

Review of **Land-use change impacts on multidimensional well-being: insights from tropical forest frontiers in Madagascar, Myanmar and Laos** (Zähringer et al.)

Overall comment: the paper makes a strong contribution to a misunderstood and under-studied relationship between land uses changes, ecosystem services loss and human well-being. It makes a clear point on the contribution it makes to the land system science literature and the gap it is filling.

It is easy to read and follow with enough references to dig further into the points made and where they come from.

It also made a clear and important contribution to literature by challenging the “the environmentalist’s paradox”.

However, it would really benefit from an extended description of the land uses mentioned in table 1, to clarify what they really entail and avoid confusion later on. For example, “village” as a land use can be confusing, and “forest” and “shifting cultivation” seem to be at times interchangeable but at times not throughout the document, and it would be good to understand what kind of plants were grown on shifting cultivation and left on fallows, to understand better what is lost if this land use is lost (and understand better the substitution).

Detailed feedback:

Abstract

Clear and well written

One sentence was not so clear to me: second paragraph: “However, these processes often fail to maintain relational and collective components of well-being and it might be that ecosystem services are often not substituted to the same level.”

>last part about “ecosystem services [] not substituted to the same level” is not very clear to me (substituted with what)

Introduction

Sentence: “Links between ecosystem services and human well-being exist in both directions, are multidimensional, complex and may change over time”

Not clear how human well being influences ecosystem services? If a “both direction link” means this.

>Suggesting using “influencing” rather than “existing in both directions” as clearer language.

Section 2 is missing, 1. Intro to directly section 3

P3 last paragraph: “through the expansion of agricultural land, at the expense of natural habitats such as forest (Ketema et al., 2021; Raudsepp-Hearne et al., 2010).”

Suggesting that deforestation is due only to agricultural expansion is a sensitive and challenged assumption, and the literature cited doesn’t really demonstrate this. I suggest nuancing this and talking about the contribution of shifting cultivation (often blamed for deforestation) to food security (ref to Carol Colfer’s work on food security

and swidden cultivation for example for more grounded work). I guess food security fits into the “bodily health” capability of Nussbaum’s framework (health and nutrition) and/or “control over one’s environment” with the capacity to generate income (economic access component of food security).

Section 3. Methodological approach

Methods applied seem very suitable and relevant for the type of data looked after.

P6, section 3.2, I think the sentence should read: “The detailed methodology is explained in Zaehringer et al. (2018).” Instead of “is explained in (Zaehringer et al. 2018).

Table 1 p7: In Myanmar, it reads that there are fallows but no shifting cultivation, if shifting cultivation has stopped, the fallows become secondary forests or something else, but cant be considered (active) fallows anymore. I believe this is contradictory.

Comment on literature:

At section 3, we hear that the participants practice shifting cultivation, however I didn’t see (at that point) any relevant literature on the contribution of shifting cultivation for human well-being (ie for cultural identity, food security and livelihoods), I suggest adding the following literature on that:

- Colfer, C. J. P., Peluso, N., Chung, C. S., Soedjito, H., Mackie, C., Sakuntaladewi, N., ... & Merah, T. (1998). Beyond Slash and Burn: Building on Indigenous Management of Borneo's Tropical Rain Forests. *Advances in Economic Botany*, 11, i-236.
- Conklin, H. C. (1961), “The study of shifting cultivation,” *Current Anthropology*, vol. 2, no. 1, pp. 27–61
- Dressler and Pulhin (2010) , “The shifting ground of swidden agriculture on Palawan Island, the Philippines,” *Agric Hum Values*, vol. 27, no. 4, pp. 445–459
- Kleinman, P. J., Pimentel, D., & Bryant, R. B. (1995). ‘The ecological sustainability of slash and-burn agriculture’. *Agriculture, Ecosystems & Environment*, 52(2-3), 235-249.
- Padoch, C., & Pinedo-Vasquez, M. (2010). Saving Slash-and-Burn to Save Biodiversity. *Biotropica*, 42(5), 550–552

And on shifting cultivation and government policies in Madagascar, see this:

Kull, C. A. (2000). Deforestation, Erosion, and Fire: Degradation Myths in the Environmental History of Madagascar. *Environment and History*, 6(4), 421–450. <https://doi.org/10.3197/096734000129342361>

Section 3.3

The authors talk about “foster[ing] open dialogue” but the literature mentioned (Morgan and Hoffman, 2018; van Eeuwijk and Angehrn, 2017) doesn’t relate to this specific “open dialogue approach”. I suggest referring to literature about this like *Andrés Lucero, Kirsikka Vaajakallio & Peter Dalsgaard (2012) The dialogue labs method: process, space and materials as structuring elements to spark dialogue in codesign events.*

Section 4 Results

General comment: The result section follows a clear lay-out that enable us to follow the results with their logic as they unroll.

Section 4.1

The sentence “The most prevalent resulting land uses after the conversion of forest were mixed perennial systems in Myanmar, rubber plantations in Laos and shifting cultivation in Madagascar. The transition from forest to rubber plantations was observed in both Laos and Myanmar.” makes us think that, in Madagascar, forests became shifting cultivation, but in the table 5, we can only see the transition *from* shifting cultivation to something else, which is a bit confusing.

Section 4.3

In the sentence starting line 5: “In Madagascar, nutrition had the most links to shifting cultivation through the provision of rice, fruits, vegetables and wild edible plants. In contrast, nutrition had the most links to forests in Laos (via wild edible plants and animals), while in Myanmar, villages contributed mainly through livestock, fruits and vegetables.” :

-“in contrast”, referring to forests as contrasting with shifting cultivation is not very true to the nature of shifting cultivation which takes place in the forest and creates a secondary forest during a fallow period.

-I wonder if “villages” is not confusing even if it is described before as a land use, but maybe a reminder of what it entails would be useful?

The figure 2 p.14 is a bit hard to follow, maybe the links themselves should have the colour codes for ease of following?

Section 4.4

4.4.1

Last sentence: ‘No positive impacts of this land use change on any cultural ecosystem services.’ seems incomplete.

4.4.3

The first paragraph: “*The decline of shifting cultivation—replaced by rubber plantations in Laos and mixed perennial systems in Madagascar—had contrasting effects on ecosystem services and human well-being components (Figure 5). No impacts on cultural ecosystem services were perceived in Laos, whereas positive impacts on recreational activities and spaces, cultural/traditional value, educational value, and experiencing nature were supported by the new land use in Madagascar.*”, would benefit from more details on what the shifting cultivation systems looked like exactly, as it is not very clear to how it was distinct to a mixed perennial system, and also later on is referred to as a loss of rice production, whereas not all shifting cultivation (SC) systems produce rice (or not only). In section 5.1.2, we are reminded or told (I’m not sure) that the mixed perennial systems replacing SC are vanilla plantations, it would be great to

mention that here in section 4 I think to make us understand better the changes in ecosystem services and the reasons why some impacts are positive and others negative.

Also, I am surprised to hear about the lack of impact on cultural ecosystem services, as, per the literature at least, shifting cultivation (SC) is a core of cultural identity of upland dwellers. Maybe more quotes from the interviews could be useful here, to understand what the participants shared about this.

Second paragraph mentions that the SC fallows were closer to homes compared to “actively” SC plots, this is a bit confusing, as fallows are part of the SC cycle, and therefore are not “inactive”. Maybe again here, a history of the SC systems and more details would clarify all of this (were those fallows already secondary forests because they had been abandoned a long-time before the transition happened?, what kind of plants/species were cultivated on the SC plots?).

Section 5

5.1.2

Sentence: “*The decline of shifting cultivation made food security more difficult to achieve, particularly because rice production was not substituted by the new land use and access to forest land for conversion to shifting cultivation fields was reduced (Llopis et al., 2020).*” Is a bit hard to follow based on the results shared before. I think it’s the first time that the term “food security” is used in relation to a well-being component, I think it would be worth mentioning it before, when talking about income and nutrition (two aspects of food security).

I’m not so clear about “access to forest land for conversion to shifting cultivation fields”, why would the shift to another system prevent people from accessing forests? And, since shifting cultivation is rotational, we can’t really talk about a conversion, but rather of a cycle of fallow to field.

And again, it would be good to know whether SC entailed only upland rice cultivation, or otherwise vegetables and fruit trees, as the implications of its decline to food security would be much wider.

For a review of the knowledge on the transition from SC to other systems in Southeast Asia, I suggest adding Padoch, C., Coffey, K., Mertz, O., Leisz, S. J., Fox, J., & Wadley, R. L. (2007). *The demise of swidden in Southeast Asia? Local realities and regional ambiguities. Geografisk Tidsskrift-Danish Journal of Geography*, 107(1), 29-41. to Dressler et al 2017, for a wider and different perspective.

5.1.3

On dramatic consequences of transition to a cash crop economy, I suggest adding a reference to Tania Li’s *Land’s End* (2014) (relates to the point made in section 5.2 too).

The conclusion is great!