


## RESEARCH ARTICLE

# Bridging scenario planning and backcasting: A Q-analysis of divergent stakeholder priorities for future landscapes

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**Abstract**

1. Many landscapes in sub-Saharan Africa have undergone rapid changes, often with negative social and ecological impacts. Avoiding (or reversing) such negative impacts requires proactive landscape planning. Scenario planning, a participatory approach that generates narratives of plausible landscape change trajectories in the future, has been widely used to support landscape planning and decisions. However, not least because of challenges arising from group dynamics, few examples exist where backcasting—the collective envisioning of a desirable future landscape and the identification of pathways to reach that future—has been applied in landscape planning.
2. In this study, building on past scenario planning work in southwestern Ethiopia, we begin to fill this empirical and methodological gap. Specifically, we used the Q-methodology to elucidate stakeholders' divergent landscape aspirations in a case study in southwestern Ethiopia.
3. Our results show that many stakeholders share a similar vision of building a future landscape that supports smallholder-based development. However, details in the envisaged pathways differ between stakeholders. Three distinct pathways were prioritized by different stakeholders: (1) Agroecological production, (2) Coffee investment and (3) Intensive food crop production. Accounting for these divergent aspirations is important when taking further steps in landscape planning.
4. We show how using the Q-methodology as a subjective assessment of stakeholders' landscape priorities can facilitate the integration of backcasting within the normative process of landscape planning. Our approach thus helps navigate conflicting stakeholders' preferences and based on that, carefully plan collective action towards a shared landscape vision.

**KEYWORDS**

backcasting, landscape, Q-methodology, scenario, stakeholder, visioning

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## 1 | INTRODUCTION

Sub-Saharan African landscapes have rapidly changed over the last decades, both through deliberate and inadvertent human intervention to meet societal goals (Blaustein, 2008; Shackleton et al., 2019). The resulting landscape change—that is, changes in the composition and function of the landscape stemming from changes in land use and land cover, social and ecosystem conditions—is driven by several interrelated factors. The main drivers are often traced to unsustainable agricultural development programs, for example, high-input modern agriculture and agricultural expansion (Blaustein, 2008; Toenniessen et al., 2008), lack of strategic land use planning that balances socio-economic and environmental goals (Enoguanbhor et al., 2021), and pressures from global environmental trends, for example, climate change (Scheba, 2018; Shackleton et al., 2019). As a result of landscape change, African countries have experienced severe biodiversity loss (Gashaw et al., 2018; Kindu et al., 2016). In many cases, rural livelihoods have also been impacted negatively because of their strong dependency on the ecosystem services generated from the landscape (Fraser et al., 2011; Griggs et al., 2014).

Efforts to mitigate the potential negative impacts of landscape change on people and biodiversity thus hinge on effective and proactive landscape planning and sustainable landscape management (Capitani et al., 2016; Marsden & Sonnino, 2008). Such comprehensive planning and management, in turn, requires an inter- and transdisciplinary approach (Lang et al., 2012) that, through the integration of the science and practice of landscape planning (Castella et al., 2014; Opdam, 2010), draws on diverse understandings of past trends, drivers, uncertainties and possible future trajectories of the focal landscape (Jiren, Hanspach, et al., 2020; Malinga et al., 2013; Tress et al., 2005).

One powerful interdisciplinary approach that integrates the science of landscape change with landscape planning is that of participatory scenario planning (henceforth scenario planning) (Schneider & Rist, 2013; Schroth et al., 2011; van Berkel & Verburg, 2012). Scenario planning supports multi-stakeholder engagement in navigating complex drivers and uncertainties of landscape change and seeks to generate narratives of plausible landscape change trajectories in the future (Daconto & Sherpa, 2010; Oteros-Rozas et al., 2015; Peterson et al., 2003). Although not all scenarios are developed in transdisciplinary contexts (Oteros-Rozas et al., 2015), a key strength of scenario planning is that the process of engaging diverse stakeholders and sectors, while accounting for key uncertainties, makes the outcomes of scenario planning highly policy-relevant. However, while scenario planning explores what *might* happen to a particular landscape, few case studies to date take the logical next steps—to also ask what *should* happen and which specific strategies are needed to reach the desired future (Johansson, 2021). The latter question often requires further steps of collectively setting a socially equitable and ecologically appropriate desirable future goal, assessing characteristics in the current system in light of the desired future, and identifying pathways to achieve the desirable normative goal of the landscape. This process of visioning and identification of strategies to achieve the desired vision state of the landscape

is captured by participatory backcasting (henceforth backcasting) (Carlsson-Kanyama et al., 2008; Robinson, 2003; van Asselt, 2012).

Backcasting is often implemented in participatory workshop settings, strengthening the legitimacy of the process and empowering decision-making processes (Capitani et al., 2016; Kok et al., 2011; Robinson, 2003). Applying backcasting for the collective visioning of the desirable future, identifying (un)desirable current system features, and devising systematic intervention strategies for achieving a shared socially and ecologically just future landscape could be extremely useful for landscape planning (van Berkel & Verburg, 2012). However, to date, very few examples exist where backcasting has been applied in landscape planning (Johansson, 2021; Muhati et al., 2018; van der Voorn et al., 2012). Reasons include difficulties in reaching a shared landscape vision due to group dynamics among the participants, including unequal power relations that lead to opinion capture by a few powerful individuals (Robinson, 2003). Similarly, stakeholders' divergent aspirations related to landscape visions and potentially divergent views regarding the (un)desirability of current dynamics may pose challenges to backcasting in group settings. As such, there is a need to better account for individual and potentially divergent stakeholder priorities, without undue influence of group processes, when working towards a widely shared vision for a sustainable future landscape—such an understanding can then inform further group processes later.

Against this background, this paper aims to fill the methodological gap between scenario planning and participatory, workshop-based backcasting, by eliciting individual stakeholder priorities for landscape development against the background of previously defined scenario narratives. Our specific objectives were to: (1) elicit the priorities of diverse stakeholders for the future of the landscape in southwestern Ethiopia; (2) examine the rationale underpinning different types of priorities; (3) explore aspects of current landscape conditions that need to be wound down or strengthened to facilitate transformation towards a desired future landscape.

To address these objectives, we applied the Q-methodology (hereafter 'Q-method'), a method used to systematically study subjective preferences or viewpoints around a given topic, in our case, preferences of the future landscape (Brown, 1996; Sneegas et al., 2021; Watts & Stenner, 2005; Zabala et al., 2018). It is an intuitive method to elicit the diversity of opinions and preferences held by different stakeholders, and provides insights into divergent stakeholders preferences and opinions about a given subject (Brown, 1996; Watts & Stenner, 2005). We used the Q-method because it integrates the strength of quantitative and qualitative methods in capturing the diverse preferences of the future landscape held by stakeholders (Brown, 1996; Watts & Stenner, 2005). In addition, in line with the aim of our study, the use of the Q-method enables understanding stakeholders' subjective preferences of the future landscape (Bredin et al., 2015; Cuppen et al., 2010; Swedeen, 2006). This, in turn, is a useful input to planning and implementing normative participatory backcasting, which aims to search for common ground and initiate informed decision making about the future landscape (see the methods section for details on the Q-method).

For the empirical case study, we focused on southwestern Ethiopia. The landscape in Ethiopia in general and southwestern Ethiopia, in particular, captures many of the social–ecological characteristics that are also typical of other African landscapes. For instance, over the last decades, Ethiopia experienced a considerable decline in natural forest and woodland through conversion to agricultural land (Amsalu et al., 2007; Betru et al., 2019; Melese, 2016; Tefera & Sterk, 2008). In its 2015 report, the FAO (2015) stated that Ethiopia's annual deforestation rate had been increasing by 1.25% since 2010. As a result, accelerated loss of biodiversity and livelihood challenges associated with reduced ecosystem services are now major challenges (Betru et al., 2019; Bufebo & Elias, 2021; Gebreslassie, 2014; Kenea et al., 2021). The direct drivers of landscape change are local (e.g. farmland expansion), but are shaped by other drivers, including demographic pressure, policy and programs that favours unsustainable agricultural growth programs, and lack of (or weakly enforced) land use plan (Berihun et al., 2019; Betru et al., 2019; Kenea et al., 2021; Marchant et al., 2018).

Indeed, within our study area, the absence of a clear land use plan is one of the key inhibitors of the harmonious integration of multiple uses of the landscape (Jiren, Leventon, et al., 2021). Notably, however, although southwestern Ethiopia is the focus of this study, the types of challenges identified, and the methodological approach taken here are likely relevant to many other rapidly changing social–ecological systems. Our methodological approach can provide an extension of exploratory scenario planning by adding information on which stakeholders from which parts of the landscape prioritize different aspects of scenarios. This, in turn, enables researchers and facilitators to identify likely agreements and conflicts among stakeholders and key stumbling blocks that need to be resolved in future workshops involving heterogeneous groups of stakeholders. Such knowledge can be invaluable to carefully plan collective group exercises in a next step towards developing a shared vision for any given landscape.

## 2 | METHODS

### 2.1 | Study area

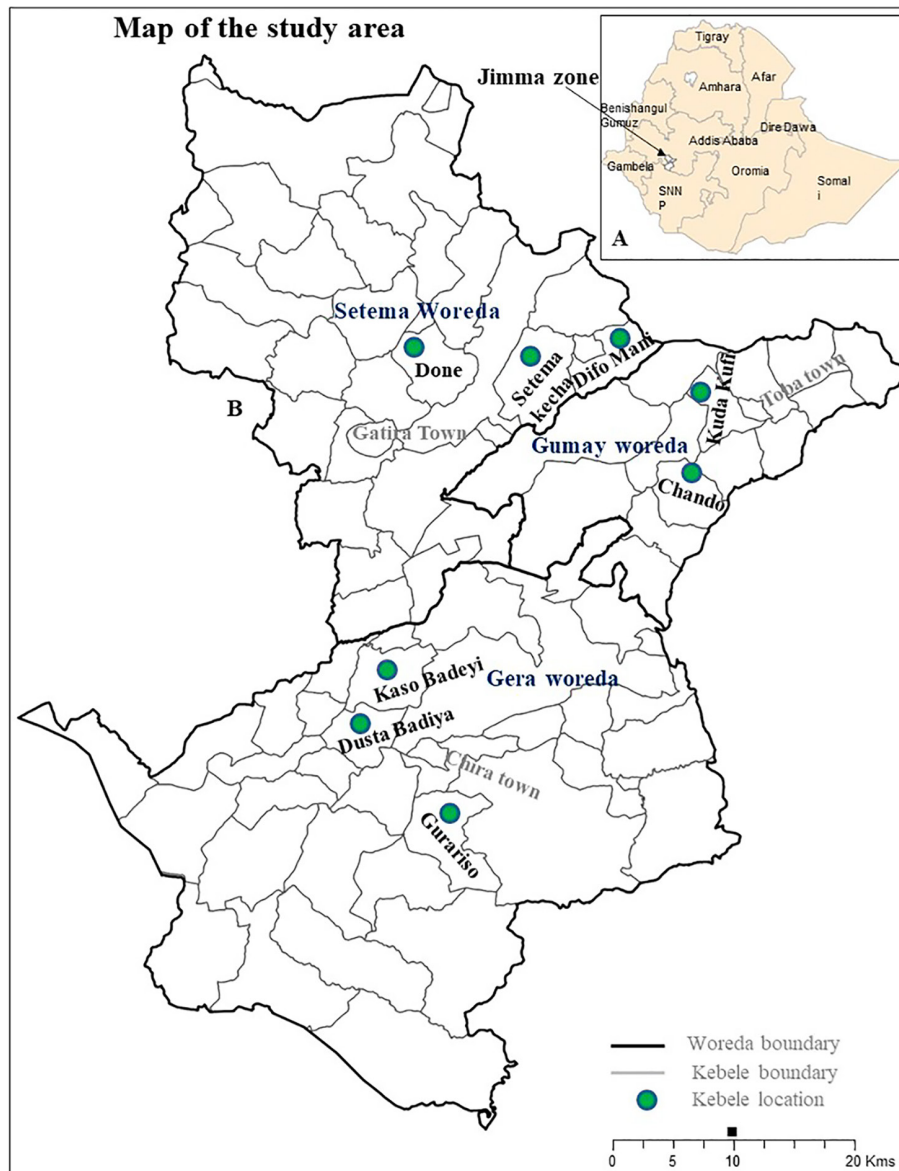
The present study was built on an in-depth scenario planning exercise we previously conducted in southwestern Ethiopia (Jiren, Hanspach, et al., 2020). Southwestern Ethiopia is characterized by rich but declining biodiversity (Friis et al., 2011; Oostdijk, 2021). People's livelihood strongly relies on the ecosystem services generated from the landscape (Jiren et al., 2022; Jiren, Leventon, et al., 2021). Over the last decades, due to pressure from a myriad of local and regional factors (Tadesse et al., 2014), the landscape has been undergoing rapid social–ecological change (Fischer et al., 2021; Jiren, Bergsten, et al., 2018; Jiren, Hanspach, et al., 2020). As a result, problems such as landscape simplification, deforestation, biodiversity loss, poverty and loss of social values have been growing (Abbink, 2011; Rahmato, 2011; Riechers et al., 2020; Tadesse et al., 2014).

Within southwestern Ethiopia, we focused on Jimma zone in Oromia regional state (Figure 1). The zone is the third tier in the country's administrative structure, that is, below the national and regional levels, and above the *woreda* (district) and *kebele* (municipality) levels. Jimma zone is one of 21 zones in Oromia and is home to nearly 3.1 million people, the majority of them belonging to the Oromo ethnic group. More than 85% of the population lives in rural areas, with subsistence agricultural activities as their main source of livelihood. However, poverty and food insecurity remain major challenges for people in the area (Jiren, Riechers, et al., 2021). Furthermore, although the study area is known for its rich biodiversity and is believed to be the origin of coffee, biodiversity loss and landscape simplification have been growing (Jiren, Dorresteijn, et al., 2018; Oostdijk, 2021).

Administratively, Jimma zone consists of 21 *woredas* or districts. Our study focused on three adjacent *woredas*, namely Gumay, Gera and Setema (Figure 1). Together, these three *woredas* encompass many of the diverse biophysical and socio-economic features of rural *woredas* in the Jimma zone (Jiren, Dorresteijn, et al., 2018, 2020). Within the three *woredas*, we selected eight *kebeles* (the smallest administrative unit in Ethiopia) to approach community-level stakeholders—Chando and Kuda Kufi *kebeles* of Gumay *woreda*, Dusta Badiya, Garariso and Kaso Badeyi *kebeles* of Gera *woreda*, and Done, Difo Mani and Setema Kecha *kebeles* of Setema *woreda* (Figure 1). These *kebeles* differ in their biophysical features, including forest cover, crop production, topography, and access to roads and other infrastructure. We selected these varied *kebeles* to capture possible differences in stakeholder preferences about the future landscape.

### 2.2 | Research design: Q-method

The Q-method is a systematic method that originated in the field of psychology (Davies & Hodge, 2007; Swedeen, 2006) but has recently been widely used in different fields, including in environmental sustainability (Sneegas et al., 2021), food security (Jiren, Dorresteijn, et al., 2020), exploring landscape preferences (Sáenz de Tejada Granados et al., 2021) and valuation of ecosystem services (Bredin et al., 2015). The method is used to systematically investigate stakeholders' perspectives, opinions or preferences towards a given subject, and the result depicts a diversity of perspectives, opinions or preferences held by stakeholders (Brown, 1996; Watts & Stenner, 2005). The Q-method focuses on identifying diverse views or preferences rather than generalizing findings from sample respondents to a larger population, unlike in a survey interview (Bredin et al., 2015; Swedeen, 2006). In an empirical setting, applying the method involves several key steps. These involve (i) the definition of a series of statements (Jiren, Dorresteijn, et al., 2020; Zabala et al., 2018) or pictures (Milcu et al., 2014; Sáenz de Tejada Granados et al., 2021) as prompts that represent the subject of the study (Q-set); (ii) selection of stakeholders (P-set); (iii) administering the ranking of Q-sets by the different stakeholders (Q-sorting); and (iv) factor analysis of the Q-sorts (Brown, 1996; Watts & Stenner, 2005; Zabala et al., 2018; Zabala & Pascual, 2016).



**FIGURE 1** Map of the study area. (a) Shows Jimma zone. (b) Shows the three woredas and kebeles within each of the three woredas. Stakeholder respondents were selected from eight kebeles, namely Kuda Kufi, Chando, Dusta Badiya, Kasi Badeyi, Gurariso, Doone, Difo Mani and Setema Kecha. In addition, stakeholder organizations from the three woredas, namely Gumay, Gera and Setema, and the zonal level participated in this study.

In the context of our study, we used the Q-method because it enabled us to address the aim of this study, which was to capture the diversity of future landscape preferences among stakeholders in Jimma zone. In addition, we used the Q-method specifically as a way to fill the methodological gap between scenario planning and backcasting, and to minimize possible problems arising from group dynamics in participatory settings. For instance, the result of the Q-method depicts the diversity of stakeholders' preferences for the future of the landscape, which can then be used as an input to plan and execute more inclusive, and thus presumably more successful, participatory backcasting through appropriate selection of topics and participants, while being able to anticipate potentially contentious issues and possibly difficult group dynamics. Motivated by these considerations, we first prepared 32 statements (Q-set) that

reflected different key features of four previously cocreated scenarios (Jiren, Dorresteyn, et al., 2020). We then identified 60 sample respondents (P-set) from different administration levels in the study area who ranked (Q-sorting) the 32 statements. Stakeholders ranked statements according to their perceived priorities using a scoreboard. The rankings were analysed statistically, and the answers to follow-up questions were analysed qualitatively to understand the reasons for the different perspectives.

### 2.3 | Data collection and analysis

We applied the Q-method to identify divergent priorities of the future landscape. At the same time, follow-up qualitative interviews

provided data on the current hampering and facilitating conditions in light of the desired future. In applying the Q-methodology, we followed six steps (Figure 2).

First, we selected the statements (Q-set). The selection of the statements followed the framing of the concourse. Typically, the Q-set encompasses broad and unambiguous statements representing various aspects of the issue under investigation (Watts & Stenner, 2005). In our case, we used the four previously coproduced scenarios as a concourse and designed an equal number of statements for each scenario. The scenarios were called 'Gain over grain: Local Cash Crops' (hereafter '*Cash crops*'), 'Mining green gold: Coffee Investors' (hereafter '*Coffee investors*'), 'Coffee and Conservation: a biosphere reserve' (hereafter '*Biosphere reserve*') and 'Food first: intensive farming and forest protection' (hereafter '*Food first*'), and differed in their social, economic and ecological characteristics (Jiren, Dorresteijn, et al., 2020) (Table 1, Figure S1A–D). Based on the scenario narratives, we initially generated 48 statements as a concourse, that is, 12 statements describing key features of each scenario (Figure 2). Second, after developing the 48 statements, we iteratively discussed these within the research team and with other researchers knowledgeable of the landscape with respect to their consistency, simplicity, clarity and completeness, such that the statements would reflect well the four scenario landscapes. In this process, we merged or removed redundant statements, further refined the wordings of the statements, and ultimately generated a total of 32 statements (Q-set), eight statements for each scenario. The 32 resulting statements emphasized key social and ecological features of the landscape presented in the narratives of each of the four scenarios. Specifically, the statements were organized around

key landscape features, means of production, the governance system and outcomes in terms of food security and biodiversity conservation (Table 2). For example, the statement '*Food crops should be grown using mechanized production methods and high-tech agricultural technologies*' (statement 1; Table 2) represents the means of production described in the narrative of the 'Food first: intensive farming and forest protection' scenario landscape (Tables 1 and 2). The final set of 32 statements was translated into the local language, Afaan Oromo, for the ranking exercise. The translated statements were then individually laminated for easy use and to avoid damage during the ranking process (Figure 2 and Figure S2).

Third, we selected the participant stakeholders (P-set) from the eight kebeles, three woredas and the zonal level (Figure 2, Table S1). Because our aim was to capture a diversity of stakeholder preferences regarding the future of the landscape, we purposively selected stakeholders representing different socio-economic and spatial settings. Accordingly, we identified 60 stakeholders: 30 local people from the eight kebeles, 16 stakeholder organizations from the woredas and 14 stakeholder organizations from the zonal level. At the kebele level, participants represented different wealth groups (rich and poor farmers), genders (men and women), religions (Muslim and Christians), community leaders and people working at local institutions such as schoolteachers, healthcare extension workers and agricultural extension agents (Table S1). At the woreda and zonal level, stakeholders were selected from different organizational types (governmental, nongovernmental, private and community-based organizations); affiliations or sectors (agricultural, biological conservation, economic and finance, administration and social sectors), and different functions (academia, research or development centres)

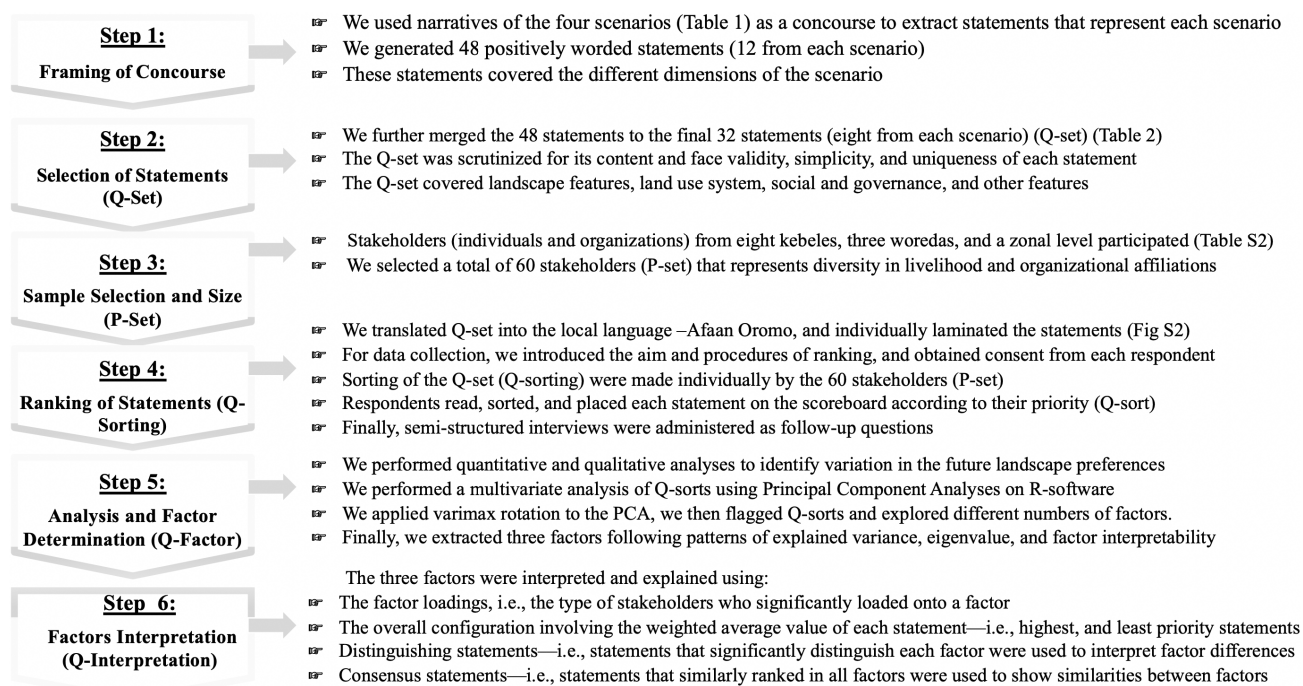


FIGURE 2 Schematic summary of the use of the Q-method to elicit subjective landscape preference

**TABLE 1** Summary narratives of the four scenario landscapes depicting the future of landscapes in southwestern Ethiopia. We codeveloped the four alternative scenarios for the Jimma landscape with stakeholders. The Q-set (statements ranked by stakeholders) for this paper were generated from the narratives of the four scenarios. The text is adopted from 'Reconciling food security and biodiversity conservation: participatory scenario planning in SW Ethiopia' by Jiren, Hanspach, et al. (2020), and 'A multi-level assessment of changes in stakeholder constellations, interest and influence on ecosystem services under different landscape scenarios in southwestern Ethiopia', by Jiren et al. (2022)

Scenario 1: Gain over grain: Local cash crops	In this scenario, by 2040, the Jimma landscape is characterized by smallholder-based intensive production of cash crops. Driven by the reinforcing feedback around increasing smallholders' income, farmers abandon the existing traditional mixed farming in favour of modernized commercial crop productions. As a result, the landscape consists of large plots of intensively managed coffee interspersed with khat and other tree plantations, including eucalyptus, grevillea and bamboo. Also, farmers actively participate in the cash crops market locally, nationally or globally. Although farmers are key actors, a shift to this scenario benefits private, organizations such as exporters due to uneven distributions of the costs and benefits of cash crops. In this scenario, the expansion of cash crops reduces food production, leading to supply-side constraints of food crops and negatively influencing biodiversity through intensive management and habitat loss
Scenario 2: Mining green gold: Coffee investors	In this scenario, private investors-based large-scale coffee investment is prioritized. Driven by the reinforcing feedback around increasing national income, private investors acquire large plots of land and invest in large-scale modernized production of a specialized coffee variety destined for a global export market. The shift to this scenario landscape is facilitated by transferring communal, forest and farmland to investors. As a result, large areas of natural forests and farmland have been converted into coffee plantations. Thus, the landscape consists of intensively produced large-scale coffee monoculture. Food crop production is maintained by smallholders, mainly in areas unsuitable for coffee plantations, such as on steep hills. In this scenario, private investors are the dominant actors benefiting from the coffee investment, while a majority of smallholder farmers remain food insecure due to landlessness and low wages. In addition, the expansion of coffee plantations caused a decline in farm and forest biodiversity
Scenario 3: Coffee and conservation: Biosphere reserve	In this scenario, by 2040, the Jimma landscape is globally recognized for its biosphere reserve and nature conservation. Driven by the reinforcing feedback around improving the natural capital, farmers engage in agroecological practices that maintain biodiversity while also diversifying their income sources, such as through organic coffee production and export, ecotourism and carbon trade, and sustainable production of food crops. As a result, a biosphere reserve is established in the landscape involving strict biodiversity protection areas in the core zone, eco-friendly cash crops production areas in the buffer zone, and sustainable food production areas in the transitional zone. The landscape thus consists of a mosaic of diversified farmland and forests that combines nature conservation, sustainable agriculture and tourism sites. In this scenario, diverse stakeholders involving smallholders and their organizations and private, governmental and non-governmental organizations are among the key actors. On the one hand, the establishment of biosphere reserve and agroecological production enhanced biodiversity. On the other hand, although food security improves due to diversified crops and income sources, economic growth is slow compared to the other scenarios
Scenario 4: Food first: Intensive farming and forest	In this scenario, farmers-based intensive food crop production is prioritized. Driven by the reinforcing feedback around increasing household income and food self-sufficiency, farmers (wealthy model farmers) abandon the existing traditional farming in favour of industrial agriculture and efficient farming of food crops. As a result, the landscape consists of industrialized agriculture, where valuable food crops and livestock are managed through intensive means of production, such as through the increased application of agrochemicals. Whereas large cereal fields now dominate flat areas, small patches of natural forest are strictly protected outside farmland. The dominant stakeholders are model farmers, private traders, input suppliers and government organizations. However, due to unequal power relations, private traders tend to capture the benefit from the food crops market. In this scenario, increased food production enhances food availability. However, most farmers remain food insecure due to low dietary diversity and fluctuating food prices-also, biodiversity declines due to farm expansion and agrochemical use

(Table S1). Typically, the size of the P-set is smaller than the size of the Q-set (Watts & Stenner, 2005; Zabala et al., 2018). However, due to high variability in the characteristics of stakeholders within the landscape, and because we covered geographically variable locations transcending three administration levels, our P-set ( $n = 60$ ) was larger than the Q-set (32 statements).

Fourth, we administered the ranking of the Q-sets (Q-sorting) in February and March 2021, starting from kebele, woreda and finally zonal level stakeholders (Figure 2). Stakeholders were asked to rank statements based on their preferences regarding what they would like their landscape to look like by 2040. We decided on a timeframe of approximately 20 years into the future because the previous study generated scenarios for the coming 20 years (Jiren, Hanspach, et al., 2020). The ranking exercise followed three key steps. Initially,

the 32 statements were assigned a nominal identifying number for the purpose of data recording—which was not disclosed to the participants. Next, the scoreboard for ranking the statements was prepared as a quasi-normal distribution in a double pyramid (diamond) shape. The ranking scoreboard thus had 32 boxes involving one most preferred statement (+4), to a least preferred statement (−4) (Figure 3 and Figure S2). Finally, before the scoring, we explained the purpose of the study, and the interview procedure and obtained voluntary verbal consent for participation in the study.

Procedurally, the actual ranking exercise was done individually by each stakeholder, but the procedure was slightly different between the stakeholders at the kebele and woreda, and zonal levels. On the one hand, for the local people at the kebele level, because many local people were illiterate, the ranking was done

**TABLE 2** The three prioritized future landscapes (factors) and weighted average Z-scores of the statements in each factor. The four scenarios (concourse) from which the 32 statements were derived are presented in the first column. Each scenario was represented by eight statements (Q-sets). The second column indicates the statement number. The 32 statements (Q-sets), which each stakeholder ranked, are presented under the third column. Finally, the Z-scores, the weighted average value of each statement associated with the three prioritized future landscape (factors), are shown in the final three columns. A double asterisk (\*\*) indicates the eight highest-ranked statements in each priority future landscape (i.e. +4, +3 and +2 in the Q-score board). A single asterisk (\*) indicates the 16 intermediate-ranked statements in each priority future landscape (i.e. +1, 0 and -1 in the Q-score board, see Figure 3 and Figure S2), and no asterisk indicates the eight least important statements in each priority future landscape (i.e. -2, -3 and -4 in the Q-score board, see Figure 3 and Figure S2). Statements with the ^ sign show that the factor is significantly different from other factors regarding the score given to the statement (i.e. that particular statement distinguishes the particular factor from others,  $p \leq 0.001$ )

Four scenarios—Concourse of the Q-set		Statement no.	Statements (Q-set)	Z-score of statement		
				Agroecological farming	Coffee investment	Intensive food crops
Food first: intensive farming and forest protection	1	Food crops should be grown using mechanized production methods and high-tech agricultural technologies	-0.20*	-0.02	1.82**^	
Food first: intensive farming and forest protection	2	High-yielding varieties of food crops such as teff, maize, sorghum, and wheat should be a priority in the landscape	0.26*	-0.12*	1.59**^	
Food first: intensive farming and forest protection	3	Land and other natural resource ownership should be granted to local people, but the government plays a major role in land management	0.97**	0.23*	1.20**	
Food first: intensive farming and forest protection	4	Cooperatives, input marketing companies, and other financial institutions should be strengthened in the landscape	0.95**	0.47*	1.11**	
Food first: intensive farming and forest protection	5	Food security should be achieved through boosting mechanized agriculture such that a surplus of cereals can be exported from here to other regions	0.92*	0.22*	0.97^	
Food first: intensive farming and forest protection	6	Biodiversity conservation and food crop production should be harmonized through the separation of intensively used farmland and strictly protected forestland	0.27*	-0.12*	1.15**	
Coffee and Conservation: a biosphere reserve	7	Food security should be achieved through diversified food production by smallholder farmers	1.22**	0.17*	0.07*	
Food first: intensive farming and forest protection	8	Innovative and progressive farmers producing food crops should be integrated into the regional, national, and East African markets	0.39*	0.74**	0.84*	
Food first: intensive farming and forest protection	9	Government policy should focus on securing national demand for food via boosting levels of food crop production in the Jimma landscape	1.27**	0.61*	0.99**	
Mining green gold: Coffee Investors	10	Coffee production in the landscape should be maximized, using high-yielding cultivars and the most advanced production techniques	0.86*	0.86**^	0.71*	
Coffee and Conservation: a biosphere reserve	11	Biodiversity conservation, both in the forest and farmland, should be integrated via whole-of-landscape planning, possibly through the creation of a new biosphere reserve	1.13**	0.37*	0.40*	
Coffee and Conservation: a biosphere reserve	12	Informal institutions such as Dabo, Dado, and Diddaro, and other social-sector institutions should be strengthened	0.64*	0.18*	0.16*	
Mining green gold: Coffee Investors	13	Food security should be ensured through economic wealth generated by the coffee industry	-0.79*	0.18*	0.41*	
Coffee and Conservation: a biosphere reserve	14	Smallholder farmers should be protected from losing access to land and land resources through strengthening land tenure security and pluralistic resource governance	0.76*	0.56*	0.48*	
Coffee and Conservation: a biosphere reserve	15	Government policy should focus on the conservation of resources, sustainable development, and green growth for improved natural capital, smallholders' income, and cultural values	1.34**^	0.84**	0.60*	

TABLE 2 Continued

Four scenarios—Concourse of the Q-set	Statement no.	Statements (Q-set)	Z-score of statement		
			Agroecological farming	Coffee investment	Intensive food crops
Gain over grain: Local Cash Crops	16	Government policy should facilitate smallholder commercialization in the form of for-profit cash crop production for regional markets	0.83*	0.55*	0.33*
Coffee and Conservation: a biosphere reserve	17	Local producers should be protected by a strengthened land tenure system and measures that support their income, such as coffee certification and protection from market failures	0.94*	0.64**	0.14*
Gain over grain: Local Cash Crops	18	Food security should be achieved by using money made from cash crops to purchase food	-1.35	-1.09	0.01*
Gain over grain: Local Cash Crops	19	Market institutions such as ECX and the transition of smallholders to commercial farming should be strengthened	0.81*	0.63*	1.15**
Mining green gold: Coffee Investors	20	Government policy should focus on increasing national earnings and profit through direct exporting of local products	-0.04*	0.42* <sup>^</sup>	-0.09*
Mining green gold: Coffee Investors	21	A priority should be to increase the nation's income and food security— biodiversity conservation will ultimately benefit from growth and development	-1.53 <sup>^</sup>	0.49*	-0.37*
Gain over grain: Local Cash Crops	22	Local people, farmers, and merchants should engage in cash crop production for the regional market and beyond	-0.88*	-1.59	-0.38*
Gain over grain: Local Cash Crops	23	Coffee, khat, and eucalyptus should be grown, for example, through the regular clearing of undergrowth, and the use of agrochemicals	-0.96	-1.53	-0.60*
Mining green gold: Coffee Investors	24	Investors with large amounts of capital and foreign firms should be leading actors in the landscape	-0.65*	1.56** <sup>^</sup>	-0.67*
Mining green gold: Coffee Investors	25	Large-scale domestic and global private investors should be attracted to invest in the coffee sector in the landscape	-1.13	1.22** <sup>^</sup>	-0.77
Coffee and Conservation: a biosphere reserve	26	The landscape should be a multifunctional mosaic of cropland, pastures, and forest resources	1.39** <sup>^</sup>	-0.37*	-0.91
Mining green gold: Coffee Investors	27	Large-scale commercial coffee production by private investors should be prioritized in the Jimma landscape	-1.04	0.84** <sup>^</sup>	-1.13
Gain over grain: Local Cash Crops	28	Forest degradation and deforestation should be minimized by encouraging the planting of useful trees on farmland	0.12*	-0.78	-1.16
Gain over grain: Local Cash Crops	29	Cash crops such as khat, eucalyptus, and grevillea should be a priority in this landscape	-1.41	-1.86	-1.19
Coffee and Conservation: a biosphere reserve	30	A mixed farming system involving traditional agricultural practices and modern techniques such as crop rotation and intercropping should be encouraged in the landscape	1.15** <sup>^</sup>	-1.41	-1.47
Mining green gold: Coffee Investors	31	The government should control and allocate land to investors where it is deemed efficient	-1.76	0.95** <sup>^</sup>	-2.05
Gain over grain: Local Cash Crops	32	Market mechanisms should govern ownership of resources	-1.62	-2.21	-2.16

Factors	Highest priority statements			Moderate priority statements			Least priority statement		
	+4	+3	+2	+1	0	-1	-2	-3	-4
<b>Agroecological farming</b>	26*	15	30	16	14 <sup>#</sup>	13	23	29 <sup>#</sup>	31
		9	11	17 <sup>#</sup>	12	24	27	21	
		7	3	5	8	1	25*	32	
			4	19	6	28*	18		
				10	2*	20			
<b>Coffee investment</b>					22				
	24	25*	27	19	4	13	1	23	32
		31	15	9	20	7	28*	22	
		10	8	14 <sup>#</sup>	11	26*	18	29 <sup>#</sup>	
			17 <sup>#</sup>	16	3	2*	30		
<b>Intensive food crops</b>				21	5	6			
					12				
	1	2*	4	8	11	20	25*	29 <sup>#</sup>	32
		3	6	10	16	21	26*	30	
		19	7	15	12	22	27	31	
		9	14 <sup>#</sup>	17 <sup>#</sup>	23	28*			
			13	5	24				
				18					

**FIGURE 3** Factor arrays. The 32 Q-sorts in each of the three factors. Under each factor, a statement number under +4 shows the highest scored priority statement, while a statement number under -4 indicates the least priority statement for the factor. For example, statement number 26 (see the actual statement number 26 in Table 2) was the highest priority statement for stakeholders in factor 1 (Agroecological farming). For each factor, the eight statements under +4, +3, and +2 represent priority statements; the following 16 statements under +1, 0 and -1 represent moderate priority; and the remaining eight statements under -4, -3 and -2 represent the least priority statements. Statements with # superscript are the consensus statements. That means there is no significant difference in the score given to these statements in all three factors. Statements with \* superscript are the statements distinguishing all factors. That means there is a statistically significant difference in the score given to these statements in all three factors ( $p \leq 0.001$ ).

by repeatedly reading each statement to the respondent. The respondent then decided the priority for each statement and placed it on the scoreboard (Figure 3 and Figure S2). On the other hand, stakeholders at the woreda and kebele levels did the ranking independently by themselves because they were all literate. Here, each respondent was given the 32 statements and asked to read and comprehend all the statements before prioritizing them. After reading all statements, we then asked the participant to classify the 32 statements into three categories as 'priority statements', 'moderate priority statements' and 'low priority statements'. We then showed how to place the statements on the scoreboard and asked the participant to undertake the ranking. Starting from the 'priority statements', the participant identified and placed the highest priority statement on the box denoted as (+4), the three next highest priority statements on the box denoted as (+3), and then the four next highest priority statements on the scoreboard under (+2). After this, we asked the participant to switch to the 'low priority statements' and rank them on the scoreboard under -4, -3 and -2, similarly to the most important statements. Following this, we asked the participant to identify five priority statements from the 'Moderate important' statements and place them on +1, the next six statements under 0, and the remaining five statements under -1. For the illiterate kebele level participants, we followed the same process in principle, but unlike with literate participants, instead of handing the 32 statements to them, we repeatedly read each of the statements and asked the participant to classify and rank them—again, first into three broad groups,

and then more specifically within those groups. After completing the ranking, we asked participants to re-read all statements on the board or re-read the entire ranking to them and allowed changes where necessary (Figure 2).

Fifth, after the Q-sorting we asked follow-up qualitative questions on four issues: (1) reasons for ranking of the priority statements, (2) reasons for ranking the lowest priority statements, (3) existing socio-political and biophysical system features that should be wound down to achieve the priority statements and (4) existing socio-political and biophysical system features that should be strengthened to achieve the priority statements (Figure 2).

Sixth, we identified and interpreted groups of respondents or 'factors' (Q-sort analysis). We performed quantitative and qualitative analyses to identify variations in prioritizing the future landscape explained by the 60 stakeholders (P-set). Initially, we performed a multivariate analysis of the Q-sorts to identify different preferred future landscapes (factors). For the multivariate analysis, we chose principal component analyses (PCAs) using the 'QMETHOD' package in R programming language in R Studio (Zabala, 2014). In determining the factors, we applied a varimax rotation (factor rotation) to the PCA, a standard approach to improve the clarity and interpretability of the factors, and we flagged Q-sorts that were representative of the resulting factors (Zabala, 2014). In this process, following the initial exploration of four- to seven-factor solutions, we finally extracted three factors that explain the variation in prioritizing the future landscape. We extracted three factors after visual inspection

**TABLE 3** Summary of key features of the three prioritized landscapes. The last two columns show some key perceived obstacles and opportunities to achieve the prioritized future landscape

Indicators	Agroecological farming (n = 21)	Coffee investment (n = 16)	Intensive food crops (n = 15)
The main goal	Ensure poverty reduction, and biodiversity conservation	Ensure poverty reduction and facilitate accelerated national growth	Ensure poverty alleviation and achieve food self-security at the national level
Preferred landscape feature for 2040	It consists of a mosaic of the different land use including low-intensity farming of food crops, eco-friendly agriculture such as shed coffee farming, and strict forest protection	It consists of intensively managed large-scale specialized coffee plantations. In addition, food crops are produced on marginal land	It consists of a mix of intensively produced food crops on large areas of farmland and patches of forest protected outside the farmland
Farming strategy	Agroecological and organic farming	Large-scale high input and industrial agriculture	Conventional intensification, including mechanized farming
Preferred equity measures	Policy that protects smallholders from eviction through land tenure and resource security, promotion of fair-trade and equitable benefit sharing among stakeholders	National financing of growth such as infrastructure, compensation of land expropriation, and transfer of skills and capital from investors to farmers	Protecting smallholders from crop market failure, and reducing elite benefit capture through strengthening farmers cooperatives
Preferred resource governance	Smallholders own and control their land except for the right to sell, and participatory mode of resource governance.	Smallholders own the land, but the state control and allocates land for different uses with fair compensation	Smallholders own and control their land except for the right to sell. The state protects resources such as forests.
Key stakeholders	Informal local institutions; cooperatives; government and NGOs	Government stakeholders; coffee investors; local people; traders; financial institutions	Smallholder producers; cooperatives; traders and input suppliers; microfinance
Food security	Stallholder farmers own production of diversified food crops	Smallholder farmers own food production, availability through food supply	Smallholder farmers own food production, availability through food supply
Biodiversity conservation	Integrated into the farmland and on spatially protected core zones of the biosphere reserve	Segregated from farmland and protected as forest land.	Segregated from farmland and strictly protected as forest land.
Existing obstacles	Growing agricultural intensification, landscape homogenization, weak stakeholders' coordination; political instability; corruption, lack of meritocracy; weak capacity of local stakeholders; increasing population and land scarcity	Lack of investment insurance; conflict between the local people and investors; fluctuating coffee market; political instability; poor infrastructure; limited access to credit services; increasing population	Weak enforcement of land use plan; inaccessibility of agri-extension and credit; high cost of farm inputs; political instability; low rate of technology adoption; traditional farming; increasing population
Existing opportunities	Good experience of agroecological farming; the presence of formal conservation strategy; the increasing number of NGOs; the presence of rich biodiversity; Participatory Forest Management	The presence of conducive investment policy and incentives; availability of land and labour	The presence of good policy support for agricultural intensification; increasing agri-modernization; high demand for food crops

of patterns of explained variance in a scree plot because the eigenvalue was high and because the three factors coherently explained the variation in priority regarding future landscape (interpretability of the factors) (Zabala, 2014) (Figure 2).

We used different means to interpret and characterize the factors. We mainly considered the following points to interpret, characterize and compare the factors. (1) We characterized each factor in terms of the nature of the factor loadings, that is, the type of stakeholders who significantly loaded onto a similar factor. Here, stakeholders who loaded onto a similar factor had similar preferences. (2) We characterized each factor in terms of the overall configuration of statements under each factor by observing the patterns of preferences involving landscape features and the social and governance aspects prioritized. (3) We accounted for the statement score in characterizing each factor. Here, we used the weighted average value of each statement to explain each factor's highest and least priority. Accordingly, highest-ranked statements (i.e. +4, +3, +2) were considered the highest priority for the factor, and lowest-ranked statements (i.e. -2, -3, -4) were interpreted as the least priority in each factor. (4) We used factor distinguishing statements to interpret the difference in the score given to a particular statement between factors. Here, we used two categories of distinguishing statements. On the one hand, we used *factor distinguishing statements (distinguishes f1 or f2 or f3 only)* to characterize each factor (Section 3.2). *Factor distinguishing statements* are those statements that distinguish one factor from the rest of the two factors. For example, a particular statement is considered a factor distinguishing statement under factor 1 when the score given to the statement in factor 1 is significantly different from the score given to that particular statement in the remaining two factors ( $p \leq 0.001$ ) and there is no significant difference on the score given to statement 1 between the remaining two factors (Zabala, 2014). On the other hand, we used a *statement distinguishing all factors (distinguishes all fa, f2 and f3)* to characterize the overall difference between the factors (Section 3.3). A *statement distinguishing all factors* is a statement that distinguishes all factors, meaning the score given to the statement in all factors is significantly different. For example, a particular *statement distinguishes all factors* when there is a statistically significant difference in the score given to that statement in all three factors ( $p \leq 0.001$ ) (Zabala, 2014). (5) We used consensus statements to show similarity between the factors regarding the score given to the statement. For example, a given statement is considered a *consensus statement* when there are no significant differences between the score given to this particular statement. That means stakeholders similarly scored this statement, and we used these statements to characterize all three factors (Section 3.3) (Figure 3).

The qualitative data obtained from the follow-up questions were transcribed from field notes. The transcribed data were analysed through content analysis in the MAXQDA qualitative data analysis software version 11 (VERBI, 2019). First, we deductively created three nodes representing the three factors. We then created four nodes representing: (1) reasons given to why the priority

statements received the highest score, (2) justifications for why statements with the least score were the least priority, (3) current conditions that stakeholders perceived as hindrances to achieving the prioritized landscape and (4) current conditions that stakeholders perceived as enabling conditions to achieve the prioritized landscape. Under each of these nodes, we then inductively coded and categorized justifications and existing conditions under each of the approaches.

For this study, verbal consent was obtained individually from each stakeholder participant prior to administering the ranking of Q-sorts. We relied on verbal consent because many of the respondents had no formal education (illiterate) and were unable to make written consent, and the identities of respondents were kept anonymous, so there is minimal risk involved in the study. This study was conducted as a follow-up to previous research work in the study area, and ethics approval was granted for the project by Leuphana University (EB-Antrag 201,702-04-Fischer\_tjSESY).

## 3 | RESULTS

### 3.1 | Overview of landscape preferences

Based on the 32 Q-statements (Table 2), the principal component analysis (PCA) produced three distinct sets of future landscape preferences (F1, F2, and F3). Together, F1, F2 and F3 explained 62% (22.5%, 22% and 17.5% respectively) of the total variance in rankings and captured the priorities of 52 stakeholders ( $N = 60$ ). Based on their content, we labelled these three factors (F1) Agroecological farming ( $n = 21$ ), (F2) Coffee investment ( $n = 16$ ) and (F3) Intensive food crops ( $n = 15$ ). Correlations among the three factors were generally low (Pearson correlation  $\leq 0.4$ ), but a moderate correlation was observed between F2 and F3 (Pearson correlation = 0.6). Below we characterize the three factors based on the preferred features of the landscape. We then compare the similarities and differences between the factors, and finally present perceived obstacles and opportunities to achieve the preferred future landscape.

### 3.2 | Landscape preferences

#### 3.2.1 | Factor 1: Agroecological farming

Among the 21 stakeholders who significantly loaded onto this factor, six, seven and eight of them were from kebele, worda and zonal levels respectively. Based on the statements (hereafter #) that significantly distinguish this factor ( $p \leq 0.001$ ; #26, 15, 30 and 21; Table 2, Figure 3), and statements that received the highest scores (#26, 15, 9, 7, 30, 11, 3 and 4; Table 2, Figure 3), stakeholders who loaded onto this factor had a strong preference for a multifunctional landscape that integrates agricultural production and biodiversity conservation through implementing a traditional mixed farming system that sustainably balances between food production and

biodiversity conservation, pluralistic resource governance that empowers local people and promotes mutual learning, and protection of forest and biodiversity for their intrinsic and instrumental values (#26, 15 and 30; Table 2). Specifically, they would like to see a new biosphere reserve established in the Jimma landscape. Accordingly, the landscape is classified into three different land use zones. The outer parts of the landscape (transitional zone) consist of mosaics of different types of food crops, pasture, fruits, coffee and vegetables interspersed with woody vegetation in the farmland. In the next land use zone (buffer zone), coffee, honey and other spices are produced with low-intensity and eco-friendly production methods. The third zone (core zone) of the landscape would be used for the protection of forest and biodiversity conservation (#11; Table 2).

Poverty alleviation and biodiversity conservation were the main goals of this landscape (Table 3). To achieve this goal, stakeholders in this factor prioritized measures involving spatial integration of crop production and biodiversity conservation within an overall land use system (#11, 26; Table 2), diversified and traditional low-input agriculture that harmonizes production and conservation on the farmland (#3, 7; Table 2); and diversifying smallholder income from farm income and promotion of nature-based economy involving organic coffee certification and engagement in the global coffee fair-trade scheme, development of ecotourism and carbon trade schemes (#3, 7, 30, 11, 26; Tables 2 and 3).

Stakeholders in this factor favoured smallholder-centred development. As a result, the programs that empower smallholders by strengthening their land tenure security, reducing their vulnerability to land grabbing, diversifying their income sources and strengthening informal institutions received priority scores in this factor (#17, 30, 3; Table 2). Also, multi-stakeholder governance of natural resources (including land) received priority preferences because they perceived that equitable sharing of costs and benefits of the landscape management, social development empowerment and conservation of biodiversity could be best achieved through pluralistic governance arrangements (#17, 3; Table 2).

Stakeholders who loaded onto this factor neither wanted land commodification nor state control and allocation of land to capital investors (#31 and 32; Tables 2 and 3). In addition, expansion of cash crops (#29 and 18; Table 2), investor-based large-scale coffee plantations (#25 and 27; Table 2), intensive agricultural production practice (#23; Table 2) and the spatial segregation of land between food production and biodiversity conservation (#21; Table 2) received the lowest priority due to the perceived negative impact on the social equity and biodiversity conservation (#21; Table 2, Figure 3).

Follow-up interviews indicated that the growing conventional agricultural modernization programs involving heavy use of inorganic agrochemicals, farm mechanization and landscape homogenization were perceived as impediments to transitioning to this preferred future landscape (Table 3). In addition, institutional problems such as lack of coordination between sectors, the weak capacity of policy implementers, and political instability appeared as impeding issues. In contrast, the existence of formal policy and discourses around green development and the increasing presence

of NGOs that favour a multifunctional landscape were considered opportunities that could drive towards the realization of this preferred future landscape (Table 3).

### 3.2.2 | Factor 2: Coffee investment

Sixteen stakeholders significantly loaded onto this group, eight from kebeles, three from woredas and five from the zonal level. The distinguishing statements ( $p \leq 0.001$ , #24, 25, 31, 10, 27 and 20; Table 2, Figure 3), and highest-ranked statements (#24, 25, 31, 10, 27, 15, 8 and 17; Table 2, Figure 3) indicated that stakeholders in this landscape would like to see a future landscape with large-scale commercial plantations of high-yielding cultivars of coffee on large parts of the landscape, while food production is maintained in a marginal land unsuitable for coffee investment.

Poverty alleviation and accelerating national growth appeared as key goals of the landscape (Table 3). To achieve these goals, priority was given to increasing the national income by increasing the production of coffee, and generating income from efficiency in production, economies of scale in the coffee sector and export earnings (#10, 24, 27 and 31; Table 2). Specifically, stakeholders sought to achieve the national growth goal from this landscape by attracting domestic and foreign capital investors, expansion of large-scale coffee investment, maximizing land use and coffee production efficiency, and employing the most advanced coffee production techniques (#10, 24, 25 and 27; Table 2). In this preferred landscape, economic gains precede biodiversity conservation, and national income raised from coffee export would ultimately benefit local food security and biodiversity conservation (#10, and 8; Table 2). The low productivity in the existing traditional farming and low capacity of smallholders'-based coffee production and the inefficient in the coffee sector drove preference for this landscape.

Large-scale domestic and foreign private coffee investors appeared as key actors in this factor (#24, 25 and 27; Table 2). They were believed to link the landscape to the global market, increase national income and accelerate national growth. Therefore, the increased presence of private coffee investors in the landscape, expansion of financial institutions that provide agricultural loans and input marketing companies was deemed key intervention priorities for this landscape (#24, and 4; Table 2, Figure 3). Also, in terms of resource governance, smallholders are the owners of resources. However, government allocate land to investors where it is deemed efficient through appropriate and fair payment of compensation to landowners (#31; Table 2).

Despite the preference for private investment, stakeholders in this factor were against land commodification and complete control of land by the state (#32; Table 2). Similarly, they were against a mixed farming system involving traditional agriculture due to its low productivity (#28, 30; Table 2). Finally, the expansion of cash crops such as khat and eucalyptus was considered the least priority because of likely negative social and ecological impacts (#22, 23, 29; Table 2, Figure 3).

The growing conflicts between local people and investors, lack of good governance and political instability, lack of investment assurance by the government, absence of financial institutions that lend money to investors, poor infrastructural development in the region, fluctuating global markets and price of coffee were perceived as stumbling blocks to transition to this preferred landscape (Table 3). In contrast, the presence of policies that encourage large-scale coffee investment in Ethiopia and the availability of land and a low-cost labour force were considered current system characteristics that could facilitate the transition to this preferred landscape (Table 3).

### 3.2.3 | Factor 3: Intensive food crops

Fifteen stakeholders defined this factor, that is, 11, three and one participants from kebele, woreda and zonal levels respectively. However, stakeholders only from two kebeles loaded onto this factor while none from the remaining six kebeles loaded to this factor. The statements that significantly distinguished this factor ( $p \leq 0.001$ ; #1, 2 and 5; Table 2, Figure 3) and the highest scored statements (#1, 2, 3, 4, 6, 7, 9 and 19; Table 2) showed that stakeholders in this factor seek a landscape dominantly covered by food crops such as teff *Eragrostis tef*, maize *Zea mays*, wheat *Triticum* and sorghum *Sorghum bicolor*.

In this factor, high priority was put on achieving the goals of poverty alleviation and national food self-sufficiency (Table 3) achieved through increasing production and commercialization of food crops. The key features of this factor involve intensive farming techniques such as increased use of agrochemicals and high-yielding crop varieties (#1, 2 and 7; Table 2); landscape-level industrial agriculture, and mechanized farming such as the use of tractors to maximize land use and production efficiency (#1, and 2; Table 2); and the spatial segregation of land use between farmland versus patches of protected forest areas dedicated to biodiversity conservation (#6; Table 2). Preference of this factor was driven by the dissatisfaction with the traditional low-intensity farming—which had been the practice in the landscape for several decades, as a strategy to feed the growing population of the country (Table 3). Market and financial institutions and innovative and progressive farmers, as opposed to large-scale investors, appeared to be key actors who would transform the landscape (#8, and 19; Table 2). Therefore, measures that support smallholder farmers, including strengthening rural institutions such as farmers cooperatives, microfinance and market institutions, and smallholders' integration into the local, national and regional food crops markets (#4 and 19; Table 2) as the equitable and preferred strategy to achieve the goals of poverty alleviation and food self-sufficiency. In terms of resource governance, smallholders are the owners of resources such as land (#2, 3; Table 2), because the land was viewed as an intergenerational resource and insurance against land consolidation by few capital investors. However, they saw a key role for the government in land management,

particularly in monitoring against land commodification and enforcing strict control of land resources such as protected forest areas (#3; Table 2, Figure 3).

Landscape multifunctionality, that is, the present mosaic of cropland, pastures and forest resources, was viewed as the least important feature of the preferred future landscape (#26; Table 2), and an impediment to food self-sufficiency (Tables 2 and 3). In addition, stakeholders who loaded to this factor were against the expansion of cash crops, including khat *Catha edulis* and eucalyptus *Eucalyptus* spp., due to their perceived negative social and ecological impacts (#25, 29–32; Table 2, Figure 3). Moreover, the expansion of large-scale coffee plantations, on the one hand, and the traditional mixed farming method, on the other hand, appeared as the least priority in this factor (#25–32; Table 2, Figure 3).

Analysis of follow-up qualitative questions showed that weak enforcement of land use plan, inefficiency and inaccessibility of agricultural extension services, bad governance and political instability, dominance of traditional farming practices, and limited adoption of agricultural technologies were perceived as key bottlenecks to transition to this preferred landscape (Table 3). Conversely, rural development policy and agricultural development plans and strategies supporting agricultural intensification were seen to be among the key opportunities to achieve this desired future landscape. Similarly, growing trends of modern agricultural practices involving cluster farming—consolidating adjacent fields to produce similar crop types and improving support from agricultural extension institutions for agricultural intensification—were perceived as facilitating conditions to transition to this preferred future landscape (Table 3).

### 3.3 | Consensus and distinguishing statements across the three factors

Three statements (#14, 17 and 29; Table 2, Figure 3) appeared as consensus statements, meaning stakeholders ranked these statements similarly across all three factors. Accordingly, all stakeholders would like to see smallholder farmers protected from forcible eviction from their land mainly through measures such as strengthening land tenure security and establishment of appropriate compensation mechanisms in cases where farmers land is transferred to socially beneficial investments (#14; Tables 2 and 3). In addition, protection of smallholder producers from product market failures including by price fluctuations and benefit capture by few private traders and elites appeared as a consensus statement (#17; Tables 2 and 3). Measures such as diversifying smallholder income including smallholder coffee certification and engagement in global fair trade were considered necessary by all stakeholders in the three factors (#17; Tables 2 and 3). The follow-up qualitative interview revealed that all stakeholders preferred land belonging to the smallholder farmers, including the right to lease and transfer the land to heirs, but without the right to sell. The justification against land commodification was those poor people could otherwise sell their land and eventually remain landless. Also, stakeholders in the three factors agree that

expansion of cash crops, including khat *Catha edulis* and eucalyptus *Eucalyptus* spp., was among the least priority of their preferred landscape (#29; Table 2, Figure 3), mainly due to their perceived negative social and ecological impacts. Moreover, poverty alleviation was a common goal of the preferred landscape among stakeholders across the three factors. Similarly, all stakeholders who loaded onto the three factors indicated that population growth and bad governance, such as corruption, affect the achieving any of the three factors, and hence, need to be managed (Table 3).

Despite these agreements, four statements (#2, 25, 26 and 28; Table 2, Figure 3) significantly and sharply distinguished the priorities of stakeholders in the three factors (*Statements distinguishing all factors*). These differences were related to whether the landscape should be covered with food crops, a biosphere reserve or coffee plantations (#2, 25, 26 and 28; Table 2, Figure 3); whether the landscape should be a multifunctional mosaic of cropland, pastures and forest or a specialized landscape (# 26); and whether forest degradation and deforestation should be minimized by encouraging the planting of useful trees on farmland or not (#28; Table 2, Figure 3).

## 4 | DISCUSSION

Using Q-methodology, we identified three different sets of stakeholder aspirations for the future of the landscapes within Jimma zone. We showed that, although smallholder development and poverty reduction were key goals for stakeholders across the factors (Table 3), stakeholders differed in their priority strategies—that is, they prioritized conflicting strategies and presented different underlying rationales regarding how to achieve the goal. Accordingly, (1) the first set of stakeholders prioritized a balanced growth and sustainable production trajectory, achieved through a natural and human capital-focused strategy (F1). (2) The second group of stakeholders preferred a future landscape around commercial coffee plantations for increasing national income, an inward investment and a commercialization strategy that seeks to bolster income by focusing on economically valuable products for export markets (F2). (3) The third group of stakeholders preferred a future landscape around surplus production and marketing of food crops achieved through a technological innovation-focused strategy (F3).

These conflicting strategies desired by stakeholders in our study landscape are not likely to be limited to our particular case study but rather reflect the current coexisting broader regional agricultural development interventions such as the green revolution in Africa (AGRA, 2006) and the food sovereignty in Africa programs (AFSA, 2008), as well as competing global discourses around agricultural and rural development, which have different implications for social equity and biodiversity (Jiren, Dorresteyn, et al., 2020; McKeon, 2015; Wittman et al., 2017). Understanding such consensus and conflicting landscape aspirations is crucial for generating socially robust system understandings, visions and

strategies for sustainable landscape management. Below we first discuss the broader implications of the identified consensus and conflicting strategies focusing on social equity and biodiversity conservation. We then discuss the methodological implications of our approach as a link between scenario planning and collective visioning in backcasting.

### 4.1 | Common social goal but divergent strategies

Consensus among stakeholders on the goal of smallholder development and poverty reduction (Table 3, Figure 3) is consistent with the development priority of Ethiopia (Ministry of Finance and Economic Development (MOFED), 2003; New Partnership for Africa's Development (NEPAD), 2003) and other African countries (New Partnership for Africa's Development, 2003). Moreover, this goal is often justified because smallholders account for the largest section of the population, occupy a large portion of agricultural land and disproportionately bear the effect of poverty, such that neglecting a large section of the society and the pertinent problem of poverty may not bring sustainable development (Frelat et al., 2016; IAASTD, 2009). However, despite this consensus, the conflicting strategies presented by stakeholders in our study area are not unique to our study area but broadly reflect two competing global discourses around agricultural development, namely, the productivism versus the alternative agroecological discourses (Jiren, Hanspach, et al., 2020; McKeon, 2015).

Driven by dissatisfaction with the low productivity of existing traditional farming landscapes, stakeholders in the F2 and F3 factors would like their future landscape around intensive production of key marketable commodities through the wide application of modern agricultural technologies. Stakeholders in both F2 and F3 factors align with the productivist discourse, but differ in strategy (i.e. F2 focused on increasing the production of food crops for direct consumption or to increase national food availability, while F3 focused on increasing the production and marketing of cash crops for revenue generation). These priorities of F2 and F3 thus align with the agricultural development program of the sub-Saharan African region, the African Green Revolution program (AGRA, 2006). These pathways align with the notion of productivist discourse (Clapp, 2015; Leathers & Foster, 2009; McKeon, 2015), which currently appears to be the dominant policy pathway of countries in sub-Saharan Africa (Blaustein, 2008; New Partnership for Africa's Development, 2003; Toenniessen et al., 2008) and is often backed by influential global philanthropic actors (AGRA, 2006). The productivist discourse is widely believed to serve as a closure of yield gaps in agricultural production (Govereh et al., 1999; Jaleta et al., 2009). Available evidence in the developing countries, for example, in central Ethiopia (Jaleta et al., 2009), in the East and Southern African region (Govereh et al., 1999; New Partnership for Africa's Development, 2003), and in the Latin American countries (Garrett & Rausch, 2016), indicates that smallholder commercialization and capital intensive agricultural investment increase smallholders' and national income. However,

when this pathway is pursued, particularly in settings where landscape multifunctionality serves multiple social and ecological purposes, the likely negative impacts of landscape change caused by this pathway are high. Importantly, in the long term, it could cause landscape simplification and biodiversity loss (Clay & King, 2019; Govereh et al., 1999; Haines-Young & Potschin, 2010; Toenniessen et al., 2008), sharpen social unrest caused by increased income inequality within society (Kerr, 2012; Shiva, 1991), and erode traditional system and social values (Riechers et al., 2020; Wayessa & Nygren, 2016).

In contrast, the views presented by stakeholders in the F1 factor align with key tenets of the Alliance for Food Sovereignty in Africa (AFSA, 2008), a regional program that seeks to capitalize on natural capital, as well as agroecological and traditional landscape management. This alternative discourse builds on the notion of agroecology which gives considerable weight to a multifunctional landscape and supports agroecological production as well as the mechanism of biosphere reserves for sustainable biodiversity conservation (AFSA, 2008; Jiren, Dorresteijn, et al., 2020). This view is primarily grounded in reducing trade-offs between production and conservation, instead focusing on long-term sustainable investment (Hospes, 2014; Pasari et al., 2013), and is often backed by local initiatives and actors (AFSA, 2008; Jiren, Dorresteijn, et al., 2020).

The observed conflicts in the prioritized strategies are not likely to be limited to our particular case study (Baylan, 2018; Lübker et al., 2021; Milcu et al., 2014), and understanding such consensus and conflicts regarding landscape change is crucial for proper and proactive landscape planning in a way that reconciles conflicting aspirations, and generates socially and ecologically sustainable landscapes (Drimie et al., 2018). In particular, harmonizing the divergence and bridging the gaps between conflicting priority strategies for the future appear crucial for landscape planning and sustainability (Drimie et al., 2018; Johansson, 2021). This could potentially be achieved, for example, through multi-stakeholder and multi-sector dialogue around the potential gains and impacts of the different pathways and priorities and collective landscape visioning and planning so that the future landscape maximizes both social and ecological sustainability. The approach we followed in this study to assess landscape aspirations thus could provide important input information for subsequent collective visioning exercises.

#### 4.2 | Individual Q-sorts as a bridge between scenario planning and backcasting

Using Q-methodology to investigate stakeholders' subjective future landscape priorities reveals both consensus and conflicting preferences regarding future landscape visions and strategies and provides useful views of the current system. Used in this way, the Q-method can provide an extension of exploratory scenario planning, for

example, by adding information on which stakeholders from which parts of the landscape prioritize different aspects of scenarios, thus pointing to likely agreements and conflicts among stakeholders. This knowledge, in turn, can be invaluable to carefully plan collective group exercises in the next step towards developing a shared vision for any given landscape—following an exercise such as the one presented here, researchers and facilitators will be acutely aware of some of the key stumbling blocks that need to be resolved in future workshops involving heterogeneous groups of stakeholders. The approach we used in this study, therefore should not be seen as a replacement to collective backcasting, which is a necessary next step to envision a widely agreed landscape trajectory and identify robust strategies to achieve such a shared vision (Johansson, 2021; Robinson, 2003). Rather, we believe that the method we applied in this study is best seen as a method to fill the gap in the transition from exploratory scenario planning to normative backcasting through adding deep insights into potentially divergent stakeholder priorities.

Specifically, using our approach provides an opportunity to capture the diversity of priorities held by different stakeholders in advance, which may not be captured in a participatory setting. The implementation of normative backcasting can be significantly constrained by power and agency differences among stakeholders (Bibri, 2018; Johansson, 2021), as well as by selection bias in which only a few influential stakeholders define the future priority of the landscape (van Berkel & Verburg, 2012). If the intention of normative backcasting is to develop a widely shared vision, the process should be inclusive and embrace a diversity of participants and their priorities. Our approach could help to minimize the underrepresentation of stakeholders and their views by providing insights on which stakeholder aspires to what type of landscape, and why. This knowledge can be very useful as a starting point for deciding who should participate in backcasting workshops, for example, by carefully selecting stakeholders whose priority differs so that different views are entertained in landscape visioning (Bibri, 2018; van Berkel & Verburg, 2012).

Second, understanding the consensus and conflicting stakeholder aspirations before multi-stakeholder backcasting workshops helps proactive planning of workshops to capitalize on consensus and minimize conflicts. Potentially, a prior understanding of consensus and conflicting points in stakeholder priority could assist in systematically reducing the conflicting aspirations, for instance, through creating a space for dialogue between stakeholders who hold conflicting landscape aspirations.

Finally, knowledge of stakeholders' subjective priorities could also help find potential interventions in landscape planning, for instance, by devising spatially different interventions across the landscape. Our case study indicated that stakeholders within the same kebele had similar landscape aspirations, while priorities seemed to vary among kebeles. This could inform the need for disaggregated and contextualized solutions instead of an effort to bring a one-size-fits-all solution to the entire landscape.

## 5 | CONCLUSION

We used the Q-methodology to navigate potentially divergent stakeholder-level future landscape aspirations. We showed that stakeholders' priorities involved three distinct pathways with different social and ecological implications for our study landscape in southwestern Ethiopia. Based on our findings from this case study, we conclude that, first, our landscape involves stakeholders with divergent aspirations for the future of their common landscape. Therefore, landscape planning efforts should account for this diversity and minimize the potential negative impacts of the conflicting aspirations. One way to do this is to systematically plan and implement a participatory backcasting activity that accounts for the diversities in landscape aspirations, creates an opportunity for inclusive stakeholder dialogue, and specifically seeks to reconcile existing conflicts, for example, through intelligent spatial prioritization. Second, we found that the socio-political and economic conditions at the country, region and global scales, such as political instability, unsustainable regional agricultural programs and global market conditions, influence the choice and realization of desired future landscapes. Landscape planning through collective visioning, therefore, will need to account for uncertainties arising from conditions outside the landscape. Finally, from a methodological perspective, we see the subjective assessment of stakeholders' future landscape priorities as a possible bridge between scenario planning and backcasting exercises, which can serve to initially minimize challenges from undesirable group dynamics and underrepresentation of stakeholders and their views in participatory backcasting.

### AUTHOR CONTRIBUTIONS

All authors conceived the ideas and designed the methodology; [Tolera Senbeto Jiren] led data collection, analysis and the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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### CONFLICT OF INTEREST

Maraja Riechers is an Associate Editor for People and Nature but was not involved in the peer review and decision-making process.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on Dryad Digital Repository (Joren et al., 2023, <https://doi.org/10.5061/dryad.5dv41ns9f>).

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### REFERENCES

- Abbinck, J. (2011). 'Land to the foreigners': Economic, legal, and socio-cultural aspects of new land acquisition schemes in Ethiopia. *Journal of Contemporary African Studies*, 29(4), 513–535.
- AFSA. (2008). *The Alliance for Food Sovereignty in Africa*. <https://afsafrika.org/about-us/>
- AGRA. (2006). *The Alliance for a Green Revolution in Africa*. <https://agra.org/wp-content/uploads/2018/08/AGRA-factsheet0806201811.pdf>
- Amsalu, A., Stroosnijder, L., & de Graaff, J. (2007). Long-term dynamics in land resource use and the driving forces in the Beressa watershed, highlands of Ethiopia. *Journal of Environmental Management*, 83(4), 448–459.
- Baylan, E. (2018). Identifying landscape values and stakeholder conflicts for the protection of landscape multifunctionality: The case of ekşisu wetlands (Turkey). *Applied Ecology and Environmental Research*, 16(1), 199–223.
- Berihun, M. L., Tsunekawa, A., Haregeweyn, N., Meshesha, D. T., Adgo, E., Tsubo, M., Masunaga, T., Fenta, A. A., Sultan, D., & Yibeltal, M. (2019). Exploring land use/land cover changes, drivers and their implications in contrasting agroecological environments of Ethiopia. *Land Use Policy*, 87, 104052.
- Betru, T., Tolera, M., Sahle, K., & Kassa, H. (2019). Trends and drivers of land use/land cover change in Western Ethiopia. *Applied Geography*, 104, 83–93.
- Bibri, S. E. (2018). Backcasting in futures studies: A synthesized scholarly and planning approach to strategic smart sustainable city development. *European Journal of Futures Research*, 6(13). <https://doi.org/10.1186/s40309-018-0142-z>
- Blaustein, R. J. (2008). The green revolution arrives in Africa. *BioScience*, 58(1), 8–14.
- Bredin, Y. K., Lindhjem, H., van Dijk, J., & Linnell, J. D. (2015). Mapping value plurality towards ecosystem services in the case of Norwegian wildlife management: A Q analysis. *Ecological Economics*, 118, 198–206.
- Brown, S. R. (1996). Q methodology and qualitative research. *Qualitative Health Research*, 6(4), 561–567.
- Bufebo, B., & Elias, E. (2021). Land use/land cover change and its driving forces in Shenkolla watershed, south central Ethiopia. *The Scientific World Journal*, 2021, 9470918.
- Capitani, C., Mukama, K., Mbilinyi, B., Malugu, I. O., Munishi, P. K. T., Burgess, N. D., Platts, P. J., Sallu, S. M., & Marchant, R. (2016). From local scenarios to national maps: A participatory framework for envisioning the future of Tanzania. *Ecology and Society*, 21(3), 4.
- Carlsson-Kanyama, A., Dreborg, K. H., Moll, H. C., & Padovan, D. (2008). Participative backcasting: A tool for involving stakeholders in local sustainability planning. *Futures*, 40(1), 34–46.
- Castella, J.-C., Bourgoin, J., Lestrelin, G., & Bouahom, B. (2014). A model of the science–practice–policy interface in participatory land-use planning: Lessons from Laos. *Landscape Ecology*, 29(6), 1095–1107.
- Clapp, J. (2015). Food security and trade: Unpacking disputed narratives. Background report for the Food and Agriculture Organization of the

- UN, trade and markets division. Food and Agriculture Organization. <http://www.fao.org/3/a-i5160e.pdf>
- Clay, N., & King, B. (2019). Smallholders' uneven capacities to adapt to climate change amid Africa's 'green revolution': Case study of Rwanda's crop intensification program. *World Development*, 116, 1–14.
- Cuppen, E., Breukers, S., Hisschemöller, M., & Bergsma, E. (2010). Q methodology to select participants for a stakeholder dialogue on energy options from biomass in The Netherlands. *Ecological Economics*, 69(3), 579–591.
- Daconto, G., & Sherpa, L. N. (2010). Applying scenario planning to park and tourism Management in Sagarmatha National Park, Khumbu, Nepal. *Mountain Research and Development*, 30(2), 103–112.
- Davies, B. B., & Hodge, I. D. (2007). Exploring environmental perspectives in lowland agriculture: A Q methodology study in East Anglia, UK. *Ecological Economics*, 61(2–3), 323–333.
- Drimie, S., Hamann, R., Manderson, A. P., & Mlondobozi, N. (2018). Creating transformative spaces for dialogue and action: Reflecting on the experience of the southern Africa food lab. *Ecology and Society*, 23(3), 2.
- Enoguanbhor, E. C., Gollnow, F., Walker, B. B., Nielsen, J. O., & Lakes, T. (2021). Key challenges for land use planning and its environmental assessments in the Abuja City-region, Nigeria. *Land*, 10(5), 443.
- FAO. (2015). *Global Forest Resources Assessment 2015: Country report Ethiopia*. FAO.
- Fischer, J., Bergsten, A., Dorresteyn, I., Hanspach, J., Hylander, K., Jiren, T. S., Manlosa, A. O., Rodrigues, P., Schultner, J., Senbeta, F., & Shumi, G. (2021). A social-ecological assessment of food security and biodiversity conservation in Ethiopia. *Ecosystems and People*, 17(1), 400–410.
- Fraser, E. D. G., Dougill, A. J., Hubacek, K., Quinn, C. H., Sendzimir, J., & Termansen, M. (2011). Assessing vulnerability to climate change in dryland livelihood systems: Conceptual challenges and interdisciplinary solutions. *Ecology and Society*, 16(3), 3.
- Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., van Asten, P. J. A., & van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, 113(2), 458–463.
- Friis, I., Demissew, S., & van Breugel, P. (2011). *Atlas of the potential vegetation of Ethiopia*. Det Kongelige Danske Videnskaberne Selskab.
- Garrett, R. D., & Rausch, L. L. (2016). Green for gold: Social and ecological tradeoffs influencing the sustainability of the Brazilian soy industry. *The Journal of Peasant Studies*, 43(2), 461–493.
- Gashaw, T., Tulu, T., Argaw, M., Worqlul, A. W., Tolessa, T., & Kindu, M. (2018). Estimating the impacts of land use/land cover changes on ecosystem service values: The case of the Andassa watershed in the upper Blue Nile basin of Ethiopia. *Ecosystem Services*, 31, 219–228.
- Gebreslassie, H. (2014). Land use-land cover dynamics of Huluka watershed, central Rift Valley, Ethiopia. *International Soil and Water Conservation Research*, 2(4), 25–33.
- Govere, J., Jayne, T. S., & Nyoro, J. (1999). *Smallholder commercialization, interlinked markets and food crop productivity: Cross-country evidence in eastern and southern Africa*. [https://www.researchgate.net/publication/238075353\\_Smallholder\\_Commercialization\\_Interlinked\\_Markets\\_and\\_Food\\_Crop\\_Productivity\\_Cross-Country\\_Evidence\\_in\\_Eastern\\_and\\_Southern\\_Africa](https://www.researchgate.net/publication/238075353_Smallholder_Commercialization_Interlinked_Markets_and_Food_Crop_Productivity_Cross-Country_Evidence_in_Eastern_and_Southern_Africa)
- Griggs, D., Stafford Smith, M., Rockström, J., Öhman, M. C., Gaffney, O., Glaser, G., Kanie, N., Noble, I., Steffen, W., & Shyamsundar, P. (2014). An integrated framework for sustainable development goals. *Ecology and Society*, 19(4), 49.
- Haines-Young, R., & Potschin, M. (2010). The links between biodiversity, ecosystem services and human well-being. In D. G. Raffaelli & C. L. J. Frid (Eds.), *Ecosystem ecology* (pp. 110–139). Cambridge University Press.
- Hospes, O. (2014). Food sovereignty: The debate, the deadlock, and a suggested detour. *Agriculture and Human Values*, 31(1), 119–130.
- IAASTD. (2009). *Agriculture at a crossroads: Executive summary of the synthesis report*. <https://wedocs.unep.org/20.500.11822/7880>
- Jaleta, M., Gebremedhin, B., & Hoekstra, D. (2009). *Improving productivity and market success of Ethiopian farmers project: Smallholder commercialization: Processes, determinants and impact*. Discussion paper no. 18. ILRI. [https://cgspace.cgiar.org/bitstream/handle/10568/27/SmallholderCommercializationProcesses\\_DiscPaper18.pdf?sequence=1&isAllowed=y](https://cgspace.cgiar.org/bitstream/handle/10568/27/SmallholderCommercializationProcesses_DiscPaper18.pdf?sequence=1&isAllowed=y)
- Jiren, T., Abson, D. J., Schultner, J., Riechers, M., & Fischer, J. (2023). Bridging scenario planning and backcasting: a Q-analysis of divergent stakeholder priorities for future landscapes. *Dryad, Dataset*, <https://doi.org/10.5061/dryad.5dv41ns9f>
- Jiren, T. S., Bergsten, A., Dorresteyn, I., Collier, N. F., Leventon, J., & Fischer, J. (2018). Integrating food security and biodiversity governance: A multi-level social network analysis in Ethiopia. *Land Use Policy*, 78, 420–429.
- Jiren, T. S., Dorresteyn, I., Hanspach, J., Schultner, J., Bergsten, A., Manlosa, A., Jager, N., Senbeta, F., & Fischer, J. (2020). Alternative discourses around the governance of food security: A case study from Ethiopia. *Global Food Security*, 24, 100338.
- Jiren, T. S., Dorresteyn, I., Schultner, J., & Fischer, J. (2018). The governance of land use strategies: Institutional and social dimensions of land sparing and land sharing. *Conservation Letters*, 11(3), e12429.
- Jiren, T. S., Hanspach, J., Schultner, J., Fischer, J., Bergsten, A., Senbeta, F., Hylander, K., & Dorresteyn, I. (2020). Reconciling food security and biodiversity conservation: Participatory scenario planning in southwestern Ethiopia. *Ecology and Society*, 25(3), 24.
- Jiren, T. S., Leventon, J., Jager, N. W., Dorresteyn, I., Schultner, J., Senbeta, F., Bergsten, A., & Fischer, J. (2021). Governance challenges at the Interface of food security and biodiversity conservation: A multi-level case study from Ethiopia. *Environmental Management*, 67(4), 717–730.
- Jiren, T. S., Riechers, M., Bergsten, A., & Fischer, J. (2021). A leverage points perspective on institutions for food security in a smallholder-dominated landscape in southwestern Ethiopia. *Sustainability Science*, 16(3), 767–779.
- Jiren, T. S., Schultner, J., Abson, D. J., & Fischer, J. (2022). A multi-level assessment of changes in stakeholder constellations, interest and influence on ecosystem services under different landscape scenarios in southwestern Ethiopia. *PLOS Sustain Transform*, 1(5), e0000012.
- Johansson, E. L. (2021). Participatory futures thinking in the African context of sustainability challenges and socio-environmental change. *Ecology and Society*, 26(4), 3.
- Kenea, U., Adeba, D., Regasa, M. S., & Nones, M. (2021). Hydrological responses to land use land cover changes in the Fincha'a watershed, Ethiopia. *Land*, 10(9), 916.
- Kerr, R. B. (2012). Lessons from the old green revolution for the new: Social, environmental and nutritional issues for agricultural change in Africa. *Progress in Development Studies*, 12(2–3), 213–229.
- Kindu, M., Schneider, T., Teketay, D., & Knoke, T. (2016). Changes of ecosystem service values in response to land use/land cover dynamics in Munessa-Shashemene landscape of the Ethiopian highlands. *Science of the Total Environment*, 547, 137–147.
- Kok, K., van Vliet, M., Bärlund, I., Dubel, A., & Sendzimir, J. (2011). Combining participative backcasting and exploratory scenario development: Experiences from the SCENES project. *Technological Forecasting and Social Change*, 78(5), 835–851.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43.

- Leathers, H. D., & Foster, P. (2009). *The world food problem: Toward ending undernutrition in the third world*. Lynne Rienner Publishers.
- Lübker, H. M., Abson, D. J., & Riechers, M. (2021). Discourses for deep transformation: Perceptions of economic growth in two rural communities in Lower Saxony, Germany. *Sustainability Science*, 16, 1827–1840. <https://doi.org/10.1007/s11625-021-01039-1>
- Malinga, R., Gordon, L. J., Lindborg, R., & Jewitt, G. (2013). Using participatory scenario planning to identify ecosystem Services in Changing Landscapes. *Ecology and Society*, 18(4), 10.
- Marchant, R., Richer, S., Boles, O., Capitani, C., Courtney-Mustaphi, C. J., Lane, P., Prendergast, M. E., Stump, D., de Cort, G., Kaplan, J. O., Phelps, L., Kay, A., Olago, D., Petek, N., Platts, P. J., Punwong, P., Widgren, M., Wynne-Jones, S., Ferro-Vázquez, C., ... Wright, D. (2018). Drivers and trajectories of land cover change in East Africa: Human and environmental interactions from 6000years ago to present. *Earth-Science Reviews*, 178, 322–378.
- Marsden, T., & Sonnino, R. (2008). Rural development and the regional state: Denying multifunctional agriculture in the UK. *Journal of Rural Studies*, 24(4), 422–431.
- McKeon, N. (2015). *Food security governance: Empowering communities, regulating corporations*/by Nora McKeon. Routledge.
- Melese, S. (2016). Effect of land use land cover changes on the forest resources of Ethiopia. *Journal of Environment and Earth Science*, 1(2), 51–57.
- Milcu, A. I., Sherren, K., Hanspach, J., Abson, D., & Fischer, J. (2014). Navigating conflicting landscape aspirations: Application of a photo-based Q-method in Transylvania (Central Romania). *Land Use Policy*, 41, 408–422.
- Ministry of Finance and Economic Development (MOFED). (2003). *Rural development policy and strategies*. The Federal Democratic Republic of Ethiopia. [https://www.gafspfund.org/sites/default/files/inline-files/6.%20Ethiopia\\_Agriculture%20strategy.pdf](https://www.gafspfund.org/sites/default/files/inline-files/6.%20Ethiopia_Agriculture%20strategy.pdf)
- Muhati, G. L., Olago, D., & Olaka, L. (2018). Participatory scenario development process in addressing potential impacts of anthropogenic activities on the ecosystem services of Mt. Marsabit forest, Kenya. *Global Ecology and Conservation*, 14, e00402.
- New Partnership for Africa's Development (NEPAD). (2003). *Comprehensive Africa agriculture development programme*. NEPAD Secretaria. <http://www.fao.org/nr/water/aquasat/sirte2008/NEPAD-CAADP%202003.pdf>
- Oostdijk, S. (2021). *Deforestation and forest fragmentation in southwestern Ethiopia from 1973 to 2019*.
- Opdam, P. (2010). Learning science from practice. *Landscape Ecology*, 25(6), 821–823.
- Oteros-Rozas, E., Martín-López, B., Daw, T. M., Bohensky, E. L., Butler, J. R., Hill, R., Martín-Ortega, J., Quinlan, A., Ravera, F., Ruiz-Mallén, I., Thyresson, M., Mistry, J., Palomo, I., Peterson, G. D., Plieninger, T., Waylen, K. A., Beach, D. M., Bohnet, I. C., Hamann, M., ... Vilardy, S. P. (2015). Participatory scenario planning in place-based social-ecological research: Insights and experiences from 23 case studies. *Ecology and Society*, 20(4), 32.
- Pasari, J. R., Levi, T., Zavaleta, E. S., & Tilman, D. (2013). Several scales of biodiversity affect ecosystem multifunctionality. *Proceedings of the National Academy of Sciences of the United States of America*, 110(25), 10219–10222.
- Peterson, G. D., Cumming, G. S., & Carpenter, S. R. (2003). Scenario planning: A tool for conservation in an uncertain world. *Conservation Biology*, 17(2), 358–366.
- Rahmato, D. (2011). *Land to investors: Large-scale land transfers in Ethiopia*. Forum for Social Studies.
- Riechers, M., Balázs, Á., Betz, L., Jiren, T. S., & Fischer, J. (2020). The erosion of relational values resulting from landscape simplification. *Landscape Ecology*, 35(11), 2601–2612.
- Robinson, J. (2003). Future subjunctive: Backcasting as social learning. *Futures*, 35(8), 839–856.
- Sáenz de Tejada Granados, C., Santo-Tomás Muro, R., & Rodríguez Romero, E. J. (2021). Exploring landscape preference through photo-based Q methodology. Madrid seen by suburban adolescents. *International Research in Geographical and Environmental Education*, 30(3), 255–278.
- Scheba, A. (2018). Market-based conservation for better livelihoods? The promises and fallacies of REDD+ in Tanzania. *Land*, 7(4), 119.
- Schneider, F., & Rist, S. (2013). Envisioning sustainable water futures in a transdisciplinary learning process: Combining normative, explorative, and participatory scenario approaches. *Sustainability Science*, 9(4), 463–481.
- Schroth, O., Hayek, U. W., Lange, E., Sheppard, S. R. J., & Schmid, W. A. (2011). Multiple-case study of landscape visualizations as a tool in transdisciplinary planning workshops. *Landscape Jnl.*, 30(1), 53–71.
- Shackleton, R. T., Richardson, D. M., Shackleton, C. M., Bennett, B., Crowley, S. L., Dehnen-Schmutz, K., Estévez, R. A., Fischer, A., Kueffer, C., Kull, C. A., Marchante, E., Novoa, A., Potgieter, L. J., Vaas, J., Vaz, A. S., & Larson, B. M. H. (2019). Explaining people's perceptions of invasive alien species: A conceptual framework. *Journal of Environmental Management*, 229, 10–26.
- Shiva, V. (1991). *The violence of the green revolution: Third world agriculture, ecology and politics*.
- Sneegas, G., Beckner, S., Brannstrom, C., Jepson, W., Lee, K., & Seghezzo, L. (2021). Using Q-methodology in environmental sustainability research: A bibliometric analysis and systematic review. *Ecological Economics*, 180, 106864.
- Swedeen, P. (2006). Post-normal science in practice: A Q study of the potential for sustainable forestry in Washington state, USA. *Ecological Economics*, 57(2), 190–208.
- Tadesse, G., Zavaleta, E., Shennan, C., & FitzSimmons, M. (2014). Policy and demographic factors shape deforestation patterns and socio-ecological processes in southwest Ethiopian coffee agroecosystems. *Applied Geography*, 54, 149–159.
- Tefera, B., & Sterk, G. (2008). Hydropower-induced land use change in Fincha'a watershed, Western Ethiopia: Analysis and impacts. *Mountain Research and Development*, 28(1), 72–80.
- Toenniessen, G., Adesina, A., & DeVries, J. (2008). Building an alliance for a green revolution in Africa. *Annals of the New York Academy of Sciences*, 1136, 233–242.
- Tress, B., Tres, G., Fry, G., & Opdam, P. (2005). *From landscape research to landscape planning: Aspects of integration, education and application*. Springer Science & Business Media.
- van Asselt, M. (2012). *Foresight in action*. Routledge.
- van Berkel, D. B., & Verburg, P. H. (2012). Combining exploratory scenarios and participatory backcasting: Using an agent-based model in participatory policy design for a multi-functional landscape. *Landscape Ecology*, 27(5), 641–658.
- van der Voorn, T., Pahl-Wostl, C., & Quist, J. (2012). Combining backcasting and adaptive management for climate adaptation in coastal regions: A methodology and a south African case study. *Futures*, 44(4), 346–364.
- VERBI Software. (2019). *MAXQDA 2020: VERBI Software*.
- Watts, S., & Stenner, P. (2005). Doing Q methodology: Theory, method and interpretation. *Qualitative Research in Psychology*, 2(1), 67–91.
- Wayessa, G. O., & Nygren, A. (2016). Whose decisions, whose livelihoods? Resettlement and environmental justice in Ethiopia. *Society & Natural Resources*, 29(4), 387–402.
- Wittman, H., Chappell, M. J., Abson, D. J., Kerr, R. B., Blesh, J., Hanspach, J., Perfecto, I., & Fischer, J. (2017). A social-ecological perspective on harmonizing food security and biodiversity conservation. *Regional Environmental Change*, 17(5), 1291–1301.
- Zabala, A. (2014). Qmethod: A package to explore human perspectives using Q methodology. *The R Journal*, 6, 163–173.

- Zabala, A., & Pascual, U. (2016). Bootstrapping Q methodology to improve the understanding of human perspectives. *PLoS ONE*, 11(2), e0148087.
- Zabala, A., Sandbrook, C., & Mukherjee, N. (2018). When and how to use Q methodology to understand perspectives in conservation research. *Conservation Biology*, 32(5), 1185–1194.

### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**Table S1.** List of stakeholders and their characteristics.

**Figure S1.** Visual presentation of changes in the landscape features and land use types from the focal (current) landscape to alternative scenario landscapes.

**Figure S2.** Scoreboard used for ranking of Q-sets by the stakeholders.

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