

The colour of maize: Visions of green growth and farmers perceptions in northern Laos



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ABSTRACT

The rapid expansion of hybrid maize in the uplands of northern Laos is viewed by the government as meeting policy aims related to green economic development. Yet, growing evidence of negative consequences of maize expansion are emerging. Based on farmers' perceptions, we study: (1) farmers' reasons for adopting and abandoning maize, and; (2) implications of commercial maize expansion on local livelihood security and inclusiveness (food supply, income, risk coping, and ability to join maize growing), and environmental sustainability (productivity, and soil and forest quality) over time (2013 and 2016). Results show that maize has advantages in terms of labour allocation, and it provides much-needed cash income. Yet, swidden is the main food provider and an essential safety net for unforeseen risks (including maize crop failures or price fluctuations). The way that maize was produced did not meet the criteria of green economic development due to its negative effects on the environment (soil and forest degradation) and socioeconomic sustainability (household differentiation, increased economic risks, debts, and food insecurity). By providing a local perspective, this study encourages a critical reflection of the underlying assumptions and conceptualization of the green economy approach in Laos, and argues for policies and measures that consider a more holistic perspective of human wellbeing and the environment.

1. Introduction

Green economy can be defined as an economy that aims to 'improve human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP, 2011: 16). It is based on the sometimes simplistic assumption that synergies between development and sustainability can be created, and that economies can at the same time be growing, inclusive, and environmentally sustainable (e.g. UNEP, 2011; Brockington and Ponte, 2015). The green economy pushes the concept of sustainable development further by claiming that environmental policy can be a driver for growth (Jacobs, 2012). The focus on growth has led to green economy being widely embraced, however these assumptions are still largely at the stage of rhetoric rather than actual implementation of transformative policies, or action on the ground (Anderson et al., 2016; Amaruzaman et al., 2017; Pham et al.,

2017). Further, the lack of specificity in how a green economy sustains (green) growth can lead to trade-offs that are at the expense of the poor (Dercon, 2014). The green economy framing has been especially popular in the context of economic development in lower-income countries, which are often both rich in natural resources, and open to processes of technological "leapfrogging" (Ministry of Energy and Mines of Lao PDR and Ministry of Energy and Mines of Lao PDR and UNDP, 2017).

The Lao People's Democratic Republic (henceforth referred to as Laos) is on the list of lower-income countries, and has abundant natural resources—including large forest areas, especially in the uplands—that provide the potential for 'green' natural resource-based economic development. Since the shift from a centralized economy to the New Economic Mechanism in 1986 through the Transforming Land to Capital discourse emerging in 2005 and now the green economy policy, Laos has sought to commodify land for development predominantly

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through agriculture intensification and concession models (Kenney-Lazar et al., 2018). Indeed, the green economy concept, or green growth, is adopted in Laos in various ways (e.g. media reports, policy announcements, draft green growth strategy, and projects). For instance, The Eighth five-year National Socioeconomic Development Plan 2016–2020 (8th NSEDP; Ministry of Planning and Investment (MPI), 2016) outlines a strategy for poverty reduction by inclusive economic growth (including reduced economic vulnerability), and enhanced environmental management (protection and utilization) according to green growth and sustainability principles. Agricultural intensification and commercialization are intended to play a key role in achieving these aims, and increased and modernised production of commodities is hoped to lead to pro-poor and green value chains (Ministry of Agriculture and Forestry (MOF), 2010; Goal 2). Simultaneously, the government is actively trying to stop traditional shifting cultivation practices (a practice commonly known as swidden farming) (Ministry of Agriculture and Forestry (MOF), 2010: Goal 3), which is viewed by the authorities to be one of the main drivers of deforestation and forest degradation, and thought to be holding back rural development (GoL, 2005). At the same time, food security is stated as a first priority (Goal 1) in the Agricultural Development Strategy 2011–2020 (Ministry of Agriculture and Forestry (MOF), 2010), and sustainable forest management stated as being essential for biodiversity conservation and providing ecosystem services and forest products (Goal 4).

The forested uplands of Laos – where the majority of the country's poorest people live (Heinimann et al., 2013) – have been the target of several government policies for decades (the latest being Green Development policies). These policies introduce more intensive and/or commercial agricultural systems to reduce poverty and improve government revenue through taxation (Land for Capital policy), control land and forest use through tenure reform (Land and Forest Allocation (LFA) program implemented since the mid-1990s) and resettle upland people to areas close to roads and public services (implemented in three different waves since the 1970s) (Dwyer, 2007; Lestrelin and Giordano, 2007; Fujita and Phanvilay, 2008; Fox, 2009; Baird, 2011; Castella et al., 2013; Vongvisouk et al., 2016). All these policies are directly and indirectly aimed at stopping shifting cultivation. Most of the people living in these upland areas are at least partially involved in shifting cultivation of rice, but at the same time, have experienced varying levels of transformation from subsistence-based to market-oriented economy and society (Cramb et al., 2009; Castella et al., 2013; Messerli et al., 2015; Ornetsmüller et al., 2018). This process was further accelerated by cycles of booms and busts of mono-culture cash crops, the latest being hybrid maize (*Zea mays*), the focus of this paper.

Actively promoted by district and local authorities, and facilitated by external trends such as global demand and prices, investments from traders, and strengthened cross-border relations with Vietnam (with high demand for maize); maize was for some time considered as a lucrative income-generating alternative to upland rice and thus supported poverty reduction goals of the government (Viau et al., 2011; Vongvisouk et al., 2016; Cole et al., 2017; Ornetsmüller et al., 2018). However, there is growing evidence of negative consequences of such policies in terms of increasing the socioeconomic differentiation between households, further marginalization of some vulnerable groups, and environmental degradation and deforestation (e.g. Lestrelin, 2010; Viau et al., 2011; Vongvisouk et al., 2016; Cramb et al., 2017; Phompila et al., 2017; Ornetsmüller et al., 2018).

While the Lao government ambitions related to green economy, and particularly related to the expansion of commercial agriculture (outlined in the Agricultural Development Strategy 2011–2020), are well publicized (e.g. Ministry of Agriculture and Forestry (MOF), 2010; Ministry of Planning and Investment (MPI), 2016), the perspectives of farmers in these processes still requires better understanding.

In reality, human activities and the environment often have complex and non-linear feedbacks (Berkes and Folke, 1998). At the more local level, the dynamism of a changing environment and adaptive

behaviour of households in pursuit of their livelihood security should be understood together. This is also highlighted, in part, through the smallholders' decision-making process of multiple activities for pluralistic objectives influenced by their perceptions (Boonstra et al., 2016). Such decisions are often a mismatch with the social and ecological conditions, and are underlined by what Elster (2007) terms as desires, abilities, and opportunities; “Desires define what, for the agent, counts as best. Opportunities are the options or means that the agent ‘can’ choose from” (p 165). And abilities refer to the capacities people to take advantage of certain opportunities. In the context of maize expansion in northern Laos, a range of factors outlined above have had significant influence on the rapid, if not full, transformation from swidden rice farming to commercial maize. As a result, traditional shifting cultivation systems in northern Laos were changing, and the crop-fallow cycles shortening (Hett et al., 2011; Castella et al., 2013; Vongvisouk et al., 2014). The upland communities have responded to these changing circumstances using the range of assets they have available (natural, physical, human, financial, and social capital) and within the policy and access constraints (Ellis, 2000). They are adopting, expanding, intensifying, diversifying, or abandoning maize (see Ornetsmüller et al., 2018) based on their pursuit of livelihood desires or ambitions based on their opportunities and abilities. These actions have a range of impacts on the land and environment, and on expected and unexpected livelihood outcomes for different types of households and individuals (Thongmanivong and Fujita, 2006; Castella et al., 2013; Vongvisouk et al., 2016; Ornetsmüller et al., 2018), which may not be fulfilling the criteria of green economy.

This study uses primary data collected in three upland villages of Huaphan Province to investigate local perceptions of land-use and livelihood changes in 2013 (when maize was booming¹) and in 2016 (when most of the farmers had abandoned maize). It aims to assess how this agricultural intensification and commercialization (a key action stated by the government for green growth and poverty reduction; Ministry of Agriculture and Forestry (MOF), 2010), relates to the holistic goals (socioeconomic and environmental sustainability) of green economic development (Ministry of Planning and Investment (MPI), 2016). More specifically, the study identifies farmers' perceptions related to: (1) the reasons for adopting, expanding and abandoning commercial maize; (2) concurrent land-use changes; (3) the implications of commercial maize expansion (and related land-use changes) on local livelihood security and inclusiveness (food supply, income, ability to cope with risks, ability to join maize expansion), as well as on environmental sustainability (crop productivity and soil and forest quality). Although the focus is on maize expansion and decline, the study also looks more broadly to past events, land-use practices, economic activities and socio-demographic trends to provide context for understanding how changes influence land-use and livelihoods in the studied swidden communities.

The development and impacts of maize expansion are highly context specific (Ornetsmüller et al., 2018), and are changing rapidly (Vongvisouk et al., 2014; Ornetsmüller et al., 2018). In fact, the process of maize expansion differs from district to district and also within districts, depending on factors such as distance to markets, traders' interests, land-use history, and time of crop expansion (Willi, 2011; Viau et al., 2011; Ornetsmüller et al., 2018). This paper builds on the earlier research on maize expansion and land-use change in northern Laos (see Thongmanivong and Fujita, 2006; Hett et al., 2011; Viau et al., 2011; Willi, 2011; Lestrelin et al., 2011; Lestrelin et al., 2013; Castella et al., 2013; Vongvisouk et al., 2014, 2016; Ornetsmüller et al., 2018), and provides additional insights from a district still understudied on the subject (Xone). Despite the flurry of different policies, the reality is that the forest and land continued to be degraded, partly due to maize

¹ ASEAN-Swiss Partnership on Social Forestry and Climate Change (ASFCC), Phase 1 (2010-2013), and Phase 2 (2014-2016).

expansion, while poverty remained a reality for many (Vongvisouk et al., 2016). Hence, we examine farmers' perspectives of maize, and the policy consequence of a case of agriculture intensification and commercialization through the lens of green growth, the new policy drive of the Government of Laos. We argue that a holistic understanding of the social, environmental and economic trade-offs at local to national levels are needed if a truly green economy can be achieved.

2. Methods

2.1. Site selection and description

The district of Xone in Huaphan Province, northern Laos is one of the poorest and most forested, located in the buffer zones of one of the most important conservation areas of Laos (Heinimann et al., 2013). Swidden remains the dominant land-use system, even though rapid land-use change was taking place at the time of the fieldwork in 2013, with swidden transitioning towards more intensive agricultural systems. Significant forest cover remained due to the proximity to the protected forest (the Nam Et-Phou Louey National Protected Area, NEPL-NPA)² and restrictions affecting access to land and forest resources. The NEPL-NPA was established in 1993, covering an area of 422,900 ha within three provinces³, the bulk of which is located in Huaphan. While the park has been actively managed since 2000 (Hett et al., 2011), it has nevertheless been encroached upon by commercial maize cultivation since the rapid uptake of the crop by local farmers (Vongvisouk et al., 2016).

Three sample villages were selected in the district of Xone in Huaphan Province for this study (anonymized as A, B, and C) using criteria including: accessibility to roads, services, and the national park; distance to the nearest larger town/s; different levels of maize expansion in the village; the level of urbanization/transition from the traditional way of living, and; ethnic variation (see Table 1). All three villages had also gone through a land-use planning process in 2001–2002 during which boundaries for the national park and different villages were delineated, and zoning for different land-uses designated (agricultural land, forest and housing). The data collection took place at two points in time, specifically in May–November 2013, and March–June 2016.

Village A was located in the buffer zone of the NEPL-NPA (see map, Fig. 1), close to a small town that was designated as a new district centre (Xone) following the first phase of the data collection in 2013. It had relatively good access to markets and off-farm opportunities. The village was established as part of the government's resettlement policy in the late 1990s, resettling several remote hamlets inhabited by ethnic Hmong people close to the roads and state services. The initial resettlement comprised 37 households, and more than 100 households had since relocated to the new village by 2013. This led to differential opportunities between the earlier and later arrivals, which defined much of the contemporary social and economic status of the households in the village at the time of the data collection. The earlier arrivals had access to most of the better quality land close to the village (including irrigated paddy lands), and also monopolized the various official roles that were available. They planted paddy in the lowlands and grew maize on the sloping lands surrounding the village. In contrast, the later arrivals were mostly given land for house construction only. They continued upland rice farming close to/in their previous village locations (the furthest being more than 20 km away in the mountains), and rarely planted maize in their upland plots as it was harder to store and transport. Staying part-time in the remote areas also entailed isolation from services and wider economic opportunities (see Cole et al., 2017).

Village B was located in the buffer zone of the NEPL-NPA. It had been in the same location since the late 19th century, and was quite self-contained, with a large area of paddy land, and upland swidden areas mostly replaced with maize. In Village B the access to land had been largely influenced by the socialist planning policies (1979), when it reorganized as a production cooperative. This meant a change from the former traditional land allocation within the community (on a 5-year basis according to household size), to the communal contribution of labour, and allocation of outputs based on the labour invested. The cooperative model remained in place until 1987, when the shift in national policy towards market-orientation led to the disbandment of cooperatives (Evans, 1995). During this change, all former privately-owned paddy lands that had been collectivized were returned to their previous owners. Those who had not previously owned land were mostly excluded by this process, although some of the paddy area that was expanded with collective efforts was assigned as communal (called by respondents as "village land"). Some of the village land had been reallocated to individual households (including some landless households), but the rest remained communal at the time of the fieldwork. Village B was more remote than the other two study villages, and was therefore further away from the maize markets than the two other villages.

Village C was established around 1977–1978 when the road was built with Chinese funding, and local communities started to move to locations along the road. The village is located in the centre of the NEPL-NPA, which had been established in the 1990s but only actively managed since 2000 (Hett et al., 2011). The main land-use practice and livelihoods of the people remained a combination of upland rice and paddy. Since there are restrictions on use of land and forests by the villagers, maize was increasingly replacing shifting cultivation systems and expanding in wide areas of land formerly used for rice. As a consequence, swidden rice lands were being pushed further away from the village, conflicting with the restrictions of the protected areas. To compensate for restrictions caused by the national park, Village C had received numerous development projects aiming to reduce poverty via alternative income earning options for the people.

2.2. Methods used

We used qualitative methods to identify how maize has changed livelihoods and land-use over time, including detailed analysis of data collected during the phase 1 field research in 2013 when maize was booming, and preliminary findings from the phase 2 field research in 2016 when it became evident that many farmers had abandoned the crop. A total of 18 gender and age-differentiated Focus Group Discussions (FGDs)⁴ were conducted in the three study sites. Participants carried out group exercises including the development of a timeline of important events (or activities) in the village history; discussion and visualization of common forms of resource exchange related to these events; and ranking of the main past events in the order of importance for people's wellbeing (ordinal ranking was used, but more than one system could have the same importance). The FGD results enabled gender and age-differentiated qualitative analyses of the past and on-going changes in land-use and livelihoods, not only maize. Each FGD took approximately two hours to conduct.

A total of 121 semi-structured household interviews (a minimum 40 per site) were used to collect data on household and farm characteristics, as well as to explore land-use and livelihoods related changes. The respondents for the interviews (household heads) were selected randomly. The structured part of the questionnaire included open-ended and closed questions on socioeconomic characteristics of the

² Xone and the neighboring district of Hiem cover more than 3,750 km², approximately 70% of which is enclosed by the NEPL-NPA.

³ Houaphan, Luang Prabang, Xieng Kouang provinces.

⁴ Participants for the FGDs were selected through consultations with key informants to represent households with different characteristics, including gender and age differentiation.

Table 1
Characteristics of the three study sites.

Characteristic	Site A	Site B	Site C
Main ethnicity	Hmong	Tai-Daeng (majority) Lao-Tai (minority)	Khmu (majority) Lao-Tai (minority)
Lao-Tai spoken	Village leaders only	All	All
Resettlement	Late 1990s	Late 19th century	Late 1970s
Location (remote/ relatively easy access)	Easy access: paved road in good condition	Remote: poor road ^a	Easy access: paved road in good condition
Rural/urban/in transition	Rural/transition	Rural	Rural
Time from district centre (hours by car)	0	5	1.5
Electricity grid	Yes	No	Yes
National park	Buffer zone	Buffer zone	Core area
Maize expansion status	Since 2007, but significantly expanded in 2013-2014	Since 2004, but significantly expanded in last 3-6 years	Since 2008-2010
No. of respondent households planting maize	39	38	NA
Total no. of households	147	85	64
No. of respondents interviewed	40	41	40

^a A new road was under construction at the time of writing, which may have improved the access to services, opportunities, and markets.

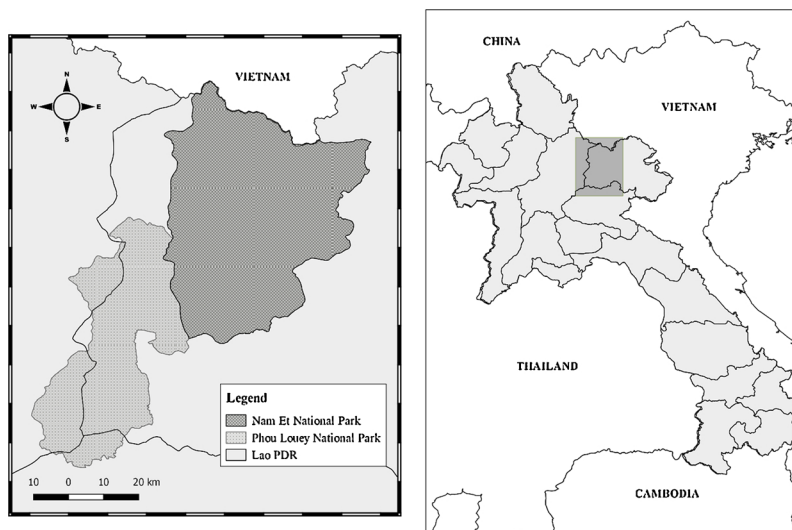


Fig. 1. Map showing the study area and the NEPL-NPA in the district of Xone, Huaphan Province, northern Laos.

household, land-use, livelihoods, food security, migration patterns, and access to different organizations and social networks. The social networks - related to commercial maize cultivation, external poverty reduction projects, and the national park - were specifically explored during the interviews (see Cole et al., 2018). The interviews were explorative in nature, with an open and flexible interview approach used (as described in Pasgaard and Chea, 2013). This approach allowed for open discussion, where many follow-up questions emerged depending on which topics the respondents highlighted. Maize expansion was a topic raised by most of the respondents from the beginning (as well as during all the FGDs), with differing local views and debates over trade-offs, hence the discussion over maize expansion were further elaborated. We carried out qualitative analyses using MaxQda© software (Gibbs, 2008) to tease out the nuances of local perceptions on maize expansion, including on the impacts of this land-use change on livelihoods, environmental sustainability and equity aspects. The combination of FGDs and interviews allowed for cross-checking of the results, and provided both individual perceptions and exploration of the past events within different peer-groups.

In Village C (the first site we studied), the data had limitations (some missing data) such that no quantitative analyses was possible. However, important aspects related to maize expansion, land-use change and livelihoods were analysed qualitatively for Village C, and included in the results.

3. Results

3.1. Maize boom – field research in 2013

3.1.1. Setting the scene: past events (FGDs 2013)

The FGD (2013) data highlighted different interventions that were implemented in the villages with the aim to improve livelihoods and conserve forest through introducing new crops, livestock or other alternative income generating options. People reported either adopting or rejecting such activities, and experimenting with different commercial crops and livestock was mentioned as a common strategy to diversify livelihoods. Many of the external efforts that aimed to improve livestock (e.g. Poverty Reduction Fund (PRF), international donors) were, however, considered as failures because of most of the animals received were sick or dying. The main events in communities identified by all FGDs can be divided into the following broad categories:

- (1) Livelihood development and poverty reduction projects: e.g. PRF, road building, opium (*Lachryma papaveris*) eradication, relocation of the villages, electricity, kindergarten, school, health station, clean water supply, viewing project, livestock project, small-scale credit systems, paddy terracing and irrigation systems;
- (2) Establishment of the NEPL-NPA: tree planting, inventories, livestock control, collection of guns and restrictions in land and forest

Table 2

The percentages of the respondent households conducting specific livelihood activities that complement commercial maize cultivation (2013).

Maize and...	Village A: % of households (n = 33)	Village B: % of households (n = 37)
Swidden rice	88	76
Livestock	76	78
NTFPs	55	57
Vegetables	46	51
Paddy	39	41
Fishing	18	38
Teacher or gov. officer	12	22
Daily labour	18	16
Skilled labour	3	24
Other cash crops	12	5
Shop/trade	6	0
Remittances	0	3

*Village C data not available.

resource use, land-use planning (land zoning), increase in livelihood development projects and REDD+;

- (3) Introduction of commercial crops: opium, chilli (*Capsicum* spp.), maize, cassava (*Manihot esculenta*), coffee (*Coffea* spp.), job's tears (*Coix lacryma-jobi*), pigeon peas (*Cajanus cajan*), sticklac (*Laccifer* spp.), water melon (*Citrullus lanatus*), and cardamom (*Amomum* spp.);
- (4) Introduction of modern technologies, mobility and communication upgrades: trucks, bulldozers, rice mills, motorcycles, herbicides, mobile phones, improved road systems.

Up to the early 1970s, the livelihoods of communities in all three study villages were predominantly based on subsistence farming activities. Over time, the villages experimented with different cash crops and expanded their irrigated paddy fields, and gradually transitioned from primarily swidden farming towards more intensive agriculture and diversified livelihood portfolios. Swidden increasingly fulfilled a more supplementary, but still important, role. Planting maize, upland rice, and raising livestock were the most common combination of livelihood activities (Table 2).

Improved road access in all the villages was rated highly (by all the FGD groups). They were considered to improve livelihoods by providing better access to services (school and health) and land (“not waste so much time while getting to farm land”), to Vietnam (markets and information), to markets in general, to information and resources, and to off-farm jobs.

3.1.2. Reasons why farmers' adopted and expanded maize

3.1.2.1. Maize provides much needed cash. Maize provided cash income and new opportunities (through investments), which were not easily available before. Maize was recognised to “improve their family condition for the better”, as one respondent put it. Not surprisingly, cash income was the strongest and most cited motivation for engaging in maize. At the same time respondents reported higher needs for cash, as more material goods were required, while there were very limited alternatives for cash income generation. One respondent described this as: “(we) don't know how to do any other work...no one will buy vegetables and (other) products”, another as: “I see there is only growing maize that makes higher income than other activities”, and finally: “But local people here still are poor and don't know how to deal with it, if they don't grow maize or rice they don't know how to do anything in order to get money. Companies arrived here, so, we have to grow it (maize) and sell to that company so that we get money to improve the quality of life.” In fact, in 2013 most of the households in the three villages were involved in growing maize (A = 82%, B = 95%, C = nearly all; based on the 2013 FGDs). Only households with no land or land located too far from the road, or very limited labour capacity (small families: e.g. old, widow,

due to migration, sickness, or very large families with few working members) selected swidden rice alone over maize as their livelihood activity in order to provide for basic food security.

The maize income was used for school fees, building better houses, purchasing new equipment (rice mills, motorcycles, mobile phones), planting more maize, building new roads and terracing new paddy fields, or in some cases for buying rice (discussed in Section 3.1.2). One respondent stated: “we save every kip (from maize cultivation) to send our children to school.” In fact, education was seen as an investment for the future, and a key way out of poverty.

Even though maize was identified during household interviews and FGDs (in 2013) as being the most important (and often the only) cash source for the households, other events, including the introduction of paddy rice, and availability of public services such as health clinics, schools, clean water supply, and electricity were considered more important. These were - as cited by one participant of the FGD in Village A - “things we got at the time of moving to the new village”. Many of our respondents viewed their resettlement to more accessible areas rather positively. One respondent also highlighted: “maize is secondary, we grow it for selling”. The long-established practice of upland rice farming was the main source of subsistence food production in all three villages and essential part of the livelihoods, as put by one respondent: “If we don't have rice, then everything is more difficult”, and in the women's FGD in Village A “without rice we do not survive”. If a farmer grew only maize and not upland rice, it was mainly because he/she had already changed to paddy rice farming, and never (or seldom) had grown upland rice. Other reasons for households only growing maize were because they had full-time off-farm work (teacher, government officer etc.), when labour for growing upland rice was not sufficient (and rice was bought), or simply did not have any land for upland rice. In fact, it could be said that some of the farmers who did not grow upland rice as part of their livelihood portfolio were mostly constrained to do so, rather than swidden being seen as an undesirable livelihood activity.

3.1.2.2. Policies favouring maize over swidden rice. Respondents reported decreases in swidden rice cultivation as a result of maize expansion, but also due to the government restrictions on land-use (e.g. national park and land zoning, especially in Village C), or due to the resettlement of the village (Village A). The village histories, especially in relation to their establishment and land allocation (particularly the access to paddy and other productive lands close to the villages), also influenced who was able to join maize farming, and/or at what level. For example, in Village A the population had increased 240% since the initial resettlement (from 332 people in 1997 to 1135 people in 2013), and there were poor “landless” people living in the area, engaged in non-agricultural activities or daily wage workers (such as helping in maize harvesting), and who, according to the women's FGD, “were only just managing to survive”.

Despite the limitations for the landless to join maize farming, maize expansion also provided an opportunity to claim new land in all three study villages, as the local government chose to not control maize expansion in the forested areas because it was a crop supported by the district and provincial authorities for poverty reduction. This was stressed by some respondents in our study when district officials asked them to “mark the spots” they would like to plant with maize, and this land then became easier to get a permit than the land that was used for upland rice farming. Some respondents mentioned having a “reservation for growing maize”. For example a respondent in Village B said: “I am holding a reservation for growing maize (in district land), the government informed villagers that who wants to get land, please go to reserve and mark points clearly, then they come to measure and take a tax, I have reserved 1 ha.”

3.1.2.3. Growing maize is easier: reduced labour effort in comparison to upland rice. Lower labour requirements for maize compared to upland rice production was the second most cited motivation for maize

cultivation, after income. The maintenance of maize was relatively easy, since, according to the respondents, it only needed to be planted, weeded once (or some mentioned twice), and then harvested. One respondent in Village B highlighted this point: “*For the maize its (management) is much easier than for the rice, we just clear the trees and burn it, then we have to clear the weeds for one time only, and then we can get harvest*” and another respondent (Village B): “*Growing maize is easy, we have more time to relax...*”. Herbicides were also used by some respondents for maize cultivation, making the production even easier. The families with limited labour force who would not be able to generate surpluses from upland rice could now generate surpluses from maize due to the lower labour requirement, and reported being better off.

Maize was being planted in lands that were previously used for swidden (a practice that was enabled by the expanding maize roads), and swidden rice production was moved further and further away, adding to the time spent to reach the site. One respondent described the difficult access to upland rice area like this: “*To do rice cultivation we have to climb up and down across many mountains and many streams to do it*”. According to the farmers, maize could also grow in poorer lands than the traditional upland rice, as highlighted by one respondent: “*Maize isn’t selective about soil, you can grow it everywhere*”. Thus maize was possible to be planted in young fallows and other poor quality land that was abundant along the maize roads. Another key reason why maize was considered easier to manage and required less labour than upland rice production was the government restrictions on the number of plots under swidden rice cultivation (three plots per household), which decreased the length of the fallow period (and hence led to more and more weeds in swidden), and increasing the time needed for weeding. These adverse government restrictions also further increased the pressure on land, and contributed to more degraded land, which in turn could be more suited to maize production than upland rice.

Opening older fallows for upland rice was hard work and labour demanding, a job that many respondents preferred to avoid. Perceptions on this, however, varied, with the younger and very old respondents preferring to avoid this hard job, and the middle aged respondents preferring to plant rice in older fallows for better production and less weeds. However, almost all respondents mentioned that there were few, or no, old fallows left close to the village, and that the restrictions by the national park did not allow clearing the older fallows (although many continued to do so). This was highlighted by one respondent as: “*Mostly (maize is planted in) young forest, small trees, bamboo, there are no big trees. They don’t permit to clear the big forest*”. Moreover, the youth representatives expressed that they would like to see their parents change from the labour-intensive upland rice to intensified agriculture, and they would themselves rather engage in paddy cultivation, maize farming and livestock farming, which provided more income and used less labour. Nevertheless, they mostly followed the same livelihood activities as their parents (in 2013).

Migration was cited by several respondents as a reason to decrease the area of swidden rice and increase maize areas planted (swidden being harder work than maize production, combined with the lack of labour, and the fact that less food was needed when there are less household members present). Cash earned from maize was partly used to support family members studying outside of the village (see above in this section).

Finally, although maize is a commercial crop intended to replace shifting cultivation of upland rice, most of the respondents reported that they planted maize in a similar kind of rotational system as rice, just with shorter rotations or without fallow periods (up to three harvests) One respondent highlighted this as: “*Yes, they tell you to do this or that, but in fact, we just continue our traditional shifting cultivation techniques for maize growing, as we know how to do that already*”. Furthermore, the labour peak of maize (harvesting) coincided at the time when upland rice cultivation did not require as much labour, hence these two activities could be combined. Our study, also showed

that labour was still shared in maize production systems (which is not the case with all commercial crops), as according to several respondents this was especially needed during the harvesting, as maize is heavier to carry than rice and cannot be stored for long periods of time.

3.1.2.4. Contract farming schemes. In each village 2–3 maize companies, Lao or Vietnamese, provided a market. This market outlet, and the associated traders, was a key reason cited for growing maize. The contract with the maize company was signed by the village leader on behalf of the households involved. In addition, especially in Village A, some of the local people acted as traders or as middlemen. The company provided genetically modified maize hybrid seeds for the households according to the land area they planned to cultivate, and the seed costs were subtracted from the crop harvests sold to the maize company. The seeds were given first to these middlemen or the village leaders, who then delivered them to the participating villagers. In fact, the village leaders, local traders, and other local authorities played a key role in the maize resource exchange system. Furthermore, individual farmers and groups of farmers could contract the maize companies for building new maize roads or for paddy field terracing with excavators and bulldozers, and then reimburse the companies through their maize sales over a period of several years.

The price for maize was reported to be around 1000 Kip/kg (2013), although there were some variations between the villages mainly influenced by the distance to the markets. Farmers were under contract to sell to a specific company although some respondents reported selling to other companies if the price was better. This indicates that farmers had some freedom to choose the company with whom they dealt with, even though in reality the number of the companies was limited and farmers were often forced to sell to a specific company due to debts incurred, sometimes even at a lower price than was initially set. Furthermore, as maize cannot be stored for very long after harvesting, farmers were sometimes forced to sell to whichever company came at the right time (or at all), at whatever price the company set. Even though price was reported to have been set at the district level before the company could approach the villages, there were no safeguards over the maize incomes. As put by one respondent: “*They broke the contract, they said that the maize was in the low price period, they can’t buy maize at 1000 Kip/kg, they would like to buy 800 kip/kg.*”

3.1.3. Land use change: the cost of maize expansion on forests and swidden

Maize production had led to land-use intensification in the uplands, facilitated by the roads that provided access to remote (often forested) areas that were previously too hard to access for intensive cropping. The area of maize was reported by the respondents to have expanded, especially close to the villages, while upland rice cultivation decreased and was gradually pushed towards the periphery (less accessible areas) of the village landscape. Many of the respondents of our study confirmed the expansion of the maize roads and degradation of the forests, but many also stated that there was not much of the old forest left to be destroyed, other than far away from the village. One respondent stated the following: “*Maize farming use more land, but it is secondary forest, it doesn’t destroy big (primary) forest, (and) yes, we can grow (maize) everywhere, but mostly we grow in secondary forest*”.

The area of swidden rice cultivation was declining in the studied communities, as 65–73% of the farmers in villages A and B reported decreases in swidden land areas compared to the past (Fig. 2b, data for Village C is not available). Furthermore, over 90% of the respondents in Village A said that they did not have enough land for swidden rice production, and half of the respondents in Village B were unsatisfied with their swidden land area (Fig. 2d). In addition to maize expansion and government restrictions, other reasons cited for the decreasing swidden areas included: a) lack of labour (old, sick, children in school, migration), b) pursuing other livelihood activities made possible by improved roads and smaller family sizes (less food needs to be produced for smaller families), c) more paddy land available (less swidden rice

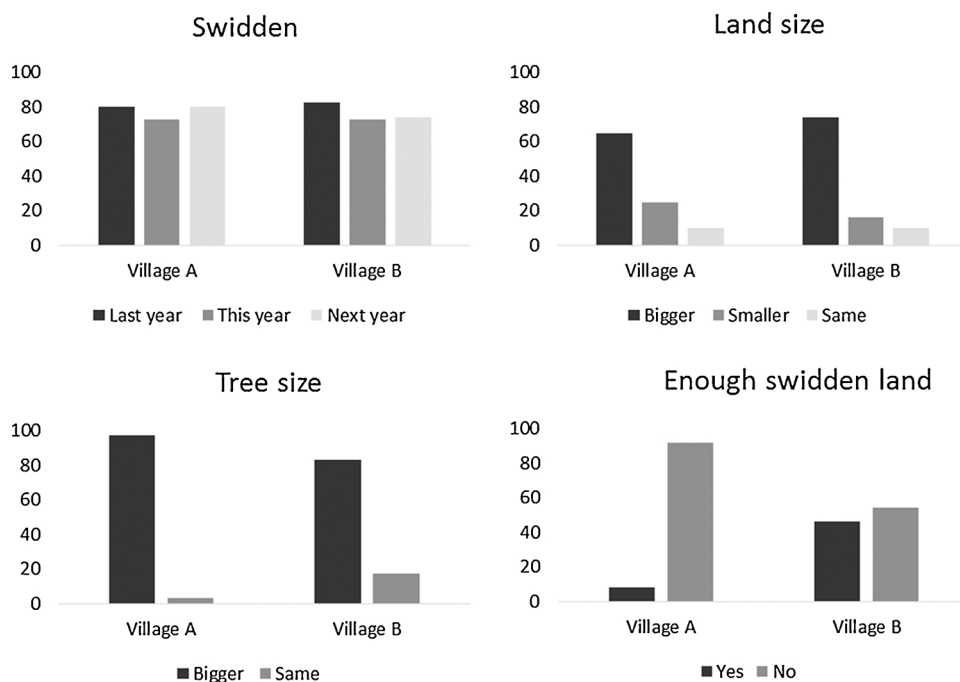


Fig. 2. (a) Percentages of the households reporting to have cultivated swidden rice last year (2012), this year (2013) and plans to do so the next year (2014) (in villages A and B); (b) Percentages of households reporting the land size used for swidden rice to be bigger, smaller or the same in their childhood (in villages A and B); (c) Percentages of households reporting the tree size cut for swidden rice cultivation as bigger or the same in their childhood than now, and; (d) Percentages of households that perceived to have enough land for swidden rice farming.

needed for food production), and d) lack of land due to natural population growth, or other in-migration (more people, less land).

Contradicting the above, the rest of the respondents - 35% of households in Village A and 26% of households in Village B - reported that their swidden rice areas were larger or the same as before (Village C data was not available). This was reasoned along the following lines: “the area is

bigger now because (we) can only clear fallow forest, which is not good for rice, so (we) have to clear more” (male, 73 years old, Village A), and “area is still the same because household has to produce enough to eat” (male, 28 years, Village A), and finally “area is bigger now because higher population clears more forest” (male, 33 years, Village A).

Even though the majority of the households reported a decrease in their swidden area, most of them continued the practice, and reported to have grown upland rice last year, this year, and planned to continue the following year (Fig. 2a), highlighting the continued importance of swidden despite all the changes.⁵ The size of the trees cut for swiddening was reported to be smaller nowadays (Fig. 2c), influencing the production level of the field.

3.1.4. Impacts of maize expansion on local livelihood security, inclusiveness and environmental sustainability

During phase 1 of our study (field work in late 2013), the price for maize was at its peak and maize planting was booming with villagers enjoying substantive increases in income. However, the increased dependency on international markets and low access to information exposed the farmers to a high level of uncertainty. Intensive farming on the sloping lands, and the utilization of the same plot for several successive rotations for mono-cropping hybrid maize was reported by the farmers to cause land degradation, decreased soil quality and productivity levels. Varying harvest levels and crop failures were mentioned by several respondents, and were mainly claimed to be caused by soil degradation, pests (such as mice, rats, monkeys, wild boar), but a

few also mentioned drought (late rain fall).⁶ However, this was not considered to be the company’s problem, but rather, the farmers’ burden. Farmers had no insurance for poor harvests, and in the case of a crop failure, some farmers ended up with high debts owing to the companies (reported by some respondents and during the FGDs in all three villages). New dependencies and socioeconomic differentiation were formed between key people in the maize networks and the participating farmers, especially if the initial investments were significant, such as in the case of using companies’ resources for the rice field terracing or making new maize roads. This was also the case between the landless and the households who were able to improve their livelihoods during the maize boom through investments with the maize money. Both the FGDs and the household interviews showed that the farmers were conscious of the limits of maize in terms of being a long-term sustainable land-use option, but had little alternatives for income generation. This was especially the case since their traditional land-use system – shifting cultivation (together with NTFP provision) – was already restricted by government policies, and was no longer providing enough to sustain their livelihoods alone (food or income to buy food). An elderly traditional leader in Village C (a key informant) said that maize was productive for only three rotations, after which the soil was too degraded for further production. When he was asked what his plans were for his land in the future if it will be degraded, the answer was: “there will be another project coming”. This is a poignant example of local self-perceptions of dependency on external projects.

Biodiversity of the overall system was also decreasing according to respondents (especially in regards of decreasing amount of useful NTFPs), as the traditional swidden landscape previously provided fallows of different ages, which were associated with a larger range of species diversity.

Converting land from subsistence agriculture to commercial maize production significantly influenced the food security of households. In Village A, 82% of households were involved in maize production, and only 33% reported adequate food production for the whole year. In Village B, 95% of households were involved in maize production, while

⁵ In the qualitative analyses, Village C most often mentioned the restrictions on swidden rice farming, but no quantitative analyses were done in this village (see methods section).

⁶ However, a few respondents also mentioned that rice was more sensitive to irregular rain fall than maize.

63% reported that they produced enough food for the whole year. The difference between the two villages was most likely due to Village B having less pressure on land (explained in Section 2.1), and larger areas of paddy and swidden rice. In Village A the initial land allocation during the resettlement of the village and large number of newcomers without land (see Section 2.1) had resulted in insufficient food production, especially as more and more land was allocated for maize production. At the time of the study, there were five households that bought 100% of their food (mainly teachers or other full-time off-farm jobs), and the remaining households that were not self-sufficient in food production bought four months' worth of food per year on average (in the two villages). The money to buy food came mostly from maize sales. One respondent stated: "if they (parents) did not grow enough (before) they could not eat; now it is very easy if we have money". The households with shortfalls in food production were the ones lacking labour (old and/or sick, or with migrating/studying household members), the landless, and those with the least diverse livelihood portfolios ($P = 0.039$ in Village B). Although, better accessibility (roads) and money (from maize) allowed people to buy other kinds of food in the markets. Furthermore, paddy rice areas had significantly expanded as a result of the recently built maize roads (providing access to areas that were previously difficult to access), access to bulldozers (for terracing paddy fields), and more cash (to pay the maize companies for terracing), which positively influenced the food security of those with access to them.

The negative health impacts of using herbicides without proper protection and techniques was yet to be realised by the villagers, but during the FGD in Village C the participants reported to have heard stories from other villages and via radio about severe health issues caused by herbicides used in maize fields.

3.2. After the 'boom' came the 'bust' – field research in 2016

When the second round of field work took place in 2016, maize farming had significantly reduced. The small number of farmers that still kept planting maize, planted it in few plots, less intensively, and rotating with other crops (e.g. rice or ginger). The price had declined (from 1000 to 1200 Kips/kg to 500–800 Kips/kg), and few traders were coming to the villages to buy maize, and if they did, it was at uncertain intervals. Low crop productivity of maize and land degradation were also cited as reasons for abandoning the crop (FGD data 2016). Between 2014 and 2016, many of the maize plots that had been expanded in the forested areas along the new maize roads were left fallow (e.g. nearly 70% of the land in Village B), and some were used for upland rice for subsistence use. The impacts of the intensive monoculture maize production for the ability of these sites, and the overall landscape, to recover and become diverse and resilient is yet to be realised. For instance, in Village C (FDG 2016), the participants mentioned that they lacked good quality land (in 2015) for crop production due to maize-related soil degradation.

One significant change enabled by the maize boom (new roads, terracing, and maize money), was the expanded areas of paddy rice, which positively influenced the food security of those with access to them. In order to replace the lost cash flow from the declined maize production: other commercial crops were experimented, especially ginger, but also Job's tear, cabbage (*Brassica* spp.), sesame (*Sesamum indicum*), chili, and cassava. These alternative commercial crops had experienced similar boom and bust cycles as maize, though on a smaller scale, as none of them were expanded as rapidly and vast as maize had. Furthermore, NTFPs (bamboo shoots, wild vegetables, herbs and medical plants) were collected and sold; weaving was increased by women (especially Village B), and migration to larger cities for off-farm work increased (e.g. construction for men and garment factories for women, especially in Village C). In fact, in Village C, the respondents of the FGDs (2016) cited that after there was no more maize income, some people preferred migration over upland rice cultivation, as they wanted to earn money, which was "hard to earn in the village". Swidden

continued to play an essential role as a fall-back strategy for the farmers in all three villages, while cash crops and migration provided money.

4. Discussion

This study explored farmers' perceptions on commercial maize expansion (and decline) in three upland villages of Northern Laos, aiming at discussing how agricultural intensification and commercialization long advocated by policies since 1986 relates with the holistic goals of the emerging Green Economic Development pushed by the GOL. Specifically, the paper explored farmers' reasons for joining, expanding or abandoning commercial maize, and how it impacted their livelihoods and environment. The main field work was conducted in 2013 when maize was booming, and the sites were revisited in 2016 when most of the households had stopped growing maize after a price crash, land degradation, and exodus of the traders.

The findings confirmed that maize, similar to many other boom and bust mono-crops in Southeast Asia (Fox and Castella, 2013; Cramb et al., 2017), expanded rapidly for some years and then declined, leaving significant consequences for the whole land-use system and local livelihoods (see also Viau et al., 2011; Vongvisouk et al., 2016; Orntsmüller et al., 2018). Farmers adapted or coped in the best way they could to the emerging opportunities and changing situations, among the relatively limited opportunities they had. For a while, nearly all the farmers, even the poorest ones (with land), were involved in maize planting at some level, showing that there was either a very strong motivation for the farmer's to join maize planting (i.e. cash, lower labour requirements compared to swidden rice, market outlet through traders, land due to government support for maize expansion and new maize roads), or a lack of other cash income generating options; a finding also reported by Viau et al. (2011) and Vongvisouk et al. (2014) in the same Province. Nevertheless, swidden rice continued to be the main food provider and played an essential role as a fall-back strategy for the farmers in all three villages. The fact that most of the farmers had not completely abandoned swidden, even in the highest boom of maize, enabled them to ensure some food security during the maize price crash. Furthermore, maize also fitted - to a certain degree - the farmers existing livelihood strategies, as it did not require new or unfamiliar management techniques, it fitted well into the farmers' labour calendar (the heavy workload did not coincide with the heavy work load of swidden rice), and labour was still shared during the peak work seasons (similar to swidden rice cultivation).

However, the findings showed disconnect between the reality on the ground and the aims of the Green Development strategy (in terms of achieving holistic goals of livelihood security, inclusiveness and environmental sustainability). In fact, the way companies promoted maize was contrary to the 'green' in Green Development. Maize provided a possibility to increase physical capital (maize roads, new land, and paddy rice terracing), financial capital (further investments with maize money with less labour requirements compared to upland rice), and human capital (maize money used to pay the education of the children - seen as a key way out of poverty by the farmers). However, this strategy undermined the natural and social capital, and also caused economic risk.

Environmentally it was not sustainable, as intensive maize production led to soil and forest degradation directly (deforestation, land degradation, decreased soil quality and crop productivity levels) or indirectly (swidden rice was pushed further in the forest due to maize expansion), even in the areas that were not accessible before (See also Hett et al., 2011; Viau et al., 2011; Thanichanon et al., 2013; Vongvisouk et al., 2016). In fact, Vongvisouk et al.'s study (2016) - in the same province as this study - found that maize had encroached more into the forested areas than shifting cultivation of rice, and that the authorities - who strongly encourage maize expansion for income generation and (green) development - allowed this expansion to take a place. This had potential influence on the biodiversity and ecological

resilience of the system (see also [Rerkasem et al., 2009](#); [Castella et al., 2013](#)), but also had implications for food and nutrition provision, seasonal gap-filling, and risk coping, as the fallows used to be the source of much of the NTFPs collected, which formed an important part of the nutrition intake of the farmers (See also [Castella et al., 2013](#); [Foppes and Ketphanh, 2004](#); [Broegaard et al., 2017](#)). In fact, as found by earlier studies, increased income from intensified agriculture will not alone guarantee reduced hunger or improved nutrition because many people, particularly those with limited resources (i.e. land, capital, and food market-access), cannot afford to buy food from markets, and continue to rely on subsistence production and wild harvest ([Pinstrup-Andersen, 2009](#); [Ickowitz et al., 2014](#); [Powell et al., 2015](#)).

Socially, maize expansion was shown to increase household differentiation, risks, dependency on traders (and other key people in the maize networks), debts, and food insecurity of some (see also [Viau et al., 2011](#) and [Cole et al., 2017](#)). The early adopters of maize were those with more land and resources (similar finding to [Evans et al., 2011](#) related to rubber expansion in northern Laos), and some households, such as the late settlers of Village A (with no land close to the village) were left behind. Fluctuations in maize prices, as with any globally traded commodity, carried risk for the smallholder farmers, particularly in our study area where the majority of farmers depended solely on maize for their cash income (especially in cases where they had high debts related to maize production, or used the maize money to buy food). This is a similar finding to [Viau et al. \(2011\)](#), who found that even the slightest fall in the price could have significant implications for the farmers that were highly dependent on maize income. Households that were dependent on maize income for purchasing food were also exposed to higher risks in terms of maize harvest declines. Being able (or having have) to buy food was also a significant livelihood change for these communities, who traditionally had to endure occasional shortfalls of food production because they were 100% reliant on self-sufficient food production, with no cash to buy food to make up for the shortfall. Farmers were well aware of the impacts of maize, but had little other opportunities for income generation. In fact, education paid for with maize money was seen a key way out of poverty, and expanding paddy rice production (funded with maize money) a key way towards food security.

Finally, the study also showed disconnect with the goals stated in the Agricultural Development Strategy 2011–2020, as how commercial maize was produced and organised did not lead to pro-poor and green value chains ([Ministry of Agriculture and Forestry \(MOF\), 2010](#); Goal 2), nor did it improve food security equally ([Ministry of Agriculture and Forestry \(MOF\), 2010](#): Goal 1), or stop traditional swidden agricultural practices ([Ministry of Agriculture and Forestry \(MOF\), 2010](#): Goal 3). How, then, can green growth be achieved with annual cash crops? What are the alternatives? We suggest that new or improved policies that support sustainable agricultural practices and integration of commercial crops (including maize) into diverse systems (e.g. in swidden and long rotation fallows and agroforestry systems) are needed. Such diverse systems could maintain food security and cultural wellbeing in a multifunctional landscape, and would be more resilient to unforeseen changes (see also [Castella et al., 2013](#)). Furthermore, the role of agriculture – and specifically the trees in the agricultural landscape – for ecosystem service provision could be better recognised instead of solely focusing on the productive functions of commercial agriculture ([Hett et al., 2011](#); [Amaruzaman et al., 2017](#)). Complementary development and conservation initiatives such as crop insurance schemes, soil conservation and ecosystem service schemes could help to both buffer against environmental risks and support local sustainability. Finally, the government could also play a stronger role in implementing safeguards to protect farmers' welfare related to market-driven crop production, particularly in relation to designing contract or investment arrangements to improve the balance of ownership, voice, risk and reward between investors, traders and farmers ([Vermeulen and Cotula, 2010](#)), and in making information available and accessible.

Declarations of interest

None.

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