Using participatory mapping for a shared understanding of deforestation dynamics in Murehwa district, Zimbabwe

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Abstract – This paper presents the results of a study using participatory mapping to collectively understand deforestation dynamics in Murehwa, a communal area approximately 90 km northeast of Harare, Zimbabwe’s capital city. The study engaged smallholder farmers in a deliberative process through participatory mapping exercises in 15 villages. For each exercise, participants collaboratively drew two maps of their village, one for 1990 and another for 2021. They depict village boundaries, land uses and the magnitude of change between the two dates. Participatory mapping served as a platform for collective thinking, with the resulting maps used to facilitate discussions. They involved comparing land use between the two maps and identifying the drivers of the observed changes. Thematic approach was used to analyse the discussions in order to come up with collectively identified drivers of land use changes. The findings show that deforestation and resulting land use changes are primarily rooted in economic depression, selling of wood, tobacco farming, veld fires, unauthorised wood exploitation, illegal selling of land, increase in gardening, agricultural expansion and population growth. These results lay a foundational step towards the co-construction of a governance framework for practising agriculture in forest-adjacent areas. Moreover, the paper shares methodological reflections and experiences intended to promote initiatives where the construction of a shared understanding facilitates sustainable land-use practices that foster natural resource conservation.

Keywords: participatory mapping / deliberation / social-ecological dynamics / forest-agriculture interactions / local actors

Résumé – Le recours à la cartographie participative pour une compréhension partagée des dynamiques de déforestation dans le district de Murehwa au Zimbabwe. Cet article présente les résultats d’une étude utilisant la cartographie participative pour comprendre collectivement les dynamiques de déforestation à Murehwa, une zone communale située à environ 90 km au nord-est de Harare, la capitale du Zimbabwe. L’étude a impliqué des acteurs de l’agriculture familiale, dans un processus de délibération par le biais d’exercices de cartographie participative dans 15 villages. A chaque fois, les participants ont dessiné ensemble deux cartes de leur village, l’une pour 1990 et l’autre pour 2021. Elles décrivent les limites du village, l’usage des terres et l’ampleur des changements entre les deux dates. La cartographie participative a servi de plate-forme pour la réflexion collective, les cartes obtenues facilitant les discussions. Celles-ci ont porté sur la comparaison des changements d’usage des terres entre les deux cartes et les déterminants des changements observés. Une approche thématique a été utilisée pour analyser les discussions afin d’identifier collectivement les moteurs des changements d’utilisation des terres. Les résultats montrent que la déforestation et les changements d’usage des sols qui en résultent sont principalement dus à la crise économique, à la vente de bois, à la culture du tabac, aux brûlis, à l’exploitation non autorisée du bois, à la vente illégale de terres, au développement des jardins sur berge, à l’expansion agricole et à la croissance démographique. Ces résultats constituent une étape fondamentale vers la co-construction d’un cadre de...
gouvernance pour la pratique de l’agriculture dans les zones adjacentes aux forêts. En outre, l’article partage des réflexions méthodologiques et pratiques, de façon à promouvoir des initiatives où la co-construction d’une compréhension partagée facilite les pratiques d’utilisation des terres qui favorisent la conservation des ressources naturelles.

**Mots-clés :** cartographie participative / délibération / dynamiques socio-écologiques / interactions forêt-agriculture / acteurs locaux

## 1 Introduction

Over the past decades, most countries in the tropics have gone through massive land cover changes, increasingly challenging the functioning of social-ecological systems (Lepers et al., 2005; Ellis and Pontius, 2006; Alemu, 2015; Liu et al. 2020). Of particular concern is the rapid deforestation of tropical forests (Lepers et al., 2005; Buchadas et al., 2022), amongst the world’s most biologically diverse ecosystems (Pennington et al., 2018; Hoang and Kanemoto, 2021). A better understanding of the causes and trends of deforestation in tropical forests is crucial, and constitutes a knowledge frontier, particularly on dryland. Dryland forests, which account for about 40% of tropical and subtropical land surface (David et al., 2022), make significant contributions to the well-being of billions of people, especially in the Global South (Valentini et al., 2014; Djoudi et al., 2015; Vogt et al., 2019). However, they get far less attention than humid forests in the international research agenda (Miles et al., 2006; Quesada et al., 2009; Blackie et al., 2014; Schröder et al., 2021).

In this work, we explore deforestation dynamics in a dryland landscape in the district of Murehwa, Zimbabwe. Deforestation in southern Africa leads to the loss of vital biodiversity, exacerbates soil erosion and disrupts local social and ecological equilibria (Shackleton et al., 2007; Kamanga et al., 2009), posing a threat to the livelihoods of communities dependent on forests and woodlands for sustenance, fuel and income (Mapfumo et al., 2017; Kamwi et al., 2020; Sheppard et al., 2020).

Previous studies in Zimbabwe on land use and land cover changes (e.g. Matsa and Muringaniza, 2011; Mataruse et al., 2021; Sibanda and Tsuyuki, 2022) were done using remote sensing techniques, particularly geographical information systems (GIS). Although generating key knowledge on land use changes, these works leave a notable gap which is the absence of deliberate inclusion of local actors in the process of creating a collective understanding of changes that directly affect them. Continuing a previous work on the dynamics of land use and land cover changes (Mataruse et al., 2021), we engaged local actors to collectively explore and better understand local deforestation in the area. Indeed, along with authors like Gumbo et al. (2018) or Malhi et al. (2020), we assume that while regulations and land use mechanisms exist, unsustainable land use and land cover changes are not likely to halt without collective understanding from local actors first, and a collective definition of a shared vision after.

Deforestation is a quintessential example of a wicked problem (Balint, 2011; Nikolakis et al., 2020; Lönngren and Van Poeck, 2021; Alexander et al., 2022), embodying complexity, interconnectivity with other problems, uncertainties, conflictive cultural values and high stakes for stakeholders (Churchman, 1967; Rittel and Webber, 1973). Participation has been identified as a strategy to address wicked problems (Roberts, 2000; Davies et al., 2015), by gathering diverse perspectives and producing more robust factual bases, thus reducing uncertainty. It provides local social, ethical and political insights that cannot be achieved through scientific approaches (Davies et al., 2015). Additionally, participation helps design socially acceptable and, therefore legitimate recommendations for actions (e.g. Stringer et al., 2006).

Addressing social-ecological dynamics, for instance leading to deforestation, can be done at several depth levels, which were summarised by Stroh (2015) with the iceberg metaphor. Often reviewed merely as the clearing of forests for agricultural, residential or industrial purposes, this surface-level approach of deforestation represents just the tip of the iceberg. We often only address the directly measurable visible consequences such as habitat loss, biodiversity depletion, and the release of stored carbon into the atmosphere by using methods such as remote sensing. Subsequently, we propose hardened sanctions, reforestation or afforestation programs. However, scholars like Stroh (2015) argue that such approaches only amount to reactive responses, overlooking the systemic structures and mental models shaping the social-ecological system and ultimately explaining deforestation dynamics. Beneath the surface lie submerged complexities involving intricate feedback loops, competing interests, and long-term environmental repercussions. Approaching deforestation through the lens of visible outcomes is only a first step towards the intricate web of systemic interactions and root causes.

With this work, we explore deforestation trends, drawing on the potential of a structured participatory mapping process to engage local actors towards a shared understanding. Through the mapping and discussion process, we aimed at diving below the surface to enhance the collective understanding of deforestation processes in the area. This process sort to highlight the diversity of drivers, patterns of behaviour and structures behind deforestation in Murehwa district. Since they were drawn collectively and later shared amongst groups of participants, we assumed that the maps could play the role of boundary objects (Trompette and Vinck, 2009), allowing the emergence of a locally negotiated understanding of deforestation.

## 2 Study area and context

The study was carried out in villages of three wards in Murehwa (Fig. 1) where the main forested landscapes are miombo woodlands. Murehwa District is located about 90 km northeast of Harare, the capital city of Zimbabwe, and approximately 95 km north of Marondera, a nearby city and the provincial capital of Mashonaland East. The district primarily consists of smallholder subsistence farmers who live in communal setups characterised by a communal land tenure...
system and no private property rights to land. Their livelihoods rely on rain-fed agriculture, small-scale horticultural production, remittances, and the exploitation of natural resources, particularly forests for both wood and income generation through the sale of forest products. Notably, the district is characterised by demographic changes with its population having increased from 162,167 in 2002 to 205,440 in 2022. This demographic change, according to Boserup (1965), is indicative of agricultural intensification within the region.

3 Methodology and methods

The study was part of a wider research on soil and land management, a project involving deliberative processes about soil and land management together with measures and models on farming performance and carbon balances. In this research, we initially described deforestation using data from a geographic information system (GIS). However, notable limitations arose from the prior GIS work as the resulting maps do not depict certain land uses, a shortcoming attributed to the utilisation of random forest classifier with a resolution of 30 m by 30 m. In addition, the previous GIS work does not consider what local actors think about the land use dynamics. Thus, hindering a deeper analysis and accurate identification of people’s activities and possible consequences on land uses.

This study adopted a qualitative methodology where participatory mapping was used as an extension of existing community platforms that address administrative and other diverse subjects. The method was fitting for us to propose a platform specifically for local actors to collectively consider land use dynamics and the factors which they associate with forest cover loss at a lower scale which presents more land uses. According to Corbett (2009), participatory mapping is a technique which integrates spoken words into a map, allows discussions and negotiations, gives local actors voice and power to control the drawing process, communicate their community challenges and evaluate the possibility of initiating development interventions. Alcorn et al. (2003) add that participatory mapping provides a rich contextual qualitative information and it can be adjusted to specific social-ecological systems analysis. Over time, participatory mapping progressed from basic sketch maps to its integration with GIS (Chapin et al., 2005), resulting in different forms which include hands on mapping, sketch mapping, mapping using scale maps and images, and participatory 3-dimensional models (Corbett, 2009).

3.1 Study site selection and sampling methods

This study employed multi-stage sampling in the study sites (Wards 26, 27 and 28), which were part of the Dynamics of Soil Carbon Sequestration in Tropical and Temperate Agricultural Systems (DSCATT) research project (www.dscatt.net). The first stage of sampling which we used to select villages was random proportionate to the number of villages in each ward as shown in Table 1.

From the selected villages, we used purposive sampling to select participants with ages ranging between 40 and 85 years.
for participatory mapping exercises. All participants were chosen with the help of village heads. Each participatory mapping group was made up of six participants with the intention to improve the quality of the discussions with a manageable number. The group composition also paid attention to gender equity. Participants had lived in the study area for not less than 40 years such that they had historical knowledge of the drivers of land use and land cover changes between 1990 and 2021. We chose to start from 1990, aligning with the starting date for GIS maps, thus, covering a relatively longer period to initiate deeper discussions on land use and land cover changes.

### 3.2 Participatory mapping process

Local actors collectively drew maps from memory on the ground first (hands on mapping) and most maps were transferred on to paper by one voted group member (sketch mapping). Participants were asked to discuss, agree and draw their village’s boundaries, the different types of land use and the magnitude of change which happened over the last decades. Therefore, participants drew two maps of their village, one for 1990 and another for 2021.

We used participatory mapping as a platform for collective thinking, specific to land use dynamics. The maps were used as a reference point to create discussion which involved comparing land uses and land cover between 1990 and 2021 and identification of underlying drivers of the observed changes. The discussion process was guided by the following questions: (i) Which land use and land cover changes can we see? (ii) Which events, factors or processes have caused the changes in land use and land cover between 1990 and 2021? (iii) What is the magnitude and consequences of the events or factors on the condition of the forested landscapes and management of land uses? (iv) What are your major reflections based on the observed land use changes and their drivers? (v) What can be done collectively to address the problem of unsustainable land use and land cover changes?

Maps from 13 villages were then scanned to make them soft copies. They are provided as supplementary material. Maps from two villages only which were drawn on the ground were presented as pictures. Notes were taken during drawing and post-drawing and they were analysed using thematic approach in order to come up with collectively identified drivers of land use changes. Presented in Figure 2 are pictures illustrating the collaborative hands on and sketch mapping processes.

Figure 3 provides evidence from the mentioned GIS maps of forest cover losses within the three wards. Ward 28 had the most substantial forest cover loss, with a rate of 27% over a 30-year span. Wards 26 and 27 experienced lower but noteworthy rates of forest cover loss of 19% and 14% respectively. It is also essential to note that there is a correlation between expansion of cropland and forest cover loss, with the highest rate of expansion occurring in ward 28, followed by ward 26 and finally ward 27.

### 4 Results

This section presents a sample of the participatory maps drawn at village level. The participatory maps provide more land use details compared to GIS maps which are at ward level. The approximate village scale is about 15 times lower. The section also provides an analysis of all the maps and drivers of land use and land cover changes which are outcomes of the mapping and discussions by local actors.

Figure 4 illustrates disparities in forest distribution between the southern parts of the village in 1990 and the corresponding areas on the 2021 map. The observed changes in land use and forest cover loss correspond with the increasing number of households within the village. On the 1990 map, households are concentrated along the main road, whereas the 2021 map shows a scattered distribution across the village, including in areas that previously had dense forests. These settlement patterns indicate a radical shift from the regimented settlement that were introduced during the colonial era through the Land Husbandry Act of 1951. The increase in household numbers has concurrently resulted in the expansion of cultivated fields that are encroaching into forests and wetlands as shown on the 2021 map. There is also a proliferation of gardens within the forests along the river to the north of the village as depicted on the 2021 map.

Table 2 summarises identified drivers of land use and land cover changes, specifying the respective village in which each driver was mentioned. Empty cells within the table denote instances where a particular driver was not mentioned in the corresponding villages. Maps from 14 out of 15 villages show land use changes. However, participants from one village only drew a 1990 map, consequently, no drivers of land use changes are presented in the table. Participants from this particular village cited that there have been no significant land use changes and loss of forest cover in their village, which is an explanation that is consistent with our observations in that village.

#### 4.1 Economic depression and lack of alternative sources of income

Participants attributed the loss of forest cover to the economic depression in Zimbabwe. Discussion by participants in 4 villages indicated that in 2008 a considerable number of people lost their jobs in nearby urban areas, prompting a migration back to their rural homes. Before the economic depression, those reaching maturity typically sought employment opportunities in Harare and other nearby towns. However, participants stressed that presently, the economically active youth opt to remain in the villages due to high unemployment rates in cities and towns. To sustain their families, these economically active youths resort to selling of firewood and timber from communal forests. Participants were
optimistic that employment creation or availability of alternative forest sources of income could address the problem of continuous forest cover loss since most youths and able-bodied men would be less dependent on wood and timber for income.

Commenting on the lack of sustainable alternative sources of income, one participant asserted the following:

“Small businesses for moulding and selling bricks are rampant, especially during the dry season. The moulding of bricks has grown to be an income generating project for the young able-bodied men. The curing of bricks requires large amounts of wet firewood resulting in cutting of large miombo trees. Those who mould bricks mainly sell to people building houses and shops locally and to those in Marondera. It is better for those who burn bricks to make use of coal as a way of reducing the large scale cutting of trees.”

4.2 Unauthorised exploitation and selling of wood

The Communal Land Forest Produce Act of Zimbabwe, Chapter 19:04, section 4 prohibits the inter-district sale of wood. Individuals seeking to engage in the timber trade must obtain a license from the Forestry Commission of Zimbabwe. The license specifies the type, size and quantity of timber to be exploited, the area of exploitation and the duration of exploitation. However, the need to generate income was said to have resulted in unauthorised exploitation and selling of wood. Those who are selling wood and timber are doing so without getting authorisation. Hence, participants bemoaned that those who exploit the intention to sell wood are destroying forests without any sense of responsibility. According to participants, in most villages, those who are caught exploiting wood for selling without authorisation only surrender the wood or timber to the village head and no further action is taken against them. One elderly woman reported the following:

“Unauthorised exploiters are just given endless warnings because of social bonds which exist in communal setups. Most village heads and their village development committees try to enforce forest management regulations but smallholder farmers keep violating them in order to generate income from selling of wood. The local responsible authorities are also weak, hence they cannot apprehend anyone found non-compliant.”

Participants were of the view that if those who violate forest management regulations are reported to the responsible authorities at district level and made to pay heavy fines, forests would be better preserved. However, participants said that apprehension of illegal exploiters is proving to be difficult because they mostly cut trees at night and sell to distant places.

4.3 Illegal selling of land

The Communal Land Act of Zimbabwe, Chapter 20:04, section 8 prohibits the selling of communal land by any individual including those in positions of authority. However, Participants from 5 villages expressed their displeasure over the increase in the cases of communal land being sold by both village heads and community members as one of the major drivers of land use changes and forest cover loss. One participant narrated:

“In our village, there exists an area referred to as the “new stands” which until recently, was a forest and grazing area. However, we are witnessing an ongoing loss of forests and grazing areas to migrants who are buying land from the...
village head and clear it for agricultural and settlement purposes. Considering that there has not been high yields in the recent years which people would sell to get income, our village head has constructed a house in the shortest possible time for a person who does not have a stable regular source of income. The only largest source of this income is illegal selling of land.”

In addition, participants reported that village members themselves are complicit in the illegal parcelling out of land. After realising the potential for village heads to sell fallow land belonging to community members, villagers have responded by selling their fallow land to willing buyers who in turn settle on the land and construct houses.

4.4. Increase in gardening

Participants in 12 villages mentioned that devastating and persistent droughts are forcing smallholder farmers to clear forested land especially along perennial rivers to create gardens. Gardening in forested areas is increasing as smallholder farmers intend to supplement rain-fed agriculture. According to participants, the drying up of water sources such as wells around homesteads has led to the shifting of gardens into forested areas with perennial rivers. Significant droughts in Zimbabwe in the early 2000s saw an exponential rise in the number of gardens as livelihoods were disrupted and smallholders depended more on gardens for food and income. Participants believed that having a garden in the forests along...
perennial rivers ensures improved food production and provides income to the household after selling the produce to the markets in Harare and Marondera.

4.5. Agricultural expansion

One of the reasons for massive land clearing between the two dates (1990 and 2021) which was deliberated in 11 villages by the participants is to support agricultural production. Participants emphasised that smallholders are practising extensive agriculture which requires more land in order to increase production to self-insure against food insecurity. The participants argued that exhausted soils have negatively affected yields and by clearing forested land, smallholder farmers are hoping to improve their yields through cultivation on virgin land.

4.6. Tobacco farming and curing

Participants also highlighted that forested landscapes are being lost because of tobacco farming which was reported in 3 villages in Ward 26. Smallholder farmers are massively clearing land for tobacco farming and they are cutting trees for the curing process, which takes place locally and consumes a lot of firewood. One participant during one of the discussions recounted that:

“Smallholder farmers intent to escape the vicious cycle of poverty through farming and selling of tobacco as well as meeting household income demands. Regrettably, the curing of tobacco has led to the extinction of large Brachystegia spiciformis (msasa) and Julbernadia globiflora (munondo) trees because they burn for long and produce the much...
4.7 Population increase

Population increase was discussed in 14 villages as one of the drivers of land use and land cover changes. Apart from natural population increase, participants agreed that there has been a rise in the number of migrants settling into the villages under study. Participants highlighted that in one Ward 28 village, farming households increased from approximately 56 in 1990, to 250 in 2021. This is not so consistent with national census data which shows an increase of households in the same ward from 1368 in 2012 to 1588 in 2022. This may be because of lack of access to the 1992 census data. Although there are variations between data sources, participants were convinced that people who are coming into the villages exceed those who are leaving.

Participants added that on average, elderly household heads own about 8 acres of land and from that same area. Parents are expected to sub-divide and give pieces of land to their children who grow up to start their own households. According to participants, the land is not adequate for parents and their children who become independent household heads. Therefore, new households and fields are being established in the forested areas. One participant narrated:

“In our family we are five male children and we all expected land from our parents’ field. However, the land from our parents was not enough for all of us. Therefore, four of my brothers were allocated land by our village head in the forested landscapes and grazing areas. Some families who used to have fallows gave them to their children who had grown up to start their own households.”

4.8. Veld fires

Participants in 3 villages in Ward 28 reported that veld fires are one of the major drivers of land cover changes. The majority of veld fires emanate from people’s fields and gardens. The participants highlighted that smallholders’ intention would be only to burn grass and crop residue in the gardens or fields. In most instances, the wind makes the fire uncontrollable. However, participants also indicated that there are also those who start fires and leave them unattended. In other instances, hunters also start veld fires as a way of trapping wild animals. In the process, they burn and destroy large forested landscapes. Participants argued that smallholder farmers do not collectively take the responsibility to extinguish veld fires despite the provisions outlined in the Forest Act of Zimbabwe stating that individuals should collaborate and take reasonable steps to suppress such fires. Participants were of the view that if people could unite to quench veld fires, forested landscapes would be preserved.

5 Discussion

In summary, the drivers identified by the participants in participatory mapping correspond to elements of context (economic depression), activities (brick moulding, selling of

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Table 2. Analysis of participatory maps showing drivers of land use and land cover changes in the three wards.

<table>
<thead>
<tr>
<th>Location</th>
<th>Drivers of land use and land cover changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic depression</td>
</tr>
<tr>
<td>Ward 26</td>
<td>✓</td>
</tr>
<tr>
<td>Village 1</td>
<td>✓</td>
</tr>
<tr>
<td>Village 2</td>
<td>✓</td>
</tr>
<tr>
<td>Village 3</td>
<td>✓</td>
</tr>
<tr>
<td>Village 4</td>
<td>✓</td>
</tr>
<tr>
<td>Ward 27</td>
<td>✓</td>
</tr>
<tr>
<td>Village 1</td>
<td>✓</td>
</tr>
<tr>
<td>Village 2</td>
<td>✓</td>
</tr>
<tr>
<td>Village 3</td>
<td>✓</td>
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<tr>
<td>Village 4</td>
<td>✓</td>
</tr>
<tr>
<td>Village 5</td>
<td>✓</td>
</tr>
<tr>
<td>Ward 28</td>
<td>✓</td>
</tr>
<tr>
<td>Village 1</td>
<td>✓</td>
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<tr>
<td>Village 2</td>
<td>✓</td>
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<tr>
<td>Village 3</td>
<td>✓</td>
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<tr>
<td>Village 4</td>
<td>✓</td>
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<tr>
<td>Village 5</td>
<td>✓</td>
</tr>
<tr>
<td>Village 6</td>
<td>✓</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
</tr>
</tbody>
</table>
wood, tobacco farming, veld fires), offences (unauthorised exploitation of wood, illegal selling of land) and trends (increase in gardening, agricultural expansion, increase in population).

Drivers of deforestation are thus multiple and interrelated, literature is prolific on the subject. For instance, Gotore et al. (2019)’s work on the drivers of deforestation and forest degradation in Zimbabwe reports that socio-economic factors significantly explain forest exploitation practices and increased pressure on forested landscapes. The cited economic conditions which cause deforestation, when not addressed, align with the broader context where pressure on natural resources has increased due to economic instability. Barbier (2004) and Acheampong et al. (2019), argue that agriculture-driven land use change is also on the rise, characterised by a strong need for improved food production. It is also causing severe challenges, especially in developing countries where smallholder farmers are battling food insecurity with poor intensification practices. Nath and Mwchahary (2012), argue that there is an inverse relationship between human population and forest cover. However, Agrawal (1995), states that the conclusion that population increase results in forest cover loss is often simplified, overlooking socio-economic and institutional factors. Hence, there is no consensus in literature on the role of population in contributing to deforestation.

Given such complexity and possibly diverging views, the fact that deforestation drivers are collectively recognised and discussed by local actors is a first step towards questioning practices and working together to find out alternatives. Building a shared understanding contributes to an environment propitious to reckon that change is needed. It can help local actors to have aligned objectives for their landscape, hence making it easier to reach consensus (Wondolleck and Yaffee, 2017; Metzger et al., 2021). Wondolleck and Yaffee (2017) add that having a shared understanding can help local actors harmonise short-term goals and sustainability, as well as developing collective action which has the potential to sustain socio-ecological systems (Olsson et al., 2004; Cumming et al., 2006; Ostrom, 2010; Nordman, 2021).

Although it is hardly measurable, the collective dynamics which happened during this process, both amongst participants and between us as facilitators and the other participants, largely helped to carry the next step in the necessary social-ecological transformation in Murehwa. This involved the elaboration of a shared vision with local actors through a hybrid of visioning and companion modelling methods (Perrotton et al., 2021). In contrast to other methods such as GIS which we used previously to characterise land use and land cover changes without the involvement of local actors, participatory mapping managed to capture elusive land use changes by shifting our unit of analysis from a ward to a village. We then juxtaposed these changes with locally identified drivers of land use alterations. In support of our experience, Corbett (2009) argues that participatory maps reflect what local actors consider essential when given a land use question. By bridging the gap between methods from natural and social sciences, participatory mapping was envisioned to unpack complex land use and land cover dynamics. The involvement of local actors through the participatory process had the potential to foster a sense of ownership of findings which also enhances the legitimacy of the results.

5.2. Methodological difficulties

Overall, compared with other methods like GIS and ordinary interviews, participatory mapping managed to actively engage local actors in deep reflection of the land use problems affecting them. Moreover, bringing people together to talk about complex issues and try to have a shared understanding of what is not working in the landscape they belong to, represents an important step towards a deeper understanding of land use dynamics which is essential for addressing the malfunctions effectively. However, some constraints were encountered during the participatory sessions we had.

The drawing process was characterised by extensive discussions and conversations between the participants. The participatory mapping forum was not immune to disagreements and arguments. As a result, the drawing process took long and had occasional pauses when there was a lack of consensus among the participants. However, the arguments, pauses and moments of reflection eventually culminated in a collective agreement on the way forward. The resulting maps can play a fundamental role in coming up with alternative approaches and perspectives.

Participatory mapping exercises provided a temporary forum where local actors physically met, exchanged information and collectively figured out the challenges affecting their landscape. Our observation that such platforms initiate collective thinking which may result in collective action resonates with DeGraff and Ramlal (2015) who argue that participatory mapping platforms have the capacity to enhance local participation and encourage positive social change. Brown and Eckold (2020) also argue that a public deliberative platform has the potential to reduce conflicts, increase trust and improve the quality of decisions. However, in Murehwa’s case, the platforms were temporary. They are further needed on the long run so that local actors can continue to deliberate on the root causes of deforestation and towards systemic interventions (Davelaar, 2021; Mammadova et al., 2022). Forums that enhance knowledge sharing and strengthen partnership can then be used to tailor make strategies and plans, and for collective decision-making to influence communal land use practices. Such platforms can take the form previously mentioned hybrid approach of visioning and companion modelling methods (Perrotton et al., 2021).

5.1 Experience from the participatory mapping process and what it brings

Transdisciplinary approaches characterised by the involvement of local actors and long term incremental collaboration, hold the promise for fostering transformative change by facilitating collective realisations. Participants realising that they are part of a problem of land use and land cover changes,
along with the factors which are associated with land use and land cover changes represent a step towards improved results of collaborative discussions and mutual agreements.

Participatory mapping was also limited in that the maps which were drawn by the participants, do not provide adequate quantitative data on the rates of land conversion and forest cover loss. It is also important to note that visual descriptions provided by the participatory maps do not offer scaled representations of land uses and their evolving patterns, which are inherently subjective based on local actors’ perceived impact and magnitude. As a result, some land uses such as isolated trees or small forests may have been engulfed by dominant land uses such as fields or settlements. Corbett (2009) suggests that it may be necessary to combine participatory mapping with scale-maps and images or participatory 3-D models. The incorporation of different mapping tools may settle each method’s shortcomings thereby improving results’ robustness.

Based on the first author’s experience, it is imperative for the facilitator to be always on the lookout in order to maintain a balance of power among participants to prevent any member from dominating others within the participatory mapping group. We realised that some members tend to shy away, giving more power to vocal members to dominate the discussions. Barnaud et al. (2010) reiterate that it is essential to be aware of influences including one’s own and allow people with less voice to be heard. In order to address power imbalances, the first author made sure that every group member had an equal opportunity to contribute to the discussion until a consensus was reached.

We observed some form of elite dominance which may compromise the quality of the participatory process and outcomes when people of position and power are part of the discussions. For instance, one of our participatory mapping groups was made up of a village head and we deemed it inappropriate to exclude him since he already made a lot of effort to attend the session. Coincidentally, the same group declined to draw the second map. This could be because the village head subtly influenced others in order to keep a reputation of being the most forested village in the ward. This observation suggests that while traditional leaders are experiencing a general decline in authority, there are instances where they exert their influence. Therefore, when one intends to use participatory mapping which requires people to discuss without fear of being reprimanded, it is essential to emphasise who the targeted participants are. Specific efforts should also be made towards making sure that participants are well informed of the study objectives and various processes.

On the other hand, there is always a complex scenario whereby purposive sampling involves researchers being helped by village heads to identify participants. This is because local leaders are community gatekeepers and they know their subjects. While it may be difficult to avoid this situation, our observations suggest that local leaders often select people whom they relate with well. Such individuals may be inclined to cover up where their counterparts are not doing well. Therefore, researchers may need to narrow the inclusion criteria, for instance, restricting participation to men or women only based on age or duration of residency in the area. This resonates with Chambers (1994) who argues that deliberate steps may be needed to offset research biases by working with specific community groups.

Participatory mapping processes require time to be completed, with each session taking at least three hours. The time spent in the field was further lengthened by selecting 15 villages. Though conscious of time constraints, we intended to have a fair representation of the study area by capturing diverse opinions and obtaining a comprehensive understanding of various land uses. Conducting participatory mapping in 15 villages allowed us to account for less common drivers that we could have missed if we used a smaller sample, however, at the expense of time. Therefore, one may only consider a larger sample size when they intend to have a deeper analysis, otherwise a smaller sample saves time and it may be sufficient for situational analyses.

6 Conclusion

Evidence from the participatory maps and discussions present what local actors consider as complex drivers of land use and land cover changes in Murehwa. Forested landscapes are massively decreasing which is resulting in imbalanced human and ecological interactions. If not addressed, ecological systems may completely fail to provide ecosystems services. Drivers of land use and land cover changes are entrenched in agricultural practices, lack of viable alternative sources of income, failure of institutions and population growth. The use of participatory mapping initiated conversations and an opportunity for local actors to deliberate on the lack of sustainability and the necessity for change.

In light of our findings, multiple research questions emerge which researchers may need to further interrogate and explore possible solutions. An essential question is how researchers and local actors can collectively navigate complex issues of, food security, economic empowerment and income generation without relying on forests. Hence, the following step towards systemic interventions will be to consider local aspirations for the future of Murehwa and analyse ways of reaching them and counteracting deforestation drivers. Rather than blame and injunction for change, the shared understanding promotes further deliberation, that is learning and dialogue for alternative strategies and action plans.

Supplementary material

Participatory maps: Engagement for a shared vision of land dynamics in Murehwa, Zimbabwe.

NB: Village 6 drew only 1 map. Therefore, the same map is used for 1990 and 2021.

The Supplementary Material is available at https://www.cahiersagricultures.fr/10.1051/cagri/2024011/olm.

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