainties meant that farmers were vulnerable to increased demands for graft which, coupled with royalty charges and transit permits, bit deeply into their profit margins.

Debunking the myth that fallow lands are unmanaged or unproductive

The philosophical underpinnings of Asian governments' opposition to swiddening lies not only in the loss of timber assets, but also in the popular misconception that fallow lands are abandoned, idle and unproductive. They have long been incapable or

FIGURE A4-1: After the harvest of swidden crops, livestock often follow behind, grazing crop residues and grassy weeds. Here, pollarded *Alnus nepalensis* trees are growing strongly in the early fallow. Their spreading canopies will soon cover the site while they fix nitrogen and enrich the soil with heavy leaf litter. This use of fallows to provide fodder is an often uncounted aspect of swidden productivity.

unwilling to accept overwhelming evidence to the contrary. Policy-makers look far more kindly on promotion of plantation economies, such as those producing rubber, palm oil or cassava, because these generate foreign exchange and taxation revenues for state coffers. There is therefore a fundamental and long-standing dichotomy in the way that fallow lands are viewed:

- States view fallows as forestal lands that are periodically destroyed by marauding slash-and-burn farmers and thus in need of protection.
- Shifting cultivators view fallows as agricultural lands on which trees are deliberately encouraged to grow on a cyclical basis, as an integral component of a sustainable farming system.

As a result, efforts to map and classify uplands have, for many decades, led to volatile tensions between state agencies and shifting cultivators. However, misunderstandings of the true nature of rotational shifting cultivation have not been unique to policy-makers. Researchers have long judged swidden systems with a strong agronomic bias. The formula popularized by Ruthenberg (1980) for measuring intensity of land use is a good example:

$$R = \frac{C \times 100}{L}$$

Where R = intensity of land use; C = number of years of arable cultivation; and L = the length of the swidden cycle (number of years of arable farming + number of years fallow).

Implicit in this formula is the assumption that the arable cropping phase is the only window of productivity within a swidden system. This can only be described as wrong and serving to perpetuate the biases that have condemned the use of fallow and fire to illegality (see Leisz, 2017 (ch 26), for an example from Vietnam). Ruthenberg's R-factor needs to be reconsidered. Similarly, foresters who apply their own parameters, such as timber yields, to fallow productivity are equally unlikely to judge swiddening kindly. Clearly a more holistic evaluation that considers the complete swidden cycle – both cropping and fallow phases, and interactions between them (e.g. fallows established through *taungya* planting patterns[1]) – is needed for a more accurate appraisal of swidden productivity and comparison with alternative land uses.

Documentation of compelling case studies that illustrate the often intricate and productive management of swidden fallows, and their importance to household economies, is therefore crucial in order to build robust arguments that these lands are far from abandoned, but constitute an essential phase of a wider and demonstrably rational land-use rotation. As illustrated in Figure A4-2, these farmer-generated fallow-management technologies may generally be classified as innovations to achieve:

- more effective fallows, in which the biological efficiency of fallow functions is improved and the same or greater benefits can be achieved in a shorter time frame;

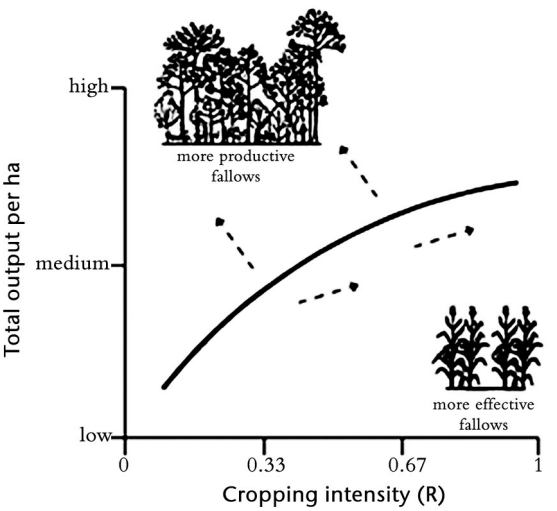


FIGURE A4-2: Evolution of intensifying swidden systems.

Source: van Noordwijk, 1996.

- more productive fallows, in which the duration of the fallow is unchanged or possibly lengthened as the farmer adds value to the fallow by introducing economic perennial species; or
- combinations of the two, where a degree of both biophysical and economic benefits may be accrued.

The pursuit of either course, or better still, both at the same time, offers to enable shifting cultivation to provide upland farmers with increased incomes and to deliver increased crop yields to growing populations.

In fact, it may be more politically astute to discard the term 'fallow management' altogether, since in the minds of many, 'fallows' are automatically associated with the pejorative term 'slash-and-burn', which in turn, conjures up narratives of a primitive practice from prehistory that persists as a leading cause of tropical deforestation. This is less likely to attract research funding than a reinforcement of the 'fines and fences' approach. Similarly, it may be strategically wise to popularize what we know as 'managed fallows' (although I personally like the term because it indicates their evolutionary origins) along the lines of a 'crop rotation matrix'.

Figure A4-3 shows a detailed continuum of indigenous approaches to modifying fallow vegetation. As the continuum intensifies from the simplest forms of fallow management (i.e. retention or promotion of preferred volunteer species) to more purposeful and sophisticated variants, it can be justifiably argued that these are no longer fallows; nor can the land-use system continue to be labeled as 'shifting cultivation' or 'swiddening'. To help to illustrate this point, the following are examples from both 'biologically enriched' and 'economically improved' systems.

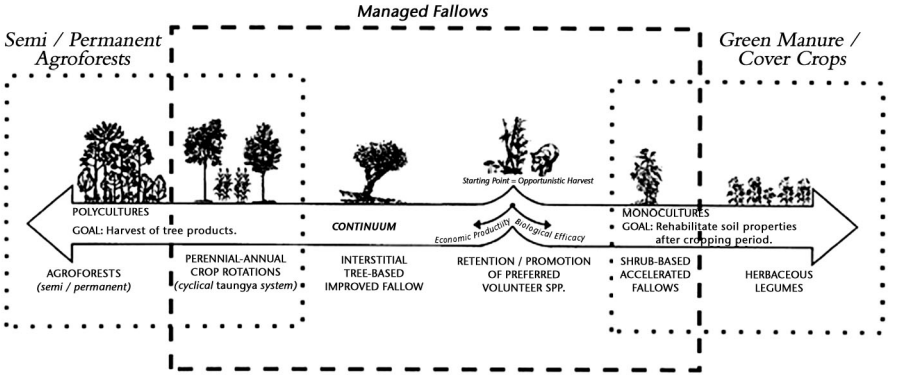


FIGURE A4-3: Spectrum of indigenous approaches to modifying fallow vegetation.

Source: Cairns (2007a).

Asteraceae (Compositae)-based fallows as examples of biological enrichment

The agricultural policies of most states endorse as a sound agricultural practice the notion of including herbaceous legumes as green manures or cover crops in cropping rotations (i.e. the extreme right pole of the continuum in Figure A4-3). This is viewed as progressive and deserving of scarce research and development resources.

In contrast, exotic Asteraceae such as *Chromolaena odorata* (Roder et al, 2007; Ty, 2007), *Austroeupatorium inulifolium* (Cairns, 2007b) or *Tithonia diversifolia* (Daguitan and Tauli, 2007), which often colonize swidden plots spontaneously, are viewed as weedy fallows that support the belief that the land resource is not being appropriately utilized. However, a growing body of literature shows a wide appreciation by shifting cultivators in Southeast Asia for the efficiency of Asteraceae species in performing fallow functions. Although these species do not fix nitrogen, they may be playing an equally important role by aggressively scavenging labile soil nutrients that would otherwise be lost through leaching or runoff, and storing them in biomass. The association of mycorrhizae with *Tithonia diversifolia* may also be playing an important role in phosphorus mobilization (Figure A4-4). Most importantly to resource-poor farmers, Asteraceae fallows require little or no capital or labour inputs.

This suggests that these are not 'weedy fallows', but green manure/cover crops. The fact that they are not leguminous (but are efficient nutrient scavengers) and are usually not planted (but are often actively encouraged) should not disqualify them from a more positive classification. Indeed, investigation of the history of their introduction from Central and South America to Southeast Asia reveals that these species were

FIGURE A4-4: *Tithonia diversifolia:* a weedy fallow or a self-sown green-manure crop that mobilizes phosphorus?

FIGURE A4-5: Ever vigilant of their natural environment, shifting cultivators quickly noticed that 'wild sunflower' (*Tithonia diversifolia*) was an effective tool for smothering *Imperata* grass.

Leucaena leucocephala (Lam.) de Wit [Leguminosae]

This species has been lauded for its multiple benefits of rapid growth, nitrogen fixation and providing both livestock fodder and firewood in swidden systems. Its use by shifting cultivators long predated its more recent promotion in various 'top-down' land-use technologies that failed to attract interest among indigenous farmers.

often deliberately introduced by colonial regimes specifically as green manure plants and to combat the spread of the rhizomatous grass *Imperata cylindrica* (see Figure A4-5). In this more favourable light, it can be argued that these farming systems should not be considered as rotational bush-fallow systems, but permanent cropping systems with a food crop-green manure rotation.

Leucaena leucocephala*-based fallows as examples of economic improvement*

Case studies from Amarasi, in West Timor, Sikka, on the island of Flores (Piggin, 2007) and Tetewatu, in South Sulawesi (Agus, 2007), all in Indonesia, and from Naalad, on the Philippine island of Cebu (Lasco, 2007) have confirmed that the adoption of *Leucaena leucocephala* as an improved fallow species by swidden farmers long predates its 'discovery' as a 'Cinderella species' by the scientific community and the coining of such terms as 'contour hedgerows', 'alley cropping', 'SALT' and so on. The driving forces that prompted farmer adoption of *L. leococephala* fallows seem to have varied from case-to-case: to smother out *Imperata cyclindrica* and rejuvenate upland slopes that were deforested to supply the ship-building industry when Cebu was an important Philippine port in Spanish colonial times; to displace thorny thickets of *Lantana camara* and provide livestock fodder at Amarasi; and to stabilize agricultural land on steep slopes on Flores and

in South Sulawesi. It is particularly interesting to consider these early indigenous systems in view of widespread farmer rejection of contour hedgerow technology, using *L. leucocephala* and other fast-growing leguminous species, that was heavily promoted as a blueprint for intensification across Southeast Asia's uplands (see the description of 'the token line' in Enters, 1996; also Fujisaka, 1991).

In addition to the biological benefits from its rapid growth and nitrogen-fixation during the fallow, *L. leucocephala* provides major economic dividends as a source of livestock fodder for fattening cattle and firewood for sale at nearby markets. The value of these 'fallow' products may even overshadow that of the arable crops (e.g. maize) and in an ironic twist, farmers may begin to consider the annual cropping phase as primarily a means to rejuvenate the 'fallow'. In the context of strong interest in developing the livestock sector of upland farming systems, farmer innovations to transform fallows into 'fodder banks' are of tremendous scientific interest. Again there are strong grounds to argue that such modifications represent a transformation of swiddening into permanent food crop - fodder/firewood crop rotations.

FIGURE A4-6: Coconut palms rise above the *Leucaena leucocephala* at Naalad, on the Philippine island of Cebu. Should this be regarded as a woody fallow or a fodder and firewood crop?

Further examples of other categories of indigenous fallow management could be quoted here, and similar arguments constructed. However, the salient point is that careful characterization would show these to be rational and viable permanent land-use systems, strengthening farmers' claims that their fallows are not forestal lands, but agricultural lands that are capably managed and over which customary tenure should be recognized by the state.

The debates over when managed fallow vegetation should more accurately be considered a crop, or when the wider land-use cycle of which it is a component has been sufficiently intensified to transform it from shifting cultivation into an 'annual-perennial crop rotation matrix', are, from the farmers' viewpoint, purely academic. To them, the issue is a simple one: the spectrum of indigenous approaches to modifying fallow vegetation shown in Figure A4-3 illustrates farmer-innovated and tested technologies that have enabled sustainable intensification of stressed swidden systems.

FIGURE A4-7: A Naga farmer in northeast India gathers *Imperata cylindrica* for making roof thatch. Although this grass is most often considered a noxious weed in swidden systems, it may be viewed as a valuable resource under conditions of scarcity.

What they may be called is, to the shifting cultivators, unimportant. But it may be enormously important, given the possibility that simple semantics may help to win the approval of policy-makers and urban 'dark green' environmentalists. Any analysis that popularizes fallow-management practices as permanent land-use systems will resonate favourably with official agendas for converting shifting cultivators into permanent farmers, reducing burning and greenhouse gas emissions, and protecting remnant forests and their contained biodiversity by boosting the carrying capacity of agricultural lands. This apparently happy convergence between farmer practices and state policy helps create what Tan-Kim-Yong (1997) termed a 'political buffer zone'. It may enlarge the political space for negotiation with state agencies for a more flexible interpretation of policies and laws as applied to upland farming systems.

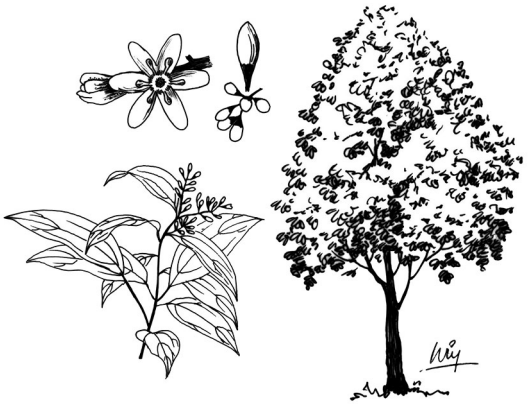
The need for managed fallows to be 'recognizable'

Government forestry departments commonly regard all lands covered by naturally regenerating secondary forest as being their domain, and hence in need of protection from agricultural incursion. In this light, an important element of fallow management may be modification of the successional vegetation to give it a significantly different species composition, thus making it easily recognizable and demonstrating continued occupation, management and private ownership (Thomas, 1997). This would build upon long-standing farmer practices of planting economic perennials in swidden fallows to demonstrate improvements and enable private claims to land from a communal pool. For example, the expansion of 'fallows' based on rubber (*Hevea brasiliensis*) and cinnamon (*Cinnamomum burmanni*) in Sumatra was part of an intentional land-grabbing strategy (see Werner, 2007). However, there is a problem

with this strategy: less intensive practices to improve fallow management have often evolved and are valued specifically because they tend to involve passive manipulation of fallow successions (e.g. shrub-based accelerated fallows). These less-intensive practices may be subtle and hard for casual observers to recognize as management strategies on agricultural land. State recognition of swidden fallows, even when they are intensively managed, will not always be easy, as demonstrated by the long struggle in Indonesia to have 'jungle rubber' (*Hevea brasiliensis*) and damar agroforests (*Shorea javanica*) removed from forest-classification maps and acknowledged as man-made agroforests (Herawati et al., 2017 (ch 46)).

Fallow management as both a cause and an effect of land privatization

Although customary tenure institutions often view swidden lands as communal property, they are generally under intense pressure to change. State policies and programmes, access to markets from even remote areas, mounting population pressures, increasing individualism and expectations of rising living standards and the weakening authority of local institutions are all conspiring to drive a strong trend away from usufruct land-use rights towards privatization. Programmes for auctioning 'wastelands' in China (Gan and Xu, 1997a), decollectivizing state lands in Vietnam (Quang, 2007) and the Lao PDR are cogent examples of the active role that has been played by states in the trend towards privatization.



Cinnamomum burmanii (Nees and T. Nees) Blume [Lauraceae]

Cinnamon trees are often planted along with coffee by shifting cultivators in Indonesia, to dominate fallow vegetation following the harvest of annual crops. Not only can the cinnamon be harvested in times of dire need, but the mature 'fallow' agroforest can also be used as evidence of improvement to support land-ownership claims (Werner, 2007; Burgers, forthcoming).

While it may invoke serious equity concerns, the privatization of land encourages more intensive husbandry, including fallow management. State taxation of fallow lands, such as that introduced in the Lao PDR, brings added pressure to manage these lands more productively. Traditional collective land-tenure systems are generally not conducive to long-term investments by individual farmers in improved fallow management because access to swidden land is both short-term and insecure. Swidden lands may be subject to cyclical redistribution within a community. Village regulations may even explicitly

forbid the planting of perennials on communal swidden lands because it is seen as a deliberate strategy leading up to private land claims. Such prohibitions are exemplified by some Minangkabau communities in West Sumatra, Indonesia (author's field notes). However, swidden communities often recognize this as a constraint and take remedial steps to adapt local institutions to better fit contemporary circumstances. Burgers (2007), for example, documented over-exploitation of ferns, fungi, bamboo and other products from communal fallow lands by Bidayuh shifting cultivators in Sarawak, and noted that 'village meetings were organized to find a solution for this problem. It was decided that individual ownership of the fallow vegetation would pave the way to a more sustainable and active system of secondary fallow management'.

It is worth noting that although swidden communities are among the most economically marginalized sectors in contemporary Southeast Asian society, they have historically been relatively rich in land. The nomadic Punan Vuhang in Malaysia are a case in point from an era when population densities were sparse and the vast lands they roamed were considered an open-access resource without value (Chan, 1997). Land was perceived as infinite and free, and it could be cleared and brought into agricultural use as needed. Fallow management was clearly not a priority since the forest frontiers were still expansive; there was no demand for intensification and the ability of these farmers to harvest fallow products was limited by their nomadism. It was not until they converted to a sedentary agrarian lifestyle that land gained importance and property regimes developed. Since those times, the declaration of large tracts of wildlands as protected areas, increasing demographic pressures, competing uses for remaining agricultural lands and the spreading influence of markets on upland economies have made land a valuable asset in limited supply. More than at any other time, swidden communities have a real opportunity to capitalize on their land wealth by engaging in enterprises that benefit from the competitive advantages of the uplands (e.g. timber, temperate fruits and livestock). A crucial proviso is whether the state will recognize and respect their customary land tenure.

Having made these points, I must acknowledge that privatization is not, unfortunately, a panacea for sustainable land use. Land commodification often leads to its accumulation by wealthy elites. This leads to social stratification into landlords and landless classes who enter into arrangements of land rental, contracted crops, share cropping, and so on. In these circumstances, we revert to the problem of short-term land access that discourages investment in long-term improvements and fosters short-term time horizons and profit maximization.

How scarcity changes property regimes

As long as forest dwellers are able to draw on abundant natural capital from forests and fallows to meet their needs, both property rights and fallow management tend to remain rudimentary. Only with depletion of natural stocks and resulting scarcity are users shaken from their complacency and driven not only to strengthen their claims to remaining resources, but also to develop more active management to ensure the

continued availability of those resources; opportunistic harvesting gradually develops into active protection and propagation in community forests and fallows. Thus, fallow management and governing property regimes develop in tandem. For example, a decline of rattan stocks is believed to have led to the development of privately-owned rattan gardens in southwest China (Chen et al., 1993a, 1993b; Xu, 2007) and in Kalimantan (Weinstock, 1983, 1984, 1985; Belcher, 2007; Sasaki, 2007). Scarcity and increasing commercial value of wild forest products in Sarawak led to farmer trials of their domestication in fallow environments, under new private-ownership rules (Burgers, 2007). Scarcities may also be artificially imposed by state prohibitions, such as the Malaysian policy of prohibiting the collection of forest products from state forest reserves. Policies that favour large-scale agribusiness are fueling the rapid conversion of forest frontiers into oil palm and rubber plantations, thus seriously aggravating the declining availability of forest products.

Equity implications of privatization and intensification of fallow management

Analytical studies should be undertaken to correlate security of land tenure with successful fallow-management adaptations, to gauge the extent to which property rights are encouraging or stifling fallow-management innovations. In analyzing their costs and benefits, such studies should carefully consider the fallow products and services of these innovations and who holds tenure over them. Communities are not homogeneous and are differently impacted by interventions; invariably there will be winners and losers, both within and between communities. Case study evidence suggests that increasing land privatization and its enclosure from outside users may bring adverse effects to more marginalized and forest-dependent subgroups within swidden communities, such as women or landless villagers who depend heavily on communal fallow lands for grazing livestock, collection of firewood, NTFPs, and so on. (Gan and Xu, 1997b; Saigal, 1997). Since they have no land to use as collateral, the landless are further disadvantaged by their inability to access credit, except that of the 'informal' variety, which usually involves crippling interest rates.

The equity implications of land enclosure clearly warrant careful investigation. On a regional scale, the forest frontier is rapidly disappearing as lands are increasingly mapped and demarcated and falling under private, corporate or state claims. Even if nomadic peoples such as the aforementioned Punan Vuhang of Malaysia wish to settle and practice sedentary agriculture, they may not have legal access to lands that the state recognizes as belonging to them (Chan, 1997).

Free-ranging livestock as a major obstacle to improved fallow management

Changes in swidden practices, such as privatization and intensified fallow management, invariably bring ramifications for other components of shifting cultivation systems, in ways that are not immediately obvious. For instance, many upland communities traditionally open their swiddens in large contiguous patches, often covering entire

hillsides, and then demarcate plots to be managed by individual households. This facilitates the use of communal labour, enables the swidden perimeter to be effectively guarded against wild boar, monkeys and other pests, requires only a single access path to be maintained and, very importantly, it synchronizes all of the cropped swiddens into a single cluster, making it easier to fence them against livestock intrusion. These large communal swiddens rotate around the village territory, with livestock generally following one year behind, grazing crop residues and native grasses.

Although the arable cropping-livestock-fallow sequence works well, it is nevertheless a major impediment to any individual farmer with notions of improved fallow management. Under these conditions, planted fallow crops such as pigeon pea (*Cajanus cajan*) are targeted by every hungry ungulate in the neighbourhood and are quickly destroyed by overgrazing and compaction. Unless fencing is an option in these circumstances, it is unlikely that improved variations of fallow management will gain a foothold. Lone innovators grow discouraged by seeing their efforts trampled, learn not to fight the system and accept the status quo. A critical mass of like-minded neighbours needs to reach a community consensus before adaptations such as improved fallow management can be made to the system.

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Note

1. *Taungya* is generally known as a cropping system in which trees are planted and farmers are encouraged to grow crops in between them for several years, until the expanding tree canopy precludes further cropping.