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Indigenous Knowledge on Soil Potential and Swidden Sustainability: A preliminary observation from Sabah, Malaysia

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ABSTRACT

This paper is an attempt to reevaluate the argument for the most commonly used indicator to assess the swidden sustainability – the fallow period. Using a co evolutionary approach developed by Richard Noorgard (1994), the author argued that it is not sufficient to rely on length of fallow alone to determine swidden sustainability. By comparing planting spacing of two swidden communities in Sabah, it was found out that, the scientific understanding of relationship between fallow period and soil suitability for farming does not fully explain the farmer's fallow management strategy. Investigation shows that, indigenous knowledge of soil potentials is more crucial to understand the swidden practice as well as possible tools for making more accurate sustainability assessments.

Keywords: *Indigenous fallow strategy, Rungus of Sabah, shifting cultivation, swidden sustainability indicator*

INTRODUCTION

This study was conducted at two main locations, namely Kampung Ontolob of Matunggong, located about 140 km to the north of Kota Kinabalu, and Kampung Buayan of Penampang, which is located about 35 km to the East of Kota Kinabalu. Both locations are linguistically from Dusunic family namely Rungus and Dusun, respectively. Few other villages are also mentioned in this paper for comparison purposes. Swidden agriculture is considered their traditional economy and is widely practiced at both locations. Works scheduling for swidden cultivation activities are almost identical at both locations, whereby, tree felling activity starts around July, burning process in early to middle of September, followed by planting activity (also in September), weeding stage will be conducted from October to November, pest control activities from December to February, while harvesting in March and storing and final processing in the month of April and May.

The intensity of labour for each phase is shown in the following chart - Figure 1.

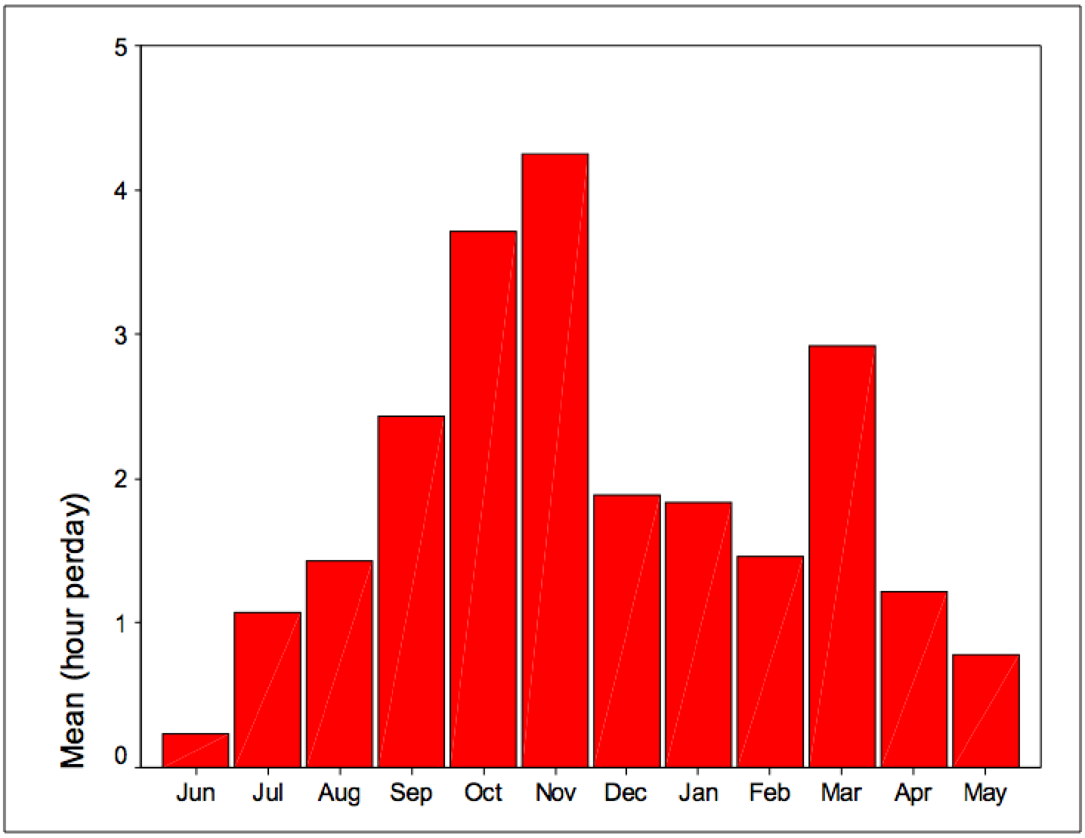


Figure 1: Mean hour per day spent for swidden related works for one-year agricultural cycle in Ontolob, Matunggong (Porodong, 2009).

The chart in Figure 1 shows that the months of September to October and March are considered the peak of labour season for farmers in Ontolob, Matunggong. These involved burning, weeding and harvesting activities.

Currently, both locations are experiencing agricultural transition from subsistence to cash crop economy. Rubber and oil palm smallholding are increasingly becoming important sources of income. This transition is largely due to changes in land ownership. In the past, land is based on usufruct system. Individual rights to land are based on usage and this right is ceased once the last crops are harvested. It was a land ownership system that was perfectly designed for shifting cultivation. The introduction of cash crop however has ushered individual land ownership pattern, which was actively promoted by the British North Borneo Chartered Company in Sabah, and was continued by the post-independence government.

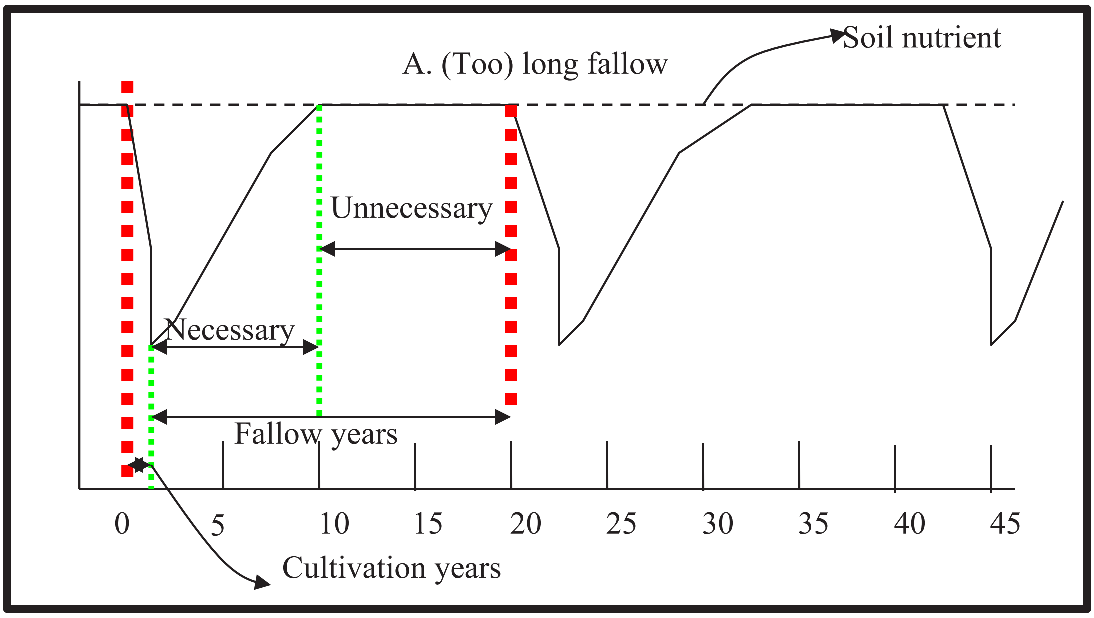
The changes in agricultural and land ownership systems have reduced land availability for swidden agriculture. Lands to grow cash crops were definitely taken away from swidden agriculture activities. Individual land ownership pattern, to some extent, has reduced individual freedom to choose the best location that previously were available almost unconditionally to them. With these changes, the ideal conditions for swidden cultivation to function are no longer available. It is not a surprise that in the context of changes in land ownership system and types of crops, even local farmers start to question the sustainability of shifting cultivation in supporting their livelihood.

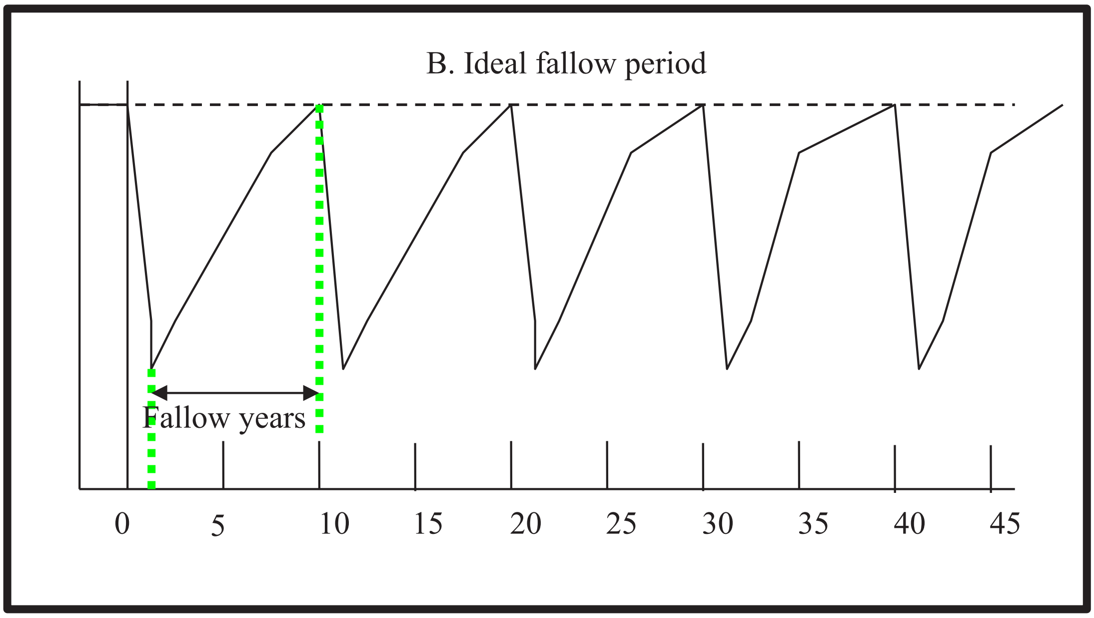
This paper, however, will focus on swidden sustainability issues squarely based on ideal swidden practice conditions where farmer's option is not limited to land ownership restriction. It is a preliminary attempt to take into account the 'wider ecological, socio-economic and cultural context in understanding swidden practices', as suggested by Conklin (1963). This is to reevaluate the argument commonly used as an indicator to assess swidden sustainability, which is the fallow period.

THEORETICAL FRAMEWORK

Mertz (2002) made an important point that studies on swidden sustainability have focused on the length of fallow period. The theory is that there are correlations between shortened fallow periods and yield decline in swidden cultivation. It is largely a logical theory that argues a decline in nutrient availability in the ecosystem can be expected with crop export, erosion, leaching, volatilization of nitrogen (N) and sulfur (S) resulting in poorer soil physical properties and weed infestation (Mertz, 2002, p.149).

Guillemin (1956) first proposed this relationship: any given system has an optimum fallow period for production, longer fallow periods are unnecessary and shorter fallow periods will lead to decline in fertility of the system and thereby in productivity. This relationship between fallow and yields in shifting cultivation is made clear from Figure 2 below.





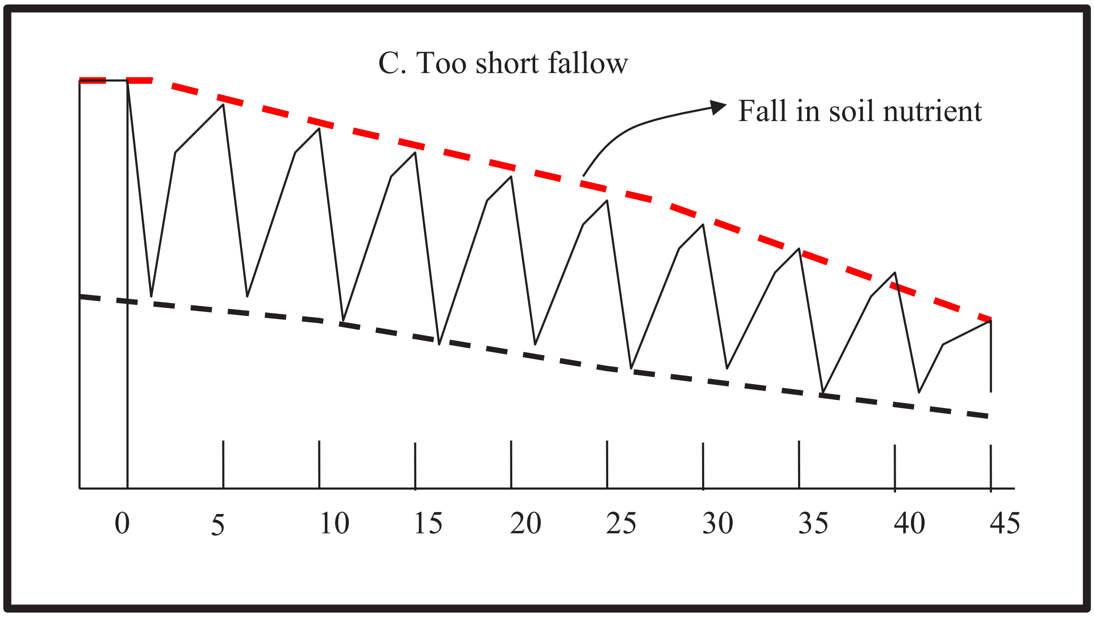


Figure 2: A theoretical presentation of the relationship between fallow period and soil productivity (Source: Ruthernberg (1980) based on Guillemin (1956), cf. Mertz (2002)).

However, after reviewing 330 swidden agriculture studies, including 15 with empirical data, Mertz (2002), pointed out that although most empirical studies support the theory, the data sets are often ambiguous and important parameters are insufficiently taken into account. In fact, Mertz added that several studies even suggested that there is no clear relationship between fallow length and yield; nonetheless these studies are also lacking in information to verify the validity of the data.

Although it is generally accepted that longer fallow correlates with soil recovery, it appears that there is no consensus on ideal fallow period. For instance, Sanchez (1976, p.351) indicated that 90 percent of the maximum biomass is attained within eight years after a field has been abandoned. Meanwhile, two decades prior, Conklin (1975, p.154) indicated that a 12-year cycle among the Hanunóo in the early 1950s was sufficient to support a relatively stable practice over a 75-to-100-year period. Cramb (1989, p.35), however, maintains that seven to 10 years of fallow is sufficient to enable forest topsoil regeneration.

These suggestions indicate that, perhaps, there are other important factors that determine yields in swidden agriculture. Mertz (2002, p.150), suggested that "substantial field data on fallow period and yields per acre unit as well as many other parameters influencing any given yield level will have to be obtained." In fact, according to Mertz, Conklin has already raised this issue much earlier on by stating "yields in shifting cultivation can not be limited to a study of climate, soil and management practices, but must be seen in wider ecological, socio-economic and cultural contexts" (Conklin, 1963 cf. Mertz, 2002, p.150).

It is in response to Conklin's suggestion that this paper is a preliminary attempt to take into account the wider ecological, socio-economic and cultural context in understanding swidden practices of two swidden communities in Sabah – Kampung Ontolob of Matunggong and Kampung Buayan of Penampang. This is to examine relationship between fallow period and soil suitability within farmers' fallow management strategy.

COEVOLUTIONARY APPROACH IN ASSESSING BIOCULTURAL DIVERSITY

Addressing the relationship between human and environment requires a multidisciplinary approach. A coevolutionary approach developed by Richard Noorgard (1994) (see Figure 3) and his other colleagues provide an excellent framework for combining the natural and social science in multidisciplinary studies.

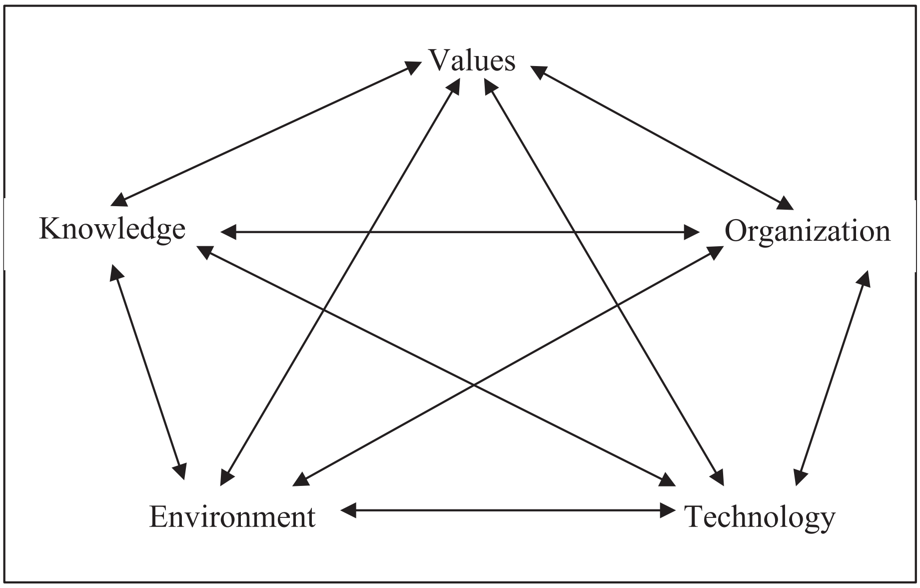


Figure 3: A coevolutionary process of development (Norgaard, 1994)

In his novel work, Noorgard highlights the linkages between values, social organisation, technology, environment and knowledge. Noorgard emphasises that the interaction between the various elements in the coevolutionary approach is not static but is rather in a constant state of dynamic interaction. Availability of new technology, for instance, may result in changes in knowledge, values, social organisation and environment. A case close to home to illustrate this is the introduction of herbicide (new technology) amongst the Rungus of Kota Marudu. As a result of the introduction of the herbicide in their decades-old swidden practice, nowadays, members of the community prefer to work on their own (values), they tend to allocate more time for cash generating activities (social organisation), and willing to alter the swidden's activities sequence by using herbicide to weed first before planting of crops (knowledge); and their keenness to cut/clear relatively younger vegetation without worrying too much about the weed (environment).

In other words, and in similar manner coevolutionary approach can be applied to examine the sustainability of swidden practices by not narrowing the focus only on the fallow period, which by default will only cover the environmental elements in coevolutionary approach. In the following section, the paper focuses on how people in different regions in Sabah take into account biodiversity in their efforts to achieve the best possible result from swidden practice.

BIOCULTURAL DIVERSITY ON SWIDDEN SUSTAINABILITY

Regardless of a farmer's locality, it is safe to assume that whenever they decide to engage in swidden farming (and for that matter in any other ventures as well), they aim for the best possible return by using known and proven techniques and strategies. It is simply too risky for 'generally poor' farmers to try something that are considered experimental.

However, there are cases why some farmers appear to deliberately choose to cultivate areas that are definitely have less potential compared to other available areas. This raises question: why is that so? I aim to answer the question by highlighting two types of swidden cultivation among the Rungus of Matunggong: the *gopu* and *tagad*.

1. *Gopu* – a swidden, cultivated on the exact site of the previous swidden (with a one- or two-year fallow), and

2. *Tagad* – swidden cultivated with sufficient fallow period (with more than five-year fallow)

With regard to optimising returns, there is actually obvious advantage of using *gopu*, whereby demands on labour are much lesser, as no large trees needed to be felled. However, rice yields are usually lower than *tagad* (see Table 1), but as suggested by Mertz (2002, p.150) there are many other parameters that need to be considered in determining the yields. Field observations during this study indicate that mature forest (*tagad*) does consistently produce better yields compared to *gopu*. But there are times when *gopu* can outperform the *tagad* as in the 2002/03 farming seasons. This is highlighted in the case of Kg. Ontolob. Members of the community have pointed out that the key to a good yield is their ability to control weed growth. They specifically mentioned the ability to properly sequence the weeding (using herbicide) and planting. Therefore, forest maturity or fallow period is just one of the many factors that are taken into account during site selection.

Swidden status*	2002/03 (kg)	2003/04 (kg)	2004/05 (kg)
Tagad only	40	40	33
Gopu only	74	16	23
Tagad and *gopu*	53	47	24

Table 1. Swidden yield (per kilogram sowed) according to swidden status in three agricultural seasons in Ontolob (n=43)

One of the factors that were adopted to become part of the local practice is the spacing (distance) requirement between each of the rice seedlings holes. (See Plate 1 and 2).

Plate 1: Monugal – dibbling (Kg. Buayan, Penampang)

Plate 2: Seedling hole with nine rice grain (Kg. Tinangol, Kudat)

Plate 3: Measuring holes spacing in Kg. Buayan (2008)

When comparing data obtained in 2004 from three 10^2 meter control plot in Matunggong, Kudat and two 10^2 meter control plot in Kg Buayan-Kionop in Crocker Range gathered in 2007 and 2008, it was found that, the two areas have big difference in the holes spacing. This is shown in Table 2.

Location	Average distance	Number of holes for 10^2 meter	Observe (relative) fallow period
Buayan-Kionop	30.9 cm (n=126)	820 – 880	Long (more than 10 years)
Matunggong-Kudat	38.2 cm (n=155)	520 – 600	Short (less than 10 years)

Table 2: Comparison of some swidden practice between Crocker Range Buayan-Kionop and Matunggong, Kudat

By using the highest number of holes for every 10^2 meters, farmers in Buayan planted 30% more holes compared to farmers in Matunggong. Observation also suggested that fallow periods are longer in duration in less dense population in Buayan-Kionop (see Plate 3), which enabled the local population to have larger areas for cultivation. The opposite can be said for Matunggong, Kudat. The fallow period is much shorter and relatively smaller area available for swiddening due to individually titled land. In addition, there is competition from cash crop such as coconut, rubber and oil palm. Furthermore, there is generally a higher population density.

My initial assumption to these differences was that the soil condition is better in Buayan-Kionop. Hence, logically this has enabled the soil to support more rice production per square meter. In the same vein, I have concluded that the less number of holes for every 10^2 meters in Matunggong is the farmers' ways to offset the less favourable soil found in Matunggong region.

However, my assumptions were wrong on both counts. Further investigation reveals that while communities in both areas are practicing two different approaches in holes spacing, their reason for doing so is similar. According to the elders in both areas, they do appreciate and are very aware about the differences in regional soil quality. They knew the fact that, some soil have faster recovery period – Rungus of Matunggong called this type of soil as *tana tatag* (good soil) while the Dusun of Buayan-Kionop called this as *tana toitom* (black-fertile soil).

However, this does not explain the reason for difference in holes spacing since one would assume that since both regions have soil of ideal type there should have similar spacing strategy. But yet, there differences in the strategies they have employed. My argument is this: the spacing strategy is the behavioural outcome based on known and proven past event. The communities consciously maintain their particular spacing arrangement to get the best yield per unit of space. In local term this is the *koubasanan* (Du) or *koubasan* (Ru) - "this is how our ancestors taught us." This practice and knowledge was then pass ed down to the next generation. Therefore, it can be safely assumed that, the spacing practice in particular area is a good indicator of the local community's intimate knowledge of soil capacity – in this case the difference soil's ability of *tana tatag* and *tana toitom.*

INDIGENOUS KNOWLEDGE IN SOIL CONDITION

According to farmers in both regions, the spacing strategy did not change much in their respective areas. Nevertheless, although it appears that they unconsciously are employing a particular spacing strategy, their elders in specific region will be able to explain that spacing strategy is one way to maximise the potential of soil capacity. First, swidden farming is labour intensive, thus it is only logical for farmers to try to cultivate available areas that they believe will produce the highest return per unit of labour. However, the ability to use local knowledge has enabled them to stretch the full potential of the soil as far as rice production is concerned.

There are two ways as to how spacing strategy work amongst the communities:

1. In region known for very good soil condition (this is indicated by faster soil recovery – short fallow), farmers will increase the holes spacing. In this way they said, the rice would produce more shoots (*maganak* – Ru), since there are more nutrients available. As a result, although number of holes is less per unit of space, the soil potential is utilised.
2. In an area where the soil is known to be unable to generate production of more rice shoots, farmers will decrease the spacing. As a result, although the number of rice shoots is less, but it will be compensated by more holes (and rice) per unit of space. Similarly, this strategy successfully utilised the full potential of the soil concerned.

In other words, a deep and intimate knowledge about soil potential has enabled the local communities to compensate for the inferior quality of soil to achieve the best yield.

If the situation is to be juxtaposed with Noorgard (1994) coevolutionary approach, it is obvious that observing fallow period alone is not sufficient to understand swidden sustainability, let alone making a sustainability assessment. In other words, other elements suggested by coevolutionary approach should be taken into account. This includes knowledge of soil, soil's attributes (environment), dibbling stick (technology), and preference to share labour resources (values).

CONCLUSION

The preliminary findings and argument in these paper show that, Conklin (1963) and Mertz (2002) were right in pointing out that we need to pay attention to other variables beyond fallow period and yield to have better understanding of swidden cultivation. Therefore, it is a serious mistake to use fallow period alone to evaluate sustainability of swidden practice in a particular area. This is particularly critical when "until recently, most government in countries where shifting cultivation is still widespread, had adopted a strategy for the 'eradication' of swidden agriculture and conversion to permanent farming" (Mertz, 2002). Cairns and Garrity (1999) shows that it is obvious that in most places today, farmers can no longer afford the luxury of long fallows. The short fallow period however does not necessarily indicate the breakdown of the swidden system as this paper suggest. This is in agreement with more than 4,500 observations from Malaysia and Indonesia that also found fallow length to be a weak predictor of yields and emphasises that other factors such as weed pressure, labour input, water related problems and pests are more important than the length of the fallow period (Mertz et al. 2008 in Bruun et al., 2009). Finally, following Mertz's (2002) suggestion, more studies are necessary to expand our existing understanding of swidden agriculture despite the inherent methodological difficulties involved when taking into account all the various parameters that may influence the relationship between the length of fallow and crop yields in swidden cultivation.

There is nothing wrong for policy makers to question the sustainability of shifting cultivation. However, it is necessary to give careful attention to its scientific foundation because it appears that the existing understanding of the topic is rather limited, including empirical data.

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