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Swidden, Sawah, and In-Between: Agricultural Transformation in Borneo

Christine Padoch,¹ Emily Harwell,² and Adi Susanto^{3,4}

The change from swidden to sawah cultivation in Tara'n Dayak villages in West Kalimantan, Indonesia, is presented as a long-term, complex incremental process in which distinct, unstable, and often confusing production technologies figure as transitional forms. The transitional phases are discussed in terms of their efficiency and sustainability. It is argued that the failure to perceive and understand long-term processes of agricultural change may result in both misinterpretation of technological patterns and environmental variables, as well as of rules of labor and resource sharing.

KEY WORDS: agricultural change; swidden agriculture; irrigated rice agriculture; Kalimantan; Indonesia.

INTRODUCTION

The Engkuang area, 20 minutes walk from the West Kalimantan village of Tae, appears to offer evidence of the worst sins attributed to traditional agriculture and its practitioners. At the southernmost end of the small valley, on one side of the path, lies a field where a tangled cover of bamboo and smaller grasses — testimony to an inadequate swidden fallow period — is being slashed in preparation for burning. This land, seemingly over-farmed and overrun with weeds, will doubtless yield a meager return of rice this season despite the large amount of labor that will be put into

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its weeding. After the harvest, infestation with yet less desirable and more fire-prone grass species, including alang-alang (*Imperata cylindrica*) is probable, and further deterioration of this field and its soils appears inescapable. This small plot seems to offer proof that the traditional shifting cultivation system used in Tae cannot cope with growing human population density and increasing production pressure.

Across the path from the degraded swidden, a large work party is hoeing a small peanut field. The hoeing, being done to prepare the plot for planting, is disturbing the soil surface. In this area of torrential rains, the practice might well lead to significant soil erosion. The low level of production realized last year in this plot also seems to point to poor farming practices. The entire harvest in 1983 was 87 kg. A work party of 11 adults had worked together for about 3 days to produce that poor harvest, giving an output of less than 3 kg of peanuts for a day of labor.

Farther down the track lies a string of poor, dry, weed-infested banded fields that appear to be futile attempts to create irrigated rice fields (*sawah*) as alternatives to failed swiddens. The apparent lack of both necessary resources — particularly water — and the requisite expertise, will obviously also lead to very poor harvests of rice, if any at all, in these plots.

While we have presented an admittedly selective tour of the agricultural fields of Tae, the plots described above are not unusual and all the dire judgments presented here have troubled the first author at some time over the last 7 years of investigation in Tae. Since we began research in the area in 1989, we have all, however, come to view many of the poorly-yielding, labor-guzzling, degraded, weed-choked sawahs, swiddens, and peanut gardens of Engkuang not as evidence of poor, inflexible farming methods, nor of a breakdown of traditional resource management patterns and ensuing environmental impoverishment. Neither the conditions of the fields nor the labor and yield patterns are signs of ignorance of more advanced methods nor of a disregard for economic realities. They, rather, offer confirmations of the dynamism of resource use in interior Kalimantan, and clues to the nature and pace of agricultural innovation and change in the region. These apparently unmistakable signs of deterioration actually provide provocative suggestions of “invisible” processes that are taking place in smallholder systems all over the world right under the gaze of researchers who claim to understand these systems and presume to evaluate their sustainability.⁵

⁵Perhaps the most interesting recent example of the need to reinterpret and reevaluate the effects of smallholder management on vegetation is the work done in Guinea by Fairhead and Leach (1996).

In this paper, we discuss several aspects of agricultural production and agricultural change in a village in interior Kalimantan. We suggest that there is very significant agricultural change going on in Tae, but that much of the ongoing shift from predominantly swidden to irrigated rice production technologies is difficult to discern. We then identify the changes that are occurring in Tae as long-term, complex, incremental processes in which many distinct, unstable, and often unexpected production technologies figure as transitional forms. We comment on these transitional phases in terms of the much-discussed issues of sustainability and production efficiency. Finally, we suggest that a failure to perceive and understand processes of agricultural change may result in misinterpretation of not only technological patterns and environmental variables but also of other important aspects of these systems including the rules of work and resource sharing.

GOOD, BAD, REAL, AND UNREAL SHIFTING CULTIVATORS

In what is doubtless still the most influential work written on the subject of swiddening, Harold Conklin (1957) stated that shifting cultivation “may refer to any one of an undetermined number of agricultural systems” (1957, p. 1). Despite his insistence on the diversity of the practices called shifting cultivation and the documentation of that diversity by many scholars (e.g., Spencer, 1966; Brookfield and Hart, 1971), a generation or more of students of *Hanunoo Agriculture* have held the subjects of the study, the Philippines’ Hanunoo as they were in the 1950s, to be the true swidders against which all others are measured.⁶ Geertz, for instance, called the Iban of Sarawak “less shifting cultivators than *mangeurs de bois*” (1963, p. 27) because unlike the more sedentary Hanunoo the Iban had been described as destructive pioneers (see Freeman, 1970; Padoch, 1982). More recently, nature conservationists have taken up this distinction. Real, traditional (i.e., Hanunoo-like) shifting cultivation is approved as conservationist — and not coincidentally found to be most rare — while all other forms are condemned and their practitioners placed in a category of destructive “shifted” rather than real shifting cultivators (Primack, 1993, p. 113; Myers, 1993, p. 95).⁷

⁶Several aspects of farming as carried out by the Hanunoo of the 1950s have been frequently cited and discussed by researchers. Among these is the central role shifting cultivation plays in their economy (making them true “integral” as opposed to “partial” shifting cultivators), their use of an enormous array of crops, and their apparently sustainable pattern of reuse of swidden sites rather than expansion into new territories.

⁷There are, of course, many real instances of “shifted” cultivators, i.e., farmers who have recently entered areas and are practicing inappropriate forms of agriculture.

One problem with accepting particular forms of swidden (or sawah)⁸ as ideal patterns is that many adaptations to local and changing, environmental and social conditions are then not duly valued. Important site- and situation-specific variations that make most agricultural practices different from those of the Hanunoo, may be and often are misinterpreted as shortcomings in technical expertise or agricultural performance.

Scholars assessing shifting cultivators and other smallholder farmers have often employed two diagnostic features. The first is the determination of whether a particular group is exceeding its “carrying capacity.” This once popular (see Conklin, 1957; Carneiro, 1961) but later much criticized and largely discredited measure (Street, 1969; Brush, 1975), has been revived as an interest in determining the “sustainability” of resource management. The second is energetic efficiency or the input–output ratio, long debated especially by pro- and anti-Boserupians, as well as many others. Data and opinions on these two issues have frequently been marshalled in arguments among scientists, foresters, planners, agronomists, and others on whether any particular example of traditional cultivation is good or bad, rational or irrational, primitive or sophisticated, destructive or conservationist, as well as in discussions on why cultivation patterns in any particular area do or do not change.

Why smallholder agricultural patterns change is and has been widely discussed (Boserup, 1965; Netting, 1993). Descriptions of just how major changes in agricultural systems take place, and studies that recount the process of change from one system to another are, however, far more difficult to find in the literature.⁹

In Southeast Asia, the transformation of swiddeners into fixed-field farmers, and of their swidden fields into sawahs is a widespread process

⁸Neither the farmers of Tae nor the government agricultural extension agents in the nearby town of Batang Tarang call the poorly irrigated fields of Balai “sawah.” That designation is allowed only to well-tended fields where water is precisely controlled and floods are well managed. Few Tae plots make the grade. What scholars consider essential to “real” sawah-making often includes not only good water control but also a series of management technologies such as extensive soil preparation including plowing, and the transplanting of seedlings. Many Bornean wet-rice systems, although highly productive, do not employ some of these techniques (Padoch, 1985).

⁹Shifting cultivation has, of course, long been described as a complex process of change from a forest or fallow to a cropping stage, and back again. More recently many such systems have been described as a series of transitions between more intensively managed annual cropping and less intensive agroforestry phases. Although processes are being described, these do not involve a transition or transformation from one cropping system to another. There are also many discussions of intensification of cropping systems or “involution.” These too delineate processes of agricultural change or even breakdown, not of transformation.

and one that recently has been encouraged by governments through numerous programs. Hanks (1972) eloquently contrasted the succession of different rice cropping systems that were employed in the Bang Chan region outside Bangkok over many years, and he outlined the concomitants and effects of these major agricultural changes. He did not, however, tell us much about how the transformation took place. Chronicles of agricultural change usually contrast several successive and structurally different stages. With few exceptions (Seavoy, 1973; Best, 1988; Menzies, 1995; Hammond, 1996) we are told little about the periods of transition or the patterns and processes of transformation. It is often difficult to recognize such changes going on in the field despite the fact that swiddens and sawahs are neither subtle alterations of the landscape, nor do they seem difficult to differentiate.

THE INCREMENTAL MODEL OF AGRICULTURAL TRANSFORMATION

In an attempt to understand agricultural change in a very different place and time, pre-Conquest dryland Mexico, the geographer Doolittle (1984) delineated and discussed two models of how change in agricultural technologies actually takes place. The first, the systematic model, assumes that new fields or other innovations will be created and completed before they are put to use. Thus, shifting cultivators would construct new permanent fields — sawahs or other — before they switched to this new form of production. The alternative model, incremental change, involves “gradual transformation of fields and features in conjunction with cultivation” (Doolittle, 1984, p. 124). Applying this model, shifting cultivators would continue farming as they were transforming their swiddens into permanently-cropped fields. The results would be a number of transitional forms of agricultural technology and changing patterns of inputs and outputs. Historically, it might well be impossible to distinguish which of these models of change more accurately described what actually had occurred, since the process would presumably leave no detectable trace. The contrasting types of change would, however, appear very different while the process of change was underway.

In this paper, we contend that in the village of Tae and perhaps in many other areas of Southeast Asia and beyond, just such incremental processes of agricultural change are occurring and are being misinterpreted by many observers. From the hills of China’s Yunnan province

to the drylands of eastern Indonesia, swidden fallow periods are being cut back, yields are dwindling, and hours spent on agricultural tasks in hill rice swiddens are rising. Shortened fallow cycles and high labor inputs are everywhere interpreted as signs of destabilization and decline of shifting cultivation as it once was done and as it should be practiced. Whether blamed for precipitating their predicament or pitied as victims of pernicious state policies, all but a few groups of Southeast Asia's shifting cultivators are believed to be now in crisis, overusing what land resources they have managed to retain. Even among swiddening's most persuasive defenders and scholars, the view that real shifting cultivators, if only they were left undisturbed, would choose to farm in a stable or equilibrated fashion is still widely accepted as true. In contrast to this view, many of the stories that we were told in Tae about change in particular fields and districts were not narratives of breakdown but rather stories of long-term planning for change.

AN INTRODUCTION TO TAE

Tae is an administrative village (*desa*) in Balai, a subdistrict (*kecamatan*) of the province of West Kalimantan on the north bank of the Kapuas river. Comprising an area of 396 km², Balai had a population in 1989 of 21,206 people, most of whom belonged to a yet little-described Dayak group we tentatively have designated the Tara'n Dayak. The subdistrict as a whole has a surprisingly high population density (54 people/km²) for an interior, rural region in Kalimantan. The territory of Tae, a village comprising five hamlets, their fields and forests, covers a total area of almost 16 km², and supports about 88 people/km². The village of Tae had a population of 1385 persons in 1990; most of the data reported here were collected in one hamlet (*dusun*) also known as Tae, which in August 1990 comprised 181 persons, divided into 37 households.

Mature forests in Balai subdistrict are very limited and are found only on a few hilltops and along boundaries with neighboring ethnic regions. Much of the area, however, is wooded. Most of the woodlands are managed as forest-gardens or agroforests for a wide array of products including construction materials, fruits, oilseeds, medicinals, and rubber (Padoch and Peters, 1993; Peluso and Padoch, 1996).

Although they are still widely assumed by outsiders to be essentially *ladang* (hill rice swidden) makers, most of the farmers of Tae and many other West Kalimantan communities are becoming increasingly depend-

ent on other forms of production, and all employ a diversified economic strategy.¹⁰ Land suitable for agriculture is limited in the area. Most households in Tae have access to 0.5–1.5 ha of fixed and bunded rice fields, few have access to more than 3 or 4 ha of swidden land, and very few farm more than a hectare of swidden a year. In 1993, for instance, among the 41 Tae households censused, 15 families, or more than a third of the total, made no swiddens at all. Of those who did make one, only nine households farmed more than a .5 ha of swidden and none used more than 1 ha. On the other hand, all but one Tae household planted rice in permanent fields; most of the better-watered sawahs were double-cropped in 1993. And every family in the village managed, tapped, and sold rubber.

Most of the hillside swiddens and swidden fallows in Tae have been converted to other uses, most notably into rubber or mixed rubber and fruit gardens. Many of those that are on flatter land and have relatively easy access to watercourses, however, have been converted to bunded pond-fields. That conversion is often a long process.

Agricultural change is hardly a new trend in Tae. Among the more recent major changes were those brought by the construction of the first major irrigation canal in 1935 that encouraged the creation of an extensive area of irrigated pond-fields or sawahs near the Tae hamlet called Ma'et. Another overwhelmingly important innovation was the introduction of rubber planting in swidden fallows in the early 1940s (see Dove, 1990 for impacts of rubber planting in other parts of Borneo).

General trends of agricultural transformation in Tae are not difficult to determine. Even the barest outlines of the history of any specific plot of land in Tae are, however, very difficult to sketch because written records are not kept, calendars are not consulted and ages of persons are largely unknown. Through long, informal interviews and recourse to relative dating using events known to have occurred in a particular year we have been able, however, to reconstruct some of the histories of a few Tae plots. The first of these stories offers an alternative explanation for both the observed degradation of swiddens as well as the apparent poor judgment used in constructing bad sawahs.

¹⁰Like other groups of interior Borneo, the Tara'n appear to have long farmed naturally swampy areas using a set of techniques that included some activities (e.g., burning) that are usually associated with swiddening, and others (e.g., transplanting) that are usually associated with sawah cultivation (see Dove, 1980; King, 1985; Padoch, 1982; Seavoy, 1973). It appears that the overwhelming bulk of Tara'n rice production 50 years ago came from dryland swiddens. The transition to predominant fixed-field farming has taken place at rates variable with time and place, but a steady trend away from swiddening is undeniable.

THE FIELDS AT ENGPUANG

Around 1956, Jaul, a Tae farmer now about 70 years old, felled and burned an area of mature forest one hectare in size in the district called Engkuang. In 1993, when we viewed that land, about one-half of that hectare had become a poorly-watered pond-field; the other half-hectare was the low-yielding peanut garden mentioned above.

Jaul, his son Lodom, and neighbor Engkuang (a farmer named for the place, having actually been born at the site) reconstructed the following history of uses of and harvests from the plot. In 1956, the first year Jaul could remember using the field, the one-hectare swidden produced about fifty carrying baskets (*otot*)¹¹ of unhusked rice, or close to a metric ton. This he considered a good yield, and since the plot was located within a 20-min walk of the village, Jaul cleared a new swidden on the same spot some 4 years later. The trees felled that second time were about the size of a person's calf, and again the swidden yielded well; about the same 50 *otot* as earlier. In 1970, when the fallow had grown up to quite large trees again, the plot was cleared once more. This time, however, yields went down considerably. Neither Jaul nor the others could remember by how much.

In 1973, the hectare of land was divided, with Engkuang receiving half of the plot, and Lodom the other half. During the ensuing 15 years, Engkuang cleared and planted hill rice on his plot six times. While he cannot remember the exact amount of rice he harvested each time he used it, he is quite sure that yields fell quite dramatically; his last swidden rice harvest was not more than 50% of the harvest he got in 1973. After this last crop, in 1990, Engkuang began levelling the swidden, bringing in water, and obviously transforming the plot into a pond-field. The first year he farmed only a small part of it as an irrigated field. Before planting the crop he spent 15 days hoeing to level the surface, removing weeds, digging out tree stumps, and bringing in water from a nearby stream to flood an area just 64 m² in size. He also made a seedbed and for the first time transplanted rice into the field. That year he harvested almost 75 kg of rice from the small tract. This harvest was about a fourfold increase over what he had gotten in an equivalent area the previous year when he had last farmed it as a dryland field. Engkuang is now in his third year of improving and enlarging the pond-field. The rice yield rose by 50% last year over the previous year's yield, and he expects another 50% improvement this year. In order to make it a real sawah, to make it yield well

¹¹The *otot*, a locally woven rice-carrying basket, is the standard measure used in estimating rice harvests. *Otot* vary somewhat in size and how high the rice in them is piled. All the *otot* we weighed have averaged about 20–22 kg of unthreshed, unhusked rice. Threshing brings the total down to around 17–19 kg.

and consistently, however, Engkuang believes that at least another 5 years of leveling, dyke-building, and other improvements will be needed, perhaps many more.

Before 1973, the history of use of Lodom's portion of the swidden at Engkuang was the same as that recounted above. After the land was divided, Lodom, like Engkuang, remembers using it as a swidden about six times. The last two times he did not farm his entire half-hectare plot, but rather about 1/3 ha, getting only about eight otot, or 150 kg of rice. Since then he has, with the help of a communal work group that meets to work weekly, twice planted peanuts in the field. Lodom plans to plant peanuts at least one more time. After that third harvest he will complete work on a small canal, bring water into the plot from Engkuang's field, turn the dry field into a pond-field, and plant it to rice.

DEGRADATION AND IGNORANCE REINTERPRETED

The two parts of the field at Engkuang have followed different trajectories in the change from swidden to sawah and they are at different stages of the process. In both cases, however, an "overfarming" of the swidden was an important stage in the creation of the permanent-field plot. Each of the farmers had cleared, burned, and cropped his field six times in quick succession between 1973 and 1990. Frequent clearing and reburning helps to destroy the stumps and roots of trees that once grew there. Fallowing for more than a few years would have been counterproductive as it would have allowed for the regrowth of trees. Reforestation would have been highly desirable had the plot been slated to remain a swidden; it was not.¹²

While the data cited on labor inputs and harvest outputs are doubtless inaccurate recollections of estimates made long ago, they do consistently show that the period of transition is characterized by first falling, then rising production efficiencies. Swiddens that are farmed frequently with little rest between croppings, do indeed require enormous labor inputs for meager rewards. That process in the Engkuang fields would have been prohibitively inefficient had it not also involved the building up of "landesque capital" as an output of the same process. In explaining the process of creating Mexican arroyo fields, Doolittle also found that "construction is an ancillary by-product of cultivation" (1989, p. 258). The practice of degrading the swidden coincided with the leveling, cleaning, and building of bunds that were needed

¹²For other examples from Kalimantan of differences between local farmers and outsiders in perception of what is environmental degradation see several articles by Dove (1984, 1985b).

to transform the swidden to a sawah. These actions, wasteful from a swidening point of view, indeed yielded a major “investment in land with an anticipated life well beyond that of the present crop or crop cycle” for the sawah farmers (Blaikie and Brookfield, 1987, p. 9).

The brief histories also explain that the very sorry-looking sawahs mentioned in the introduction need be interpreted neither as signs of ignorance nor as evidence of crushing land pressure forcing farmers to farm unsuitable plots. A sawah is commonly constructed over many years, and unlike a swidden tends to improve with increased labor input (Geertz, 1963; Bray, 1994). Water control can especially be expected to become better as canals are strengthened and deepened, dykes built up, and the submerged soil surfaces made less permeable. Many leaky, poorly-watered, weed-infested, and low-yielding sawahs in Tae are merely sawahs under construction. The precise amount of time it takes to construct a good sawah varies greatly, of course, with the peculiarities of the plot of land and of the farming household.¹³ The following story illustrates another variation of the way the transition has been made in Tae.

Lodom and his family of five (one is an infant) have another pond-field (he is still reluctant to call it a sawah) across the ridge from Engkuang in an area called Empua'n. Its history is also complex but briefer and different from that of Lodom's Engkuang plot; the conversion from forest to pond-field took only 7 years or so. It, however, is similar to the example of swidden to sawah transition described by Seavoy from another area of West Kalimantan (1973).

The plot at Empua'n was made next to a small sawah that had long been owned and farmed by Jaul. Lodom first worked his piece, approximately a half-hectare in size, about 10 years ago. It was then a small area of wooded bottomland; it was poorly drained, but not too deep for making into a sawah. It had been farmed as a swamp swidden before Lodom took it over, but had never produced well and no one could specify the date of its last use. The first year Lodom also farmed it more as a swidden than a sawah (cf. Seavoy, 1973; Dove, 1980; Padoch, 1982; King, 1985). He estimates that he put in about 74 days of labor into that first year's farming and got a reasonably good yield of approximately 600 kg of rice. However, that first year he also began transforming that plot into a bunded and irrigated pond-field. The amount of work he had to put in was large, but his yields steadily improved. The following year he worked about 80 days and harvested about 700 kg of rice. The next year he got a bit more, and the fourth year, over 900 kg.

¹³The incremental development of dryland arroyo fields in Mexico can, according to Doolittle (1989) take 10 years or more; some fields are abandoned before they are completed or are only intermittently worked.

The usual swamp swidden work of clearing, stacking the slash, burning, making seed beds, transplanting, weeding, and harvesting was supplemented in the first year with another 120 days of clearing out stumps and leveling; in years two and three, the 120 day supplement was somewhat reduced to approximately 80 days of stump clearance and 30 days of canal digging. In the fourth year, much of that heavy work was done and Lodom began to turn over the land with a large hoe, which cost about 40 days of work. Three years later, a few dykes were first made around the plot, but a mere 3 days were needed to complete that task since only a few bunds were necessary. That was 3 years ago and harvests have been stagnant at about a ton, although that yield was cut by almost 50% due to a stinkbug infestation in 1993. Lodom expects in the next few years to grade the land a bit better (water level is still quite variable), add more dykes, and perhaps begin fertilizing the field.

THE SWIDDEN/SAWAH AT KASAI

The specific swidden to sawah transformations recounted above differ in several aspects but all appear to be quite simply a one-way swidden-to-sawah transition. But again the fields of Tae produce surprises. Across the Tae stream from Engkuang lies a small valley called Kasai, where a long-term process of sawah construction has been unfolding. A new household, headed by Tanjal, younger brother of the headman of all Tae, received almost a half-hectare in the district from his brother a few years ago. Down the center of the valley a good irrigation canal has been completed and several well-watered pond-fields are found. Tanjal's plot, however, lies on the outer edge of the irrigated zone. When rainfall is short, the plot receives far less water than a pond-field needs.

Nineteen ninety-two was a very dry El Niño year throughout Indonesia. Despite the fact that he had hoed the plot, opened the irrigation canals, and prepared a seedbed, Tanjal responded to the lack of water by farming the plot as a sort of swidden, dibbling in the rice seeds. Each year in farming his marginal field he insists he preserves three options, and has employed all within the last few years. He may plant his field as a swidden with seeds dibbled in. When a seedbed has been constructed and growth of seedlings is adequate, but field irrigation water inadequate, he will make a hybrid field. He will dibble holes in the dry earth and transplant the sprouted seedlings into them. If waters begin flowing again, then a pond field is created. None of these forms quite coincides with what is widely accepted as swidden or sawah technology.

While these options are indeed ways of responding to variable and often unpredictable weather conditions, they are also ways of dealing with a sawah

under construction. As the land is lowered and leveled and as irrigation systems are improved over the years, the more sawah-like option will presumably be employed more frequently. The other technologies are, however, still available as ways of coping with exceptionally dry years while the transition is underway.

CHANGES IN TECHNOLOGIES AND CHANGES IN WORK AND ACCESS

Accurate identification of “invisible” processes of agricultural transformation is necessary for making sense not only of unusual agricultural technologies but also of some apparently anomalous patterns of work, remuneration, and access to land resources in Tae. Understanding of these processes makes comprehensible, for instance, the forms of labor and resource sharing employed in Lodom’s peanut field mentioned above and in the management of a fishpond described below.

Directly behind a populous nearby Tara’n village called Ma’ Dadong there is a large fishpond. The pond is well-constructed, with abundant water from a nearby stream piped in and out through lengths of bamboo. This pool once was used as rice field, but since the bamboo irrigation system was put in, it has been used to produce introduced tilapia fish. As in the case of the peanut field, the makers and users of the fishpond are a communal work group that collectively manages it and divides the harvest equally. The owner of the land — like Lodom in the case of the peanut field — is an equal member of the work group and shares equally in any profits. When and if the fishpond becomes a small sawah (the owner is contemplating the construction of a fence that would keep out roaming pigs and make rice farming close to the village practical), the plot will again revert to the ownership of the household that owned the rice plot. The fish farmers will retain no access rights.

Swidden farms and fallows, fish-ponds, and sawah fields are owned by farming households in Tae and throughout Kalimantan.¹⁴ Ownership rights may be established through first clearing of forested lands as well as through inheritance and sale. Different types of land are at times lent to farming households in Tae that are short of land or at least short of plots in a desirable district, with only a symbolic rent of one rice basket charged for a season’s use. Permitting a work group to use a plot and then divide the harvest as was done in the case of both the peanut field in Tae and the fishpond in Ma’ Dadong is unusual.

¹⁴For more information on Tara’n Dayak rules of resource tenure and access, see the article by Peluso and Padoch (1996).

The use of work groups in Borneo is quite common, especially in the construction of new fields (Dove, 1985a; Padoch, 1985). In *Tae* the more traditional work sharing known as *pengiri*, works on a principle of rather strict labor exchange with the group rotating through the fields of all the member households. Other types of groups are occasionally organized to accomplish very large or pressing tasks and can be very large indeed, sometimes with nearly the whole village participating. The workers then apparently do the job in exchange for a good meal, especially one that features pork, but actual reciprocity, although not strictly enforced, is doubtless expected. In yet other arrangements, people work for wages.

The work groups that were found planting peanuts and maintaining the fishpond were both of a type that is a rather recent addition to the list of possible work group arrangements. The first of this type was established in a neighboring hamlet about 20 years ago. These groups are said to work on much more precise schedules than was traditionally the pattern, and have an agreed upon and strictly enforced schedule of work and rest. They often work on the production of cash crops, fish, or other livestock. Production is sold and any profits are then divided equally among the participants.

The work group in which Lodom participates was rather recently organized and has been operating for almost three years. So far it has only worked on the production of peanuts and Lodom has always lent his own land for use by the group, and has apparently received no extra compensation for the land on which the peanuts are planted. Despite his being both the landowner and a worker, in two consecutive years he has allowed the group to divide the peanut harvest equally, taking for his own family only one share of the crop.¹⁵

This arrangement may appear anomalous, but only if the history of the plot and the further plans Lodom has for it are not appreciated. The field is, of course, not merely a peanut field, it is also a "sawah in the making." The clearing, burning, and hoeing that are done to rather inefficiently produce a crop of peanuts are also helping create a sawah for Lodom. Those activities, as mentioned above, are accelerating the removal and decay of any tree roots and stumps, the elimination of stones, and the leveling of the field. Activities that degrade a field that is to be used further as a swidden, are actually creating "landesque capital" (Blaikie and Brookfield, 1987), since the field is being transformed.

¹⁵Although the harvest, as was mentioned above, was not large, the sales in 1993, evenly divided, provided each work group participant with a cash income of approximately U.S. \$3.00, not great compensation for 3 days' work but not an unacceptable reward. An additional benefit of doing the work may have been the participants' gaining experience in growing what is to *Tae* farmers a rather new crop and one that has the cachet of a modern, market product.

The case of the fishpond illustrates a similar pattern. In this case, the communal workgroup is also using an area of land with no apparent compensation for the owners. But lest the owners be credited with much altruism, it should be remembered that in making the fishpond, the group has created conditions that will be easily converted into a good sawah when and if the owner has need for a small pond-field close to the village.

Such considerations also appear to account for the extensive amount of rent-free lending of new sawahs that goes on among Tae farmers. The farmers of the hamlet of Bankan, for instance, are among the poorest in sawah land. Their hamlet (an administrative part of Tae) is located on the upper slopes of the tallest mountain of the area; swidden farming of the steep hill-sides and rubber tapping has long supported Bankan's population. Now these hill folk are seeking opportunities to farm fixed rice fields. Six of the 18 constituent households have bought or inherited land suitable for sawah at the foot of the mountain. The 12 other families are all borrowing sawah land from farmers in the nearby villages of Semangkar and Sapa'n. Most of them have been borrowing the same plots for at least 3 years in a row. They pay no rent but they are expected to improve canals, reinforce bunds and try to minimize leakage of irrigation waters from the fields. By working repeatedly on these sawahs they create no rights of their own to the land. They do, however, build landesque capital for the owners.¹⁶

Repeated borrowing of the same agricultural plot is not common among Dayak swidders. Although swidden fallows or rubber gardens are frequently lent for one season's use, especially to close relatives in Tara'n and other Dayak communities, borrowing these resources year after year is rarely done. Unlike a sawah that may well improve with good management, continued use is not desirable if an area is to remain a swidden, nor is the frequent tapping of a rubber garden.¹⁷

CONCLUSIONS

We have attempted to explain why much of a cursory assessment of Tae agriculture is apt to be inaccurate. It is easy to grossly misidentify and misunderstand ongoing long-term processes of deliberate agricultural

¹⁶The sawah makers are also getting a benefit apart from the crop of rice: many of them are getting their first extensive experience in farming a sawah. Since irrigated rice farming is widely accepted as the technology of the future, most if perhaps not all Tae farmers want to become proficient in the techniques.

¹⁷Shifting cultivators are commonly allowed to farm and "degrade" forest lands for a few years in Amazonia, before cattle ranchers move in and plant pastures. In making their swiddens, they produce a crop for themselves, but their swiddening also performs a valuable and otherwise unremunerated service for those who are interested in transforming the system.

change in Tae, mistaking them for unintentional or forced misuses of resources, or for evidence of ignorance of proper management techniques. We do not wish to argue that all apparent overfarming of swiddens is necessarily part of a long-term, well-thought-out scheme of agricultural transformation. Nor do we wish to suggest that it is inappropriate to analyze agricultural technologies or cropping systems in any way other than as stages of very extended processes. We do however, believe that the long-term, unnoticed processes we eventually detected in Tae are neither unique nor unusual and should be considered in deciding how we do our research on smallholder resource management and in examining what assumptions we bring to our inquiries. How widespread they are must obviously be carefully determined, case by case.

As has been pointed out by many scholars, most research on smallholder agriculture is done over a brief time period. The current enthusiasm for very rapid assessments is suggesting strongly to many Southeast Asian researchers and others that quick snapshots of resource management technologies are quite adequate for developing a broad grasp of their important qualities and problems. While long-term research is not strictly necessary to unravel the kinds of confusing processes that we have discussed, it does grant researchers an opportunity to detect these invisible plans and trends and, if necessary, radically switch hastily made environmental and agricultural assessments. As was eloquently pointed out to us by anthropologist Enrique Mayer, "agricultural fields are subject to historical processes beyond . . . cycles such as fallowing or crop rotations. They were created by someone, have been divided, consolidated, modified, inherited, shared, transferred, acquired, lost, etc. They have been lent, sold, bought, rebought, bought, fought over, litigated, impounded, recuperated, cursed, and bloodied as putative owners fought it out" (Mayer, personal communication). All or any of the events that Mayer mentions may have important effects on how fields and the landscapes they make up are managed. Taking the time to elicit histories of specific fields from their present and past managers is rarely time misspent by researchers who hope to understand the processes of change in resource management.

As a final point, we wish again to bring up two issues touched upon at the beginning of this paper: the present observed plight of swiddeners, and the widely discussed issue of sustainability of resource use.

Government functionaries, scholars, and others have been arguing about whether the current widespread unsustainable situation of many of the world's swiddens and swiddening societies is really caused by poor farming methods, the growth of swiddening populations, the encroachment of outsiders with or without the help of the state, the growth of market dependency, or any number of other possible causes. These are certainly important questions and need to be asked in Tae.

The population of Tae is a young one¹⁸ with a high potential for growth and it appears to have been expanding in the recent past; chances for enlarging Tara'n Dayak territory have long been limited by the presence of other groups and individuals, some from the outside the region. The farmers of Balai have been the objects of myriad government programs aimed at changing and regulating their resource management and production strategies, and they have increasingly been drawn into dependence on market products and services. All of these factors have influenced how successfully the Tara'n can continue swiddening or how sustainable this form of resource management will be on their hillsides.

It is obvious, however, that in many cases Tae farmers have quite deliberately farmed in ways that cannot be sustained. They have planned for change and like many an uncompleted project, their "fields in transition" are messy and difficult for the outsider to understand, and not easily classified as parts of any resource management strategy acceptable to external experts. The question of whether the Tara'n would be making these changes if their growing economic needs were not pressing them to change cannot be answered simply. Contrary to Boserup's formulations, other Bornean and many other tropical groups have adopted fixed-field farming without being forced to do so by high human densities or hostile states (Padoch, 1985; Lian, 1987; Brookfield *et al.*, 1995). The Tara'n have previously changed their farming methods, even when population densities were lower and market needs fewer. Some of those fields now in transition would surely have been changed, others probably not.

Finally, the stories illustrate quite simply that sustainability of Tara'n resource management depends, among other things, on what the folks of Tae choose to sustain. Their plans for the future span longer time periods and are more complex than researchers commonly assume. Our investigations of Tara'n forest-gardening shows them planting Borneo ironwood trees that take a century to mature in gardens that rival rainforests in their diversity (Padoch, 1994). Their agricultural vision is no less far-reaching or complicated.

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¹⁸In 1990, more than 36% of Tae's population was under the age of 15.

REFERENCES

- Best, J. R. (1988). Change over time in a farming system based on shifting cultivation of hill rice in Sarawak, Malaysia. *Agricultural Administration and Extension* 29: 69-84.
- Blaikie, P., and Brookfield, H. (1987). *Land Degradation and Society*. Routledge, London and New York.
- Boserup, E. (1965). *The Conditions of Agricultural Growth*. Aldine, Chicago.
- Bray, F. (1994). Agriculture for developing nations. *Scientific American* 271(1): 30-37.
- Brookfield, H. C., and Hart, D. (1971). *Melanesia: A Geographical Interpretation of an Island World*. Methuen, London.
- Brookfield, H. C., Potter, L., and Byron, Y. (1995). *In Place of the Forest: Environmental in Borneo and the Eastern Malay Peninsula*. United Nations University Press, Tokyo.
- Brush, S. B. (1975). The concept of carrying capacity for systems of shifting cultivation. *American Anthropologist* 77: 799-811.
- Carneiro, R. L. (1961). Slash-and-Burn cultivation among the Kuikuru: A closer look at its implications for cultural development in the Amazon Basin. *Anthropological Supplement* 2: 47-67.
- Conklin, H. C. (1957). *Hanunoo Agriculture*. FAO, Rome.
- Doolittle, W. E. (1984). Agricultural change as an incremental process. *Annals of the American Association of Geographers* 74(1): 124-137.
- Doolittle, W. E. (1989). Arroyos and the development of agriculture in northern Mexico In Browder, J. O. (ed.), *Fragile Lands of Latin America*. Westview Press, Boulder, CO.
- Dove, M. R. (1980). The swamp rice swiddens of the Kantu of West Kalimantan. In Furtado, J. I. (ed.), *Tropical Ecology and Development*. International Society for Tropical Ecology, Kuala Lumpur.
- Dove, M. R. (1984). Government versus peasant beliefs concerning *Imperata* and *Eupatorium*: A structural analysis of knowledge, myth, and agricultural ecology in Indonesia. Working paper, East-West Environment and Policy Center, Honolulu.
- Dove, M. R. (1985a). *Swidden Agriculture in Indonesia: The subsistence strategies of the Kalimantan Kantu*. Mouton Publishers, Berlin, New York, Amsterdam.
- Dove, M. R. (1985b). The agroecological mythology of the Javanese and the political economy of Indonesia. *Indonesia* 29: 1-36.
- Dove, M. R. (1990). Smallholder rubber and swidden agriculture in Borneo: A sustainable adaptation to the ecology and economy of the tropical forest. *Economic Botany* 47(2): 136-147.
- Fairhead, J., and Leach, M. (1990). *Misreading the African Landscape: Society and Ecology in the Forest-Savanna Mosaic*. African Studies, No. 90, Cambridge University Press, Cambridge.
- Freeman, D. (1970). *Report on the Iban*. Athlone Press, London.
- Geertz, C. (1963). *Agricultural Involvement: The Processes of Ecological Change in Indonesia*. University of California Press, Berkeley.
- Hammond, E. (1996). The Evolution of Peat Swamp Forest to Agroforest in West Kalimantan, Indonesia: Seminar Presentation, New York Botanical Garden, January 10, 1996.
- Hanks, L. M. (1972). *Rice and Man: Agricultural Ecology in Southeast Asia*. AHM Publishing, Arlington Heights, IL.
- King, V. T. (1985). *The Maloh of West Kalimantan*. Instituut voor Taal-, Land-, en Volkenkunde, Verhandelingen 108, Martinus Nijhoff, Leiden.
- Lian, F. J. (1987). *Farmers' Perceptions and Economic Change: The Case of Kenyah Swidden Farmers in Sarawak*. PhD thesis, Australian National University.
- Menzies, N. K. (1995). The Changing Dynamics of Shifting Cultivation Practices in Upland Southwest China. Paper given at Symposium on Mountain Mainland Southeast Asia in Transition, Chiang Mai University, November 12-16, 1995.
- Myers, N. (1993). *Ultimate Security: The Environmental Basis of Political Stability*. W. W. Norton, New York and London.

- Netting, R. Mcc. (1993). *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture*. Stanford University Press, Palo Alto.
- Padoch, C. (1982). Migration and Its Alternatives Among the Iban of Sarawak. Instituut voor Taal-, Land-, en Volkenkunde, Verhandelingen 98, Martinus Nijhoff, Leiden.
- Padoch, C. (1985). Labor efficiency and intensity of land use in rice production: An example from Kalimantan. *Human Ecology* 13(3): 271-289.
- Padoch, C. (1994). The woodlands of Tae: Traditional forest management in Kalimantan. In Bentley, W. R., and Gowen, M. (eds.), *Forest Resources and Wood-Based Biomass Energy as Rural Development Assets*. Winrock International/Oxford and IBH Publishing Co., New Delhi.
- Padoch, C., and Peters, C. (1993). Managed forest gardens in West Kalimantan, Indonesia. In Potter, C. S., et al. (eds.), *Perspectives on Biodiversity: Case Studies of Genetic Resource Conservation and Development*. AAAS, Washington.
- Peluso, N., and Padoch, C. (1996). Changing resource rights in managed forests of West Kalimantan. In Padoch and Peluso (eds.), *Borneo in Transition*. Oxford University Press, Kuala Lumpur.
- Primack, R. (1993). *Essentials of Conservation Biology*. Sinauer Associates, Sunderland, MA.
- Seavoy, R. E. (1973). The transition to continuous rice cultivation in Kalimantan. *Annals of the American Association of Geographers* 63: 522-528.
- Spencer, J. E. (1966). *Shifting Cultivation in Southeastern Asia*. University of California Press, Berkeley.
- Street, J. M. (1969). An evaluation of the concept of carrying capacity. *Professional Geographer* 21(2): 104-107.