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Managing Africa's Soils No. 24

Understanding diversity in farming practices in Tigray, Ethiopia

Atakilte Beyene, David Gibbon and Mitiku Haile

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About the authors

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About NUTNET

NUTNET is a network that aims to improve the management of soil fertility in Africa. It is a partnership of fifteen organisations from six African and two European countries: INERA, Burkina Faso; SOS Sahel, Ethiopia; KARI, KIOF & ETC East Africa, Kenya; IER, Mali; Environment Alert & University of Makerere, Uganda; IES, Zimbabwe; IIED & IDS, United Kingdom; and AB/DLO, LEI/DLO, SC/DLO, ETC & KIT, The Netherlands. NUTNET is funded by DGIS, the Ministry of Foreign Affairs in The Netherlands.

About *Enhancing soil fertility in Africa: from field to policy-maker*

This project builds on the work done by the NUTNET network, which has been extended to include the Swedish University of Agricultural Sciences (SLU), the Universidad Complutense de Madrid (UCM) and the National Agricultural Research Foundation (NAGREF) from Greece. It is funded by the International Co-operation for Development (INCO) programme of the European Union, which links ongoing research projects on soil fertility management in sub-Saharan Africa, focusing on the implications of diverse social, economic and environmental settings, and the differing perceptions held by stakeholders of research and policy design.

Acknowledgments

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Summary

The management of soils is an important issue for policy makers in Ethiopia. However, most of the interventions designed to conserve these resources have fallen short of the expectations they aroused, performing impressively in the short run, but proving unsustainable on a long-term basis. There are no simple explanations for the failure of these interventions to reverse soil degradation, but it has been evident for some time that there is an uneasy connection between 'objective' assessments of the environment and the way that this information is used in the policy making processes. It is now widely accepted that understanding the processes of soil degradation is not simply a matter of analysing changes in the stock of physical and nutrient capital. While studies of nutrient balances are an important complement to research into soil erosion and land degradation, they need to be considered in the context of other social, cultural and political factors.

This paper presents the results of a study undertaken in Tigray, Ethiopia, exploring local people's perceptions and understanding of their land resources, and the way that their views influence natural resource management. Farmers distinguish three different types of plots, which are managed in very different ways according to the agricultural and social value attached to them. Although farming activities may seem to be determined solely by the physical properties of fields, our findings indicate that land use is shaped by historical processes and local cultural values, and that the management strategies adopted by farmers are influenced by a broad range of factors. These include history of tenure and patterns of inheritance, investment in a plot, and the sense of place, identity and attachment to a locality that develops over time as generations pass through the same family dwelling. Land users in Tigray do not consider arable land purely in terms of its agricultural value.

The cultural and social meanings attributed to specific areas also play an important role in the physical condition of fields, and the manner in which farmers engage with their surroundings may explain why certain plots are still 'good', despite having been continuously cultivated by successive generations. It also accounts for local resistance to some types of land distribution and acceptance of others. Policy makers therefore need to pay more attention to the relationships between people and land, and to the value that farmers attach to different fields and plots. Our findings have significant implications for policies on agricultural extension and land redistribution, and for on-farm research, as the type of plot used to test technologies will have a significant impact on the outcome of trials.

French summary

Résumé

La gestion des sols est une question importante pour les décideurs politiques en Ethiopie. Toutefois, la plupart des interventions conçues pour conserver ces ressources, n'ont pas répondu aux espoirs qu'elles avaient suscités, en ayant des performances impressionnantes au début, mais s'avérant non durables à long terme. Il n'y a pas d'explication simple à l'échec de ces interventions faites pour interrompre la dégradation des sols mais il est clair, depuis un certain temps, qu'il y a une connexion difficile entre les évaluations "objectives" de l'environnement et la façon dont cette information est utilisée pour préparer les processus de prise de décision. Il est généralement accepté, désormais, que la compréhension des processus de dégradation des sols n'est pas simplement une question d'analyse des changements constatés dans le stock d'éléments nutritifs et physiques. S'il est vrai que les études portant sur les éléments nutritifs apportent un complément important aux recherches sur l'érosion des sols et la dégradation des terres, elles doivent néanmoins être considérées dans le contexte d'autres facteurs sociaux, culturels et politiques.

Ce document présente les résultats d'une étude effectuée au Tigré en Ethiopie, explorant les perceptions et la compréhension de la population locale de leurs ressources foncières et la façon dont leurs opinions influencent la gestion des ressources naturelles. Les agriculteurs font la distinction entre trois types différents de terrains qui sont gérés de manières très différentes, selon la valeur agricole et sociale qu'ils leur accordent. Nos résultats indiquent que l'exploitation foncière est façonnée par des processus historiques et des valeurs culturelles locales et que les stratégies de gestion adoptées par les agriculteurs sont influencées par une grande gamme de facteurs. Parmi ceux-ci, on notera l'historique des tenures, l'investissement dans une parcelle et le sens de place, d'identité et d'attachement à une localité qui se développe au fil du temps alors que les générations se succèdent dans la même demeure familiale. Les utilisateurs fonciers au Tigré ne considéraient pas leurs terres arables, notamment les terrains proches, simplement au vu de leur valeur agricole.

La dimension culturelle et sociale que les agriculteurs attribuent à des zones spécifiques joue aussi un rôle important dans les conditions physiques des champs. La manière dont les agriculteurs traitent leur environnement peut expliquer pourquoi certaines terres arables sont encore "bonnes", en dépit du fait qu'elles aient été cultivées sans interruption par des générations successives et pourquoi la population locale a refusé certains types de distribution des terres alors qu'elle en acceptait d'autres. Les politiques devraient donc prendre plus en compte les relations entre les gens et la terre et la valeur que les agriculteurs attachent à leurs différents champs et terrains. Cela a des implications pour les politiques de vulgarisation agricole, de redistribution des terres et pour les recherches agricoles sur le terrain, car le choix des parcelles retenues pour les tests aura un impact significatif sur le résultat des essais.

1 Introduction

Introduction

The management of soils is an important issue for policy makers in Ethiopia. However, most of the externally driven interventions designed to conserve resources have fallen short of the expectations they aroused: performing impressively in the short run, but proving unsustainable on a long-term basis (Shaxon et al., 1989; Reij, 1991; Hoben, 1996). There are no simple explanations for the failure of these interventions to reverse soil degradation, but it has been evident for some time that there is an uneasy connection between 'objective' assessments of the environment and the way that they are used to inform policy making processes (Röling, 1997; Leach and Mearns, 1996; Fairhead and Leach, 1998).

It is now widely accepted that understanding the processes of soil degradation is not simply a matter of analysing changes in the stock of physical and nutrient capital, particularly if the objective is to inform policies aimed at facilitating more sustainable land use (Scoones and Toulmin, 1998; Scoones, 1997). While studies of nutrient budgeting and nutrient balances are an important complement to research into soil erosion and land degradation, they need to be considered in the context of other social, cultural and political factors in order to understand the characteristics of change in natural resource management in Africa. The main challenge currently faced by researchers and policy makers is the need to improve their understanding of the diversity, complexity and uncertainty of smallholder farming systems (Chambers, 1990; Scoones and Toulmin, 1998).

Many assessments of the African landscape take a short term view, overlooking the effects of longer-term processes, and it is all too easy to draw misleading conclusions about the broader picture by extrapolating from limited, locally specific data sets (Cornwall et al., 1994). The simplifications used to explain environmental change can result in inappropriate policies and interventions. The evidence used to inform policy making processes needs to be reassessed, and data should no longer be regarded as objective fact simply because it is based on quantitative measurements of the physical environment (e.g., Blaikie, 1993; Biot et al., 1995).

Environmental change cannot be explained by hard evidence alone (Röling 1997). Hard evidence is not very effective in explaining the 'soft' side of the system – human activities and daily reality, individual perceptions and interpretations of the world, the meaning attributed to the natural system, and people's goals, intentions, purpose and sense of agency. According to Woodhill and Röling (1998), this has created a gap in our understanding of human systems, undermining our attempts to link them with ecosystems. This type of analysis will only have any real relevance if it pays more attention to patterns of human activity and the values on which they are based (Hannigan 1995).

This paper presents the results of a study undertaken in Tigray, Ethiopia, exploring local people's perceptions and understanding of their land resources, and the way that their views influence natural resource management. Although farming activities may seem to be determined solely by the physical properties of the plots, our findings indicate that land use is shaped by historical processes and local cultural values, and that the management strategies adopted by farmers are influenced by a broad range of factors.

Methodology

Fieldwork was conducted from May 1999 to April 2000, using qualitative and quantitative methods to collect information. A process of observation and informal participatory discussions with individuals and groups representing men and women from different socio-economic categories led to the formation of a set of focus groups. They regularly met the team for discussions, and over time developed categories to define village spaces and their distinguishing qualities, as well as the ways that local people interpret, compare and judge their land resources.

Further studies were conducted on factors affecting the management of arable land, and a questionnaire was developed, containing a mixture of closed and open-ended questions about the social and economic situation of households. A total of 96 households were interviewed, and information collected on 285 plots held by them. Four assistants were recruited from the area and trained to conduct the survey.

This paper starts with a brief description of the region of Tigray and the village of Mishig, continuing with an analysis of land patterns and plots, local perceptions of land value and the categories used to differentiate between various types of arable land. After considering the characteristics of particular plots and the way they are managed, the paper closes with a discussion of the results of the study and their implications for future policies.

2 Background and context of the study area

The region of Tigray

This study was conducted in Mishig, a village in the central part of Tigray in northern Ethiopia. Altitude varies from about 500 metres above sea level (masl) in the northeast to almost 4000 masl in the southwest. According to local agro-climatic classification, about 53% of the land is lowland (*kola*), as it is less than 1500 masl; 39% is of medium altitude (*weinadega*), situated 1500 to 2300 masl; and 8% is classified as highland (*dega*), located at over 2300 masl.

Rainfall generally increases with altitude, averaging from about 200 mm in the northeast to over 1000 mm in the southwest highlands. However, this pattern is highly influenced by topography and altitude, and a variety of agro-ecological niches or microclimates can be found (Amare, 1996). Situated in the African drylands, the region is characterised by sparse and highly variable seasonal rainfall and frequent droughts (Warren and Khogali 1992). The coefficient of variation in annual rainfall for Tigray is about 28%, compared to 8% for Ethiopia as a whole (Amare, 1996). Rainfall is generally mono-modal, mainly occurring between June and September, although it is bimodal in the southwest, which has a short rainy season from March through to May.

Agriculture is one of the most important activities in Tigray, where about 65% of the land is under cultivation, with the rest taken up by pasture, forests and wasteland. Over 95% of the cultivated area is farmed by smallholders (BoANRD, 1997), most of whom follow a mixed crop/livestock system[1].

Over the last thirty years, farming practices in Tigray have largely been determined by the shortage of land and prevalence of very small holdings. Land holdings in Tigray have shrunk over the last decades, and now tend to be very small. A regional survey study conducted in 1964 found that average holdings in the region covered 1.7 hectares, varying from 0.37 ha in highly populated areas to 3.5 ha in less populated areas[2]. In 1994, the average arable holding in the region was 1.2 hectares per household. This

[1] 75% of the 616,000 farmers surveyed followed this system in 1996/1997. Other farming systems include the pastoral system and the food crop production system (CSA, 1997).
[2] EPID Publication no. 9, 1974 Eth. Cal., cited in BoANRD 1997, p.20.

figure covered a range from 0.5 ha in the Eastern Highlands to 2.0 hectares in the lowlands, with over 60% of these households having less than one hectare of farmland (SAERT 1994).

The study village

Set in a relatively remote mountainous area, Mishig is 21km from the nearest local market place and about 55 km from the town of Axum. This area has a long history of human settlement and agricultural activity, with the earliest archaeological evidence of domesticated plants dating from 500 BC (D'Andrea et al., 1999). The village has a total population of 6,793, spread across 1,680 households, 40% of which are headed by women. The population density is very high at 430 people per km^2.

Most of Mishig is located on the summit plateau. Altitude varies considerably over short distances, ranging between 2300 – 2700 masl, and any flat land is used to produce crops. The shallow, stony soils are composed of basalt from Tertiary volcanic activity, which produces soils of high mineral fertility when weathered (EMA, 1998). Average annual rainfall is 1000 mm, which is highly variable and erratically distributed over a single rainy season from mid-June to early September.

Cereal crops provide the major means of livelihood in the mixed farming system, which produces teff (*Eragrostis tef*), barley (*Hordeum vulgare*), wheat (*Triticum vulgare*), horse beans (*Vicia faba*), field peas (*Pisum sativum*), chickpeas (*Cicer arietinum*), lentils (*Lens culinaris*) and flax (*Linum usitatissimum*). Farmers in Mishig are also known for their intensive cultivation of *gesho* (*Rhamnus prinoides*), a shrub used to prepare local beer, which is an important source of cash (Vetter, 1995). They also plant a variety of trees, particularly eucalyptus, in pockets of their fields.

Our survey showed that 78% of the households studied have some livestock. Of these, 70% had cattle (averaging 2.3 head per cattle-owning household), 33% had sheep and goats (averaging 3.7 per owner), and 26% had donkeys, mules or horses (averaging 1.3 per owner).

3 Farmers' perceptions of land value

The different types and amount of arable land held by households, and their ability to earn a livelihood from these resources, are the result of several factors. These include the physical availability of land, which affects the size of the holding; land fragmentation, which determines the spatial distribution of holdings; and issues of equity, which influence the distribution of land among households.

Size of holdings and fragmentation

The total landholding of the village is 1,579 hectares, which is composed of arable fields, grazing areas, protected enclosures, settlements, community plantations and some wetlands. The amount and proportion of land taken up by each use is shown in Table 1 below.

Table 1. Land use in Mishig (in ha) for the year 2000

Arable and grazing	*Protected land (enclosure)*	*Community plantation*	*Wetland*	*Total village area*
1079 68%	220 14%	185 12%	95 6%	1579 100%

Source: fieldwork 1999-2000

Landholdings in the village are small, averaging only 0.39 hectares within a range of 0.05 to 0.94 ha. These small farms differ remarkably in terms of their biophysical condition and internal management regimes, which vary from one plot to another.

Land fragmentation is such that the holdings of only 5% of the 96 households interviewed were confined to one plot. The average number of plots per household was three, although in the most extreme case, one farmer had sixteen plots. They are generally very small and scattered, averaging only 0.13 hectares each, within a range of 0.025 to 0.75 ha.

Table 2. Criteria used by farmers to assess land value and management options

Physical characteristics	*Other plot characteristics*	*Social relations*	*Plot history*	*Management priorities*	*Potential risks*	*Subjective issues*
• Soil type • Soil depth • Topography • Stoniness • Moisture retention • Manure retention • Water-logging • Drainage pattern of surrounding area	• Area of plot • Distance from home • Manure requirements • Location • Infestation by pests • Weed growth • Suitability for crop & grass varieties	• Type of neighbours and relationship with cultivator • Previous generations living on the site • Sense of attachment to site • Symbolic value • Means of access • Knowledge about history of plot	• Length of ownership • Previous owner • Means of acquisition • Rental history • Past fertility management • Past improve-ments and investments in plot	• Planting perennial shrubs, trees and cash crops • Rent and other land transfer decisions • Apply manure • Apply mineral fertilisers • Use for experimen-tation and trial site • SWC requirements • Intercropping • Crop rotation • Fallow	• Susceptible to gully formation • Susceptible to erosion • Security of tenure/ length of tenure	• Importance • Productvity

Source: fieldwork 1999-2000

Perceptions of land value

The importance assigned to each plot varies according to the way it is viewed by the person cultivating it. When farmers were asked to list the criteria used to assess the value of land, they identified thirty-eight characteristics, of which only eight were purely physical factors. A summary of these criteria, grouped into seven categories, is presented in Table 2 below.

It is interesting to note the broad range of criteria used to assess the value and quality of an arable field. Farmers are not simply concerned with physical attributes, such as soil properties, fertility and suitability for a specific crop. They also take account of a whole range of other properties related to social and cultural issues, such as its history, previous management, and how it relates to other plots, and dwellings[3]. This contrasts with classic approaches to evaluating land, which only use the physical aspects of a site to assess its inherent qualities and determine its agricultural value.

To better understand how social relationships affect land management, the research team conducted a focused study on sharecropping, based on the hypothesis that the value attached to a field can be judged by whether or not it is offered for sharecropping, and to whom. Sixty-eight sharecroppers were asked about their criteria for entering into this type of contract, and their responses showed that the relationship between the owner and sharecropper was a dominant factor in the transaction. Of the 123 responses recorded, 57% referred to social issues, such as whether the two parties were relatives or neighbours, knew each other, were considered trustworthy, easy to understand and work with, etc.; while 43 % focused on the physical aspects of the land, such as soil fertility, soil type, location, stoniness, etc.

Categories of arable land

Using a system of symbolic values and meanings attached to specific places, as well as physical criteria such as location and distance from the homestead, farmers identified three categories of land: *gedena*, *wofri* and *dehri-bet*.

Gedena

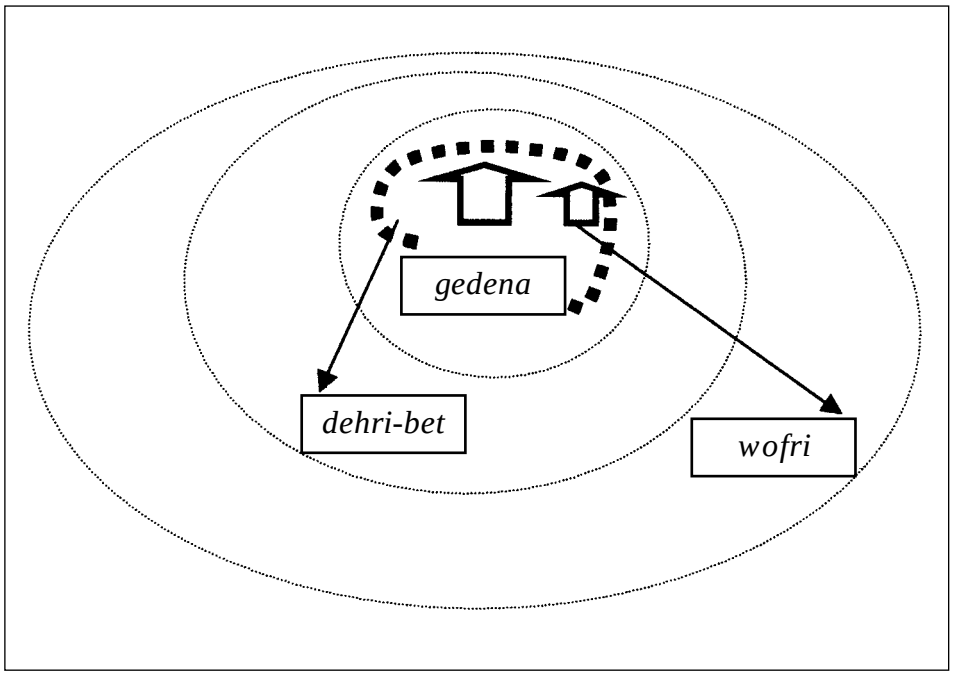
Gedena refers to land near the home and its surroundings, which include the backyard, farm and any ruined structures (see Figure 1). About a third of the plots fell into this category, which embodies a set of significant social and cultural values. Local people see this type of land as a 'fingerprint' of their family and previous generations. This sense of history imposes both the right to inherit the land and live on it, and the obligation to

[3] Similar findings have been documented in southern Ethiopia, where farmers base their management decisions on a range of parameters (Eyasu Elias, 2000).

preserve and sustain the environment. There is thus a profound psychological link between people and *gedena*, which has a significant influence on the physical environment and the farming practices used.

With a long history of continuous cultivation, *gedena* provide the most textured landscapes in terms of fencing, conservation structures and perennial plant species. They are also the most intensively cultivated areas, mainly used to grow high-value crops and species that require protection. Their position close to the homestead makes them the most convenient plots to manage, as they can be tended in the evenings, while 'relaxing', or when seeing to other tasks, such as housework. Children can protect the crops from animals while they play, learning their first lessons about farming. More members of the household work on *gedena* than on any other category of land, and the social and cultural value attached to it influences a whole range of local activities.

Figure 1. Sketch showing farmers' representation of the spatial distribution of the three types of arable land in relation to their residence. Approximate distances between the house and the *gedena*, *dehri-bet* and *wofri* are 0,2km, 5km and over 7,5km, respectively.



Dehri-bet

This land is similar to the *gedena*, but located further from the homestead. As *dehri-bet* plots are usually about a 20-minute walk away,[4] they cannot be seen from the house or tended while carrying out other tasks. About 28% of the plots surveyed fell into this category.

Wofri

Wofri, which makes up 40% of village lands in Mishig, covers the remote fields and plots furthest from the homestead. Because of their location, full days have to be set aside to work these areas, which cannot be managed with the short bursts of activity used in the *gedena*. This type of land changes hands most often, generally through short-term rental and sharecropping contracts, and is the first to be leased out if the owner decides to follow this option. It has also been the most frequent target of various rural land redistribution schemes. Villagers do not seem to be particularly attached to these areas or attribute any symbolic value to them, regarding them purely in terms of their agricultural potential.

Variations in plot size and soil depth in different types of land

The physical properties of plots and the values attached to them are also shaped by broader political and social changes, which influence the land use system. This section explores how different land types relate to important physical features, such as soil depth and the size of plots.

Land type and soil depth

Farmers in the study area identified three bands of soil depth: *reguid* (deep), *makelay* (medium) and *rekik* (shallow). These categories are widely used as indicators of the physical quality of a plot, and to determine how land resources should be distributed and crop production managed (Corbeels *et al*., 2000). According to Mitiku (1995), this indigenous classification system is closely related to the fertility status of the soil. Deep soils have better water holding capacity and are more fertile.

Of the 285 arable plots surveyed, 58% had shallow soils, 29% medium soils, and only 13% had deep soils. About 70% of the plots with deep soils and 44% of the plots with medium soils were located in the *gedena*, which accounted for only 20% of the plots with shallow soils (see Table 3). W*ofri* accounted for 50% of the plots with shallow soils.

[4] Estimates of the time taken to travel from the homestead to these plots was based on how long it took the average unladen active adult to make the journey, assuming that men and women travel at the same rate. However, tests on randomly selected estimates showed that farmers underestimated the times, as a' ten-minute trip' actually turned out to take almost double that time.

Table 3. Relationship between land type and soil depth

Soil depth	*Frequency (N)*	*Land type (%)*			*Total (%)*
		Gedena (%)	*Dehri-bet (%)*	*Wofri (%)*	
Deep (*reguid*)	36	69	17	14	100
Medium (*makelay*)	84	44	28	28	100
Shallow (*rekik*)	165	20	30	50	100

Source: fieldwork 1999-2000

It would be interesting to determine the extent to which ease of management and the values attached to different types of land influence the quality of the soils found on them[5].

Land type and plot size

We also found that there is a reciprocal relationship between plot type and size. Plots in the *gedena* are about 34% bigger than the average plot, while those in the *wofri* are about 25% smaller than average (Table 4). This runs counter to the general view that bigger plots tend to be located further from the homestead because more land is available away from dwellings. So why do plots get smaller the further they are located from the homestead?

This pattern could be explained as the result of interaction between the historical process of land distribution and the differentiated values the villagers attach to various types of land. Land resources are not privately owned in the Tigray region. Land was periodically redistributed both before and after the 1975 land reforms, in order to accommodate the landless. However, the process of redistribution, and the extent to which certain areas were reduced varied between different types of land, and most of the changes were made to the *wofri*. The cultural value attributed to the *gedena* made villagers extremely protective of them, and they were not initially targeted, as this would have been seen as an attack on the history, status and identity of the family, rather than an attempt to reduce the amount of land they had available to grow crops. Because the terms of tenure for *gedena* tend to be longer than for the *wofri*, farmers feel that they have greater security of tenure, and are prepared to make long-term plans and invest in *gedena* plots.

[5] It has already been noted that it is easier to work the *gedena* because they are close to the homestead, so less labour is needed to apply manure and household waste to these plots.

Table 4. Relationship between the type and size of plots

Size	*Land type*		
	Gedena	*Dehri-bet*	*Wofri*
Total area (ha)	16.9	9.75	11.09
Average area of plots (ha)	0.18	0.12	0.10
% deviation from the average plot area (0.13 ha)	34%	-7.5%	-24.5%
Frequency	95	79	111

Source: fieldwork 1999-2000

Management strategies for coping with diversity

When considering the management strategies adopted by farmers, it is important to take account of the heterogeneity of their plots and the criteria used to prioritise activities. The different characteristics of each plot, such as biophysical features, management, history, perception of its quality and importance in the farm as a whole, play a role in the way the land is managed. These factors were discussed with farmers, and selected activities monitored, such as the cultivation of perennial cash crops, farmer experimentation and trials, and soil fertility management strategies.

Table 5. Summary of relationships between plot properties and management strategies

Actions and preferences	*Relationship with plot properties*					
	Area	Distance from home	No. of years owned	Soil depth	Frequency of leasing	Rate of soil erosion
Number of gesho plants	* ↑	** ↓	↑	↑	↓	—
Experiments and trials	↑	↓	—	↑	—	—
Fertility management strategy						
• Apply manure	—	↓	—	↑	↓	—
• Apply mineral fertiliser	—	—	—	↓	—	—
• Need for SWC measures	—	↓	—	—	—	↑

Key: *Planting density increases with size of plot; **Number of *gesho* plants decreases the further the plot is located from the homestead.
Source: fieldwork 1999-2000

Table 5 illustrates how these relationships influence the management of *gesho*, a valuable perennial cash crop. After counting the number of *gesho* plants on each plot, the team analysed the density of planting in relation to the area of the plot, its location (distance from the homestead), soil depth, length of ownership and history of land transactions. Planting tended to be denser on larger plots, on those closest to the homestead (*gedena*) and on plots that the farmer had owned for some time and not leased out to other users[6]. The main aim of this type of management was to ensure productivity and secure access to the crop.

Soil fertility management strategies are both selective and strategic. More manure is applied to plots close to the homestead (usually *gedena*), to those with deep soil, and to land that is cultivated by the owner rather than leased out. A scarce and highly valued resource in Mishig, manure is used as part of a long-term strategy based on the assumption that it will maintain crop production for three to five years, depending on soil type and topography. Farmers are aware that it makes the soil more workable and improves seed germination, that it has longer-lasting effects on deep soils than on shallow soils, and that it is important to minimise wastage through leaching or run-off. Mineral fertilisers are seen as a short-term investment, whose impact is immediate but limited to a single cropping season. Used on shallow-soiled plots, their long-term effects are viewed rather negatively, as farmers believe that they 'kill' the land, making it 'addicted' and unable to produce crops without continuous amendments[7].

[6] Regression summary output indicates these patterns with r=0.53, significant at 0.01.

[7] Farmers in the southern highlands of Ethiopia were found to hold similar views (see Data Dea, 1998)

4 Discussion and conclusions

This study focused on the diverse patterns and heterogeneity observed in different types of field on individual farms, and the manner in which these patterns relate to the management of particular plots. We were interested in exploring why the quality of management differs between various types of field, rather than conducting a comparative analysis of households from different socio-economic groups.

Although every arable field plays a role in the overall production of a farm, farms are not uniform entities whose different elements can be treated in the same way. This observation challenges the common concept of the farm as a homogenous 'agricultural unit', with a single production goal for crops and livestock. Our research revealed that the local system for classifying land is based on a broad range of criteria, and that the values related to this system provide a relevant basis for explaining the management decisions and actions taken by farmers, as well as the physical state of their plots. Farmers distinguish three different types of plot (*gedena, dehri-bet* and *wofri*) that are managed in very different ways, according to the agricultural and social value attached to them

In order to understand the reasoning behind the management strategies adopted by farmers, we need to recognise and take account of certain subjective and cultural factors. This will involve moving away from approaches that explain farmers' behaviour and the physical state of the land purely in terms of its productive capacity, and from methodologies that assume that the value of land is not affected by intangible parameters. The manner in which farmers engage with their surroundings can help explain why certain arable lands are still 'good', despite having been continuously cultivated by successive generations, and why local people resisted some types of land distribution but accepted others.

The tenure, management history, and current physical condition and use of various fields were analysed, and farmers were asked to explain the meaning of each type of field and identify the criteria used to assess their value. During this exercise they identified a number of factors that explain both the diversity of the land and the strategies used to manage it. These include patterns of inheritance and the sense of place, identity and attachment to a locality that develops over time as generations pass through the same

family dwelling, as well as the history of tenure and investment in a plot. It became clear that land users in Tigray do not consider their arable fields purely in terms of their agricultural value.

Analysis of the values attached to certain land types is also important in any situation requiring collective action, such as land and water management at catchment level. Activities extending beyond individual plots and farms should be based on an understanding of how groups of individuals regard and value the landscape and the elements within it. Their intensive investment in labour and inputs to rehabilitate degraded lands indicates that the farmers in our study area share a wider vision of natural resource management.

Policy implications

The findings of this study have important implications for future policies affecting the relationships between people and land. The most important conclusion relates to policies on land reform and redistribution. In our view, more account should be taken of the values that resource users attribute to different areas and plots, particularly when addressing the issue of allocating land to newcomers. Given the current emphasis on participation in local decision-making and policy formulation, it should be possible to take account of different viewpoints and rationales for using land, and include them in plans for land reform or interventions designed to encourage different forms of land use.

Research strategies based on a more participatory approach, which explicitly stresses the need to work with farmers and take account of their values, should be used to inform the policy making process. The manner in which the research agenda is defined and the driving forces behind the process determine where the research is carried out, and ultimately influence the results and relevance of its outcomes. Our study shows that researchers need to have a better understanding of the values assigned to particular pieces of land, as the outcome of any trial will be strongly influenced by the history of the plot, the value attached to it by the farmer and the current system used to manage it. Such understanding is also needed to determine the relevance of specific research on plot types or broader land systems. The results of our research also provide important lessons for extension policy and practice, which need to take account of the range of values attributed to different categories of land, and plan their work accordingly.

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