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Title: Socio-economic perspectives on shifting cultivation landscapes in Northern Laos

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Abstract:

Despite the rapid agricultural transition which has occurred in the past decade, shifting cultivation remains a widespread agricultural practice in the northern uplands of Lao PDR. Little information is available on the basic socio-economic situation and respective possible patterns in shifting cultivation landscapes on regional level. Based on a recent approximation of the extend of shifting cultivation landscapes for two time periods and disaggregated village level Census data, this papers characterized these landscapes in terms of key socioeconomic parameters for entire northern Laos. Results showed that over 550,000 people lived in shifting cultivation regions. The poverty rate of this population was with 46.5% considerable higher than the national rural rate. The largest share of shifting cultivation landscapes are located in remote location and showed a high share of ethnic minority population, pointing to multi-dimensional marginality of these areas. We discuss that economic growth and increased market accessibility may not be sufficient to lift these landscapes out of poverty.

Keywords:

Shifting cultivation, poverty, accessibility, ethnicity, Lao PDR

Introduction

For centuries, shifting cultivation has been the dominant land use system in the north of the Lao Peoples Democratic Republic (Lao PDR and hereafter referred to as Laos), securing the livelihoods of the large percentage of the rural population living in these mountainous regions. However, nowadays, this traditional socio-ecological system is undergoing a rapid transformation. This transformation, from subsistence to market oriented agriculture production, has been accelerated by the increasing regional and global economic integration together with the rapidly expanding major transportation infrastructure (Thongmanivong *et al.* 2009; Roder *et al.* 1997; Seidenberg *et al.* 2003; Padoch *et al.* 2007; World Bank 2008). In addition to these economic policies and international market forces, other important driving forces are the land use policies in general and those specific for shifting cultivation; since the mid-nineties the Lao government has aimed at reducing the area under shifting cultivation (Lestrelin *et al.* 2012). These policies are rooted in the policy-makers' general perception of shifting cultivation as a backward and underdeveloped form of land use (Mertz *et al.* 2009), representing a poverty trap (Bounthong *et al.* 2003), and mainly responsible for the continuing deforestation (Lawrence *et al.* 2010) and forest degradation (Fox 2000; Thongmanivong *et al.* 2009). However, various local case studies suggest that upland farmers frequently simply have not many alternatives to shifting cultivation and that these controversial policies have had little effect (Ducourtieux 2005; Roder 2001; Yokoyama 2004; Saito *et al.* 2006; Inoue *et al.* 2007; Leek 2007; Linquist *et al.* 2007; Yamamoto *et al.* 2009; Inoue *et al.* 2010; Hett *et al.* 2011; Alexander *et al.* 2010).

Since the current and future role of shifting cultivation in the country's agricultural development remains highly contested, the availability of reliable and systematic evidence on the general characteristics and dynamics of this practice beyond that of anecdotal insights of case studies is crucial. Currently there are no national statistics kept on shifting cultivation. It does not appear as a category in either the agricultural statistics or the socio-economic census. This is common throughout South East Asia (SEA) (Mertz *et al.* 2009). Furthermore, since official national land cover inventories not only fail to capture those areas under shifting cultivation but, in fact, obscure these by classifying them as "potential forest" or "barren lands" (Hett *et al.* 2011), there was, until recently, no established approach for the detection of such land use across larger areas beyond that of local case studies (Schmidt-Vogt *et al.* 2009). Hence, basic data such as the areas under shifting cultivation or the population living in such regions are vague and very diverse (Mertz *et al.* 2009; Schmidt-Vogt *et al.* 2009).

This lack of regional level studies and consistent data have resulted in intensive debates on the management of shifting cultivation landscapes in Laos; debates that are usually highly ideological but without any factual basis. The following characteristics of shifting cultivation are commonly assumed for the entity of the territory:

1) Shifting cultivation is mainly practiced in inaccessible uplands,

2) Shifting cultivation is mainly practiced by the ethnic minority groups of the population, and

3) Shifting cultivation regions are prone to high levels of poverty.

These assumptions must be considered as being only hypothetical in nature since no consistent or recent data, either for the country as a whole or even for large areas, exist to substantiate them.

Recent studies have made the first attempts in delineating shifting cultivation landscapes and estimating the percentages of population involved. Based on a landscape mosaic approach using existing land cover data from 2002, the recent study of Messerli *et al.* (2009) was able to identify different dominant

landscapes, including those under shifting cultivation at the national level. Using data from the 2005 National Population and Housing Census, the authors were also able to assess, for the first time, the population living in these landscapes. The study estimated that 17% of the national population lived in the 29% of the country comprised of shifting cultivation landscapes. More recently, Hurni *et al.* (2012, this issue) have developed an approach based on remote sensing data, which estimates the shifting cultivation dominated landscapes for northern Laos for two time periods between 2000 and 2009. These studies have laid the foundation for a further characterization of shifting cultivation landscapes using selected socio-geographic indicators.

The aim of this paper is to shed light on the basic validity of the above mentioned three general assumptions concerning shifting cultivation landscape throughout northern Laos. Specifically we use the newly available spatially explicit data on the extent of shifting cultivation areas in northern Laos as well as socio-economic data at the village level to analyses emerging (spatial) patterns in shifting cultivation dominated landscapes with regard to poverty, ethnicity, accessibility as well as altitudinal belts. We hope to lay an empirical basis for more in-depth future analyses by experts from different disciplines, and on the other hand to contribute evidence into to the general developments and policy debates on shifting cultivation in Laos.

Materials and methods

Study area

A considerable part of northern Laos is mountainous with limited accessibility by a few all season roads connecting only the main district capitals. The traditional land use systems are shifting cultivation (mainly upland rice) on the slopes and paddy rice cultivation in the few available valley bottoms. Over

the past decade, increased regional economic integration and policies promoting economic growth and investment, resulted in a swift transformation from subsistence to cash crop oriented agriculture and the introduction of tree plantations (Alton *et al.* 2005; Ducourtieux *et al.* 2006; Padoch *et al.* 2007; Cramb *et al.* 2009; Fox *et al.* 2009; Thongmanivong *et al.* 2009).

The study region of the paper at hand is approximately 158,000 km^2 or 2/3 of the whole of Laos and so included a large percentage of those shifting cultivation landscapes as estimated initially by Messerli *et al.* (2009). It was necessary to limit our study to this northern part of Laos as the recent assessment of Hurni *et al.* (2012, this issue) which serves as one of our baseline data, was also limited to this region. For simplicity we hereafter refer to this study area as "northern Laos".

The extent and dynamics of shifting cultivation landscapes

Hurni *et al*. (2012, this issue) recently developed a new approach using hyper-temporal MODIS satellite data in conjunction with multi-temporal Landsat imagery from 2000 to 2009 to detect shifting cultivation landscapes. This approach is based on the dominance of the very specific spatio-temporal land cover pattern of clearings and regrowth left on the landscape by shifting cultivation. In their research Hurni *et al*. (2012, this issue) estimated the extent of shifting cultivation dominated landscape (hereafter called shifting cultivation landscapes) for northern Laos for two time periods (2000-2006 and 2003-2009). This overlap in time was necessary as six years of data were needed to delineate these landscapes. The assessment does not differentiate the land use systems or land cover outside of the delineated shifting cultivation landscapes. For the study region these are mainly forests, permanent agricultural landscapes and some build-up and water areas. This has to be considered when interpreting any comparison between socio-economic characteristics of shifting cultivation landscapes with non-shifting cultivation areas, presented in the study at hand.

Data on the socio-economic setting

The 2005 Population and Housing Census of the Lao Department of Statistics is the only coherent and spatially disaggregated countrywide socio-economic baseline in Laos (Messerli et al. 2008). We used village level aggregates of this Census data for all of the 6,521 villages (62% of all villages in Laos and 58% of the Lao population) in our study area. For data on poverty, we used the village level poverty estimates of Epprecht et al. (2008); estimates of the number of people living beneath the national poverty line. This estimation was based on the 'small area estimation' method which combined information derived from the 2005 Population and Housing Census with that from the Lao Expenditure and Consumption Survey (LECS) of 2003. The poverty measure used by Epprecht at all (2008) uses a welfare indicator of the value of per capita consumption expenditure, including the value of subsistence food production and the imputed rental value of owner occupied housing. The poverty line used there corresponds to the per capita expenditure, including the value of home production, required to purchase 2100 Kcal per person per day using the food basket of households in the third quintile, plus a non-food allowance equal to what households in the third quintile spend on non-food items. In this sense, poor people are not at an adequate subsistence level, as their per capita consumption expenditure is not enough to cover basic needs, be that minimal heal care, education or food. This has to be kept in mind when interpreting the results of this study as there are a number of other poverty measurement approaches existing which take into account an even wider concept of well-being. For Laos, however, the expenditure based poverty measure of Epprecht et al (2008) is the only available national data at village level, and was therefore used in this study.

Furthermore the use of socio-economic data for only one time period and aggregated at the village level has two important consequences for the interpretation of results: 1) All the changes in socio-economic

characteristics of shifting cultivation landscapes presented, were based on a change in the land use pattern over time and not on the socio-economic data. 2) It was not possible to reach any conclusion on the characteristics of sub-village populations. Therefore, although this study, provided, for example, information on the total numbers of people living within shifting cultivated landscapes not all villagers within this number may depend exclusively on shifting cultivation.

Data on accessibility

The 2005 Population Census does not provide any information (beyond simple indicators of road access) of village remoteness. Accessibility, here understood as travel time to land itself and to basic services such as market, has been shown to be a key determinant of land use and land use changes (Angelsen and Kaimowitz 1999; Castella *et al.* 2005; Chomitz and Gray 1996; Geist and Lambin 2002; Verburg *et al.* 2004; Epprecht *et al.* 2010).

This is especially relevant in Laos, as the still very weak transportation infrastructure in general is being upgraded through current massive investments in this sector; firstly through mega projects such as the establishment of economic development corridors in the Greater Mekong Sub-region (GMS) by the Asian Development Bank (ABD), or more recently through the discussion of a Chinese funded high-speed railroad though Laos, and secondly, through a slightly slower process of upgrading smaller roads to provide rural areas access to these economic development corridors. As a result, rural accessibility is being enhanced in Laos quite swiftly.

In order to provide insights into possible basic patterns of accessibility related to shifting cultivation landscapes, a model of physical accessibility has been developed. This model estimates travel time from any point in the study area to, for example, the nearest district capital using standard GIS raster based (in our case 100 meter resolution) cost-distance functions (see Figure 1). District capitals were chosen as

the “sources” (or destinations) for this model, as they frequently act as a development gateway or entry point to the more remote hinterlands (Messerli et al. 2008). Thus this accessibility model may also be partly understood as yielding an approximation of market accessibility. When interpreting the accessibility related result of this study, the following has to be kept in mind: firstly, physical accessibility does not automatically imply actual access to services. In this study we only consider physical accessibility and not socio-economic distance as defined e.g. by Epprecht et al (2010). Secondly, our accessibility model estimates travel time to certain destinations, taking into account availability and quality of road networks, terrain, land cover, and potential means of transport – thereby assuming access to typically available means of transport.

Overview of approach

The different datasets employed in this study vary in terms of their basic geometries or spatial units of reference. While the village level census data uses an estimated village area (i.e. the so called village polygon) as reference, the assessment of Hurni *et al*. (2012, this issue) used the delineated borders of shifting cultivation landscapes, and the accessibility data is rater based. To have a spatial unit of analysis at hand for this study, we used standard spatial intersections of the village polygons with the data on the extent of shifting cultivation for the two time periods as new basic geometries for all further analyses. For the assignment of the socio-economic attributes based on the village geometries to the new polygons created through the spatial overlay we followed an area-based approach: the absolute data of the socio-economic variables (e.g. population, ethnicity,) were attributed to the respective new geometry based on the respective share of area of the village polygon, which was dominated by shifting

cultivation at one of the two time periods considered. This mitigates the issues of using only village level aggregated data (see above) to a certain extent but naturally cannot solve it.

In order to depict socio-economic characteristics of shifting cultivation landscapes spatially at one point in time and provide insights to the larger overall patterns of poverty and accessibility, a landscape typology was developed. This typology was based on different combinations of the following three main factors:

1) Presence of shifting cultivation landscapes in the second time period considered (2003-2009; based on Hurni *et al.* 2012 this issue).

2) The travel time to district capitals based on the accessibility model. This was classified as two spatial categories, i.e. regions from where a district capital is reachable within a daytrip (< 2 hours) and regions where a district capital is more than a daytrip away (> 2 hours). Hence a "daytrip" is defined as a 4-hour travel time (there and back) which we consider as a reasonable estimate in order to reach markets and services such as agricultural extension services.

3) The poverty data used were reclassified in two classes: areas where village-level poverty rates were lower than the national rural poverty rate (hereafter referred to as "better off") and those where rates were higher (hereafter referred to as "poorer") than the national rural poverty rate. The latest countrywide estimate of the national rural poverty rates of 40% were used (Epprecht *et al.* 2008).

Results

The following results section begins with an overview of the population and poverty figures in shifting cultivation landscapes, followed by the pattern of the distribution of shifting cultivation landscapes across travel times to district capitals, the ranges of elevation and the composition of ethno-linguistic

families and ends with the presentation of a typology of shifting cultivation landscapes in relation to accessibility and poverty.

Estimation of numbers and poverty rates of the population living in shifting cultivation landscapes

Using the recent delineation of shifting cultivation landscapes of Hurni *et al.* (2012, this issue), the latest available Census information (Messerli *et al.* 2008) and the poverty estimates (Epprecht *et al.* 2008) we were able to estimate the population and the respective poverty rates in shifting cultivation landscapes in northern Laos in two time periods (see Table 1). In northern Laos, both the absolute numbers and the percentages of the population living in shifting cultivation landscapes were found to be considerably large. Over 550,000 people or 15.6% of the total population lived in such landscapes in the study area (2003-2006).

In the time periods examined (2000-2006 and 2003-2009) the area of shifting cultivated landscapes decreased by 3,500 km^2 (or 10%) while the population living in such landscapes decreased by 115,300 people (or 17.3%).

Poverty rates in shifting cultivation landscapes were 45.6% in 2000-2006 and 46.5% in 2003-2009. This slight increase between the two time periods (see Table 1) does not imply a change in poverty per se, but rather points to the fact that the shifting cultivation landscapes in the second time period were located in poorer regions. However both these rates were considerably higher than the national poverty rate (37.7%) of the total population in 2005 and that of the rural population (40%) (Epprecht *et al.* 2008).

	Shifting cultivation landscapes 2000- 2006 (t0)	**Shifting cultivation landscapes 2003 - 2009 (t1)**	**Net-change of shifting cultivation landscapes t0 - t1**
Area km^2	35,140	31,640	-3,500
Percentage of total study area	22.2	20.0	-2.2
Population	667,300	552,000	-115,300
Percentage of population of total study area	19.0	15.6	-3.3
Poverty rate	45.6	46.5	-

Table 1: Basic socio-economic information on shifting cultivation landscapes in northern Laos in 2000-2006 and 2003-2009 (area estimates are based on Hurni et al. (2012, this issue).

Accessibility and areas of shifting cultivation landscapes

A clear pattern of the distribution of shifting cultivation landscapes across travel times to district capitals emerged (see Figure 2). Only small percentages (8% in 2000-2006 and 6% in 2003-2009) of the total of shifting cultivation landscapes were found in the immediate vicinity of district capitals while percentages increased dramatically in areas slightly further away. A further decrease in accessibility correlated with a gradual decrease in areas under shifting cultivation. The increase in regions > 8 hours has to be interpreted with care as the respective accessibility class does not follow the 1 hour classification system and hence comprises the cumulative shifting cultivation areas beyond 8 hours. Overall the largest shares of shifting cultivation landscapes were found in regions beyond 2 hour travel time (71.4% and 72.6% of the total respective area of the two time periods considered). Hence, there is a slight tendency that that the shifting cultivation landscapes are located to a larger share in less accessibly regions over time. In contrast, percentages of shifting cultivation landscapes in close vicinity to towns sharply decreased between the two time periods with more than 33% of all shifting cultivation landscapes closer than 1 hour to district capitals disappearing. This decrease accounted for over 27% of the total net decrease in shifting cultivation landscapes between the two considered time periods.

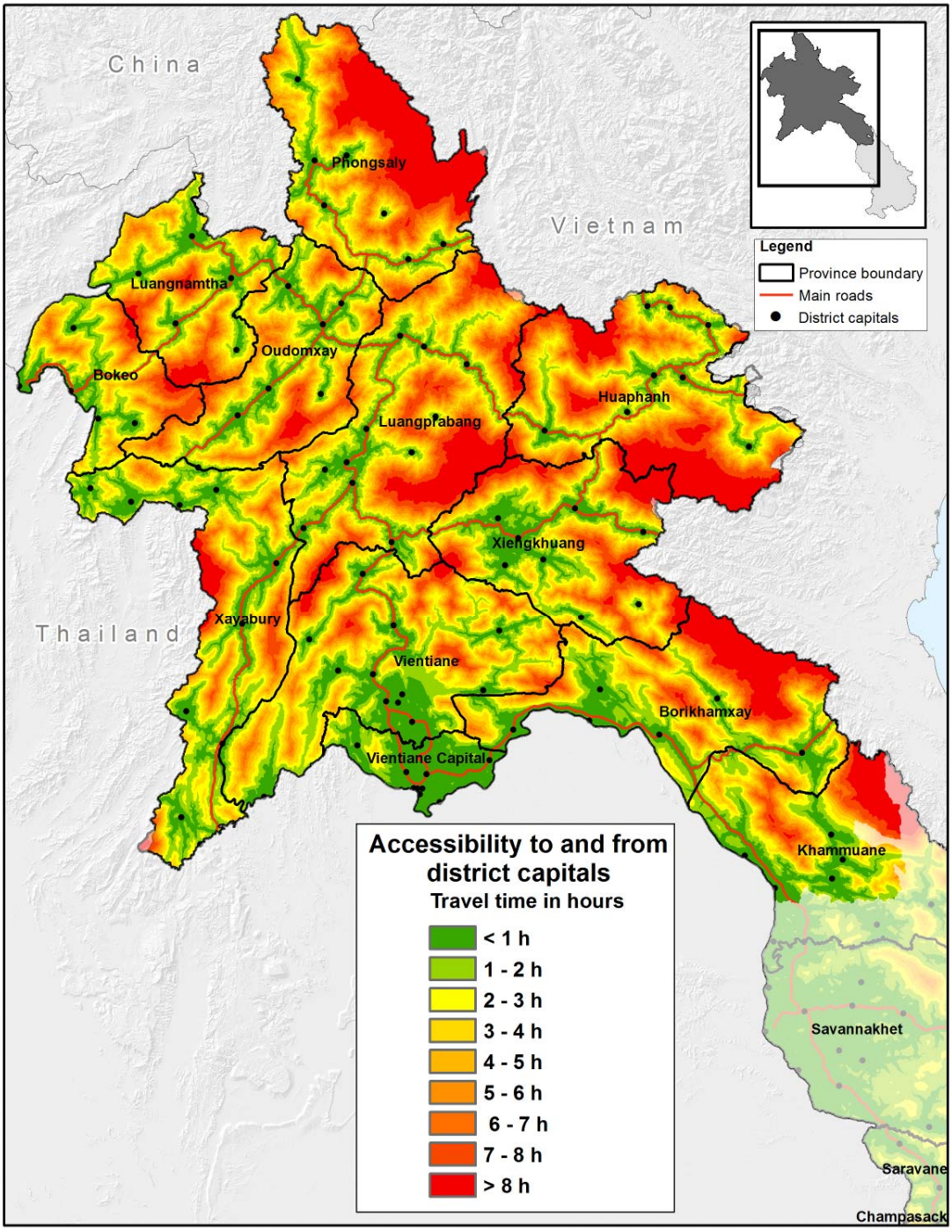

Figure 1: District accessibility: Travel time from and to district capitals.

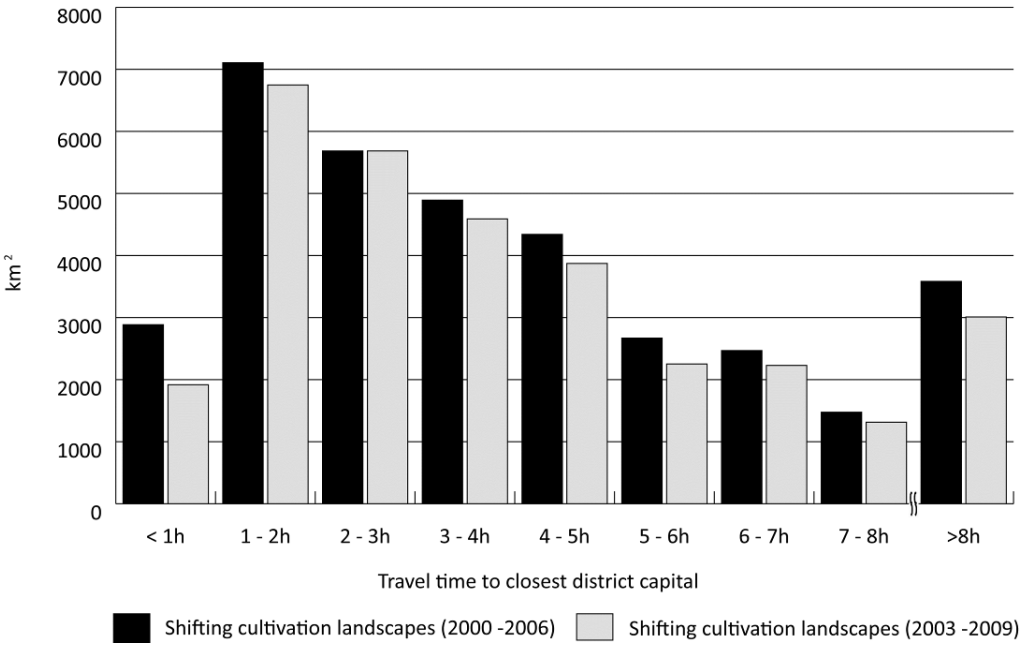

Figure 2: Distribution of shifting cultivation landscapes across accessibility to district capitals.

When the entire study area was considered, shifting cultivation landscapes proved not to be the dominant landscape at any accessibility level (see Figure 3). However, it is still interesting to note that except for the most accessible and the most remote areas, shifting cultivation landscapes represent a very important landscape element across all other accessibility classes.

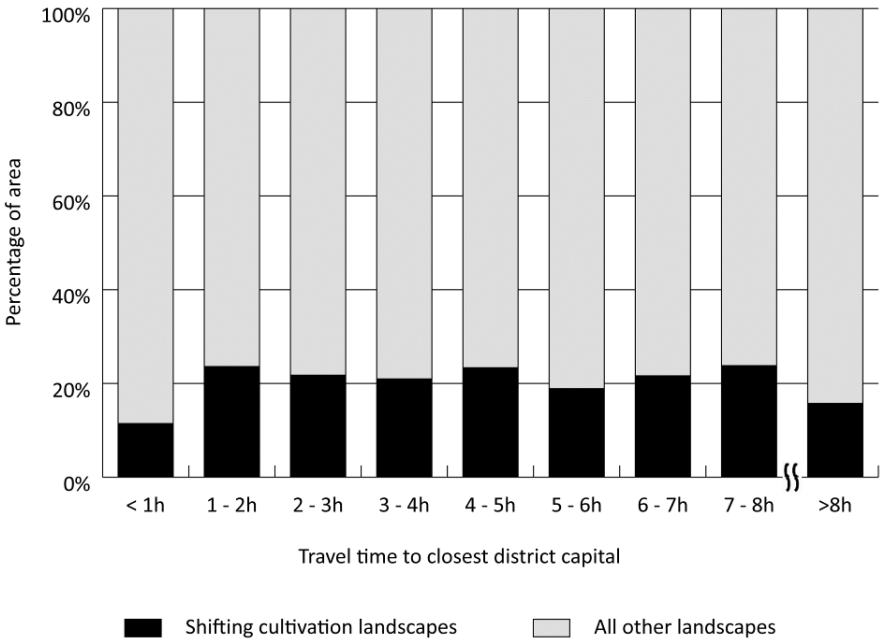

Figure 3: Shares of shifting cultivation landscapes (2003-2009) of the entire study area in relation to accessibility.

Furthermore, linked to accessibility, is the question of the range of elevations at which shifting cultivation landscapes can be found. As already mentioned, shifting cultivation is commonly assumed to be an upland agriculture system in Laos. Our results clearly depict that this is indeed the case. Over 78% of the shifting cultivation landscapes in 2003-2009 were above 600 meter asl which can be considered as upland regions in a Lao context. (see Table 2). The general pattern across the elevation range confirms the intuitive assumption: While only a small share of shifting cultivation is located in the lowlands (due to the dominance of e.g. permanent agriculture) the major is located at intermediates to high elevation. The share decreases in very high elevation ranges due to rough terrains and some large plains with natural grasslands (e.g. Xieng Khouang plain)".

	Elevation Zones [meter asl]									
	0-200	201-400	401-600	601-800	801-1000	1001-1200	1201-1400	1401-1600	>1601	Total
Shifting cultivation landscapes	0.4%	6.7%	14.9%	33.3%	30.3%	10.8%	3.4%	0.4%	0.0%	100%
Not shifting cultivation landscapes	4.7%	11.5%	14.8%	19.5%	20.6%	18.3%	7.9%	2.1%	0.5%	100%

Table 2: Percentages of shifting cultivation and all other landscapes in 2003-2009 per elevation zones.

Ethno-linguistic families living in shifting cultivation landscapes

There are 49 different ethnic groups in Laos. These are usually classified as belonging to four ethno-linguistic families: Lao-Tai (Tai-Kadai); Mon-Khmer (Austro-Asiatic); Hmong-Mien (Hmong-Yao, Miao-Yao); and Sino-Tibetan (mostly Tibeto-Burman) (Messerli *et al.* 2008). The Lao-Tai ethno linguistic family is dominant at the national level (comprising 65% of the total population) and also in our study area (comprising 60%), while the other groups can, to some degree, be considered a collection of ethnic minorities (Messerli *et al.* 2008).

However, in shifting cultivation landscapes in northern Laos (2003-2009) the Lao-Tai made up only 19.4% of the total population while the largest percentage was composed of other families (Mon-Khmer: 55.0%, Sino-Tibetan: 9.8% and Hmong-Mien: 15.8%) (see Figure 4). This basically confirms information from local case studies (e.g. Thongmanivong *et al.* 2009; Fujita and Phanvilay 2008; Ducourtieux *et al.* 2006; Thongmanivong *and Fujita* 2006) and provided the respective evidence for entire northern Laos, that sifting cultivation landscapes are mainly inhabited by ethnic minorities. For example, while only 5% of the total Lao-Tai population of the study area lives in shifting cultivation landscapes the area is home to almost 33% of the entire population of the other three ethno-linguistic families. This emphasizes the importance of shifting cultivation landscapes to the lives of all the ethnic

minority families in the area. The clear national pattern is that the Lao-Tai live mainly in the easily accessible areas in the floodplains (Messerli *et al.* 2008). This pattern was also observable in our results, even though we considered only those Lao-Tai living in shifting cultivation landscapes in northern Laos where more than 70% of this population lived closer than a 2-hour travel time from a district capital, while this was true for significantly less than 50% of the other groups.

There was no change in this overall pattern of shifting cultivation landscapes in the two time periods considered. In shifting cultivation landscapes, the percentage of Lao-Tai of the total population did however decrease slightly from 21.1% to 19.4%.Hence there is a trend that the shares of the other three ethno-linguistic families in shifting cultivation landscapes are still increasing.

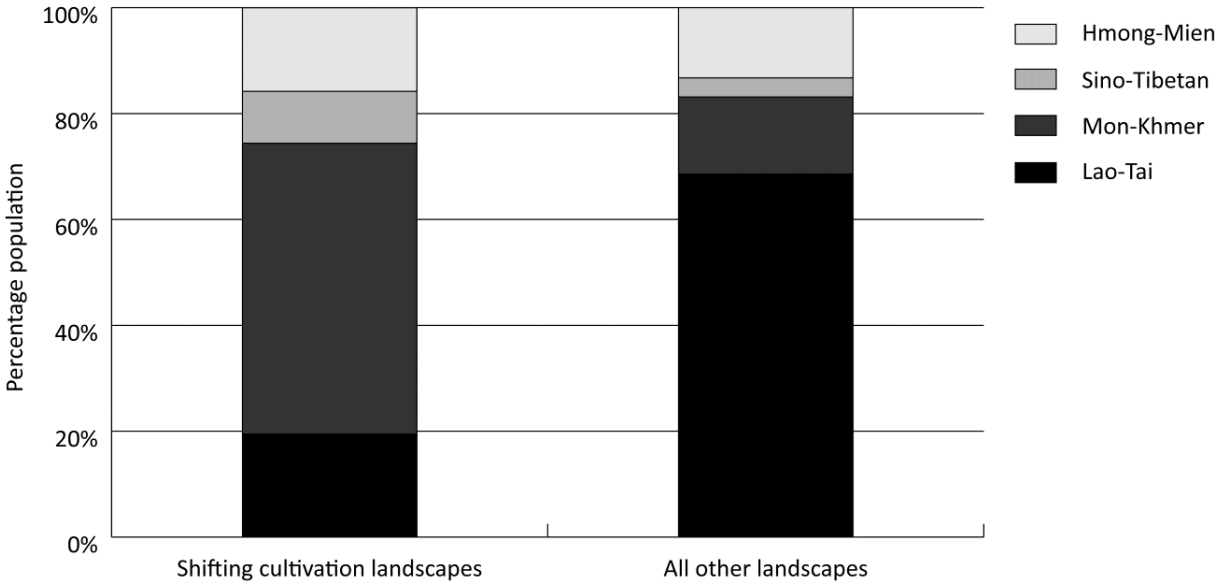

Figure 4: Percentages of the population of the four ethno-linguistic families in shifting cultivation landscape (2003-2009) and all other landscapes in the study area.

Detecting patterns: Landscape typology of shifting cultivation landscapes in 2003-2009

In order to be able to depict the basic socio-economic characteristics of shifting cultivation landscapes spatially in the first time period considered (2003-2006) and to obtain insights to the larger overall patterns of poverty and accessibility in shifting cultivation landscapes, a landscape typology was developed and is presented here. This landscape typology classifies the shifting cultivation landscapes by using the two main criteria of poverty and accessibility.

More than 75% of the shifting cultivation landscapes are in regions that are poorer than the national rural average (see Table 3). These areas are also home to more than 66% of the population of the study region. This does not imply that all the people are poor, but rather that they live in a landscape where the majority of people are poor i.e. with poverty rates higher than national rural poverty rate. The actual calculated poverty rate in shifting cultivation landscapes (2003-2009) was 46.5% (see Table 1).

A further sub-classification of the landscapes into areas beyond and within a daytrip reveals clear patterns (see Table 3). In shifting cultivation landscapes where village poverty rates are lower than the national rural poverty rate, the greatest percentage (72.8%) of the population lived within a daytrip of a district capital. This relates mainly to the higher population densities in these areas since the percentages of area within (50.4%) and beyond (49.6%) a daytrip respectively were almost equal. In regions with poverty rates higher than the national rural poverty rate, most people (68.1%) were found to live in those areas beyond a daytrip and the respective share of area was equally dominant (78.5%).

In terms of the ethno-linguistic composition of the four landscape typologies (see Table 3), it is striking that in poorer landscapes, almost 70% of the population who lived both within (69.3%) and beyond (68.5%) a daytrip are from the Mon-Khmer family. In contrast, the chances of “finding” members of the national ethnic majority (Lao-Tai) in such landscapes were shown to be very small (6.6% and 9.1% respectively). Yet, in better off landscapes the Lao-Tai make up more than 40% of the population living within (48.2%) and beyond (42.3%) a daytrip.

	Shifting cultivation (SC) landscapes			
Poverty	**SC landscapes with lower poverty rate ("better off") than the national rural poverty rate**		**SC landscapes with higher poverty rate ("poorer") than the national rural poverty rate**	
Percentage of area	24.6		75.4	
Percentage of total population per landscape type	33.8		66.2	
Accessibility to district capital	**Within daytrip**	**Beyond daytrip**	**Within daytrip**	**Beyond daytrip**
Percentage of above area	50.4	49.6	21.5	78.5
Percentage of above population	72.8	27.2	31.9	68.1
Ethnic composition of population of each poverty/accessibility class				
Percentage of Lao-Tai	48.2	42.3	6.6	9.1
Percentage of Mon-Khmer	35.0	24.8	69.3	68.5
Percentage of Sino-Tibetan	5.8	23.4	4.1	6.7
Percentage of Hmong-Mien	11.1	9.5	20.0	15.7
Total ethnic composition	*100*	*100*	*100*	*100*

Table 3: Results of the landscape typology of shifting cultivation landscapes (2003-2009) by poverty and accessibility.

Figure 5 depicts the resulting spatial pattern of the typology of shifting cultivation landscapes in 2003-2009. Shifting cultivation landscapes which have higher poverty rate ("poorer") than the national rural poverty and are beyond a daytrip represent the largest share (59.1% of area and 45.1% of population) and are mainly large connected patches. . A certain clustering of better off shifting cultivation landscapes were found in the north-west (in Luang Namtha Province) and in the very north (in Phongsaly Province) of Laos.

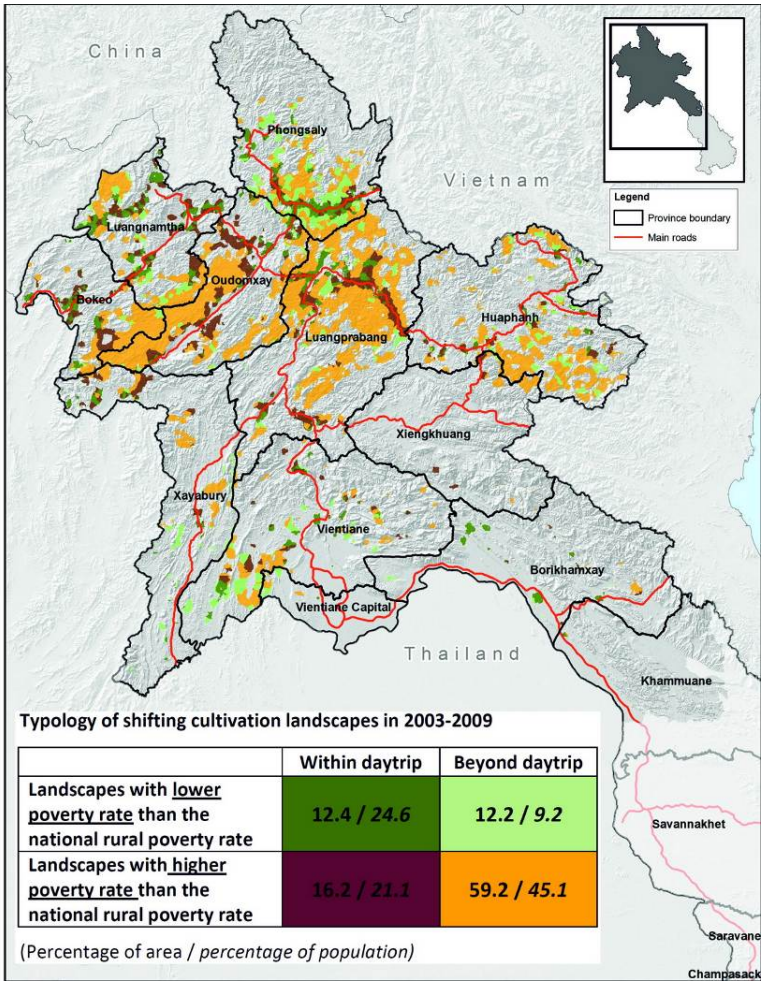

Figure 5: Map of typology of shifting cultivation landscapes (2003-2009) and the percentage of area and population in northern Laos.

Discussion

In the following discussion we briefly reflect how the approach chosen in this paper compares to others in terms of the most important results. We will then discuss the common beliefs and assumptions about shifting cultivation in Laos in order to present a more differentiated picture. Finally we will explore the relevance of these insights for the current debates on development policy in the country.

It is difficult to make a direct comparison with earlier (e.g. Fujisaka 1991) and more recent (Messerli *et al.* 2009) attempts at estimating the extent and the population of shifting cultivation landscapes. These estimations were either rather vague (Mertz *et al.* 2009) or, as was the case in the estimations of Messerli *et al.* (2009), employed methodologies not directly comparable to ours. Nevertheless, a cautious comparison of the national figures of Messerli *et al.* (2009) with our figures revealed a certain similarity, although these figures of 29% of the area and 17% of the population of shifting cultivation landscapes are slightly higher than ours. The different time periods of the observations could well explain the small deviation and we may tentatively conclude that the main results of our study could be confirmed by two different approaches.

Our insights provide a base for reflecting on the widespread beliefs and generalisations that have come from local case studies on shifting cultivation in Laos. Firstly, we can confirm that shifting cultivation areas can indeed be characterised by considerably higher poverty rates than that of the national average in rural areas. Secondly, shifting cultivation is generally found in remote upland areas. More specifically, the largest shares of shifting cultivation landscapes were found in regions beyond 2 hour travel from district capitals. Furthermore, shifting cultivation landscapes are mainly (78%) found above 600 m asl. corresponding to the uplands Laos. Thirdly, in such landscapes the Mon-Khmer ethno-linguistic family, an ethnic minority group at the national level, predominates. The percentages of other minority populations are also elevated in shifting cultivating landscapes when compared to national population statistics, while the overall national majority, the Lao-Tai, account for less than one fifth of the population in shifting cultivation areas.

Despite a general correspondence of our results with the already mentioned general assumptions on shifting cultivation we believe that a more differentiated picture needs to be drawn in terms of poverty, remoteness and ethnic composition. If accessibility to district capitals is considered as a proxy indicator

for people's access to markets it is questionable whether shifting cultivation landscapes - given their dominance in remote areas - will benefit from a stronger market economy. This contradicts the transition, being currently promoted, from a planned to a market economy, whereby the government is attempting to incorporate even the remotest rural areas through economic growth, increased food security and greater opportunities for people's participation (GOL 2006).

More precisely, the general remoteness of shifting cultivation landscapes confirmed through our research implies a lack of access not only to markets and capita, but also to other services such as agriculture extension and health services, and to information and technology. This greatly limits the options for future agricultural development in these remote locations (Alexander *et al.* 2010) making shifting cultivation farmers highly dependent on forest resources for their livelihoods (Cavendish 2003).

Finally, we would also like to draw the attention towards the results showing that ethnicity plays a key role in terms of poverty in shifting cultivation landscapes independent of their accessibility. While high poverty rates can be related to high percentages of ethnic minorities, we observed recurrent patterns of shifting cultivation where lower poverty rates also coincided with high percentages of the ethnic minority populations. This may be interpreted as showing that it may be difficult for certain ethnic minorities engaged in shifting cultivation to escape poverty even if they are living in geographically accessible areas. In other words, social distances or marginality may be more important than physical distances to markets, services, infrastructure, etc. This hypothesis can be further strengthened by our results indicating that the percentage of marginal shifting cultivation landscapes has increased over time.

This issue is certainly relevant in terms of the highly debated resettlement policy, a key instrument of the government of Laos for upland development and poverty alleviation. It has been a longstanding policy of the Lao government to integrate these remote populations of largely ethnic minorities into the ethnic lowland society (Evrard and Goudineau 2004; Ireson and Ireson 1991). The initial argument for

such integration was that of national security. This was replaced by one focusing a poverty alleviation strategy through facilitating state service delivery and market access (Lestrelin *et al.* 2012; Baird and Shoemaker 2007). More recently, shifting cultivation has been blamed for causing environmental degradation (e.g. deforestation, soil erosion) and this was used as the rationale for the village resettlement policy (Lestrelin 2010; Fox 2000). Our results provide evidence that these policies, targeting the resettlement of marginal shifting cultivation villages, may have little effect, as improved accessibility may not be enough to alleviate poverty of ethnic minorities (Alexander *et al.* 2010; Ducourtieux 2005). And so, shifting cultivation landscapes persist as the dominant land use in remote areas of northern Laos.

Conclusion and Outlook

In this study we have presented selected socio-economic characteristics of shifting cultivation landscapes and visualized their respective patterns for the whole of northern Laos. We have shown that a large share of the shifting cultivation landscapes in northern Laos were indeed marginal from various perspectives, i.e. they are in remote areas, where poverty rates are higher than the national rural poverty rate and the percentages of ethnic minorities are disproportionately high compared to country wide statistics. These results confirm, for the first time, the validity of similar insights gained from single case studies for the whole of northern Laos.

The results of this study on shifting cultivation landscapes at an aggregated level for the whole of northern Laos are intended to contribute not only to the current debates on development policy but also to scientific discourses on the dynamics of shifting cultivation. At the same time, our analysis gives rise to new questions and opens the door to further in-depth studies. Additional case studies should

disentangle the complex interactions between remoteness, ethnicity and poverty in a shifting cultivation context. Furthermore, the understanding of changes in shifting cultivation landscapes could further be improved by conducting a comparative analysis with the dynamics of other existing land use types. This would allow to reveal possible trade-offs in terms of the different economic, social, and cultural functions of land that the ongoing transformation processes bring about.

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