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The Last Swiddens of Sarawak, Malaysia

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Abstract Swidden cultivation was observed to be under pressure but still persisting in many areas in Sarawak, Malaysia around 2000–2003. Since then rapid development of smallholder oil palm and rubber, continuing urbanization and rural to urban migration appear to have considerably reduced the area under swidden cultivation. With the aim of understanding the extent and impacts of this development, 55 households in three communities that were interviewed in 2002–2003 were re-interviewed in 2011. In an area with rapid oil palm development, the households engaged in smallholder oil palm production have experienced considerable improvements in income and wealth whereas the other households have experienced more limited wealth increases or even a decline in income. Many households have decreased or abandoned cultivation of upland rice, which used to be the core of the swidden cultivation system, and the upland soils in the area are now dominated by oil palm. In another area, where no oil palm development has taken place because of a hydroelectric dam, upland rice fields under swidden cultivation have also decreased and new high yielding rubber is now being planted because of the favorable rubber prices. Moreover, tourism has in this area gained further economic importance and overtaken agriculture as the main economic activity of households. The demise of swidden has not yet occurred in Sarawak, but a continued decline has been observed. However, there is a possibility that the new smallholder oil palm and rubber may provide an opportunity for a new type of 'productive fallow' that will allow continued cultivation of upland rice on a small scale.

Keywords Land use change · Livelihoods · Malaysia · Oil palm · Shifting cultivation · Smallholders · Southeast Asia

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Introduction

The possible demise of swidden cultivation in Southeast Asia was assessed by Padoch *et al*. (2007) and the majority of cases reviewed did indeed show strong signs of swidden cultivation disappearing in many areas, particularly in mainland Southeast Asia. This was confirmed later by a study focusing on changes in swidden cultivation globally, but here it was also revealed that this farming system still exists and thrives in many parts of the world (van Vliet *et al*. 2012). In both studies, the cases reviewed from Borneo showed that upland rice cultivation under swidden still persisted in many areas, but that the rapid economic development and land policies in both Malaysia and Indonesia were putting increasing pressure on the system, especially from large scale and smallholder plantation development.

Such land use changes can be very rapid (Ziegler *et al*. 2009) and the hypothesis of this paper is that the Iban communities of Sarawak referred to in the two reviews above may indeed have moved beyond smallholder farming of rice since the early 2000s when they were last studied.

Iban agriculture and the development of swidden cultivation in Sarawak have been on the research agenda for many years and the study by Freeman (1955) brought Iban agriculture to most anthropological curricula at universities worldwide. Much has changed since Freeman described the Iban as '*mangeurs de forêt*' ('forest eaters') – a term made famous by his contemporary, Georges Condominas, who worked on swidden cultivation in Vietnam (Condominas 1957; Condominas 2009) – and there is indeed not much primary forest left in Sarawak for the Iban to eat. Sarawak is beyond being a forest frontier as a majority of the forests have been logged, converted to plantation agriculture or set aside for protected areas. These land use changes have been explicitly mentioned in Sarawak development policies, whereas swidden cultivation has been perceived by the State Government as an obstacle to resource utilization – timber especially – and the subsequent land development as well as not contributing to the local development and well-being of the rural population. The last mentioned concern is mainly due to the fact that swidden cultivation is perceived by government as a subsistence activity on 'idle wastelands' that do not produce cash income and need state intervention to be developed (Cramb 2007; Majid Cooke 2002). In fact, swidden cultivation has de facto been illegal through a ban on open fires, though this rule does not seem to be enforced on smallholders. In recent years, as swidden cultivation is becoming a waning practice, government pressure appears to have been easing somewhat.

Local farmers have been trying their best to negotiate these pressures driven by the local government and private as well as semi-private enterprises. There are several excellent accounts of the history of land development in Sarawak (Cramb 1992; Cramb 2007; Fox *et al*. 2009; Ngidang 2002) that demonstrate the mixed results of these schemes in terms of bringing prosperity to the former swidden cultivators. The most recent development in the late 1990s includes the invention of joint venture companies (JVC). These companies get a 60 year lease on native customary land and are owned 60 % by the developer (usually a large plantation company), 30 % by the land owners and 10 % by the governmental Land Consolidation and Development Agency, which ensures the land titling (Ngidang 2000; Ngidang 2002). The JVCs are in principle a way for swidden cultivators to stop farming rice and get a share of the income from the land produced by the oil palm. However, according to several authors, the benefits for smallholders remain to be seen (Fox *et al*. 2009).

This has led swidden cultivators to look for alternative ways of development. Many farmers have realized that cultivating upland rice in swiddens is not the ideal way of reaping the benefits of the rapid economic development in Sarawak; nor is the prospect of being workers in large oil palm plantations very appealing. Swidden rice actually produces higher returns on invested labor than working in oil palm plantations or other low-paying jobs (Nielsen *et al*. 2006), but still the income level is low. The solution is to optimize the local development opportunities while at the same time maintaining control over land and resources and this is what is increasingly happening in Sarawak.

In this article we revisit communities in two very different areas of Sarawak that were studied during the late 1990s and early 2000s. Our aim is to analyze whether changes in swidden cultivation are following the trends of gradual demise as in other parts of Southeast Asia (Padoch *et al*. 2007) or whether swidden cultivation is indeed as persistent as it appeared in the late 1990s and early 2000s (Hansen and Mertz 2006; Mertz *et al*. 1999). Moreover, we analyze how processes of land use change have influenced land management and livelihoods in the communities. The article starts with an overview of the two study areas as they were around 2002–2003 and then analyzes changes over the past 10 years in three Iban communities: Rumah (Rh) Muyang and Rh Ulat located in Niah District, and Nanga Sumpa located in Lubok Antu District (Fig. 1).

Swidden Cultivation in Sarawak Around 2000

As observed by Cramb (1978; 1988), swidden cultivation was already diminishing in some areas of Sarawak in the 1970s as people began to seek alternative activities that could generate more income, especially by increasing the cultivation of cash crops like rubber and pepper. Although it had started in the early 20th century, the transition to a cash crop economy really took off in the 1970s. In some areas, especially rubber was well integrated into the swidden cultivation system in mixed stands with fruit trees and other productive crops that could be harvested flexibly and eventually return to the swidden cycle – a system also described in Kalimantan (Dove 1993).

In the 1990s the cash crop transition gained speed as large scale plantations expanded and smallholder cash crop production was encouraged through government production subsidies. The cash crop element was a more or less integrated part of swidden cultivation by the Saribas Iban in Sarikei Division south of Sibu (Fig. 1), who alternated between pepper, rubber and upland rice to maximize production and income in different years (Cramb 1993). This strategy was later tested in West Kalimantan and found to be less evident partly because other cash income opportunities

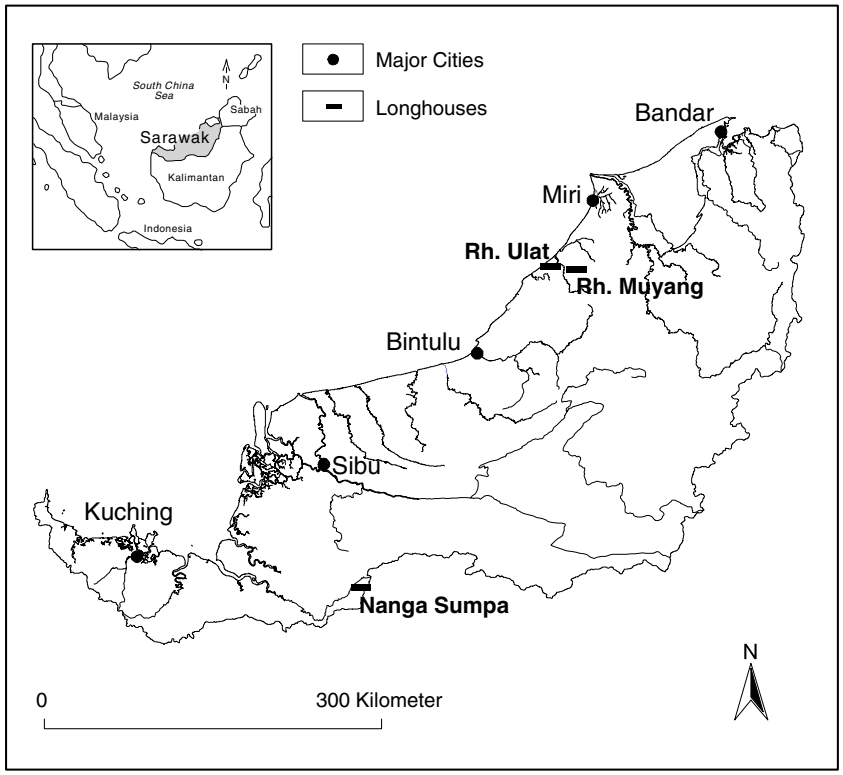

Fig. 1 Map of Sarawak showing study sites

existed and the response of cash crop production was too slow for the rapidly changing world market prices in the late nineties (Wadley and Mertz 2005). The low rubber prices in the early nineties to the early 2000s nearly brought rubber tapping to a standstill, but government schemes still supported the planting of new rubber, e.g. in Nanga Sumpa, where cocoa and pepper schemes were also introduced (Mertz and Christensen 1997). Cocoa was unsuccessful due to diseases and pests and was soon abandoned, whereas pepper took off and became the most important cash crop by 2003 in Nanga Sumpa (Wadley and Mertz 2005). Still, swidden cultivation remained the most important land use and livelihood practice, supplemented by income from tourism and temporary labor migration, at least until 2003 (Hansen and Mertz 2006; Mertz *et al*. 1999; Wadley and Mertz 2005).

In Saribas, swidden had largely disappeared by the 2000s (Cramb 2007), whereas in Niah, swidden cultivation was still present in 2002–2003, despite the rapid expansion of oil palm plantations. All households in Rh Ulat and half of the households in Rh Muyang farmed upland rice in swidden cultivation (Nielsen *et al*. 2006). At the time, several communities in the area had already engaged in or were negotiating agreements with joint venture companies to develop their land with oil palm, but neither Rh Muyang nor Rh Ulat had committed to such agreements. In Rh Ulat some households had small stands of smallholder oil palm, but otherwise the main cash crops were pepper and wet rice. Although there was little old growth forest left in the area aside from Niah National Park, no studies have found evidence of land degradation or declining soil fertility as a function of swidden cultivation practiced in the area (Bruun *et al*. 2006; de Neergaard *et al*. 2008; Tanaka *et al*. 2005).

Rapid change was subsequently reported to occur in the Niah area and we therefore decided to re-study this area as well as the apparently more stable community of Nanga Sumpa, which is located upstream of a hydroelectric dam and therefore off-limits to large plantation development.

Study Areas and Methods

The study areas are described in detail in numerous other publications (Bruun *et al*. 2006; Hansen 2005; Jepsen 2006; Mertz *et al*. 1999; Mertz *et al*. 2008; Nielsen *et al*. 2006; Wadley and Mertz 2005) and will only be mentioned briefly here. Rh Muyang and Rh Ulat are located in the lower Niah River catchment (Fig. 1) in an area characterized by rapid land development of oil palm plantations and with good infrastructure as it is close to the main highway linking Miri in northeastern Sarawak with Bintulu, Sibu and the State capital Kuching further southwest. Besides farming and plantation work, the area offers few job opportunities and off-farm jobs are mainly in Miri and Bintulu. The population in the rural areas is mainly ethnic Iban. Rh Muyang and Rh Ulat used to be one community and the land of individual households is found in the same area.

Hence the two communities are considered as one in this paper.

Nanga Sumpa is located in the upper part of the Batang Ai River catchment on the Delok River and just upstream of the Batang Ai Reservoir that supplies the Batang Ai Hydroelectric Dam. The settlement is near the Batang Ai National Park and most of the area is forested. There are no roads leading to the community and travel by longboat on the reservoir and river takes 1½–3 h depending on river conditions. The village has an agreement with a travel agency in Kuching and a steady influx of tourists, making tourism the main job opportunity in the area. The population in the area is Iban. In both areas, short- or long-term labor migration is common as it has always been in Iban communities (Kedit 1993; Padoch 1982; Wadley 1997).

Field work for the re-study was carried out in January 2011. The same households interviewed in 2002–2003 in Niah and in 1995 and 2003 in Nanga Sumpa were re-interviewed. In Nanga Sumpa, a questionnaire was administered with 26 of the current 35 households (there were 28 in 1995 and 32 in 2003), and in Rh Muyang and Rh Ulat questionnaires were administered with 29 out of the 33 households previously interviewed in 2002–2003 (Nielsen *et al*. 2006). The remaining households had either moved or were not at home. One focus group interview was carried out in each community to get a broader impression of the land use and livelihood changes that had occurred.

Questionnaires were slightly different in the two villages in order to compare with data previously collected. Data collection included basic household demographics, field size, harvest and fallow length, other land uses, main income sources and key assets and housing conditions. Reasons for changes over the past 8–10 years were explored with each household.

Details on field size and livelihood data were only available from Rh Ulat and Rh Muyang. Field areas were either provided directly by households or stated as the number of trees/palms for tree crops and oil palm. The number of oil palms was converted to hectares using the standard of 120 palms per hectare. The Food and Agriculture Organisation (FAO) assesses the optimum to be 130 trees per hectares and the Malaysian Palm Oil Board has a standard of 120–200 palms per hectare, depending on terrain and soil type (Ghani and Omar 2010). We assume that in the smallholder system the lower density of palms is used. Yields of oil palm were either given in tons or cash income and the conversion rate used was Malaysian Ringgit (MYR) 0.8 per kg, which was the current price at the time of the study (MYR 1=USD 0.32, January 2011). Yields of upland rice were given in number of bags. A large sample of bags used for rice harvest was weighed in 2003 (Mertz *et al*. 2008) and households stated that they used the same bags in 2011, which in 2003 had an average weight of 45 kg. The total unmilled rice harvest was converted to the cash equivalent by comparing with market prices of milled rice, which range between 2 and 4 MYR per kg. Although upland rice fetches higher prices than other rice types, the lower figure of 2 MYR was used in the conversion in order not to overestimate the income from rice farming.

Results and Discussion

Nanga Sumpa

In Nanga Sumpa, there has been a slight increase in the number of households even though high out migration could be expected from a remote location with no government facilities such as schools, clinics etc. (Table 1). Part of the reason is that tourism provides a relatively good – yet not very stable – income source and that the largely forested area still supports fishing and hunting, which are both important for food supply and a cherished activity, especially of younger Iban men.

Twenty-five of the 26 households interviewed in 2011 have upland rice and the only household without their own upland rice field is a young and newly established family that still assists in the parents' fields. The number of upland rice fields under swidden cultivation per household has remained stable since 2003 and while the length of fallow periods appears to have increased, this could be due to annual variation. There is an increase in the number of smaller permanent upland rice fields, which were almost non-existent in the past, and several households indicated that they are focusing increasingly on these areas to avoid clearing new land every year.

Rubber and pepper have been the most important cash crops in Nanga Sumpa since their introduction. Since 2003 considerable changes in the two crops have occurred. Rubber, which was all but abandoned in the 1990s and early 2000s, is now being planted again by most households. They are also pleased with a government supported rubber planting scheme that they reluctantly accepted in 1994, as it now provides good income from trees ready for tapping. The apparent decrease in rubber trees from the 1990s to 2011 is not, therefore, a good representation of the development in this crop. Many of the trees in the 1990s and early 2000s were not tapped and became old and unproductive. These gardens are now gradually being replaced by new hybrid varieties of rubber.

The development in pepper has been even more dramatic as practically all pepper gardens have been abandoned and converted to other land uses. The reasons given by households are that pepper is too labor intensive and requires too many inputs to maintain a good production without the subsidies that ended more than 10 years ago. Thus, the

Table 1 Land use and household changes in Nanga Sumpa since 1995

Year	No. of hh	No. of upland rice fields/hh	Average fallow length, years	No. of permanent upland rice fields/hh	Average no. of rubber trees/hh[b]	Average no. of pepper vines/hh
1995–1997	28	1–1.5	5.1–5.9	≈0	749	200
2002–2003	30	1.1	4.6	≈0	–	242
2010–2011	35	1.1	6.4 (4.8[a])	0.3	480	≈0

Historical data based on (Mertz and Christensen 1997; Wadley and Mertz 2005)

hh household

[a] Including fields without fallow

[b] Data for rubber not available from 2003 as rubber gardens by then were largely abandoned

concerns raised by Wadley and Mertz (2005) that the upsurge in pepper production in 2003 might be temporary and that the flexibility of alternating between pepper and rice cultivation described in the Saribas (Cramb 1993) might not be the same for more remote communities appear to have come true to a much higher degree than expected.

The main sources of income in Nanga Sumpa have shifted from being mainly from farming in 2002–2003 to being split evenly between farming and non-farm income (Table 2). Tourism income, in particular, has become more important for many households and tourism arrivals have indeed increased as the lodge has been expanded to double the capacity of the 1990s. This has also led more people to invest in outboard engines for the longboats that are used to bring tourists to the village and take them on tours further upriver. The offshore income comes from men who temporarily migrate to work on oil and gas rigs all over the world. Income from this activity is high, but it is dependent on job availability and only a limited group of younger men normally engages in this work.

Unfortunately, income data are not available for the 1995 to 1997 period, but self-sufficiency in rice was assessed in 1995–1996. In that year only 7 % of households produced sufficient rice for 12 months of consumption (Mertz and Christensen 1997), but it was an exceptionally poor harvest due to excessive rains during the burning in August 1995. In 2011, a majority still had a consumption deficit, but half of the households stated that they had produced sufficient rice for 10 or more months of consumption, and only three households had rice to last for less than six months. Hence, self-sufficiency in rice can be considered reasonably high and remains an important activity by most households despite increases in other income sources.

Rh Muyang and Rh Ulat

As mentioned previously, Rh Ulat and Rh Muyang will be considered together as the two communities used to be one and their land resources are mixed spatially, making it difficult to distinguish the territory of each community. The number of households has remained more or less the same in both communities during the 10-year period. None of the communities has engaged in joint venture arrangements with plantation companies and they have thus maintained full control over their land resources, in contrast to other communities in the Niah area (Fold and Hansen 2007; Hansen and Mertz 2006). Nonetheless, both communities have engaged heavily in planting oil palm between 2002–2003 and 2011, but exclusively as smallholder oil palm, whereby individual farmers invest in their own land. Of the households surveyed, 82 % now have their own oil palms against only 36 % in 2002–2003 (Fig. 2) and all farmers that grow oil palm mention that its cultivation has either increased or is new (Fig. 3). The oil palm is grown using similar techniques to those used in the larger plantations and as more and more households engage in oil palm, the former upland rice and secondary forest areas are being transformed to a smallholder oil palm plantation. However,

Table 2 Household income and assets in Nanga Sumpa

Year	Main income from farming, % of hh	Main income from offshore, % of hh	Main income from tourism, % of hh	Own outboard engine, % of hh	Rice deficit, % of hh
2002–2003	77	5	2	40	n.a.
2010–2011	50	12	35	65	62

Historical data based on (Hansen and Mertz 2006; Wadley and Mertz 2005)

Income data was not collected in 1995–1997

hh household

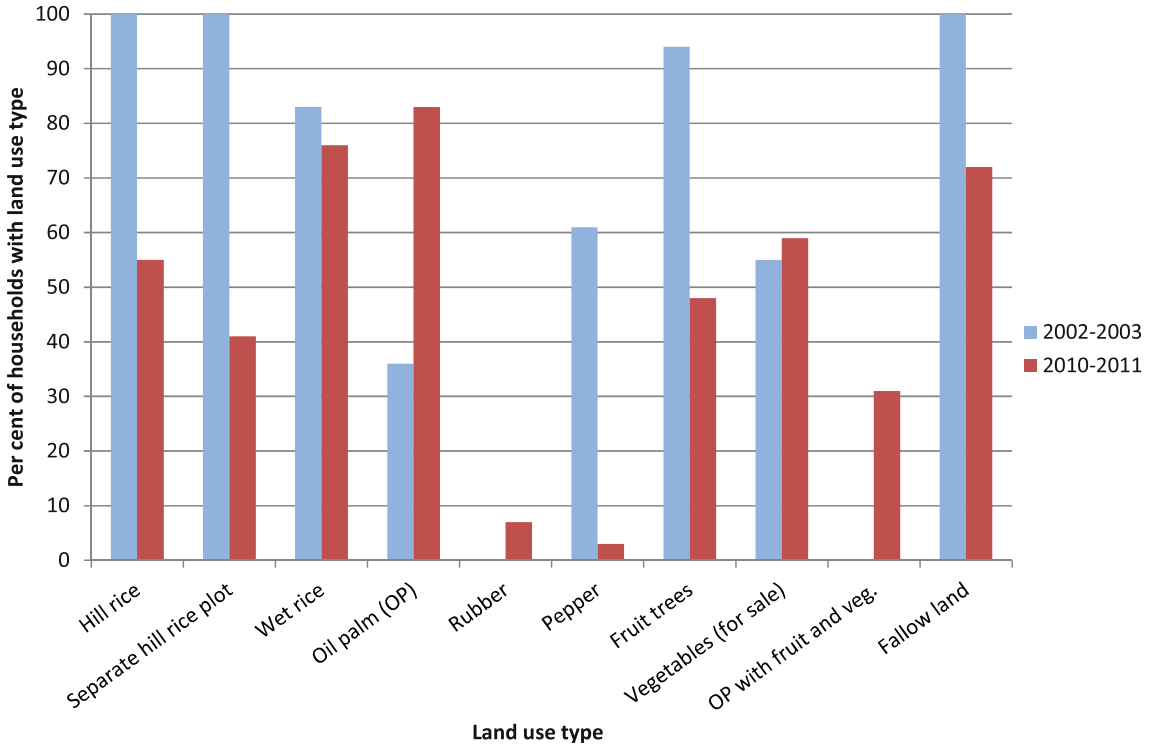

Fig. 2 Distribution of land use types among households (hh) in Rh Muyang and Rh Ulat in 2002–2003 (n=33) and 2010–2011 (n=29). Only hh with upland rice were selected in 2002–2003. Area indications in 2011 are based on hh assessments whereas in 2003 upland rice fields were measured

there are also important differences: 1) intercropping of upland rice during the first years is common and so is cultivation of fruits and vegetables, 2) no new roads are constructed, mainly due to the high costs involved, and 3) although terracing is generally not done, erosion is likely to be less as weeds are not removed systematically and dead palm fronds are left to decompose on the ground. Hence – and to distinguish this from larger oil palm plantations – we will call the individual oil palm plots palm gardens.

The number of farmers growing upland rice has decreased by 50 % (Fig. 2) and almost 70 % of respondents mention that it has either decreased or disappeared (Fig. 3). Moreover, this is from a sample of farmers that all grew upland rice under swidden cultivation in 2002–2003 so the overall trend for the entire communities may be stronger. The figure is likely to decline further in the future as only 40 % of the farmers have separate plots with upland rice and vegetables whereas the rest intercrop with oil palm. As land or financial resources become scarce for further expansion of oil palm, this practice is likely to stop at least until the oil palm gardens have to be replaced.

Other traditional land use practices such as wet rice and fruit tree gardens have also declined, but not to the same degree as upland rice. This is partly because wet rice areas are less suitable for oil palm – or at least more costly to convert because of the need for drainage – and wet rice production is usually higher than that of upland rice fields. The fruit gardens are located in fairly small areas that are maintained at least as long as there are still secondary forest areas to clear for oil palm. But with a few exceptions, most people are investing less time in these activities and they are increasingly considered subsidiary to oil palm cultivation.

As in Nanga Sumpa, pepper has almost disappeared from the landscape, much for the same reasons. When weighed against the necessary labor, fertilizer and pesticide investments, the profit is too small and uncertain to make it an attractive competitor to oil palm or other income sources. Rubber was already more or less gone in the early 2000s and only a couple of households have started tapping again after prices have increased. One farmer noted that he regretted having cut all his rubber as it is good income source now. There were no reports of planting rubber in the Niah area.

Finally, as can be expected, the number of households with fallow land has decreased and most of those that still have fallow land available report it to be decreasing (Figs. 2, 3). The impacts on the natural environment in the area of this development have not been assessed, but it is very likely that it will lead to an impoverishment of the biodiversity and that the neighboring Niah National Park increasingly will be a forest island without secondary forest as a buffer around it.

The mainly positive impacts for the household economy of the rapid land use changes, on the other hand, were clearly visible. Income from oil palm varied hugely between households and was dependent on both the area with oil

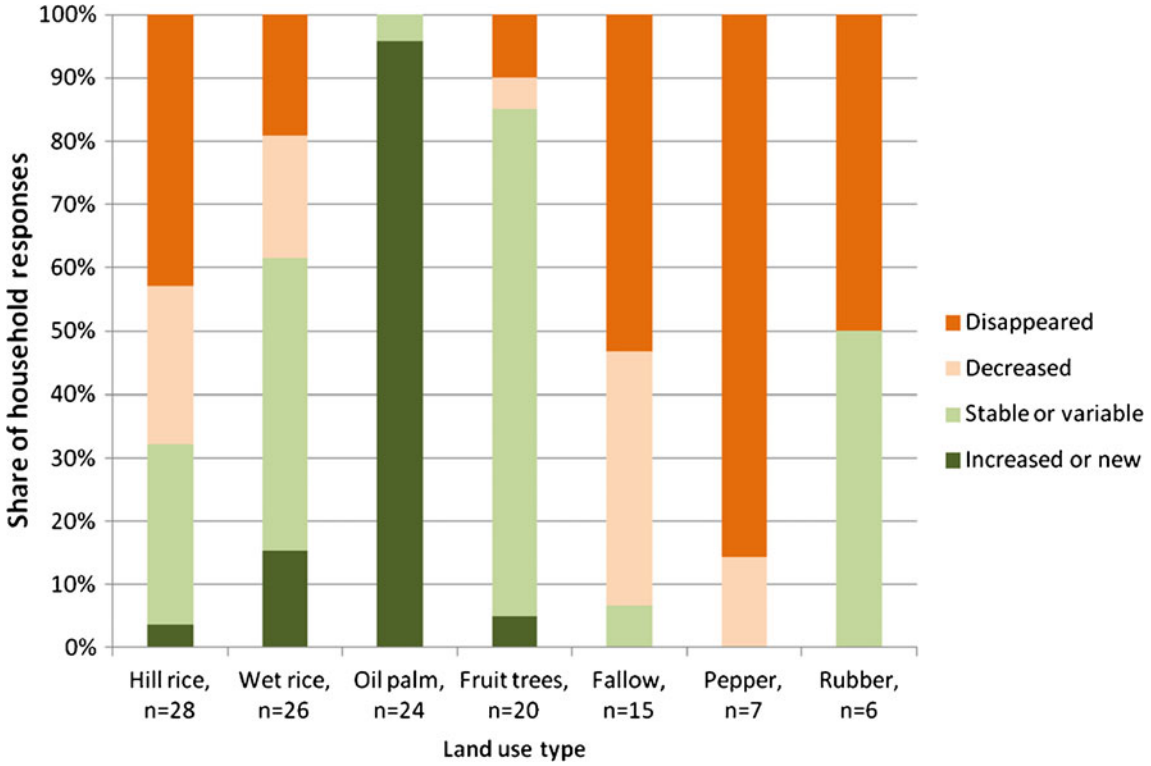

Fig. 3 Household assessment of land use change between 2002–2003 and 2010–2011 in Rh Muyang and Rh Ulat. All households were asked specifically whether each land use type had increased, decreased, remained stable, was variable, had disappeared or was newly introduced. The number of respondents is less than 29 for each category as not all land use types were relevant to all households in either 2002–2003 or 2010–2011. The categories 'new' and 'variable' had only four responses each and were included in 'increased' and 'stable', respectively

palm and the maturity of the oil palm gardens. There was a significant positive correlation between oil palm area and household income in 2010–2011, with the oil palm area explaining about 50 % of income levels (Fig. 4). The outlier with a very high income (MYR 144,000) is a household that had started oil palm planting early and already had many palms in 2002–2003, whereas the other outlier with a very large area (41.7 ha) had no oil palms in 2002–2003 but has been planting a great deal in recent years. A positive, but non-significant correlation between oil palm area and income levels was also observed in 2002–2003. Obviously, the relationship may also be inverted as income levels could

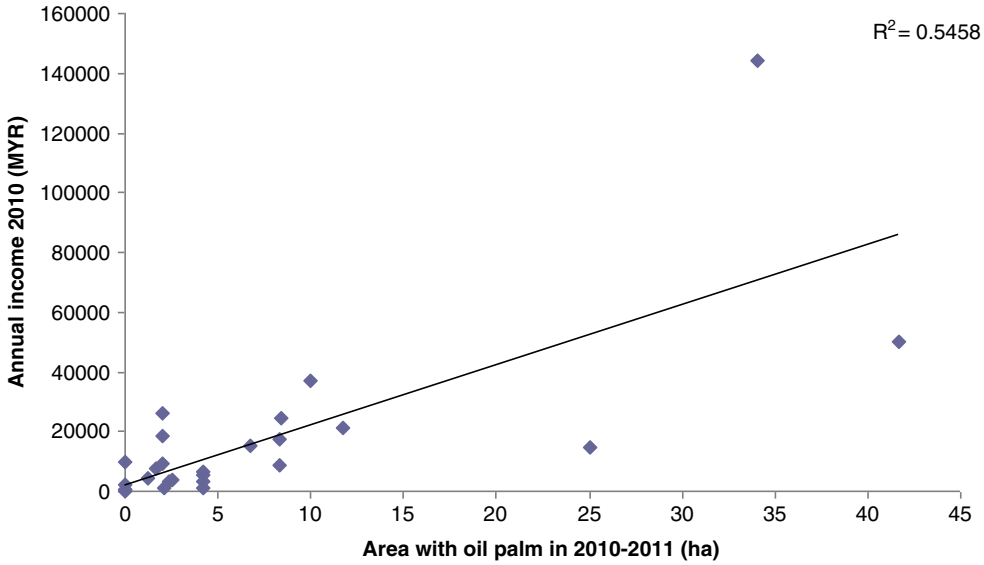

Fig. 4 Annual income as a function of oil palm area in 2010–2011 in Rh Muyang and Rh Ulat. Regression significant, $P<0.001$

Table 3 Ownership of cars and motorbikes in 2010–2011 related to upland rice and oil palm area in Rh Muyang and Rh Ulat

	Average oil palm area, ha	Average upland rice area, ha
No car	1.4	0.7
Car	11.5	0.9
No motorbike	6.8	0.1
Motorbike	7.4	1.2

also explain oil palm areas. It is not possible to establish which one of the factors is the main driver of the other, but it is clear that the two go hand in hand and that investment in oil palm also requires initial capital. There was no significant relationship between income and upland rice area in any of the years studied.

Important new household assets such as cars could also be related to oil palm expansion and several of the households with large oil palm gardens owned four-wheel drive vehicles. In 2011, 59 % of respondents owned a car against 31 % in 2003, and in 2011 the average oil palm area was 10 times larger for households owning cars compared to those not owning cars (Table 3). Motorbikes were owned by 66 % of respondents in 2011 against 52 % in 2003 and average oil palm area was about the same for households with and without motorbikes. This is partly because several households that have acquired cars no longer own motorbikes and in general, motorbikes are more affordable for households with a lower income. Upland rice area does not affect car ownership whereas households with larger upland rice areas are more likely to own motorbikes than those with small or no areas. This is because upland rice areas are usually worked by the farmers themselves and are often most easily accessed by motorbike. Households without upland rice therefore have less need of a motorbike, and those that have oil palm gardens usually employ hired laborers – mostly Indonesians – to work in the plantations.

There is thus no doubt that households that have successfully embarked on smallholder oil palm cultivation are better off in economic terms than 10 years earlier, but it also appears that the households without oil palm or those that have started late are in fact worse off than before. Four of the five households without oil palm in 2010–2011 are found in the 33 % of households with the lowest income and their income has declined compared to the lowest third in 2002–2003 (Table 4). Overall average income has increased and for the richest third it has doubled. This indicates an increasing inequity in the communities, and although some of the poorer households are those with only older people having few income opportunities, there are signs of increasing social differentiation in the communities. Informal discussions with informants and statements by several households during the questionnaire survey indicate that social status is now largely related to the level of engagement in, and income from, oil palm plantations rather than from successful upland rice cultivation, which was the sign of status and recognition in Iban society in the past. Households that do not engage in oil palm will be helped by relatives in the community, but they are not likely to obtain high economic status or have a chance to increase their income.

Conclusions

In Niah upland rice seems to be diminishing, although more than 50 % of the households surveyed still cultivate it, so the transition is slow. Some households are reluctant to give up upland rice because of the establishment costs of oil palm gardens, the labor requirements and uncertainty about economic returns. Farmers wait instead to see whether others are successful. That capital is needed to 'jumpstart' the transition is observed in Rh Ulat, where poorer households have family members who search for employment outside the village in the hopes of purchasing land areas to plant oil palm upon their return.

There is, however, no doubt that oil palm has been an economic success for many households. The question is whether oil palm will eventually take over completely or whether it will find its way into a modified swidden system, where oil palm gardens will have the same function that rubber, rattan and other cash crops have had for many years in swidden systems. They have been integrated as long-term productive fallows that can be followed by upland rice cultivation once production goes down and the garden is cleared (Dove 1993; Mulyoutami *et al*. 2009; Weinstock

Table 4 Average income of households surveyed divided between income groups - lowest, middle and highest third. Data for 2010-2011 and 2002-2003, Rh Muyang and Rh Ulat

	Income 2010–2011, MYR, n=28	Income 2002–2003, MYR, n=19	Difference between 2010/11 and 2002/03, MYR	% change between 2010/11 and 2002/03
average, lowest third	1,794	3,053	−1,259	−41.2
average, middle third	8,848	6,992	1,856	26.5
average highest third	39,299	19,274	20,025	103.9
Overall average	15,886	9,627	6,259	65.0

1983). The nutrient dynamics of oil palm gardens may not have the same 'forest-like' character as the rattan and traditionally managed rubber gardens, but on the other hand, fertilizer application is already used by all farmers for most of the crops in Niah and may give the necessary nutrient input to make rice cultivation feasible for 1–2 years until a new oil palm or other cash crop garden is established.

The situation is different in Nanga Sumpa, where swidden cultivation still remains important. However, even in this remote village, the practice is on the decline as other income sources, especially non-farm activities, become increasingly important. The abandonment of pepper and the current rush to plant rubber epitomizes the volatility of cash crops and their lack of sustainability in areas where agricultural extension is limited and transport costs to and from markets are high. Although rubber is more suitable than pepper to fit into a swidden cycle as trees can be felled after 20–25 years when their production decreases, it remains to be seen whether the current good income from rubber will continue.

We consider the two study sites to be representative of areas in Sarawak where large scale plantation companies have not taken over much of the land. In older plantation areas along the main roads in, for example, Sri Aman and Serian Divisions, swidden cultivation is likely to have been abandoned to a larger extent, as has also been seen in the Saribas area in Sarikei Division (Cramb 2007). The same may be the case for areas where joint venture companies have been established, such as in the upper Niah River catchment not far from Rh Muyang and Rh Ulat.

It is still difficult to predict a time frame for the 'demise of swidden' in Sarawak, and this study confirms the 'persistence trend' outlined before (Hansen and Mertz 2006; Padoch *et al.* 2007), although some way has been traveled further down the path of decline in swidden cultivation. Many households still find it worthwhile to continue upland rice cultivation in some form and it will be interesting to follow the smallholder rubber and oil palm cultivation and see whether it can become a sustainable alternative to large scale plantation development as well as providing communities with a continued opportunity to farm upland rice. If households manage many small plots of oil palm with different ages, it may indeed become a productive fallow that can enter a new kind of swidden cycle. For the 'large smallholders' though – households that are more aggressively expanding and maximizing profits from oil palm – upland rice has become a thing of the past and must be bought at the market.

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References

Bruun, T. B., Mertz, O., and Elberling, B. (2006). Linking yields of upland rice in shifting cultivation to fallow length and soil properties. Agriculture, Ecosystems and Environment 113: 139–149.

Condominas, G. (1957). Nous avons mangé la forêt de la Pierre-Génie Gôo. Mercure de France, Paris.

Condominas, G. (2009). Anthropological Reflections on Swidden Change in Southeast Asia. Human Ecology 37: 269–280.

Cramb, R. A. (1978). The transition from shifting cultivation to commercial agriculture: a case study from the Layar River. In Do, A. (ed.), Shifting Cultivation in Sarawak. A Report Based Upon the Workshop on Shifting Cultivation Held in Kuching 7-8th December, 1978. Department of Agriculture Sarawak, Kuching, pp. 1–23.

Cramb, R. A. (1988). Shifting cultivation and resource degradation in Sarawak: perceptions and policies. Review of Indonesian and Malaysian Affairs 22: 115–149.

Cramb, R. A. (1992). Problems of state-sponsored land schemes for small farmers: the case of Sarawak, Malaysia. Pacific Viewpoint 1: 58–78.

Cramb, R. A. (1993). Shifting cultivation and sustainable agriculture in East Malaysia: a longitudinal case study. Agricultural Systems 42: 209–226.

Cramb, R. A. (2007). Land and Longhouse. Agrarian Transformation in the Uplands of Sarawak. NIAS Press, Copenhagen.

de Neergaard, A., Magid, J., and Mertz, O. (2008). Soil erosion from shifting cultivation and other smallholder land use in Sarawak, Malaysia. Agriculture, Ecosystems & Environment 125: 182–190.

Dove, M. R. (1993). Smallholder rubber and swidden agriculture in Borneo: a sustainable adaptation to the ecology and economy of the tropical forest. Economic Botany 47: 136–147.

Fold, N., and Hansen, T. S. (2007). Oil palm expansion in Sarawak. Lessons learned by a latecomer? In Connell, J., and Waddell, E. (eds.), The Local and the Global: Environment, Development and Change in Rural Asia-Pacific. University of Hawai'i Press, Honolulu, pp. 147–166.

Fox, J., Fujita, Y., Ngidang, D., Peluso, N. L., Potter, L., Sakuntaladewi, N., Sturgeon, J., and Thomas, D. (2009). Policies, Political-Economy, and Swidden in Southeast Asia. Human Ecology 37: 305–322.

Freeman, J. D. (1955). Iban Agriculture: A Report on the Shifting Cultivation of Hill Rice by the Iban of Sarawak. Her Majesty's Stationary Office, London.

Ghani, E. A., and Omar, I. (2010). Perusahan Sawit di Malaysia: Satu Panduan (Oil Palm Cultivation in Malaysia: A Guide book). Lembaga Minyak Sawit Malaysia, Kajang.

Hansen, T. S. (2005). Spatio-temporal aspects of land cover and land use changes in the Niah Catchment, Sarawak, Malaysia. Singapore Journal of Tropical Geography 26: 170–190.

Hansen, T. S., and Mertz, O. (2006). Extinction or Adaptation? Three Decades of Change in Shifting Cultivation in Sarawak, Malaysia. Land Degradation and Development 17: 135–148.

Jepsen, M. R. (2006). Above-ground carbon stocks in tropical fallows, Sarawak, Malaysia. Forest Ecology and Management 225: 287–295.

Kedit, P. M. (1993). Iban Bejalai. Sarawak Literary Society, Kuching.

Majid Cooke, F. (2002). Vulnerability, control and oil palm in Sarawak: Globalization and a new era? Development and Change 33: 189–211.

Mertz, O., and Christensen, H. (1997). Land use and crop diversity in two Iban communities, Sarawak, Malaysia. Geografisk Tidsskrift-Danish Journal of Geography 97: 98–110.

Mertz, O., Christensen, A. E., Højskov, P., Birch-Thomsen, T. (1999). Subsistence or cash: strategies for change in shifting cultivation. Geografisk Tidsskrift-Danish Journal of Geography Special Issue: 133–142.

Mertz, O., Wadley, R. L., Nielsen, U., Bruun, T. B., Colfer, C. J. P., de Neergaard, A., Jepsen, M. R., Martinussen, T., Zhao, Q., Noweg, G. T., and Magid, J. (2008). A fresh look at shifting cultivation: Fallow length an uncertain indicator of productivity. Agricultural Systems 96: 75–84.

Mulyoutami, E., Rismawan, R., and Joshi, L. (2009). Local knowledge and management of simpukng (forest gardens) among the Dayak people in East Kalimantan, Indonesia. Forest Ecology and Management 257: 2054–2061.

Ngidang, D. (2000). A clash between culture and market forces: problems and prospects for native customery rights land development in Sarawak. In Leigh, M. (ed.), Borneo 2000. Environment, Conservation and Land. Universiti Malaysia Sarawak, Kuching, pp. 237–250.

Ngidang, D. (2002). Contradictions in land development schemes: the case of joint ventures in Sarawak, Malaysia. Asia Pacific Viewpoint 43: 157–180.

Nielsen, U., Mertz, O., and Noweg, G. T. (2006). The rationality of shifting cultivation systems: labor productivity revisited. Human Ecology 34: 210–218.

Padoch, C. (1982). Migration and Its Alternatives Among the Iban of Sarawak. Martinus Nijhoff, The Hague.

Padoch, C., Coffey, K., Mertz, O., Leisz, S., Fox, J., and Wadley, R. L. (2007). The Demise of Swidden in Southeast Asia? Local Realities and Regional Ambiguities. Geografisk Tidsskrift-Danish Journal of Geography 107: 29–41.

Tanaka, S., Kendawang, J. J., Yoshida, N., Shibata, K., Jee, A., Tanaka, K., Ninomiya, I., and Sakurai, K. (2005). Effects of shifting cultivation on soil ecosystems in Sarawak, Malaysia - IV. Chemical properties of the soils and runoff water at Niah and Bakam experimental sites. Soil Science and Plant Nutrition 51: 525–533.

van Vliet, N., Mertz, O., Heinimann, A., Langanke, T., Pascual, U., Schmook, B., Adams, C., Schmidt-Vogt, D., Messerli, P., Leisz, S., Castella, J. C., Jørgensen, L., Birch-Thomsen, T., Hett, C., Bruun, T. B., Ickowitz, A., Vu, K. C., Fox, J., Cramb, R. A., Padoch, C., Dressler, W., and Ziegler, A. (2012). Trends, drivers and impacts of changes in swidden cultivation in tropical forest-agriculture frontiers: a global assessment. Global Environmental Change 22: 418–429.

Wadley, R. L. (1997). Circular Labor Migration and Subsistence Agriculture: A Case of the Iban in West Kalimantan, Indonesia. Arizona State University, Tempe.

Wadley, R. L., and Mertz, O. (2005). Pepper in a time of crisis: Smallholder buffering strategies in Sarawak, Malaysia and West Kalimantan, Indonesia. Agricultural Systems 85: 289–305.

Weinstock, J. A. (1983). Rattan: ecological balance in a Borneo rain forest swidden. Economic Botany 37: 58–68.

Ziegler, A. D., Fox, J. M., and Xu, J. (2009). The Rubber Juggernaut. Science 324: 1024–1025.