



1 **Title**

2 Local perspectives on futures amidst crop booms: insights from a Southeast Asian upland landscape

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15 Abstract

16 In Southeast Asia, the rapid expansion of intensive agriculture has triggered radical land-use changes
17 and posed significant challenges to local livelihoods. While macro-level land use patterns of crop
18 boom to bust cycles are relatively well understood, local community perspectives on grappling with
19 negative consequences of the intensive farming systems and seeking livelihood pathways beyond the
20 bust phase remain understudied. Gaining insights into local visions of futures and ideas for transition
21 pathways helps ensure that development programs and policies resonate well with peoples' actual
22 desires and mindsets, as well as the prevailing environmental conditions. This study examines how
23 local stakeholders in a northern upland landscape of Laos envision sustainable futures and ideas for
24 transitioning out the boom-and-bust trajectories of hybrid maize monocropping, using the Nature
25 Futures Framework and the Three Horizons Framework.

26 Despite ongoing environmental deterioration, local stakeholders frame their visions around their
27 immediate needs which reflect maintaining the status quo. Context-specific socio-economic
28 limitations may have constrained their capacity to envision sustainable futures that reflect desires.
29 Our findings suggest that a mix of policies may be required to support locals in transitioning away
30 from unsustainable farming practices. This study contributes to the growing literature on the
31 application of the Nature Futures Framework and the Three Horizons Framework in boom crop
32 contexts where people struggle to meet basic needs and may be less capable of developing future
33 scenarios based on their desires. We suggest that refining these frameworks for similar contexts
34 could be an important focus for future research.

35 Keywords

36 Nature Futures Framework; Three Horizons Framework; visions; ecosystem services; Nature's
37 Contributions to People; plural valuation; power imbalance.



38 1. Introduction

39 During the past decades, many Southeast Asian countries have witnessed cycles of boom crops (Hall
40 2011). A characteristic of boom crops, such as maize, rubber, coffee, cocoa, or bananas, is their rapid
41 and vast expansion across landscapes which is often induced by favorable market and policy
42 conditions (Hurni et al. 2017). Macro-level land use patterns of boom crops are fairly well
43 understood. They can follow variegated trajectories but often have in common consecutive phases of
44 emplacement, displacement, and replacement (Castella et al. 2023). However, how communities at
45 the local level grapple with the degraded environment, resulting from intensive agricultural use, and
46 try to find livelihood solutions for a transition out of the bust phase is less well-researched.

47 In this contribution, we start to fill this gap by investigating locals' visions of the future and ideas for
48 transition pathways from the current unsustainable socio-ecological system to a more desirable
49 future, in the context of a hybrid maize boom landscape in northern Laos. Understanding locals'
50 visions of the future and ideas for transition pathways is important to ensure that development
51 programs and policies resonate well with peoples' actual desires and mindsets as well as the
52 prevailing environmental conditions. For instance, in some cases, it may be possible to revert to the
53 pre-boom crop state, while in others, alterations to the socio-ecological system may be irreversible or
54 constrained by lock-in effects (Junquera et al. 2024).

55 Hybrid maize is an example of a crop that has transitioned from boom towards bust in northern Laos.
56 Its expansion started around the year 2000 and evolved along the typical stages of a crop boom from
57 the emplacement of maize on fallows in shifting cultivation systems to a full-fledged maize
58 monoculture that displaced forests and shifting cultivation (Castella et al. 2023). From 2000 to 2016,
59 the national maize production quantity increased 13-fold and reached a peak of nearly 1.6 million
60 tons in the year 2016 (FAOSTAT 2024). From 2016 to 2022 the production quantity rapidly contracted
61 by 70 percent and the production area by 64 percent. During the boom phase, the lure of quickly
62 improving incomes drew smallholders into monocropping, but came at the cost of declining soil
63 fertility, soil erosion, biodiversity loss, and often precarious economic dependencies (Ornetsmüller et
64 al. 2019). Experiences from other crop boom cycles in the Mekong region, as elsewhere, predict that
65 the bust which typically follows the boom can be characterized as a replacement phase in which
66 alternative land uses are tested as potential substitutes for the boom crop in the degraded landscape
67 (Nghiem et al. 2020; Castella et al. 2023; Mienmany et al. 2024).

68 To investigate villagers' visions of a positive future in and with the upland farming landscape of
69 northern Laos, we applied the Nature Futures Framework (NFF) as a tool. The NFF has been
70 promoted as "a flexible tool to support the development of scenarios and models of desirable futures



71 for people, nature and Mother Earth” (IPBES 2022). Departing from the conventional dichotomy of
72 use values versus intrinsic values of nature, the NFF spans a triangular space to explore peoples’
73 preferences for positive future relationships in and with nature along three dimensions, Nature for
74 Nature, Nature for Society, and Nature as Culture (Pereira et al. 2020; Dunn-Capper et al. 2023; Kim
75 et al. 2023). Nature for Nature refers to the intrinsic values of nature that exist irrespective of any
76 obvious benefits for society. Nature for Society relates broadly to utilitarian values, i.e. benefits
77 humans derive from nature while Nature as Culture captures relational values such as feelings of
78 identity or spirituality that are tied to nature (Chan et al. 2016; Pascual et al. 2017).

79 The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has
80 called for applications of the NFF that test the framework in different contexts, in particular among
81 indigenous peoples and in local communities to showcase and discuss the opportunities and
82 limitations of this novel tool (IPBES 2022). The expectation is that a diverse set of local applications
83 around the world will help develop a rich and in-depth understanding of the diverse viewpoints on a
84 desirable future for nature (Pereira et al. 2020).

85 Since the introduction of the NFF in 2020, the framework has been applied across various
86 geographical regions, spatial scales and socio-ecological contexts (Dunn-Capper et al. 2023; Kuiper et
87 al. 2022; Shaikh and Hamel 2023; Durán et al. 2023; Pereira et al. 2023) and has engaged different
88 stakeholder groups (Kuiper et al. 2022). These applications generally indicate that the NFF is highly
89 effective in facilitating the development of positive sustainable futures, identifying transformative
90 pathways, and allowing thorough consideration of nature through its diverse value perspectives.
91 However, the applicability of the NFF in developing country contexts, particularly in engaging rural
92 communities in agrarian change in Southeast Asia, has not been extensively examined (Okayasu et al.
93 2025).

94 Our contribution to this growing body of literature thus represents one of the early attempts to
95 engage local communities in considering their farming futures within a crop boom context in Laos.
96 Combining sustainability strategies associated with the different corners of the NFF triangle with our
97 empirical allocation of the villages within the triangle allows us to derive policy recommendations on
98 how to support villages in attaining their visions over time.

99 2. Expanding the NFF framework to derive policy recommendations

100 According to (Junquera et al. 2024) communities can pursue two main strategies when a boom crop
101 reaches the bust phase. Either they dynamically try to restore the environment and revert to the land
102 use system in place prior to the boom crop or they accept the degraded environment and try to
103 identify new or alternative livelihood strategies that are viable in this environment. However, if the



104 environmental degradation due to years of mono-cropping is utterly irreversible, communities may
105 not have a choice and will have to search for alternative livelihood strategies.

106 For this context, we propose to use the NFF as a tool to identify where communities that are facing
107 the bust phase of a boom crop currently situate themselves in the triangular space between Nature
108 for Society, Nature for Nature, and Nature as Culture. Analyzing communities' visions of a sustainable
109 future helps understand whether they intend to consolidate their livelihood activities at the current
110 point (i.e. accept and live with the degraded environment) or intend to shift away from the current
111 point (e.g. by restoring the environment). Understanding communities' desire for consolidation or
112 shift allows us to derive policy recommendations that can support their preferred pathway. For
113 example, green economy policy strategies are suitable for fostering Nature for Society values, policies
114 promoting earth stewardship and biocultural diversity can strengthen Nature as Culture values, and
115 nature protection policies can underpin Nature for Nature values (Martin et al. 2024).

116 For instance, if a community currently expresses strong Nature for Society values but maintains a
117 vision of a sustainable future that has strong Nature for Culture values, then policymakers could
118 support this transition by implementing earth stewardship policies that can help pave the way and
119 'pull' the community in the desired direction. By contrast, a community that currently expresses
120 strong Nature for Society values and wants to consolidate its future in the same value space could be
121 supported by green economy policies.

122 3. Methods and case study

123 This study was conducted at an early stage of a stakeholder engagement process in a science-based
124 development project, which remained ongoing at the time of writing (November 2025). The project's
125 aim is to engage with commercial smallholder farmers in transitioning towards sustainable land
126 management.

127 We applied the NFF in 2-2.5-hour focus group discussions in four villages in Xieng Khouang Province
128 in northern Laos. All focus group discussions were conducted in the second week of May 2024. After
129 an extended period of extreme heat, this week marked the beginning of the rainy season.

130 The villages were selected for the research project in two previous field visits. The broader project
131 within which this research was conducted has a focus on commercial farmers and sustainable land
132 management. A key criterion thus was that a high share of households is engaged in commercial
133 agriculture. Further selection criteria were potential synergies with the area of operation of a local
134 partner project, the availability of basic knowledge on the villages from previous projects, and for
135 practical reasons, accessibility.



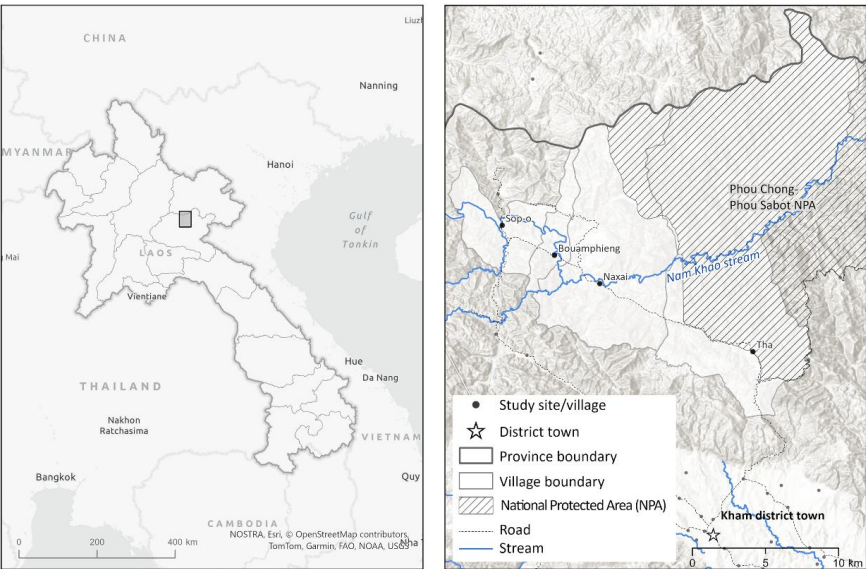
136 The four selected villages are situated within a sub-watershed area of Longkhao which is adjacent to
137 the Kham basin, the broader intensive hybrid maize monoculture landscape in the province. They
138 feature a gradual land use and topographic transition from an upland, relatively multifunctional,
139 landscape to the lower maize monoculture-dominated landscape. Yet all the villages have converted
140 forest land for maize cultivation. Tha is the most upstream village along the topographical gradient
141 reaching an altitude of 1,200 meters above sea level (masl). It is followed by Naxai and Bouamphieng
142 where the altitudes are gradually lower; Sop-O village is located in the lowest area of the valley with
143 an altitude of 400 masl (see Figure 4).

144 The land use area of Tha and Naxai villages is partly located in Phou Chong – Phou Sabot National
145 Protected Area (NPA) (see Figure 1). This NPA was designated in 2011 with the primary objective
146 being biodiversity conservation (Government of Laos 2011). Despite the official designation of the
147 protected area in 2011, the operation of the NPA management was initially limited. The five-year
148 management plan of the forest area has only been available since 2020 with support from the World
149 Bank-funded Second Lao Environment and Social project. The project further supported the
150 demarcation of the NPA boundary in the overlapping area with the two target villages in early 2021.
151 However, the project was phased out in late 2021 and since then the enforcement of the NPA
152 management plan has been limited. Some parts of the NPA located within the land area of the two
153 villages have been converted into agricultural land (see Figure 2).

154 Nam Khao is the major stream in the watershed. The stream stretches across all four target villages
155 (see Figure 2) and is the main source of water especially for lowland agriculture as well as for drinking
156 water, and fish for household consumption for local communities. Fish supply from the Nam Khao
157 stream has long been a source of protein supply for local communities. To secure long-term fisheries
158 in the area, villagers, with support from a previous development project, have introduced fish
159 conservation zones in the area since 2015. Fish conservation zones exist in all the target villages



160 except Tha – the upstream village because the stream is too narrow there.



161
162 *Figure 1: Location of study area. Sources: Esri, TomTom, FAO, USGS | Powered by Esri*

	Tha	Naxai	Bouamphieng	Sop-O	Data source
Total area (hectares)	21,373	10,496	1,341	2,309	(PAFO Xiengkhouang province 2019)
Total forest area in 2023 (hectares)	16,592	6,388	635	256	Land cover and land use 2023, Ministry of Agriculture and Forestry, Laos
Area of forest loss 2005-2023 (hectares)	1,645	2,003	546	1,360	(Hansen et al. 2013)
Population size (inhabitants)	639	793	206	453	(Administrative office of Kham district 2023)
Ethnic groups	Lao loup, Khmu	Lao loup, Khmu	Khmu	Tai daeng, Khmu	Focus group discussion
Village relocation history	Original village	Original village	Relocated from a neighboring	Original village	Focus group discussion



			district in 1991		
Literacy (% of literate population)	89.4	83.3	91.2	77.3	(Epprecht et al. 2018)

163 *Table 1: Summarizes key socio-economic characteristics of the four study villages.*

164 The villages were pre-informed about the visit of the research team by the Provincial Agriculture and
165 Forestry Office (PAFO). We intended to include a broad set of village representatives. Based on
166 information collected in the preceding field visits and previous experiences, we asked local facilitators
167 to extend the invitation to the village head, the representatives of the women's union, the youth's
168 union, the village elder, a farmer, a trader, and a teacher. Only in the fourth village, there was a mix-
169 up, so the villagers were not pre-informed about the visit. The village head kindly agreed to
170 spontaneously participate in the focus group and to convene more people from the village. This led to
171 a higher share of women participating than in the other three villages. In all four villages, the study
172 team was accompanied by facilitators who represented the PAFO of Xieng Khouang province and the
173 District Agriculture and Forestry Office (DAFO) of Kham district. In total, 62 participants were involved
174 in four focus group discussions.

175 The focus group discussions were co-moderated by two of the co-authors in Lao. At the beginning of
176 each focus group discussion, they explained the research project, answered any questions, and
177 obtained verbal and written informed consent from the participants. Participants were made aware
178 that their data would be used for research purposes. One of the moderators wrote a protocol of the
179 focus group discussions which was later checked and completed by the other.

180 Building on previous literature (Kuiper et al. 2022; Pereira et al. 2023; Mayer et al. 2023), we
181 unpacked the NFF by applying the three horizons framework (Sharpe et al. 2016). This involved a
182 sequence of three steps. In the first step, we addressed the first horizon. For this assessment of the
183 status quo, the moderators presented two large posters of the village area that they hung up on the
184 wall side-by-side. The first showed a satellite image of the village and the second a land use map.
185 Both were printed on the same scale. Initially, the villagers were invited to familiarize themselves with
186 the maps and identify the location of the settlement. Conveniently, the villagers were well-acquainted
187 with reading maps from previous land-use planning projects. Corresponding to the three corners of
188 the NFF triangle (see Figure 3), the moderators explained that many different values can be attributed
189 to nature, such as nature for nature, nature for society, and nature as culture. To avoid information
190 overload, they did not explicitly refer to or show the NFF triangle. The moderators asked the villagers
191 to give examples of these different values and to come forward and place sticky notes on the map to



192 indicate places and land uses that they associate with these values. The moderators were careful to
193 avoid giving suggestive cues but eventually did ask questions about ecosystem services that were
194 implicitly mentioned during exploratory fieldwork in the villages.

195 The moderators further asked the villagers to mention the pressures that were inflicted on
196 ecosystems and their services. They inquired about pressures for four broad land use categories
197 separately: cropland, pasture, forest, and water bodies. They then noted the responses on large sticky
198 notes and hung them on a sheet of paper next to the maps.

199 The second step focused on developing visions of a positive future (horizon 3). As for the time span,
200 we chose 10 years. This is substantially shorter than the time spans proposed in previous studies.
201 However, we deemed that 10 years is already a very distant horizon for members of a subsistence
202 economy whose planning may often span merely from planting to harvesting or sometimes even just
203 morning to evening. A further reason for choosing this period was that the overall project intends to
204 issue small grants supporting the realization of actions towards sustainable land management
205 practices to the villages within the next years. We assume that the impacts of the grants could be
206 measurable within 10 years. The opportunity to obtain small grants was not communicated to the
207 villagers on this occasion, but they may have had expectations in this direction based on previous
208 projects by other organizations in the area. To help envision the future, the moderators asked the
209 following guiding questions: “What does a desirable future of the community’s land use look like in
210 10 years? What desirable future would you like to see in your children’s generation?”. Answers were
211 again noted down and hung up on the wall.

212 The third step (horizon 2) finally served to assess the villagers’ ideas on how to transition from today’s
213 situation to the desirable future that they outlined in the previous step. The moderators used the
214 following guiding questions to stimulate the discussion: “To realize that desirable future, what steps
215 would you take in the next few years?”. Answers were again noted down and hung up on the wall.
216 Before closing each focus group session, the moderators summarized the inputs from the participants
217 in all the steps.

218 After thanking the villagers for their participation, the focus group discussions concluded with a joint
219 picnic.

220 Key data from the focus group discussions included map stickers, sticky notes, and responses from all
221 key steps, which moderators noted down. Map stickers indicating examples of nature’s values were
222 counted and categorized by nature’s contributions to people and value perspectives. We digitized all
223 locations of nature’s values from the paper maps using ArcGIS Pro software, enabling us to better
224 analyze spatial distributions of values in relation to land use types. Subsequently, maps were



225 produced. Sticky notes and field notes from the moderators on pressures inflicted on ecosystems and
 226 services and the subsequent steps were further analyzed for commonalities and patterns across the
 227 villages' gradient. Notes were categorized thematically by village and then assigned to broader
 228 themes, facilitating patterns identification.

229 4. Results

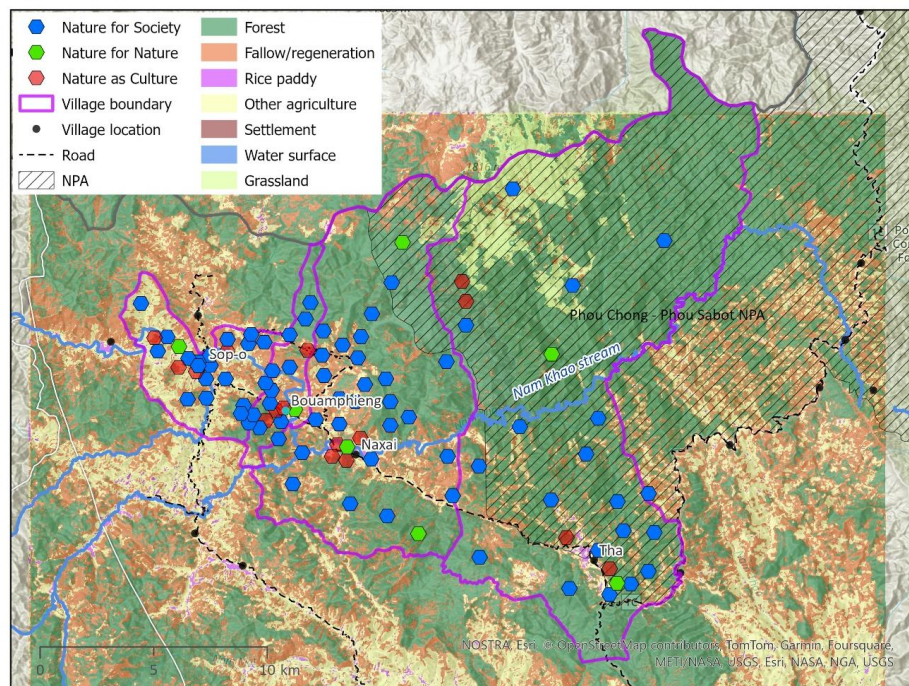
230 The assessment of nature values and pressures in the status quo (first horizon), was the most
 231 interactive part of the focus group discussions. Participants actively engaged in the discussions and
 232 placed stickers indicating various nature values onto the maps. By comparison, the visioning (third
 233 horizon) and pathways (second horizon) were more difficult.

234 4.1. More diverse values mapped in upstream multifunctional landscape

235 In total, 98 stickers were placed on the maps during the four focus group sessions covering all three
 236 corners of the NFF triangle.

Value perspective	Tha	Naxai	Bouamphieng	Sop-O	Total
Nature for Society	11 (21)	11 (22)	8 (14)	8 (18)	11 (73)
Nature for Nature	1 (2)	2 (3)	1 (1)	1 (1)	2 (9)
Nature as Culture	3 (4)	3 (3)	3 (5)	3 (4)	3 (15)
Total	15 (27)	16 (28)	12 (20)	12 (23)	16 (98)

237 *Table 2: Numbers of ecosystem services per village and category of nature value. Note: the absolute numbers of stickers,*
 238 *including duplicates, are given in parentheses*



239
240 *Figure 2: Distribution of value perspectives in the study villages.*

241 *Sources: Base map, Esri, TomTom, FAO, USGS | Powered by Esri; land cover and land use 2023, Ministry of Agriculture and*
242 *Forestry, Government of Laos.*

243 In general, more examples were provided for the Nature for Society category than for the Nature for
244 Nature or Nature as Culture categories (see Table 2). Most stickers indicating Nature for Society
245 values were placed within cropland and forest areas on the map. Sometimes they were repeated in
246 multiple locations of the same land use. Examples of Nature for Society included food supplies from
247 staple and cash crops, livestock, non-timber forest products, and bushmeat, reflecting the main
248 sources of livelihoods of the communities within the landscape. Watershed protection forests were
249 also mentioned in every village, implying the importance of nature conservation for long-term supply
250 of fresh water for the communities.

251 Nature for Nature values concentrated mainly in the NPA and Nam Khao stream where the
252 community fish conservation zones were designated. Stakeholders especially those from the first two
253 upstream villages, in which the village administrative areas overlap with the protected area,
254 described nature as places for conserving wildlife and plant habitats.

255 As examples of Nature as Culture values, the stakeholders indicated places for recreational and
256 spiritual activities (e.g. places they visit during New Year celebrations or to perform ritual
257 ceremonies) in all the communities. Spatially, the Nature as Culture value stickers were placed in

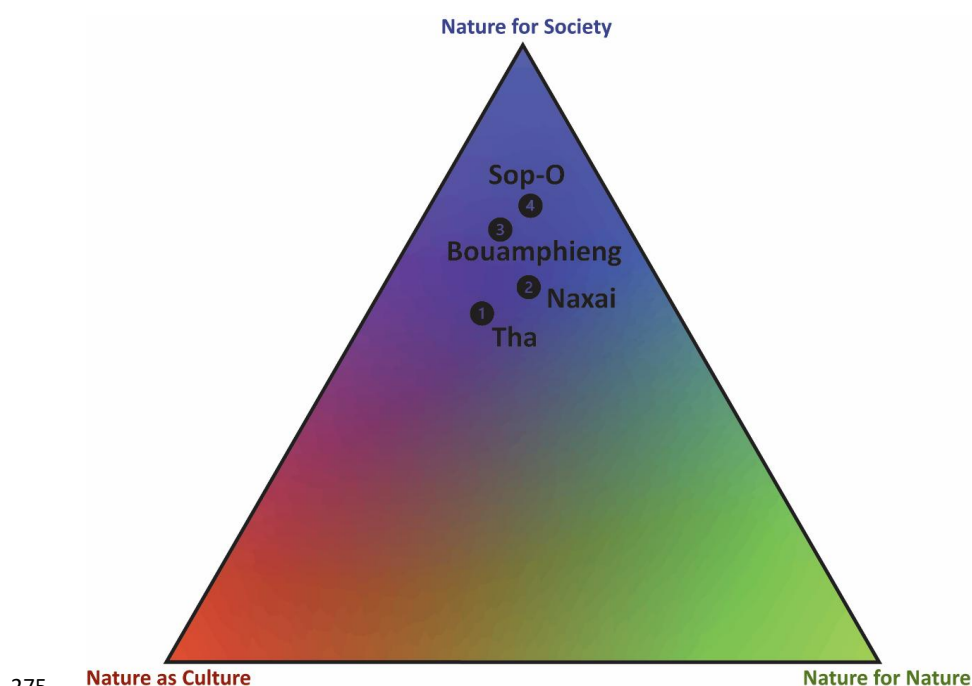


258 forests near village settlement areas and rivers, as well as waterfalls or caves, which are relatively
 259 distant from the village centers.

260 Comparing across the villages, we find that the quantity and diversity of value perspectives were
 261 higher in the first two upstream villages of Tha and Naxai. These two villages have a relatively larger
 262 share of forest resources, while in the two downstream villages, Bouamphieng and Sop-O,
 263 smallholder hybrid maize monoculture is the main land use type, and there are only very small
 264 fractions of forest patches. For example, in Tha and Naxai villages, stakeholders listed 15 and 16
 265 different individual ecosystem services, respectively, while in both Bouamphieng and Sop-O villages,
 266 only 12 ecosystem services were mentioned in each village (see Table 2). Generally, the Nature for
 267 Society value perspective was mentioned far more frequently across the landscape, while the Nature
 268 as Culture and Nature for Nature value perspectives constituted only small fractions of the total
 269 ecosystem services perspectives.

270 We place all villages in the NFF triangle at different proximities to the different corners, according to
 271 the results of the focus group discussions. We put Naxai a bit closer to the Nature for Society corner
 272 than Tha, as stakeholders from the village gave more examples of utilitarian values of nature.

273 Bouamphieng and Sop-O villages are both located a bit further from the Nature for Society corner of
 274 the NFF triangle (see Figure 3).



275 **Nature as Culture** **Nature for Nature**
 276 *Figure 3: NFF triangle illustrates the relevance of ecosystem services per village in three value perspectives.*



4.2. Similar pressures but at different intensities across the villages

Some pressures were mentioned more frequently than others, but we could not detect distinct differences in pressures or specific patterns between the villages. However, the pressures were more distinct and pronounced in the two downstream villages than in the two upstream villages. Indeed, the stakeholders in all villages mentioned that the intensive cash crop monoculture had caused an extensive decline in soil fertility and yield. This also referred to land degradation, especially soil erosion (including increased sedimentation in one village). Drinking water and water for household consumption were said to be insufficient in all villages. The villagers also all mentioned economic challenges, e.g. by explaining that prices for seeds and agrochemical inputs had increased while maize prices were fluctuating or had decreased.

Challenges that were mentioned in the three villages included livestock diseases and pest infestations with rats and insect larvae. Thieves stealing large livestock were a governance concern. Further, three villages mentioned fluctuating climate patterns with droughts, and extreme natural hazards such as landslides.

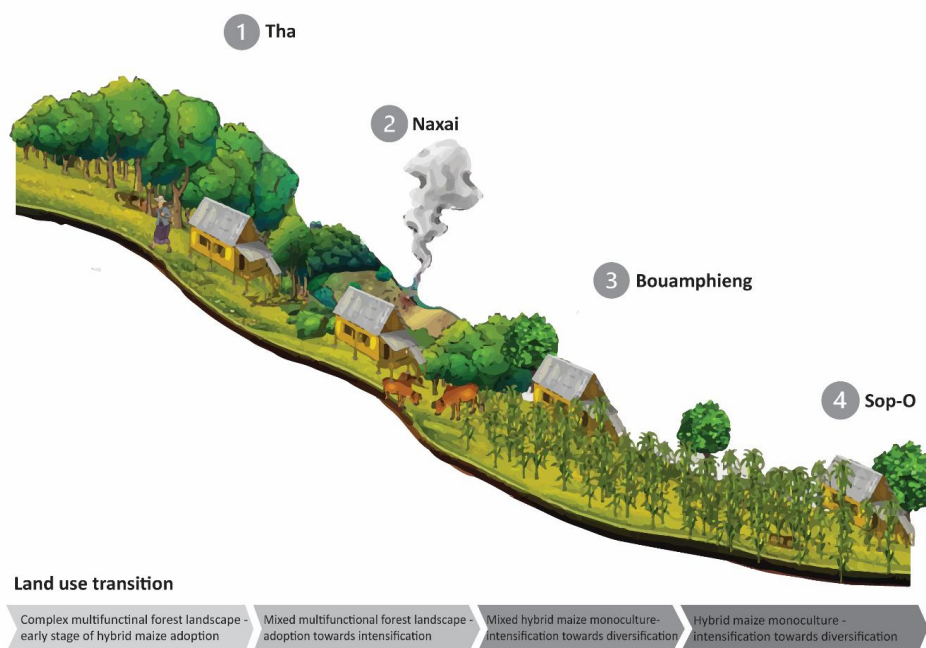
Other challenges were specific to two or only one of the villages. The stakeholders in Tha and Sop-O villages raised concerns over excessive use of herbicides which they feared was contaminating livestock fodder and the grazing area with ensuing negative effects of this pollution on public health.

In the first village, stakeholders mentioned that the village committee had limited capacity for forest patrolling which left the door open for agricultural expansion into the forest, illegal logging, and over-harvesting of non-timber forest products. Tha and Bouamphieng villages mentioned that slash-and-burn practices had resulted in uncontrolled forest fires. Stakeholders in Bouamphieng village especially highlighted that forest fires reduced the potential space for the red mushroom collection.

Kor Daeng in the local language or red mushroom (*Rosy Russula*) collection is a main source of cash income for local livelihoods, especially in the two upstream villages (see Figure 4). The mushrooms which typically grow in “specific places” under shades of Mai Kor, a common broadleaf wild tree species, are in high demand in neighboring countries, mainly in the Chinese market. Since the mushroom price skyrocketed in the last decade, locals have been extensively harvesting the species for commercial purposes. Stakeholders in all villages consensually indicated that the collection of the wild species has recently been threatened, as the mushroom collection spots in Mai Kor forests were in decline, mostly due to forest conversion to agriculture and forest fire in connection with agricultural practices. In the past, some individuals from Tha village had tried expanding the wild species collection area by inoculating red mushroom fungus to new places in the forest. Due to a lack of adequate knowledge, the attempt eventually failed.



310 In Bouamphieng and Sop-O, the downstream villages, stakeholders also mentioned that they had
 311 limited land for further maize expansion and limited land for livestock grazing.
 312 Stakeholders from Bouamphieng village were the only ones to mention a demographic challenge –
 313 they stated that young people were moving out to pursue their education elsewhere or were moving
 314 away as migrant workers which resulted in insufficient labor availability for farming in the village.



315
 316 *Figure 4: Illustration of land use and topographical gradients of the study villages.*
 317 *Source: Khamhoung Pasomsouk*

318 4.3. Visions and transitional pathways

319 The visions put forward by the stakeholders revolved around two common themes: (i) infrastructure
 320 improvements, and (ii) maintaining the status quo in the context of a shifting baseline. Transitional
 321 pathways were not explicitly discussed by the stakeholders.

322 4.3.1. Infrastructure improvements

323 It was key to stakeholders in all villages that, in the future, road access to the communities should no
 324 longer be a challenge during the monsoon season. This would improve accessibility to health care
 325 and transportation for the locals during the wet season. In addition, stakeholders specifically from
 326 Naxai village where a large area of forests remained, expressed their interest in developing natural



327 attractions within the village such as waterfalls and caves. This is envisioned as a potential
328 supplementary source of income for the community.

329 4.3.2. *Maintaining the status quo*

330 The stakeholders understood and acknowledged the long-term negative impacts of the current
331 monoculture system. In this context, the visions put forward by the stakeholders focused on
332 maintaining income, natural resources, and ecosystem services. Maintaining income was to be
333 achieved by further engaging in cash crops and mitigating yield declines by expanding the cultivation
334 area, if possible. A certain openness to new perennial crops and more diversified farming systems
335 was also mentioned. Perennial crops and diversification were deemed advantageous if they require
336 less inputs, ease the dependencies on traders and release farmers from costly contract farming
337 arrangements.

338 Maintained access to non-timber forest products (NTFPs), such as the red mushroom, was also
339 mentioned. Stakeholders explained that members of neighboring villages who had depleted their
340 own forest resources, were now intruding into others' forests and exploiting the resources by e.g.
341 occupying some red mushroom collection spots without permission. The need for continued
342 freshwater provision, flood and erosion control, as well as biodiversity conservation were further
343 ecosystem services that were mentioned in the stakeholders' visions.

344 5. Discussion

345 Our application of the three horizons framework revealed that the stakeholders are feeling the onset
346 of the bust phase of the hybrid maize monoculture. In this context, the visions of positive futures
347 proposed by the stakeholders mostly revolved around infrastructure improvements and hopes to
348 maintain the status quo in terms of income, natural resources, and ecosystem services.

349 Situating the villages in the NFF triangle and assessing the directionality of their visions allows us to
350 put forward policy recommendations. To secure incomes and in line with the stakeholders' ideas, we
351 suggest supporting green economy livelihood alternatives, such as perennial fruit tree crops,
352 integrated livestock management, and aquaculture, that allow for more stable and diversified income
353 generation in the longer term. At the same time, it would be important to start restoring the land, not
354 least for the sake of maintaining ecosystem services flows. Given the degree of degradation,
355 restoration will most likely take time and resources. Eventually, external financial support for the
356 alternative livelihood activities could be tied to efforts in land restoration. Further, we recommend
357 supporting the improvement of forest governance, especially sustainable use of NTFPs such as the
358 red mushroom in the protected area and its buffer areas.



359 Our finding that the stakeholders envision a future which can be characterized as ‘more of the same’
360 differs from previous literature which put forward visions encapsulating transformative change, in the
361 sense of alterations to existing socio-ecological systems that are expected to result in more
362 sustainability (Kuiper et al. 2022; Pereira et al. 2023; Mayer et al. 2023). Several factors could be
363 driving the difference in the types of visions proposed.

364 Firstly, stakeholders in all the villages found that it was difficult to come up with clear long-term
365 positive visions and ideas for such transitions as their main priority was to find enough food for the
366 family on “a daily basis” – a common metaphor in the local language which referred to the annual
367 basis in this case. Thus, few and rather broad common visions on livelihood security were developed
368 that revolve around immediate needs rather than desires which commonly emerge only once basic
369 needs are satisfied (Maslow 1943).

370 Stakeholders’ limited risk-bearing capacity is another plausible interpretation. Stakeholders in the two
371 downstream villages maintained staple crop cultivation alongside hybrid maize adoption, which could
372 be seen as a risk-mitigation strategy against the instability of boom crops (Wang and He 2024). The
373 possible absence of immediate financial returns during the transition to alternative sustainable
374 practices, coupled with insufficient knowledge, might further constrain stakeholders’ risk-taking
375 capacity and thereby narrow the imaginative space in which visions of alternative sustainable futures
376 can emerge (Miriti and Lambarraa-Lehnhardt 2025).

377 A further explanation could lie in the prevalence of strong lock-in effects and a paucity of convincing
378 and reliable triggers that could induce a shift to a different trajectory. Hybrid maize cropping provided
379 attractive financial and practical incentives – 50% higher earnings and less labor input- compared to
380 traditional subsistence-oriented farming practices. The expansion of hybrid maize in the area was
381 facilitated by traders who offered informal contract farming schemes consisting of credits for seeds
382 and technical services. Furthermore, established and easily accessible markets created path
383 dependencies (Ornetsmüller et al. 2019).

384 The concept of bounded rationality offers another possible explanation. Farmers’ imaginations of
385 possible futures may have been limited to what they have seen, experienced or previously heard of.
386 Extension work, farmer-to-farmer learning opportunities and living labs are some of the approaches
387 available to increase stakeholders’ exposure to innovations that may foster more sustainable
388 aspirations, ideas, and ultimately adoption over time (Githinji et al. 2023; Qiao et al. 2022; Wens et al.
389 2021).

390 Finally, we would like to point to limitations of our work and put forward lessons learned. Despite
391 having included broad stakeholder groups in all the focus group discussions, there may have been



392 power imbalances at play (Jacobs et al. 2023). The homogeneity of ideas on visions among
393 stakeholders is an indication of such imbalances. The presence of highly influential figures including
394 the village heads and local traders who have a strong connection to the village head may have
395 influenced the discussions. Those notable figures dominated the discussions, and non-privileged
396 individuals, although they were encouraged by the moderators, might not have felt comfortable
397 speaking out and expressing their ideas and concerns. Contesting or arguments during public
398 consultations are very unusual in the Lao context.

399 The three horizons helped structure both the discussion and the facilitation into a clear, logical
400 sequences. It proved particularly useful for guiding farmers through the research agenda. The NFF,
401 which structures diverse value perspectives of nature, enabled the research team to systematically
402 examine current value perspectives perceived by farmers and their envisioned future trajectories,
403 providing a basis for formulating policy recommendations. These feedbacks are consistent with
404 previous case studies (Okayasu et al. 2025). Nevertheless, in practice, we found that explaining the
405 NFF three-corners concept directly to local stakeholders often proved challenging for them to
406 understand, even with examples provided. We recommend that future applications translate these
407 concepts into more interactive materials and practical guidelines incorporating locally adapted
408 examples. This approach would better facilitate understanding among local stakeholders.

409 6. Conclusions

410 In this study, we set out to examine the visions and ideas of local stakeholders regarding their
411 pathways for transitioning out of the hybrid maize boom-and-bust trajectories in the northern upland
412 landscape of Laos, using the NFF and the Three Horizons framework. We initially expected that these
413 visions and ideas would be based on intuitive desires. However, the stakeholders instead built their
414 narratives around needs that were focused on maintaining the status quo of their livelihoods in the
415 context of severe environmental degradation. We conclude that context-specific social-economic
416 limitations constrained the stakeholders' ability to express visions of sustainable futures that reflect
417 desires. Our findings further imply that a mix of policies may be necessary to help the stakeholders
418 explore pathways for transitioning away from the current unsustainable farming practices.

419 The NFF and the Three horizons frameworks proved effective in guiding local stakeholders through
420 structured research steps and systematically examining local aspirations through diverse value
421 perspectives of nature. This formed a basis for policy recommendations. However, in practice, we
422 found that explaining the NFF three-corners concept directly to local stakeholders often proved
423 challenging. Power imbalances among involved stakeholders were an aspect that should be given



special consideration during future methodological design. It could distort the ways visions and ideas are being formulated.

Future research could focus on refining the NFF and Three Horizons framework for contexts in which people are struggling to meet basic needs and may be less capable of developing future scenarios based on their desires.

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Informed consent statement

All participants provided informed consent before taking part in the study. Participants were made aware that their data would be used for research purposes. Responses were anonymous.

Declaration of competing interests

The authors declare no competing interests.

CRedit authorship contribution statement

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