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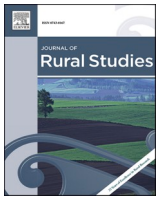

# "You never farm alone": Farmer land-use decisions influenced by social relations

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ABSTRACT

*Context:* Farmer land-use decisions are commonly explained and predicted by socio-demographic, economic, ecological, and psychological factors. However, these models explain only part of the empirical data without accounting for the effect of social relations.
*Objective:* This study aimed at exploring the effect of social relations on farmer land-use decisions using the status-power theory of relations. We hypothesised that farmer land-use decisions are driven by the need to comply with requirements of their salient reference groups, such as family, government, and spiritual beings.
*Methods:* We undertook a case study in the Mt. Kenya region where we conducted individual interviews and focus group discussions among smallholder farmers. We then used chi-square automatic interaction detection (CHAID) to explore influence of social relations on land-use practices.
*Results and conclusions:* Reported social relations were diverse and accounted for land-use decisions that could not be explained by socio-demographic, economic or ecological factors. The results showed that a farmer seemed more likely to choose a land-use option if he/she believed his/her salient reference groups would be pleased with the option. Reconciling social relations with other factors such as farmer's socio-demographic factors and geographic location also had a significant effect on the results.
*Significance:* Insights into the impact of social relations in farmer land-use decisions can explain the often-heterogeneous decisions and can complement the economic analysis that is the conventional focus in analysis of farmer decisions. An understanding of the effects of social relations can strengthen development of policies that motivate implementation of more sustainable agriculture options.

## 1. Introduction

In arid and semi-arid areas, intensification of farming practices usually requires irrigation, which imposes additional stress on already scarce water resources (Abou Zaki et al., 2022; Ochoa-Noriega et al., 2022). Although irrigation increases food production and income, it leads to unsustainable agricultural practices and, at times, water-related conflicts among stakeholders (Abou Zaki et al., 2022; Ochoa-Noriega et al., 2022). Farmer land-use decisions impact significantly on sustainable agricultural practices (Githinji et al., 2023). For many years, sustainability has been linked to a 'triple bottom-line' of planet, profit, and people (Elkington and Rowlands, 1999). These three elements can be identified with three realms: ecological, economic, and social-relational. The ecological perspective on land suitability emphasises variation in soils and climate, the economic lens of profitability adds the way costs and benefits vary with location, land/labour ratio and resource endowment of an enterprise or household, while the social relations lens includes emotions such as pride or loyalty.

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Effects of the realms of sustainability on farmer land-use decisions have been explored by means of various theories. Such theories include expected utility theory, which postulates that a rational individual makes decisions based on his/her risk tolerance and personal preferences (Birthal et al., 2021; de Frutos Cachorro et al., 2018; Schoemaker, 2013); the prospect theory, which analyses farmer's decisions as influenced by prospective loss or gain from a land-use option (Villacis et al., 2021; Wang et al., 2018); the theory of bounded rationality, which states that a farmer's decision is bounded or limited by resources such as finances, time and knowledge (Cordaro and Desdoigts, 2021; Home et al., 2019; Křečková and Brožová, 2017; Wens et al., 2022); and the theory of planned behaviour, which assesses the influence of attitude, subjective norms, and perceived behavioural control on farmers' decisions (Ajzen, 1991; Buyinza et al., 2020; Senger et al., 2017). While the ecological and economic realms have been extensively explored in literature, the influence of social relations has yet to be adequately assessed. The theory of planned behaviour covers part of the social relations by analysing the role of referent others in inculcating social norms that affect an individual's decision. However, this theory does not account for multiple reference groups—with possibly conflicting interests—that can potentially impinge on farmers' decisions(Githinji et al., 2023). Reference groups are persons or groups of persons, real or imagined, that an individual takes into account while taking an action (Kemper, 1968). The status-power theory of relations (Kemper, 1968, 2006, 2011, 2017) referred to in this paper as Kemper's theory, can model elements that are beyond the range of the theory of planned behaviour, including a diverse set of reference groups. In Kemper's theory, there is no difference between an individual's attitude and group norms, but an individual's decision is the outcome of the subconscious 'reference group meeting' that takes place in the mind of an individual. While the theory of planned behaviour is targeted to conscious behaviour on a particular decision, Kemper's theory is about feelings, emotions and behaviour in general that subconsciously influence decisions.

Kemper's theory defines a farmer's decision within the context of the farmer's social world. The theory is not a substitute for ecological and economic analysis of land-use patterns, but rather a complement to them. It suggests that economic and ecological rationality can influence farmer land-use decisions through social relations, with 'relational rationality' complementing other factors. Relational rationality is driven by relations a farmer has with an important person or persons that form so-called reference groups (Kemper, 2017). Reference groups may include family, farmer groups, religious leaders, government, or spiritual entities. Kemper's theory would expect a farmer to make decisions that are aligned to his perceptions of the preferences of his/her important reference groups.

We hypothesised that social relations, as understood from Kemper's theory, influence farmer land-use decisions. To test this hypothesis, we collected and analysed data from the Upper Ewaso Ngíro North River Basin in Mt Kenya. The study site lent itself especially well to the study of reference groups since its land use has 'upstream' agricultural market connections, and 'downstream' impacts on water availability. Farmers in the study site are not only conflicted between ecological and/or economic benefits but could also be interested in sustaining good relations with their important reference groups. These reference groups might include community water project members, neighbours, friends, family, community leaders and extension workers, all of whom have been identified in other studies in the region. (Giroux et al., 2022; McCord et al., 2015).

## 2. Status-power theory of relations and farmer land-use decisions

The status-power theory of relations defines individual decisions as actions that give voice to salient reference groups (Kemper, 2017). A reference group is salient if it has a strong status-power position, which can be built up by any combination of status-worthiness and power. If the reference group is status-worthy, the individual will voluntarily comply with its bidding. If it is powerful, the individual will comply involuntarily to avoid punishment (Kemper, 2006, 2017). Voluntary compliance is driven by status accord, whereby respect or love leads an individual to take an action that they perceive to be pleasing to a salient reference group. The individual will expect the salient reference group to reciprocate the status conferral. Failure to do so may evoke negative emotions and the individual may reduce the salience of such a group. Regarding involuntary compliance, the salience of a reference group and its influence is upheld if it can use power against the individual. The relation between an individual and the reference group revolves around rules, fear, and sanctions for non-compliance. An individual may thus have no option but to oblige. Substantial use of power can be socially accepted. However, excessive use of this power may evoke negative emotions that can lead to action (sometimes collective action) against the power-wielding reference group. In this case, collective action is taken by some, if not all, individuals who feel afflicted.

We posit that farmers, consciously or subconsciously, identify with specific reference groups and undertake land-use decisions that they believe will please those reference groups. Farmers may attach various levels of salience to reference groups that could lead to heterogeneous land-use practices. Their actions are not only to please the reference groups but also an attempt to gain status or power of their own. In the minds of the individuals, the influence of the reference groups is exerted at an emotional level. If several reference groups exist in the minds of the individual, mixed emotions may occur, and it is not always easy to differentiate which reference group is shaping this individual's behaviour (Kemper, 2017). People themselves may not be aware of how this works. However, in situations where decisions made do not follow economic rationality or ecological factors, these decisions might be explained by identifying the salient reference groups and their perceived opinion on a particular decision.

## 3. Methodology

### 3.1. Study site

We used the Upper Ewaso Ngíro River Basin to assess the influence of social relations on farmer land-use decisions. The study site (Fig. 1) is located on the northwest side of Mt Kenya between longitudes 36°48′42E and 37°41′17E and latitudes 0°44′3N and 0°13′58′ N. It includes parts of Meru and Laikipia counties and totals approximately 2,500 $km^2$. The study site cuts across a humid-to-semi-arid gradient, receiving an average of 2000 mm per annum in the upper region but less than 350 mm per annum in the lower region (Kimwatu et al., 2021). Besides rainfall, other major sources of water in this region are groundwater and rivers that flow down the slopes of Mt. Kenya. There have been major land-use changes over the years. Before Kenya's independence in 1963, land was being converted from dominant pastoralism to large-scale arable farming and ranching, and this period was followed by subdivision of some of the arable large farms into smallholder farms (Eckert et al., 2017; Roden et al., 2016; Taylor et al., 2005). The most common food and cash crops are potatoes, maize, vegetables (kale, cabbage, spinach) tomatoes, onions, and fruit (McCord et al., 2015). A growing agribusiness environment has enabled the smallholder farmers to shift slowly from traditionally grown crops to more profitable horticultural export crops such as French beans, garden peas, and flowers (Dickson Kinoti, 2018). Farmers sell their produce to the local traders, but some also access the global market by engaging in contract farming with agro-exporters or large farm owners (McCord et al., 2015). To sustainably produce enough for the markets throughout the year, farmers mostly use river water to irrigate their crops. Access to irrigation water increases chances to engage in irrigated farming (Giger et al., 2022). Therefore, most of the irrigation is done in the water-abundant upper and middle zone, reducing water availability downstream (Wamucii et al., 2023). This leads to conflicts among pastoralists,

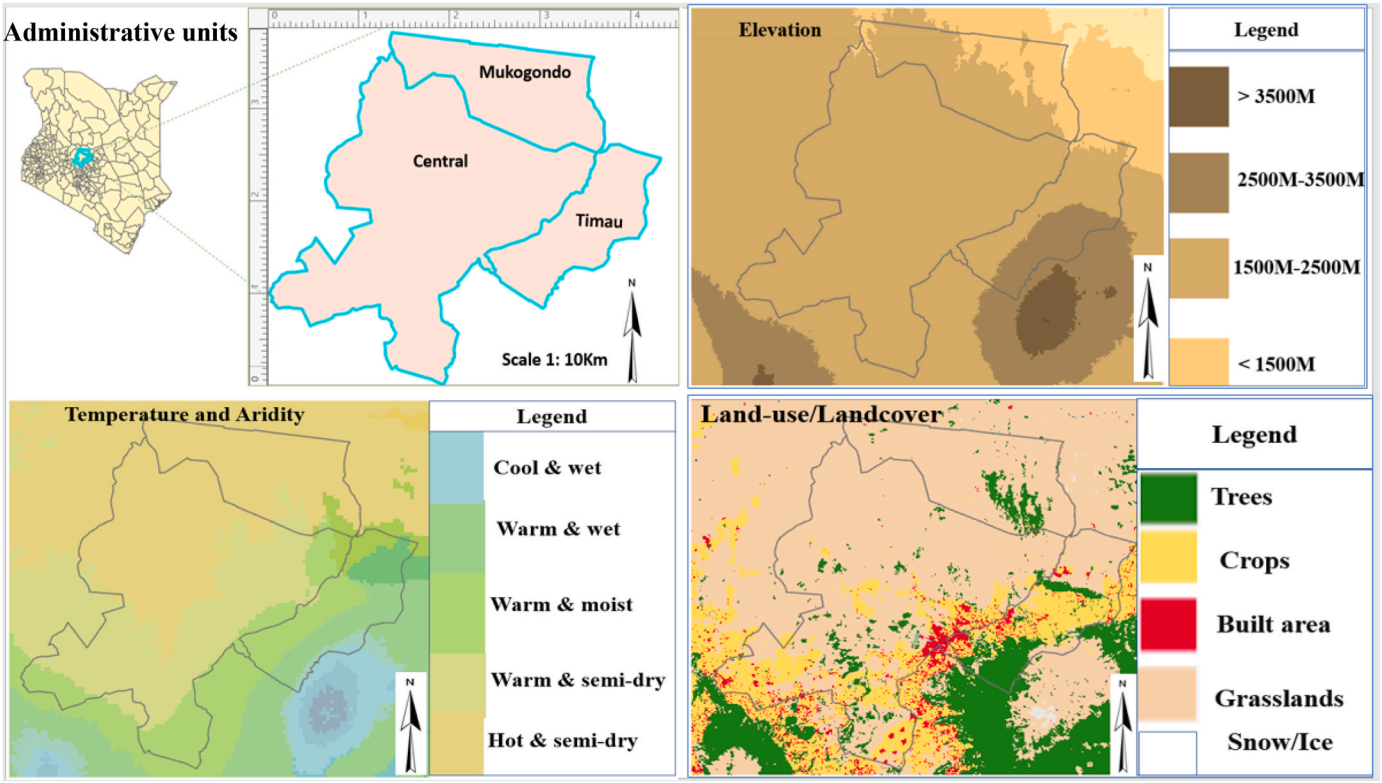


**Fig. 1.** *Case study site covered three administrative units: Central ward and Mukogondo ward in Laikipia County, and Timau ward in Meru County* (DIVA-GIS, 2023)*; Elevation ranged from upstream (close to the top of Mt. Kenya over 4000 m a.s.l.) to downstream(less than 1500 m a.s.l.)* (Esri, 2020a)*; Mean annual temperatures and humidity range from cool (<12.3oC) and wet (P/Epot >1) to hot (>19.2oC) and semi-dry (P/Epot<0.6, where P = precipitation, Epot = potential evapotranspiration* (Esri, 2020b)*; Land-use cover include crops, trees, grass lands and built areas* (Esri, 2023).

smallholder farmers, large-scale farmers and conservancies, especially during the dry season when water is scarce and insufficient to meet all water demands (Eckert et al., 2017; Ulrich et al., 2012; Zaehringer et al., 2018).

### 3.2. Study design and data collection

Data were collected in two phases using a sequential exploratory design (Creswell and Clark, 2017) (Table 1). With this design, qualitative data is collected first, followed by quantitative data collection. This approach is often used where qualitative data is needed to inform the development and administration of quantitative data collection tools, and the quantitative results are used to verify the qualitative results using a larger sample (Creswell and Clark, 2017). In this study, we collected qualitative data in phase 1 and used it to prepare a questionnaire for data collection in phase 2. This approach facilitated an in-depth analysis of existing reference groups. We applied qualitative interviews and focus group discussions to explore the study area, its land and water use practices and social relations that had a possible effect on farmer land-use decisions. Our aim was to identify i) existing reference groups; ii) what made reference groups salient (status, power, or both); and iii) how farmers perceived the land-use preferences of these reference groups. The analysis of these data helped in narrowing down to the main reference groups included in the questionnaire for phase 2. In the quantitative phase (phase 2), we collected data on i) land-use practices, ii) relative importance of identified reference groups and their preferred land-use practices as reported by interviewed farmers. Details for each phase are provided in subsequent sections.

#### 3.2.1. Qualitative data collection (phase 1)

We conducted a literature review of past studies, government reports and documents to get more information on land-use practices, water management and possible drivers for land and water use practices in the region. Transect walks and observation were used to identify and document land-use patterns, water availability and use (irrigation or not, type of irrigation, by whom and where). Once an understanding of the landscape was obtained, the case study site was divided into three geographical locations: i) upstream, characterised by more rainfall and more rivers with high river flow; ii) midstream, with less rainfall and fewer rivers; and iii) downstream, which was drier, with much less rainfall and lower water levels in the few existing rivers. This categorisation allowed us to identify any significant difference in land and water use practices as well as any possible differences in dominant reference groups in the different locations. Specific areas visited within the landscape were Central ward and Mukogondo ward in Laikipia County, and Timau ward in Meru County. Individual interviews were conducted, followed by two distinct focus group discussions between April and August 2021 until there was no generation of new information in terms of land use, water use and reference groups. This led to a total of 59 interviews. Our interviews focused on farmers who were easily accessible, gave written consent to interviews and use of information they provided, and had adequate information on the identified thematic areas (listed in Table 1). Thus, respondents were identified through snowball (Berndt, 2020), and purposive sampling (Etikan et al., 2016). Most respondents were 31–40 years old (41%) followed by those between 21 and 30, 41–50 years and 51–60 years at 19% each, while respondents above 60 constituted 3% of the sample. The number of people living in each of the sampled households ranged from 1 to 13 with an average household size of 4.6 people. Out of the total respondents, 43% had secondary education. Other educational levels were primary (39%), college (10%), university (5%) and no formal education (3%).

#### 3.2.2. Quantitative data collection (phase 2)

We used information obtained from phase 1 to develop the

**Table 1**
Overview of methods used for data collection in the two phases.

| Overall method | Sequential exploratory design | |
|---|---|---|
| Phases | Phase1 | Phase 2 |
| **Objective** | Support designing and administration of questionnaire in phase 2 | Verify results from the exploratory qualitative survey using a larger sample |
| **Sampling method** | Purposive & snowball sampling. The aim was to get farmers with different crops (subsistent, for local and export market), engaged and those not engaged in contract farming. This presented an opportunity to assemble a diverse set of reference groups | Purposive & snowball sampling |
| **Data collection method** | •Semi-structured interviews (Questionnaire is provided in supplementary Material)<br>•Focus group discussion<br>•Literature review<br>•Transect walk and observation | •Structured questionnaire (Questionnaire is provided in supplementary Material)<br>•Individual interviews |
| **Sample demographic variables** | •59 respondents<br>•38 male & 21 female<br>•5 villages<br>•Age 21–70 years | •199 respondents<br>•83 male, 116 female<br>•6 villages<br>•Age: 21–70 years |
| **Thematic areas/ main topics** | •Land-use practices (current, past, and future practices)<br>•Drivers for land-use decisions<br>•Reference groups, their level of importance and opinion on different land and water uses | •Farmer socio-demographic information and geographic location<br>•Current land-use practices<br>•Relative importance of reference groups<br>•Opinion of reference groups on different land-use decisions as reported by interviewed farmers |

questionnaire for phase 2. The questionnaire was comprised of four main sections. Section 1 covered general questions on the farmer's age, gender, number of people living in the household, size of rented land, size of owned land, level of education, average monthly expenditure (as a proxy for economic status) and whether a farmer was engaged in other economic activities. Section 2 covered current land-use practices, section 3 dealt with ranking of reference groups, while section 4 was about the farmer's opinion on preferred land-use options for each reference group. From 2nd to November 5, 2021, the questionnaires were administered face-to-face to facilitate clarification of questions and translation to local language if necessary. Snowball and purposive sampling were used to identify farmers engaged in small-scale farming for the local market, contract farming with existing export companies, and a mix of farmers who accessed river water directly and/or through community water projects (CWPs). This was to enable identification of the level of influence of the different reference groups that had been identified earlier in phase 1 of data collection. A total of 199 questionnaires were used in this study. Out of the total respondents, 58% were female and 42% were male. When arranged by age, the highest proportion of respondents were 31–40 years (36%), followed by 41–50 years (26%), 21–30 years (22%), and 51–60 years (14%), while those above 60 years were 2%. Out of the total respondents, 49% had secondary education, 31% had primary education, and 19% had tertiary education, while 1% of the respondents had no formal education. The average household size for this sample was equal to that in phase 1 i.e., 4.6 people per household.

### 3.3. Data analysis

#### 3.3.1. Qualitative data analysis

The main documents used for qualitative analysis were farmers' respondent sheets, voice and video recordings, and photographs. The collected data were transcribed and analysed with ATLAS.ti version 9.0.23.0 (ATLAS.ti, 2022). To this end, we conducted a thematic analysis where rounds of open (in vivo) coding were followed by axial coding. This procedure led to an inventory of reference groups and/or individuals that influenced farmer land-use decisions, factors that made a reference group salient, and farmers' perceived land-use preferences. Identification of reference groups from the respondents' statements was based on authors' judgement, since it was sometimes difficult for respondents to distinguish whether a reference group's salience resulted from status or from potential for using power. Additionally, status-worthiness usually conferred some power. For instance, a knowledgeable farmer might be chosen as a chairman of a farmers' association, giving him power to influence decisions. Conversely, a powerful actor/reference group might be given status; for instance, a rich farmer might be listened to or copied.

#### 3.3.2. Quantitative data analysis

Descriptive analysis of data was performed to provide frequencies and percentages concerning age, gender, number of people living in the household, size of rented land, size of owned land, level of education, average monthly expenditure, and current land-use practices, as well as information on reference groups, their perceived opinion on different land-use options, and level of importance. This was essential information for the next step of drawing inferential statistics on the effect of different variables on land-use decisions. We used chi-square automated interaction detection (CHAID) (Wilkinson, 1992) to explore relations between land-use practices and reference groups. The CHAID procedure assessed and generated a simplified visual tree-like structure that predicted the dependent variable (i.e., the land-use decision; for instance, whether or not to farm maize), as an equation of independent variables (i.e., scores of the reference group). In this process, the score of a reference group $j$ on crop $i$ ($S_{ij}$), is a composite variable based on relative importance of reference group $j$ and the extent to which a farmer believes that reference group $j$ would prefer farming of crop $i$. Thus, we have $S_{ij} = W_j{}^*P_{ij}$, where $W_j$ denotes the weight (i.e., relative importance/salience) of reference group $j$; and $P_{ij}$ is the farmer's perceived preference of reference group $j$ for crop $i$. We had three categories of predictors: i) a salient reference group with a negative opinion of a land-use decision; ii) a salient reference group with a positive opinion of a land-use decision; and iii) a salient reference group with a neutral opinion of the land-use decision.

Besides the analysis of social relations, we further performed CHAID analysis to test the effect of socio-demographic and geographic location factors on land-use options. Additionally, we assessed the combined effect of socio-demographic, geographic location factors, and social relations on land-use decisions. Quantitative data were analysed using IBM SPSS Statistics 25.

## 4. Results

### 4.1. Qualitative results

The majority of farmers interviewed (95%) practiced smallholder farming on land that was either rented or privately owned land, while community land was mainly used by pastoralists. The size of smallholder farms ranged between 0.4 and 1.2 ha. There were three farmers with larger sizes of land, namely 2.8, 6.9 and 48.5 ha. Farmers had various land-use practices: they farmed multiple crops, kept livestock, and planted trees. Commonly grown crops were maize and potatoes, both of which were farmed by 25% of respondents, while French beans were farmed by 24% of respondents. Out of the total number of respondents, 19% had trees (mostly *Grevillea robusta*, pine and fruit trees) on their farms. Other crops farmed by less than 8% of respondents were carrots, beans, wheat, fruits, onions, Napier grass, flowers, sweet potatoes, tomatoes, baby corn, canola, millet, and khat. Most farmers indicated that

they were shifting from traditionally grown crops such as wheat and large-scale maize farming, either in totality or having left only a small portion of land for such crops as a result of decreasing farm sizes and a growing export market. Commonly reared livestock were cattle, raised by 48% of respondents and poultry, raised by 17%.

The most frequently mentioned reference groups were family, community water project/water resource users' association/water regulatory authority, agro-export companies, local community, neighbours, local traders/intermediaries/brokers, and the local government (Table 2). Other rarely mentioned reference groups included friends, private training farms, NGOs, and dairy farmer associations.

Most farmers considered family as the most salient reference group. They found it a responsibility to satisfy the family's food and income requirements first, before pleasing other reference groups. The community water project (CWP) was recognised as a salient reference group worthy of high status due to its position as a community-owned organization composed of community members. Also, as one of the water regulatory bodies, the CWP possessed a great deal of power, whereby it could cut off access to water for farmers who failed to comply with the set rules. The relation between farmers and agro-export companies was a combination of status accord and power use. Agro-export companies would acknowledge the importance of farmers (that is, accord status) by having agents on the ground interacting with farmers, incentivising farmers with quality seeds, trainings, and a stable market for their crops. In return, farmers would feel obligated to confer status in return by farming crops needed by the agro-export companies and adhering to their required level of quality. Even without such a status motive, farmers might comply because of the agro-export companies' power over them. After all, non-compliance to the agro-export companies' requirements, for example use of poor-quality seeds, use of prohibited herbicides or failure to irrigate as required, would lead the agro-export company to exert power by refusing to buy produce from non-compliant farmers.

Neighbours were considered significant, and their influence could be noted from similarities between crops planted by farmers within close range. Farmers would only learn from those neighbours/community members whom they perceived to be status-worthy, either because they were wealthier or simply because they had had a better harvest in the previous season. To some respondents, downstream communities were a salient reference group: these farmers said they would regulate their water use to allow good river flow to the downstream communities. In return, these farmers expected to be respected or accorded status not only by the downstream communities but also by the rest of the community. Local traders were considered important since they provided attractive gate prices for the crops. At times some local traders provided advance loans which would be considered to drive farmer land-use decisions towards a particular crop; upon receipt of the loan, a farmer would not have no choice but to do the trader's bidding. There were two respondents whose responses could be interpreted as recognition of government as a salient reference group. The government was recognised since it was providing farm input subsidies, a market for cereals, and training, especially for tree planting, in addition to resolving inter-community conflicts. Some of the farmers interviewed noted that they rarely took government into account while making their land-use because of the decline in their extension services support compared to that provided by agro-export companies.

### 4.2. Quantitative results

Most of the sampled respondents (82%) privately owned land. A proportion of respondents (29%) rented land; some landowners rented extra land for farming to increase their farm income. Use of community land was not common in the study site, with only 4% of the population making use of it. Most farmers used their land to farm crops that are traditionally considered food for family and those that are widely consumed in the local market or among the local community, such as

**Table 2**
List of reference groups, the reason for their salience (status, power, or both), accompanied by number of times a reference group was referenced and an example of comments made by respondents. Key words that were used to identify a statement with a particular reference group have been highlighted in the respondents' statements. This list is not comprehensive. It was narrowed down to those reference groups that were frequently mentioned and those that the authors thought would be interesting to explore based on reviewed literature.

| Reference groups (coded) | Status/ Power | Number of occurrences | Sample of comments |
|---|---|---|---|
| Family | Status | 28 | 'I plant different crops for food or cash to sustain my **family**. I am interested in pleasing my family, their opinion matters.'<br>'I breed fish since this is what my **grandfather** used to farm, and he is happy when I follow in his footsteps.' |
| community water project/water resource users' association/ water regulatory authority | Status and Power | 24 | *'I regulate my water use while irrig*ating to avoid conflict with members of my community water project.'<br>'At times I have to pump water at night to avoid confiscation *of my water pump and fines by the **water resource user's association**'*<br>*'When pumping water directly from the river, I have to be on the look-out for the **water scouts** who can confiscate my water pump and surcharge me'* |
| Agro-export company | Status and Power | *14* | *'I choose to plant **French bean**s* since I get subsidised seeds, fertiliser and agrochemicals from the company.'<br>'I am planning to start planting flowers (geraniums) since the flower company |

(*continued on next page*)

**Table 2** (*continued*)

| Reference groups (coded) | Status/ Power | Number of occurrences | Sample of comments |
|---|---|---|---|
| | | | has assured me of a ready market.' |
| | | | 'I am in contract farming with an a***gro-export company***. *Therefore, I must irrigate my crops to meet the standards of the agro-export company.'* |
| Local Community/ downstream communities/ Neighbours | Status and power | *8* | *'I am satisfied if my **community** is happy*. Therefore*, I plant crops that will create more jobs for the **community**.'* |
| | | | *'I keep cattle for prestige. My **community** will respect me more if I have cattle.'* |
| | | | *'Sometimes we have to reduce our water intake to prevent **pastoralists** from migrating upstream in search of water and destroying our crops in the process.'* |
| Local traders | Status | *5* | |
| | | | 'I plant several crops such as onions, potatoes, tomatoes and vegetables because local traders provide competitive price for my crops.' |
| Government | Status and power | *2* | |
| | | | 'As a youth, I started farming because our county Government started the 'Youth into farming competition'; I get a cash reward if I win the competition.' |

maize, potatoes and vegetables. Some farmers had also diversified to include export crops, with 49% of the farmers planting French beans. Average farm sizes were 0.1 ha for rented land and 0.4 ha for privately owned land. The small farm sizes had affected adoption of agroforestry by some households. A full description of farmed crops is shown in Table 3.

**Table 3**
Description of respondents' land-use practices at the time of data collection.

| Farmed crop | Proportion of respondents farming crop | Standard deviation |
|---|---|---|
| Potatoes | 0.86 | 0.3 |
| Maize | 0.84 | 0.4 |
| Vegetables(spinach, kales, cabbage) | 0.69 | 0.5 |
| French beans | 0.49 | 0.5 |
| Trees | 0.47 | 0.5 |
| Beans | 0.28 | 0.5 |
| Fruits | 0.24 | 0.4 |
| Peas | 0.19 | 0.4 |
| Tomatoes | 0.17 | 0.4 |
| Onions | 0.15 | 0.4 |
| Drought-resistant crops | 0.09 | 0.3 |
| Wheat | 0.03 | 0.2 |

#### 4.2.1. *Farmer opinions of land-use preferences of reference groups*

Farmers ranked reference groups depending on their perceived level of importance. On average, family was considered the most important, followed by agro-export companies, the community water project, local traders, neighbours, government, and downstream communities, while ancestors were the least important (Table 4). We measured the level of concurrence/variation on the importance of reference groups among farmers across the landscape. It was notable that most farmers agreed that ancestors were not important; however, there was a wider divergence in ranking of the community water project and government (Table 4). A detailed ranking of each reference group is provided in the supplementary Material.

Farmers felt that different reference groups would be pleased, displeased, or neutral regarding their land-use decisions to farm different types of crops. For instance, out of the total respondents, 92% felt that their family would be pleased if they farmed potatoes while 63% felt family would be displeased if they farmed wheat and 47% felt family would be neutral if they chose to farm drought-tolerant crops (Fig. 2). Another example with the community water project (CWP) as a salient reference group is that 83% of the respondents felt that the CWP would be pleased if they planted trees, while 27% felt the CWP would be displeased if they farmed vegetables (Fig. 2). Other interesting results were that most respondents (more than 75%) felt the local market would be pleased with all crops. Detailed information for each crop is provided in the supplementary Material.

#### 4.2.2. *Influencers of land-use decisions*

a) Socio-demographic influencers

There was a significant relation between some socio-demographic variables and farming of maize, tomatoes, fruits, and trees (Table 5). For example, maize farming was influenced by household size and location (county). The probability that a household with less than two

**Table 4**
Relative ranking of reference groups and spread (standard deviation) as calculated using the average rank across respondents.

| Reference group | Average rank | Rank | Standard deviation |
|---|---|---|---|
| Family | 2.88 | 1 | 1.7 |
| Agro-export company | 2.92 | 2 | 1.5 |
| Community water project | 3.78 | 3 | 2.0 |
| Local trader | 3.88 | 4 | 1.9 |
| Neighbour | 4.4 | 5 | 1.9 |
| Government | 4.44 | 6 | 2.0 |
| Downstream communities | 5.38 | 7 | 1.6 |
| Ancestor | 7.23 | 8 | 0.8 |

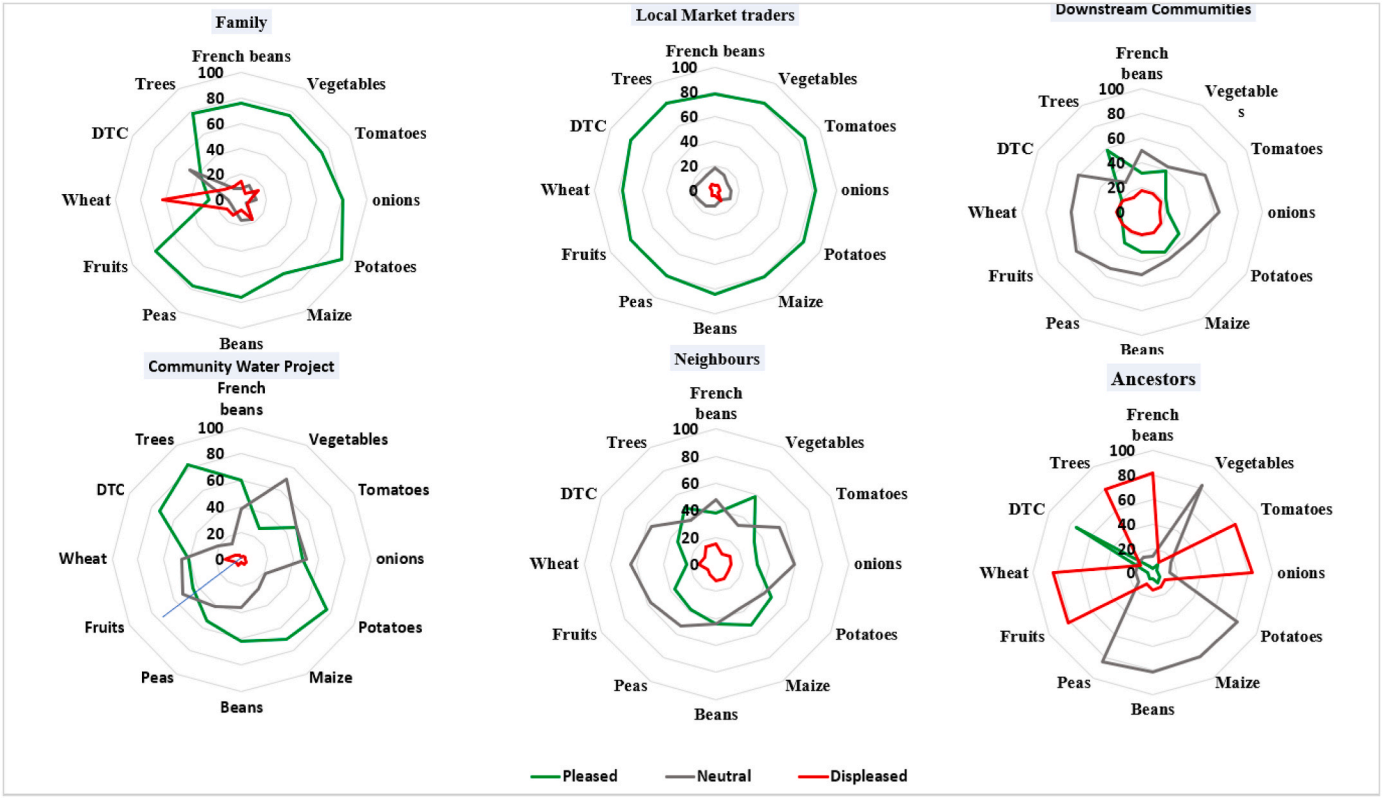


**Fig. 2.** Farmers' perceived preferences of reference groups on select crops. The diagram shows the proportion of respondents that felt a reference group would be pleased, displeased or neutral if a farmer chose to farm a select crop.

**Table 5**
Results from CHAID analysis showing probability of farming select crop given the listed socio-demographic factors and geographic location. Insignificant results were not included.

| Land-use option (% of respondents farming crop) | Significant Socio-demographic variable | Variable description | | | p-value | Chi-square | Accuracy of predictions (%) |
|---|---|---|---|---|---|---|---|
| Maize | Household size | ≤2 members | >2 members | | <0.001 | 17 | 86.4 |
| (84%) | County | | Laikipia | Meru | 0.03 | 4 | |
| | **Probability of farming maize (%)** | 33 | 91 | 80 | | | |
| **Tomatoes** | Engagement in other economic activities | No | Yes | | 0.018 | 5 | 83 |
| **(17%)** | **Probability of farming tomatoes (%)** | **21** | **7** | | | | |
| **Fruits** | Engagement in other economic activities | No | | Yes | 0.006 | 7 | 76 |
| **(24%)** | County | Laikipia | Meru | | 0.02 | 5 | |
| | **Probability of farming fruits (%)** | **34** | **14** | **11** | | | |
| **Trees** | Age in years | ≤45 | >45 | | 0.039 | 7 | 56 |
| **(47%)** | **Probability of planting trees (%)** | **51** | **26** | | | | |

members would farm maize was 33%. On the other hand, the probability that a household with more than two members in Laikipia County would plant maize was 91%, while in Meru it was 80%. There was no correlation between any of the socio-demographic variables and potatoes, vegetables, French beans, beans, peas, onions, drought-tolerant crops or tree farming.

b) Social relations

There was a significant relation between reference groups and some of the land-use decisions (Table 6). For example, potato farming was influenced by neighbours and the local market. There was a 100% chance that a farmer who believed neighbours were in support of potatoes would farm the crop. Further, there was a 72% chance that a farmer who believed that neighbours and local market did not support potato farming would farm the crop anyway. While negative opinion was expected to lower the chances of farming a crop, we had some interesting results on French bean farming. Here, the highest probability (78%) of farming French beans was when a farmer believed the agro-export company would support farming that crop, but neither the local market nor the government would support the decision. There were no significant relations between reference groups and farming of wheat, trees, or drought-resistant crops. Table 6 also provides the accuracy of the predictions. For example, in maize farming, the percentage of correct classification was 92%, This signifies a 92% probability that a farmer who the model predicted would farm maize would actually do so. Salient reference groups that had no significant influence on land-use decisions according to the CHAID test were not printed.

c) A combined effect of socio-demographic, geographic location, and social relations

Noting that the theory of reference groups complements other theories, we tested the combined effect of using socio-demographic

**Table 6**

*Summary of results from CHAID decision trees showing probability of farming select crop given the opinion of salient reference group. ✓ represents a positive opinion while ✗represents a negative opinion from the corresponding reference group. Merged cells show a node that has been split further due to existence of other salient reference groups affecting results within the node. Reference groups that have no significant influence on land use according to the CHAID test were not printed.*

| Land-use option (% of respondents farming crop) | Significant reference group | Opinion | | | | p-value | Chi-square | Accuracy of predictions (%) |
|---|---|---|---|---|---|---|---|---|
| **Potatoes** | Neighbours | ✔ | *x* | | | <0.001 | 17 | 86 |
| **(86%)** | Local market | | ✔ | *x* | | 0.001 | 12 | |
| | **Probability of farming potatoes (%)** | 100 | 94 | 72 | | | | |
| **Maize** | Family | ✔ | *x* | | | <0.001 | 53 | 90 |
| **(84%)** | Local market | | ✔ | | *x* | <0.001 | 24 | |
| | Government | | ✔ | *x* | | 0.001 | 11 | |
| | **Probability of farming maize (%)** | **99** | **93** | **59** | **0** | | | |
| **Vegetables (69%)** | Local market | ✔ | *x* | | | 0.001 | 12 | 69 |
| | **Probability of farming vegetables (%)** | **80** | **58** | | | | | |
| **French beans** | Agro-exporters | ✔ | | | *x* | 0.041 | 5 | 63 |
| **(49%)** | Local market | ✔ | *x* | | | 0.015 | 5 | |
| | Government | | ✔ | *x* | | 0.004 | 8 | |
| | **Probability of farming French beans (%)** | **44** | **45** | **78** | **36** | | | |
| **Beans** | Neighbours | ✔ | | *x* | | 0.012 | 7 | 72 |
| **(28)** | CWP | ✔ | *x* | | | 0.021 | 6 | |
| | **Probability of farming beans (%)** | **41** | **23** | **0** | | | | |
| **Fruits** | CWP | ✔ | *x* | | | 0.006 | 8 | 76 |
| **(24%)** | **Probability of farming fruits (%)** | **40** | **19** | | | | | |
| **Peas** | CWP | ✔ | *x* | | | 0.002 | 10 | 81 |
| **(19%)** | **Probability of farming peas (%)** | **32** | **12** | | | | | |
| **Tomatoes** | CWP | ✔ | *x* | | | 0.003 | 9 | 83 |
| **(17%)** | **Probability of farming tomatoes (%)** | **30** | **11** | | | | | |
| **Onions** | CWP | ✔ | *x* | | | 0.002 | 11 | 85 |
| **(15%)** | **Probability of farming onions (%)** | **29** | **9** | | | | | |

variables and reference groups in predicting probabilities of farming selected crops. The precision of predictions increases when one combines social demographics, geographic factors, and effect of reference groups as explanatory variables of farmer land-use decisions. To illustrate, exclusive use of socio-demographic and geographic variables as the only influencers of farmer decisions shows no association of these factors with farmer decisions, while use of social relations as the only predictors shows that there is a chance that 72% of farmers would farm potatoes despite a negative opinion from neighbours and local market traders. However, combining all the factors shows that the likelihood that farmers will farm potatoes despite a negative opinion from salient reference groups (i.e., neighbours and local traders) varies with geographic location. For example, farmers in Meru County were more likely (87%) to farm potatoes than those in Laikipia County (64%). Similarly, the probability of farming vegetables varies not only with opinions from local markets but also with land ownership and household size. In Table 7, we highlight instances of significant variation in predictors and probabilities of farming select crops while using a combined model. A comprehensive table that includes areas where there were no significant changes is provided in supplementary Material.

## 5. Discussion

In this paper, we used the status-power theory of relations to explore the effect of social relations on farmer land-use decisions. This is in addition to other concepts and theories that have been used before, notably socio-demographic factors, utility theory, prospect theory, bounded rationality, and theory of planned behaviour. Our results showed that socio-demographic factors can be used to predict farming of a few crops, i.e., maize, tomatoes, fruits, and trees. A household with more family members living in the homestead was more likely to farm maize. The results were consistent with other studies in which larger families were found likely to focus on food crops such as maize (Siphesihle and Lelethu, 2020). Since maize and fruits are considered low-water requirement crops, the prevalence of these crops in Laikipia County, which is drier than Meru County, shows that farmers did consider ecological factors. This perspective is corroborated by other studies on ecology and land-use decisions (Wanyama et al., 2021; Zobeidi et al., 2022). Regarding tomato farming, farmers engaged in off-farm activities are less likely to farm tomatoes. Although lack of engagement in off-farm activities ensures availability of labour and the care that is needed for tomato farming, this finding is contrary to some studies where alternative sources of income are critical in financing crops such as tomatoes, which need huge capital investment (Giller et al., 2021). In our study, younger farmers were more likely to plant trees than older farmers because of prospective long-term benefits. This finding contrasts with some studies that indicate older farmers are more likely to plant trees because of their prolonged interaction with the environment and understanding of the importance of tree planting (Wijayanto et al., 2022).

Other variables exist that were not significant in this study but have been attributed to land-use patterns. For example, farmers with greater land sizes were found to engage in more sustainable management practices (Kansanga et al., 2021; Oduniyi, 2022) and were likely to invest in tree planting (Beyene et al., 2019; Kansanga et al., 2021; Lambert and Ozioma, 2012; Oduniyi, 2022; Pello et al., 2021). Farming of traditional crops was found to be significantly influenced by a farmer's age or level of education (Brown et al., 2019; Dhraief et al., 2018; Jha and Gupta, 2021; Lambert and Ozioma, 2012) while larger households were likely to adopt new land-use practices (Bartkowski and Bartke, 2018; Kansanga et al., 2021). Finally, an increase in land, labour, capital, and knowledge was likely to increase sustainable crop production (Marinus et al., 2022).

Besides socio-demographic factors, there are economic and ecological perspectives on farmer land-use decisions. In our study, most farmers prioritised potatoes and maize farming, while fully aware that these crops are less profitable than other crops such as French beans or snow peas. This finding fits the prospect theory (Kahneman and Tversky, 1979, 2013), in which farmers would be expected to choose safe options to avoid losses. Potatoes and maize are considered less prone to losses since they can be consumed in the family, are easy to store for a longer period and can also be easily sold in the local market. Moreover, crops such as French beans are mainly grown as a cash crop, making them vulnerable to market dynamics, and they are also difficult to manage after harvesting. It is then understandable that farmers would choose a crop that has sure gains and avoid crops that are subject to possible

**Table 7**
Presents the percentage of farming select crops using socio-demographic and geographic factors, reference groups, and when using a model combining all three factors. The figures in round brackets show the probability of farming a crop given the predictors. An X before a reference group, indicates instances where the reference group is perceived to be against farming of the crop, while * signifies a combined effect of two factors in a model. For instance, Family-*Neighbour means support from both family and neighbour, while Family-*XNeighbour means support from family but not neighbour. We note that while there could be other explanatory factors that affect farmer decisions, only a few were tested in this study.

| Crop | Socio-demographic & geographic factors model | Reference groups model | Combined model |
|---|---|---|---|
| **Potatoes** | None | Neighbours (100%)<br>XNeighbour *Local trader (94%)<br>XNeighbour*Xlocal trader (72%) | Neighbours (100%)<br>XNeighbour *Local trader (94%)<br>XNeighbour*Xlocal trader*Meru (87%)<br>XNeighbour*Xlocal trader*Laikipia (64%) |
| **Maize** | Hhsize ≤ 2 (31%)<br>Hhsize>2* Laikipia (91%)<br>Hhsize>2* Meru (80%) | Family (99%)<br>XFamily*Local traders*Government (93%)<br>XFamily*Local traders*XGovernment (59%)<br>XFamily*XLocal traders*XGovernment (0) | Family (99%)<br>XFamily*Local traders*Government (93%)<br>XFamily*Local traders*XGovernment (59%)<br>XFamily*XLocal traders (0) |
| **Vegetables** | None | Local traders (80%)<br>Xlocal traders (58%) | local traders*own land*HH > 5(100%)<br>local traders*own land*HH ≤ 5 (79%)<br>local traders*rented land (60%)<br>XLocal traders*own land (53%)<br>XLocal traders*rented land (76%) |
| **Trees** | Age ≤ 45 years (34%)<br>Age >45 years (11%) | None | Age ≤ 45 (51%)<br>Age>45*Neighbours (47%)<br>Age>45*Xneighbours (6%) |
| **Fruits** | Off-farm activity (11%)<br>No off-farm activity * Laikipia (34%)<br>No off-farm activity * Meru (14%) | CWP (40%)<br>XCWP (19%) | CWP*Meru (13%)<br>CWP*Laikipia (50%)<br>XCWP (19%) |
| **Peas** | None | CWP (32%)<br>XCWP (12%) | CWP (32%)<br>XCWP*Meru (22%)<br>XCWP*Laikipia (6%) |
| **Tomatoes** | Off-farm activity (21%)<br>No off-farm activity (7%) | CWP (30%)<br>XCWP (11%) | CWP (30%)<br>XCWP*age>30years (14%)<br>XCWP*age<30years (0) |

losses. Farmer land-use decisions have also been attributed to limitations of knowledge, cognitive ability, and time (Simon, 1990). An increase in either of these attributes has been found to increase chances of sustainable crop production (Hammond et al., 2021; Marinus et al., 2021). This is confirmed in our study where export crops (French beans, garden peas, geraniums, basil), despite their possible good profits, were not common due to limited knowledge of markets and how to farm them, in contrast with traditional crops (maize, potatoes) about which farmers have extensive knowledge.

In this study, socio-demographic factors could only account for decisions on a few crops. Further, while some results are consistent with past studies, others are contradictory. This contradiction is not an exception; an analysis of past studies also shows that findings using socio-demographic factors, economic and ecological perspectives have been inconclusive (Githinji et al., 2023). Furthermore, those studies which used the theory of planned behaviour to capture the effect of attitudes, norms and perceived behavioural control on farmer land-use decisions have produced varied results (Borges et al., 2014, 2016; Lalani et al., 2016). This could be because there was no shared norm. From the perspective of the theory of planned behaviour, social norms are inculcated by a society holding an opinion that is shared by all individuals. From Kemper's perspective, this would imply that all farmers have the same salient reference groups with the same opinion, for instance, which type of crops should be farmed. This would constitute a norm across those reference groups. In instances where this holds, predicting behaviour using the theory of planned behaviour could be accurate, but this is not always the case. We use Kemper's theory as an approach that acknowledges existence of multiple reference groups with divergent opinions affecting the decision process. Kemper's theory uses the status-power analysis to determine which reference groups mould observed behaviour.

### *5.1. Social relations as an additional perspective on farmer land-use decisions*

The contribution of Kemper adds another perspective to farmer land-use decisions. It makes explicit which reference groups matter to farmers when they decide on their land use. Farmers' land uses may vary across farmers who have the same socio-demographic characteristics, as a result of the weight that individual farmers place on specific reference groups. From Kemper's perspective, since farmers seek to please their salient reference groups (Kemper, 2017), we expect a perceived opinion from a salient reference group, whether positive or negative, to have a significant effect on land-use decision. To a substantial extent, our results concur with Kemper's theory. Indeed, farmers practice land-use options that they believe would please their salient reference groups. For example, none of the farmers would farm maize if they believed family and local market traders would not support the option. The probability of farming maize rises to 99% if they believe that their family, which is a particularly important reference group, supports maize farming. The same applies to most of the other land-use options. Reference groups ranked as the least important have less or no influence on the farmers' land-use decisions. For instance, downstream communities and ancestors do not have any significant relations with any of the land-use options. Although ancestors were perceived to have a strong negative opinion on French beans, tomatoes, onions, fruits and wheat as viable land-use options, their influence on these crops was not significant, as a result of the low salience of this reference group. Downstream communities would be expected to have a strong opinion and possibly influence on some crops, especially high-water requirement crops since they affect water availability downstream. However, our results contradicted this expectation. Apparently, farmers considered downstream communities as having little authority over water regulation and most of the land-use options, making them less salient.

Puzzlingly, we have instances where, irrespective of a negative opinion from a salient reference group, a substantial percentage of farmers would still farm the crop. For example, 78% of farmers who got a positive opinion on French beans farming from agro-export companies were likely to farm the crop despite perceiving a negative opinion from government and local markets. The move to defy the perceived negative opinion could have been largely attributed to other factors. French beans are grown mainly for the export market and more specifically Europe. The highest export market demand and consequently the best prices for the crop are between October and April, during and slightly after the

winter season in Europe. During the period within which these data were collected, i.e., November, there was a high likelihood that, despite farmers' respect for local market and governments, their negative opinion would carry less weight than the positive opinion from agro-export companies. This result does not discount the effect of government or local markets; rather, it implies that the reference group that offers/provides more economic benefits, for instance the agro-export company or family, takes precedence.

Economic, ecological, and social-relational perspectives can be interrelated, and if used simultaneously, they could increase understanding of farmer land-use decisions. The expected utility, defined by economic models, can be attributed to the perceived preferences of reference groups. If farmers believe their salient reference groups would be pleased with land-use decisions that maximise economic or ecological gains, they are likely to implement such decisions. Basically, reference groups mould an individual's priorities. A strong contribution of Kemper's theory is that it explains why farmers with the same demographic characteristics and context would make different land-use decisions. Noting the significant role of reference groups, it would then be important to know i) what makes a reference group gain or lose its salience, and ii) what informs farmers' perception of preference of reference groups.

### 5.2. Salience of reference groups

The salient reference groups were family, community water project (CWP), agro-export companies, local market traders, government, neighbours, downstream communities and ancestors among others. This finding is in line with those of studies conducted in the Upper Ewaso Ngíro North River basin where neighbours, friends, family, community leaders, extension workers, and community water project members were found to influence land-use decisions (Giroux et al., 2022; McCord et al., 2015). Ancestors were considered the least important reference group. This is possibly because most of the farmers, who came from different parts of Kenya, settled in the region more than 20 years ago, and their norms blended with time into one, forming new practices that were compatible with local conditions (Giger et al., 2022). This scenario may change if a similar study is conducted in an indigenous community which these farmers originated from; there is likely to be a self-selected difference between those who emigrate and those who stay.

### 5.3. Farmers' perceived preferences of reference groups

Farmers believed that family preferred land-use practices that would ensure there is enough food and income. Hence, family was perceived to support all crops except drought-tolerant crops, and wheat, which takes longer to mature and has less profit. Notably, since family is the most salient reference group on average, the dominant food crops are those that can also be easily sold in the local market such as maize, potatoes and vegetables. The CWP was perceived to be supportive of options that led to protection of the water tower and less abstraction of river water. This is in line with the CWP policy documents (Kenya Water Act., 2016) and other studies on community-driven water projects (Dell'Angelo et al., 2016; Gidey and Gidey Weldeabzgi, 2021; Villamayor-Tomas and García-López, 2017). The agro-export companies and local market traders were perceived to be interested in land-use practices that would produce enough crops for the export market, such as French beans, peas, and fruits, as well for the local market, including such as maize, potatoes and vegetables. The government was perceived to be more supportive of most of the crops, since its main intention is to ensure adequate food production and income generation across seasons for its citizens. Most of the farmers felt neighbours and downstream communities did not strongly support or object to any land-use option. Unlike the other reference groups, neighbours rarely voiced their preferences and despite the influence from neighbours, it was difficult for a farmer to establish what their neighbours supported or opposed, and hence settled for the neutral option. Downstream communities were perceived to be neutral on most of the crops, including those with a high-water requirement. This was an unexpected result, since there is documented evidence of persistent water-related conflicts between pastoralists in the downstream and crop farmers in the upstream, originating from what downstream communities consider as excessive irrigation in the upstream region (Gichuki, 2002; Kiteme, 2020; Lesrima et al., 2021; Mutiga et al., 2010). This could mean that although farmers were aware of the downstream communities' preferences, this awareness yielded to the need to please other reference groups. Possibly it was easier for the respondents to present themselves as less aware of the opinions of downstream communities than to seem unempathetic to them. Continuous engagements on shared platforms with farmers across the landscape could possibly generate empathy and status-worthiness of the downstream communities.

## 6. Conclusion and future research

We explored farmer land-use decisions from the perspective of social relations using the status-power theory of relations. The study indicates how the status-power theory of relations can complement these theories and help explain inconsistent results. The status-power theory of relations views human life, including decision-making processes, as happening within the context of social relations. It posits that farmer land-use decisions are not only influenced by prospective loss or gain; attitudes towards an option; limitations in knowledge, cognition or time; or farmer's socio-demographic and geographic location. Apart from these factors, farmers associate with salient reference groups that they try to please to gain status in the group's eyes, and whose power use against them they try to avoid. A limitation of using status-power theory of relations is that most of the time individuals may not be aware of which reference group moulded their decisions. Additionally, it may be difficult to differentiate whether a reference group used status, power or both to influence a decision. Our data relied heavily on authors' judgements of the respondents' statements. Despite these limitations, we were able to produce a rich data set from which we drew our conclusions. Using empirical data from the Mt. Kenya region, we note that i) reference groups exist with various levels of salience, i.e., combinations of status-worthiness and power; ii) farmers had a perception of which land-use options their salient reference groups would like them to choose; and iii) these perceptions did indeed influence land-use practices. Therefore, researchers and policy makers should identify and account for the effect of social relations on farmer land-use decisions within and across groups. One way to do this is through consultation and active engagement of stakeholders, including local stakeholders in a shared platform. This platform would acknowledge that farmers on the same landscape have vastly different reference groups: for instance, some might love and admire the water regulatory bodies, while others despise them. Farmers are also likely to disagree about measures such as water regulation. However, the shared platform would also generate discussions that clarify areas of misunderstanding and congruence of opinions.

We note that the effect of social relations on land-use patterns (which farmers use land in what way) likely varies with culture. The more the prevailing culture has strongly embedded relational ties (in other words, the more collectivistic and hierarchical it is), (Hofstede et al., 2010), the more one expects an important role in decision-making for relational factors such as obedience, allegiance, and loyalty, and other non-economic factors as well. Apart from these considerations, other significant factors will be social diversity (for instance, migrant, or long-term settled communities), geography (homogeneous lowlands or structured mountain systems) and accessibility patterns (for instance, distance to markets). Although our study did not include cultural dimensions, exploration of social relations in a cross-cultural setting would be an interesting topic for future research.

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## CRediT authorship contribution statement

**Margaret Githinji:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Meine van Noordwijk:** Writing – review & editing, Validation, Supervision, Methodology, Funding acquisition, Conceptualization. **Catherine Muthuri:** Writing – review & editing, Supervision, Methodology. **Erika N. Speelman:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Jarl Kampen:** Writing – review & editing, Methodology, Formal analysis. **Gert Jan Hofstede:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization.

## Declaration of competing interest

None.

## Data availability

Data will be made available on request.

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## Appendix A. Supplementary data

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