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The Political Morphology of Drainage—How Gully Formation Links to State Formation in the Choke Mountains of Ethiopia

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Summary. — To understand why soil erosion is persistent despite three decades of massive investments in soil conservation, this paper explores how drainage and soil conservation change a hill slope in the Choke Mountains. By paying close attention to the practices that reshape the hill, we account for the active roles of people and material flows in shaping their identities, forms, and power relations. Social relations can be read in the landscape as their material outcomes are literally scoured into the hill slope. Such a material reading of Ethiopia's "developmental state" reveals three issues: First, drainage and soil conservation practices are configured by particular historical regimes of land distribution and rent appropriation. Second, the power of the Ethiopian government's model of the developmental state derives from the exploitation of this configuration by a new coalition of landholders and government officials. Government officials mobilize landholders to construct terraces in exchange for government support in conflicts over land and input distribution. When the terraces create obstructions that can trigger flooding, landowners convert them into drains and divert drainage flows to plots sharecropped by landless families. Consequently, the yearly mobilization for terrace construction does not halt soil erosion but further aggravates it. This continues because the performance of this yearly ritual affirms the authority of landholders and government agents. Third, landless families which fail to live up to the model of the "farmer interested in soil conservation" have created a competing "trader model" with its own institutions. The denial of their non-farmer identities by landholders and officials fuels generational conflicts over drainage which deepen the fractures in the hill and pose a challenge to government authority. Land degradation thus embodies both the powers and the limits of the developmental state.

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Key words — political ecology, land degradation, identity, drainage, Africa, Ethiopia

1. INTRODUCTION

In May 1998 an Ethiopian farmer refused to drain water from upstream plots over his land. He blocked the flow and drained the water down the slope along the boundary of his plot. As soon as the first heavy rains of the season fell a month later, a gully was created 300 m further down the hill. In the 15 years that followed, this gully grew 230 m long, 70 m wide and 8 m deep, eating away the plots of six households; and it continues to grow.

Land degradation in Ethiopia is often presented as the natural outcome of a growing rural population that is not capable of conserving the soil (e.g., Hurni, Tato, & Zeleke, 2005; Osman & Sauerborn, 2001; Shiferaw & Holden, 1999).¹ Since the 1970s, government officers and donor agencies in Ethiopia have worked with the rural population on soil and water conservation and "good land governance" (FAO, 1986; MoA, 2013). More than 30 years of soil erosion research in the highlands of Ethiopia has demonstrated the possibilities of a range of soil conservation techniques to reduce soil erosion (e.g., SCRP, 2000, Gebremichael *et al.*, 2005, Nyssen *et al.*, 2007, Frankl *et al.*, 2011, Taye *et al.*, 2013). Yet, despite massive investments in soil conservation, erosion remains severe, especially in the humid parts of the highlands (Hurni *et al.*, 2005; Monsieurs, Poesen, *et al.*, 2015a).

This article documents the making of the above described gully to address a straightforward question: Why is soil erosion on the hill slope persistent despite decades of popular mobilization for soil conservation? To answer this question

we draw on studies of political ecology which identify social relations of production and the nature of the state as key factors in explaining environmental transformation (Andersson, Brogaard, & Obsson, 2011; Blaikie, 1985; Blaikie & Brookfield, 1987). Here we build on the work by scholars who explored how the Ethiopian government mobilizes its "developmental state" model to reinforce state power under the guises of democracy and technical packages of development (Lefort, 2012). The agricultural extension service has received particular attention in this regard, as it makes up the densest state bureaucratic network in the Ethiopian countryside (Planel, 2014; Vaughan, 2011). Political analyses of what are widely presented as technical development packages provide valuable insights into how practices of land registration (Chinigò, 2015), Green Revolution (Adem, 2012), decentralization (Chinigò, 2014; Emmenegger, 2016), and input provision (Planel, 2014) have been instrumental in the expansion of state power. In particular, programs of mass

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mobilization have been highlighted as vehicles to implement the “developmental state” model, both in the countryside (Emmenegger, 2016; Rahmato, 2009; Segers *et al.*, 2009) and the city (Di Nunzio, 2014). We are struck however, by the limited attention for the materialization of these programs: how has the “developmental state” model shaped and been shaped by the distributions of people, land, and water in the landscape? We aim to materialize the analysis by developing a political morphology of drainage.

In Section 2 we elaborate what it means to employ a political morphology approach. In Section 3 we operationalize the approach by analyzing how socio-material relations of drainage are literally scoured into a hill slope of the Choke Mountains. In the concluding section we analyze how the approach sheds light on the (limited) powers of Ethiopia’s developmental state.

2. METHODOLOGY: TOWARD A POLITICAL MORPHOLOGY OF LANDSCAPE TRANSFORMATION

Soil erosion is a classical object of political ecology (Robbins, 2012). In his path-breaking work, *The Political Economy of Soil Erosion in Developing Countries*, Blaikie (1985) explored why land degradation and social marginalization often go hand in hand. His account was followed by a wealth of studies on “the political, social and economic content of seemingly physical and ‘apolitical’ measures” (Blaikie & Brookfield, 1987, p xix) commonly put forward to curb environmental degradation (for Ethiopia e.g., Chinigò, 2015; Hoben, 1995; Keeley & Scoones, 2000; Segers *et al.*, 2009). While the co-production of societal values, environmental knowledge, and the physical environment is often claimed as central in this literature, the morphology of the landscape often figures as a result of this production process but not as its constituent. In this way, the instrumentalist studies of soil erosion critiqued by Blaikie in the first place are replaced (or complemented at best) by disembodied accounts of environmental knowledge production and resource extraction. To overcome this divide, this article moves away from the epistemological search for an accurate representation of social or physical processes. Instead we zoom in on the ontological question of how the morphology of a hill slope comes into being (following Mol, 2002) and how this process can be accounted for. Our political morphology approach resonates with accounts which analyze how political power, technologies, and environmental knowledge are relationally formed in the distribution of flows of land and water (Barnes, 2014; Gandy, 2002; Meehan, 2014; Mollinga, 2014; Van der Zaag, 2003).²

The focus in this article is not on morphology as an expression of cultural forms (Sauer, 1925) or on the ideology of depicting morphology (Cosgrove & Daniels, 1988) but on accounting for the practices through which the hill and its users interact and morph together, i.e., accounting for the morphodynamics of the landscape. This shift entails a transition from the analysis of nature as a resource subject to domination or construction by humans, to an understanding of the socio-ecological process through which nature is “produced”, i.e., continuously transformed—mediated by technology—through labor (Mitchell, 2012; Smith, 1984). Gender, race, and class identities are not taken as drivers but rather as products of these very material and discursive practices (Haraway, 1991). Scholars of subject formation use this insight to show how the implementation of projects, policies, and rules may create new collective identities that are often aligned with

the interests of powerful actors (Agrawal, 2005; Li, 2007; Robbins, 2007). In this paper we mobilize this insight to analyze how international policy makers, government agents, and land users are constantly at work to uphold the idea of a “farming community” of the Choke Mountains, although many on the hill spend most of their time outside the farming profession. By paying close attention to the practices that reshape the hill we account for the active roles of people and material flows in shaping their identities and forms.

(a) Case study area and data gathered

Our analysis draws from observations and interviews in Yeshat *kebele* in the Choke Mountains (Figure 1) during 2009–12.³ Together with 23 other *kebelles*, Yeshat *kebele* is part of Sinan *woreda* (district) which currently has around 60,000 inhabitants. Yeshat *kebele* consists of 10 *goths*—parishes in which people attend the same church or *idder* (religiously oriented institution through which burials are organized and through which people are mobilized for communal activities such as bridge and path construction). The *kebele* is situated between 2400 m and 2700 m above sea level and the average annual rainfall is around 1400 mm/a (Tekleab, Mohamed, Uhlenbrook, & Wenninger, 2014). In particular we use: (1) observations of people’s activities and the functioning of drainage and soil conservation technologies on a hill slope that makes up the south of Michael goth (approx. 50 ha of hill slope, of which 38 ha are cultivated); (2) repeated conversations and interviews with members of the 14 households living on this hill slope and with 31 other households that were involved in cultivating its land or otherwise connected over a period of three years; (3) 24 samples of 2 m² of crops harvested from the hill slope in December 2010 and January 2011 to calculate grain yields and their variations along the slope; (4) an analysis of changes in the landscape based on discussions of aerial photographs of 1957 and 1982 and a satellite image of 2009 with people from Yeshat; (5) participation in meetings organized by government officials or *kebele* leaders and an internship with extension agents responsible for the agricultural program of the government; (6) rainfall data collected on the hill slope over a period of two years.

The next section explains the approach in three steps by first describing how social and physical objects relate in a particular event through which the landscape transforms (cf. Latour, 2005). We follow a rain drop that fell during the storm of 9 July 2010 and drains over the hill to ground our morphology of drainage (paragraph 3(a)). This shows how drainage takes place along particular paths and borders and how people divert water according to particular strategies.

Second, we trace the history of the sociomaterial conditions that shaped these paths, borders, and strategies (cf. Mitchell, 2012), understanding the hill as a product of intertwined and changing relations of labor and geology. The people of Choke are not socially and physically positioned equally but caught up in historical and geographical relations embodied in physical boundaries, land holdings, and institutions such as sharecropping and oxen sharing (paragraph 3(b)).

Third, we analyze how these historical conditions are actualized through people’s contemporary practices related to drainage and soil conservation. We analyze the organization of a participatory watershed development program (paragraph 3(c)), the drainage of a heavy rain storm (paragraph 3(d)), and terrace construction (paragraph 3(e)) to understand the ongoing transformation of the hill and its people.

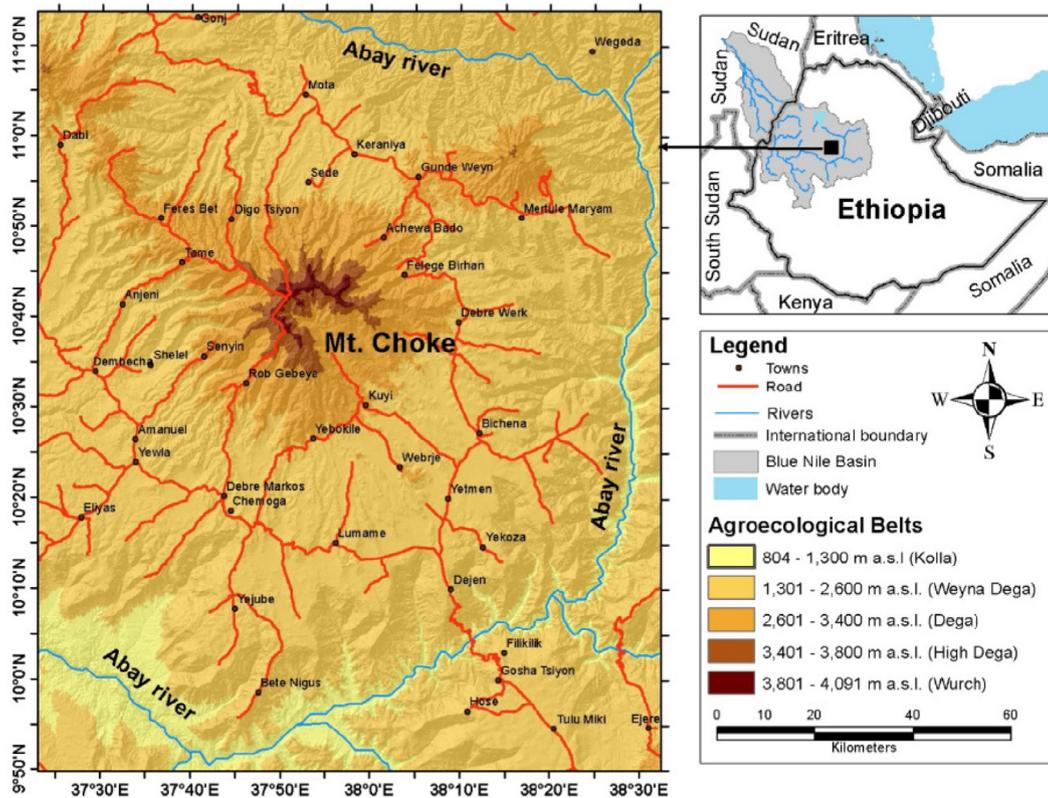


Figure 1. Map of Mt. Choke and surroundings. The study area is located on the boundary between the agroecological belts indicated as Dega and Weyna Dega. Source: Teferi, 2015, p. 68.

3. POLITICAL MORPHOLOGY IN PRACTICE: TRACKING DRAINAGE AND SOIL CONSERVATION

(a) *Introducing drainage: Following a drop along a hill slope in the Choke Mountains*

Intensive rainstorms at the start of the rainy season pose risks for cultivation in the Choke Mountains. Whereas government officers and academics often point out that the washing away of fertile soils will reduce soil fertility in the long run, the immediate concern of the ox-plow cultivators in the Choke Mountains is with flooding. To prevent storm waters washing away seeds, fertilizers, or young plants, they use the traditional ox-drawn *maresha* plows to plow furrows to drain their plots. By following a raindrop along the 1-km route from where it hits the ground (A) to the point where it drains into the river (G), we discover that the practice of drainage is far from self-evident (see Figure 2).

(i) *From A to B*

On 9 July 2010 at around 5 pm, a raindrop hits Mr. Workeh's plot where he had planted wheat three weeks earlier (A—Figure 2). The drop detaches some soil particles and starts its journey down to the Jedeb River. Fifty millimeters of rain had fallen earlier that day and saturated the plowed upper layer of the soil. The layer immediately below was compacted by many repeated earlier plowings, and makes it difficult for the water to infiltrate. The drop flows quickly to the nearby furrow, which intercepts it and transports it to the plot boundary. Workeh had subtly increased the slope of the furrow along its way to accommodate more water as it flows down. He derived this knowledge from his long experience with draining

the plot: heavy rain showers turn steep furrows into gullies. Furrows that are not steep enough overflow and flood the plot. Too many furrows cost energy to construct and use up part of the cultivated land. Too few furrows create harmful overflows that erode the soil. After traveling 15 m through the furrow, the water reaches the plot boundary (B).

(ii) *From B to C*

Here, it joins the water from the deforested hill slope and from the neighboring plot. The drop now moves along the boundary between the two plots straight down the slope. It speeds up. Every eight or so meters another furrow adds water to the drain. The concentrated downhill flow scours the drain and deepens it. To reduce the scouring, Workeh had covered the drain with stones. Despite his efforts, earlier flood events had already created a 1.5-m-deep gully over the last 10 m of the boundary (C).

(iii) *From C to D*

The water flows 30 m down a steep part of the hill slope with eucalyptus trees and quickly reaches Mr. Abebe's house and vegetable garden. Fifty meters further, the drop ends up in a protected drain. Abebe had managed to fill the "man deep" gully along his plot by planting eucalyptus trees at both sides and constructing check dams every 20 m. As the protected drain is too small to carry all the water down, it washes over a fifth of Abebe's plot and destroys half of the young maize plants on this part of the plot.

(iv) *From D to E*

Just before the water reaches the head of a 7-meter-deep, 45-meter-wide, 330-meter-long gully (D), it hits stones that force

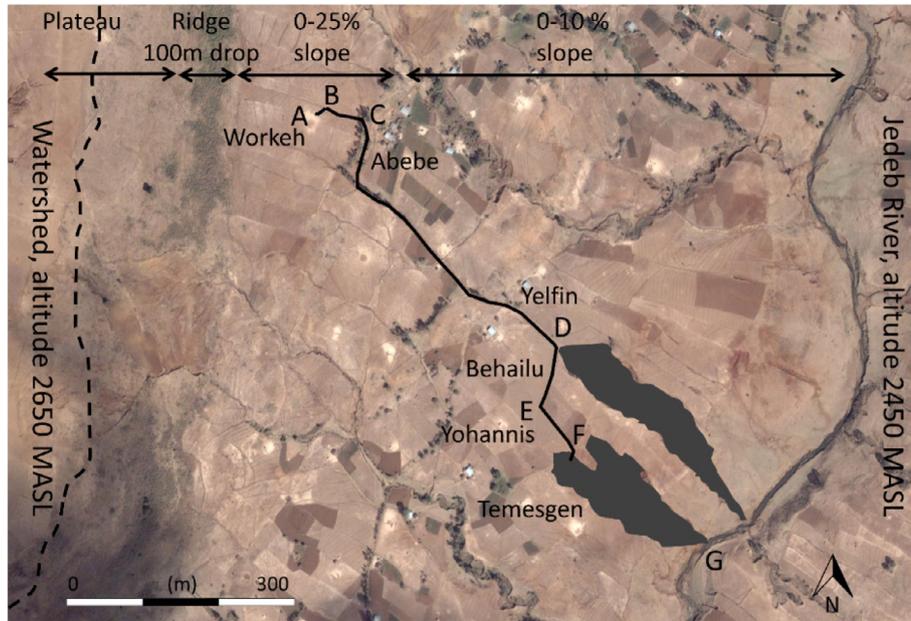


Figure 2. Route of the water drop from the point where it hits the ground (A) to the point where it reaches the Jedeb River (G). Note: The black areas indicate the gullies in 2010—they are about 1 ha each. The hill slope studied in this article is characterized by a small plateau around the watershed and a steep ridge with bushes, rocks, and patches of grass above Workeh's plot. At the foot of this ridge starts a patchwork of cultivated plots, typically 0.1–0.5 ha each, draped down in strips toward the river. The slopes of the cultivated plots vary between 0% and 25%. The 100-m strip along the river is used as communal grazing land. Source base map: Google Earth (c) 2009 Digital Globe. For more (ethno)graphic accounts of the drainage of this hill please visit www.nilewaterlab.org/choke-mountains.

it to make a sharp turn toward the south. It is here where a diversion was made in 1998 when the gully approached Ms. Yelfin's house. The sudden turn slows the flow and makes the coarse soil particles carried by the water deposit and clog the drain. The overflowing water washes Mr. Behailu's plot and buries his small wheat plants under a layer of fertile soil. The rest of the water and soil continue through the drain until it reaches the plot of Mr. Yohannis (E), who blocked the flow with stones that direct the water down the slope.

(v) *From E to G*

The water drop moves along the plot boundaries until it drops into a gully (F) that takes it to the river (G). This gully had emerged a year after the diversion in 1998. Within two years, a 3-meter-wide gully developed. From the riverside, it “grew” up the hill eating into six plots along the drainage route. Since then, the gully has grown 230 m long, 70 m wide, and 8 m deep (Figure 3).

(b) *Historicizing drainage: On the (re)distribution of access to land and nutrients 1950–2010*

The above account follows only one raindrop from Workeh's plot to the Jedeb River. Along the way, 25 more land users drain into the same route. Their relations are not merely charged by the risks of occasional overflowing. This section shows how the maneuvers described in 3(a) were configured by particular regimes of land distribution and rent appropriation that shaped the hill since imperial times.

The division of plots into strips over the hill (Figure 3) and the consequent drainage pattern have to be understood in the context of the land tenure system that evolved with ox-plow cultivation in Northern Ethiopia from the thirteenth century. The essence of the *rist* system is that people claim rights to a

share of the land of their ancestors who are considered as original rightholders of the area (*wanna abbat*). In principle, the land was to be shared by male and female heirs. The people on the hill claim their rights as shares of a larger area held by the *rist* holder from whom they descended and do not attach rights to particular plots (Hoben, 1973). Considerable ambiguity is created by the fact that heirs who do not inherit land after the death of a family member do retain rights to the land and can pass these on to their children. In practice, this often means that sons who were too young to cultivate and the offspring of daughters who often did not claim land at the time of inheritance claim land later.

Two elements of the *rist* system that persist are important for understanding land tenure and drainage of the hill slope. First, the multiple possibilities through which one can gain access to land make that the amount of land claimed by people is larger than the area of land available. Second, the ambiguity created by the multiple claims enable the authorities to exercise power in resolving land and natural resources management disputes. As an elder stated when explaining his drainage route: “The water flows the way the king wants it.” The outcomes of disputes over land and its drainage depended crucially on the contestants' abilities to convince the local court, which has recently been embedded in the government court system.

After the overthrow of the imperial government (1974), landlordism and the *rist* system were abolished and all land was proclaimed public property with the official aim to correct injustices of imperial land tenure (Rahmato, 2009). In practice this did not mean the end of the influence of the former landholding class. Mr. Eshetu, the *rist* holder of the hill slope, was elected as both chairman and leader of the militia (designated armed civilians who assist the *kebele* administration to maintain law and order) of the Peasant Association (PA) in Yeshat *kebele*.



Figure 3. Mr. Temesgen plowing with oxen next to the gully formed in Michael since 1998. Note: This is a picture of the southern gully in taken from point F in Figure 2. The Jedeb River flows between the slope on which Temesgen is plowing and the slope at the upper part of the picture.

Officials of the Dergue regime (that ruled Ethiopia from 1974 to 1991) in the *woreda* capital worked with Eshetu to distribute his own lands. Yeshat's land committee divided Eshetu's land between himself, his adopted son Mr. Temesgen, and the three tenants, Mr. Negus, Mr. Yohannis, and Mr. Mersha, who had cultivated his land until then. Two women servants, Ms. Wolete and Ms. Ashene, received part of the grazing lands for cultivation.

Lands on the top part of the hill, which was partly covered by trees and partly leased out by the church for grazing, were distributed to other families. During 1976–82, the number of families on the hill slope doubled from 12 to 24. New families cleared acacia and juniper trees from steep slopes and around major drainage routes for construction and fuel. As many of these families would not increase their landholding until their parents died, they reduced fallowing of lands to intensify cultivation. This shift was enabled by the introduction of inorganic fertilizers that were heavily subsidized and provided on credit by the state.

Although the initial land distributions were welcomed by most people living on the hill slope, the implementation of a series of extractive policies that followed created new divisions. The new roles of PA leaders significantly changed relations between people cultivating the hill. Mr. Eshetu not only involved in the distribution of land but also became responsible for the collection of the grain quota. Between February and June every family had to sell roughly a third of the harvest at a little over half the market price. Mr. Fekadu, who had one of the upstream plots draining to the gully, was put in charge of recruitment of young men for the army and for mobiliza-

tion for the yearly construction of terraces. He recruited one of the sons of Mr. Yohannis, who holds land at the downstream part of the slope, to fight revolutionaries in the north.

At least four rounds of land distribution during 1975–85 increased the cultivated area and increased disputes over drainage. A rising number of people refused to allow their neighbors' water to drain over their lands. By blocking the flow at the plot boundary, they refused them access to the main drains to the river. Fresh cracks appeared on new vertical drainage⁴ routes along plot boundaries. Along one of the new drainage routes thus created, a 200-meter-long, man-deep, and up to 15-meter-wide gully had emerged by 1982 (Figure 4).

By the time the Dergue regime fell in 1991, fallowing had been almost abandoned. As more young families needed land, calls for land reform or new redistributions increased. The new Ethiopian People's Revolutionary Democratic Front (EPRDF, the coalition of ruling parties that was formed after the Dergue was overthrown) kept all land under state control and included the right to arable land for all adults in the countryside in the 1995 constitution (see Rahmato, 2009). To correct the injustices of previous land distributions by the Dergue government, a new land redistribution was implemented in 1997 (Ege, 2002). Many who held official positions in the Dergue regime, like Eshetu and Fekadu, were listed as *birocrat*, that is, associated with the ousted regime. Consequently, their landholdings were reduced to 1 ha, whereas "normal" families (among whom the families of their sons, like Temesgen) were allowed to keep up to 3 ha. Most of the land freed up was allocated to young families.



Figure 4. Aerial photograph of the hill slope taken in 1982. The emerging gully encircled is the Northern gully in Figure 2. Source: Ethiopian Mapping Agency.

In the face of increasing competition over land among a growing population and aware of sensitivities of earlier redistributions, the government has refrained from distributing land to young households in Yeshat since 1997. Like elsewhere in the Ethiopian highlands (Chinigò, 2015; Ege, 2015; Lefort, 2012) this has led to widespread landlessness among young households, postponed marriages, further intensification of cultivation and encroachment into grazing lands. Both the land under cultivation and cropping intensity have doubled since the 1950s, leading to a fourfold expansion of the cropped area.⁵ On the 38 ha of land around the gullies, 122 of 130 plots were cultivated during the 2010 main cropping season (Figure 5). This intensification has come at a price. One cultivator on the hill explained that “while soils wash away, only stones remain”. Another stated that “these stones were grown from my land like the crops I cultivate. These big stones in my land are creating difficulty for my oxen to plough even. The stones were not here before”. The plots halfway up the slope now have more than 20% of their land surface covered with stones.⁶ Land users in Michael report that, after years of yield increases due to the introduction of new crop varieties and fertilizers,⁷ yields are now falling because “fallowing was aban-

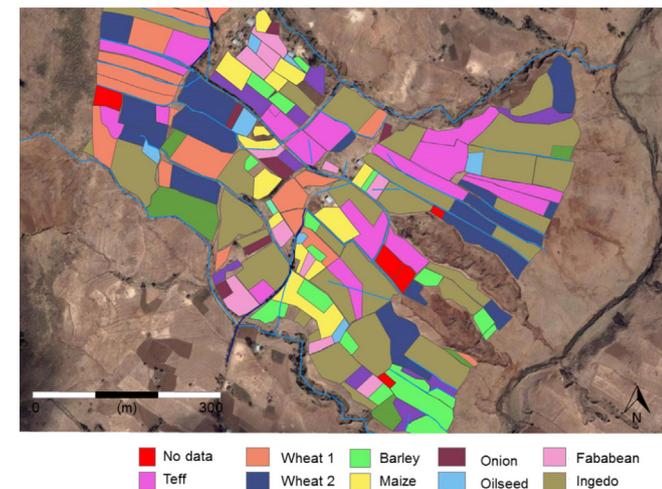


Figure 5. Crop map for the 38-ha cultivated area of Southern Michael, October 2010, wheat 1 = white wheat, wheat 2 = adja dekel, ingedo = oats.

doned and soils are being cultivated every year“ and “the soil became addicted to fertilizer”. Others stated that: “If our lands have mouths to speak, they will tell us how much they are exhausted by ploughing all these years“ and “lands are now deaf to hear our investment.“ We found that average yields on the hill in 2010/2011—reported as an average year⁸—are low at 1.0 ton per ha for *teff*,⁹ 2.0 ton per ha for *adja dekel*,¹⁰ 1.0 ton per hectare for oats (*ingedo*), and 1.1 ton per ha for white wheat.¹¹

Farming has now become a costly business. Cultivated plots are plowed on average five times before planting to reduce weeds and—as many in Yeshat say—to scrape fertile particles into the exhausted upper layer (Figure 6). Moreover, most crops no longer grow without fertilizers. Those who cannot afford fertilizers have turned to the cultivation of oats—which almost everyone in Yeshat now uses for making *injera*. As their oats’ yields are often around half the yields of people who grow the crop *with* fertilizers, many sharecrop out their lands in return for half the crop.

Agricultural intensification in Yeshat is paralleled with increasing social fragmentation. The involvement of some on the hill in redistribution of land and forced recruitment of others has strained cooperation between households. At the same time, the increasing scarcity of land sparks protracted struggles *within* households. Many young people from the hill have left the area. Yet, still half of the households in Michael *goth* have no access to land at all or only have a small garden plot. Some of them engage in sharecropping on the lands of old and absentee owners or landholding people who have no oxen to plow or money to cultivate. Almost all are involved in trade with the lowlands—30 km downstream—that produce for the growing urban centers in Ethiopia.

In the next sections we explore how the superimposition of below-subsistence wages and petty commodity production on the cultivation of the socially and physically fragmented hill is transforming the shape of the hill, its people, and the political economy. To elucidate how these changing relations of land, water, and labor are experienced by, and embodied in, different people and the eroding hill, we turn to the practices of party meetings (3(c)), drainage (3(d)), and soil conservation (3(e)) during 2010–12.

(c) Contemporary practices of reshaping drainage 1: Participatory watershed development

During the 12 months I (first author) lived in Yeshat as a neighbor of the Farmer Training Centre, the *kebele* office,

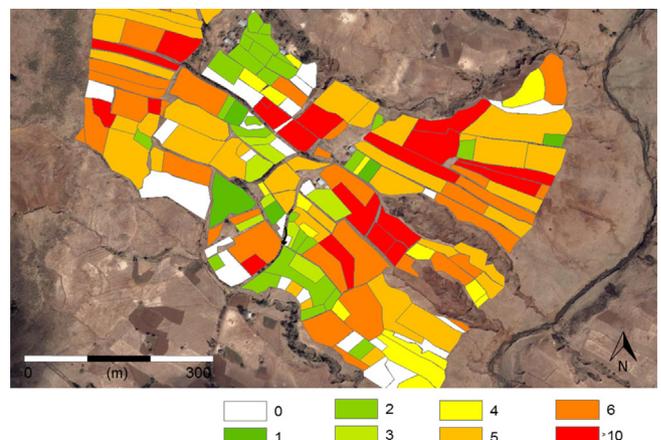


Figure 6. Number of plowings before planting the Summer 2010 crop for the 38-ha cultivated area of Southern Michael.

and the *kebele* jail in 2010–12, the boundaries between democracy and autocracy became increasingly unclear to me. The agricultural extension office launched a “Community-based participatory watershed development programme” and recruited a “development army” (2011) with the promise that these would bring democracy and development. Mr. Molla, the head of the natural resources management department of the Amhara regional state, explained to me that the focus is on democracy and participation and therefore “*the community will be involved in the planning, the implementation, and the monitoring and evaluation of the plan.*” He continued that: “[a] watershed committee is established in every 250–500 ha watershed that develops an integrated plan, which includes soil and water conservation, livestock development, crop production, and irrigation.” Yet, the participatory role that Molla had in mind for these “representatives” did not fit easily with the top-down approach of the watershed program, which included forced mobilization of farmers. Molla explained:

“Something has to be done because fertile land is lost not only for them but also for the generations after them. Therefore, first we have to create awareness about this, but if they still do not want to comply after that, we have to enforce the measures to preserve the land for the coming generations. Therefore we have the land proclamation, which says that every farmer should conserve his land and provides a legal basis for this enforcement.”

As government officers at the *kebele* level, the development agents (DAs) have a key role in implementing government and party policies. To the people of Yeshat, they are the face of the *mengist*—the Amharic word which “designates indifferently power as such, the ruling party, the state and all their agents or members” (Lefort, 2012, p. 439). Mr. Yonas is the DA responsible for Michael *goth*. He was raised in the *woreda* capital 20 km down the river and was 21 years old when he moved to Yeshat. After obtaining his diploma in vocational training for agriculture, he subscribed to the EPRDF party to be able to join the agricultural extension office. Like the other DAs sent to the highland *kebele* of Yeshat, he was inexperienced. Together with the other DAs and the newly appointed *kebele*

manager, he set out on his first important job: the expansion of the *kebele* council from 60 to 300 people. With the local militia, they selected 280 out of around 900 Yeshat household heads (90% men) for a meeting on governance. The *woreda* officials had instructed the DAs to select landholding farmers, especially those who were rich or in leadership positions. Whereas the main opposition leaders who were held responsible for the unrest during the 2005 elections were excluded, the landholding *birocrasi* were included in the new council. Together with the three DAs, 15 teachers, two health extension professionals, one policewoman, and one security guard who were posted in the *kebele*, the selected people formed the 300 member council (300 *sew conferencegna*).

“Participation” and “development” were subsequently used by the *kebele* office to enroll the selected group in numerous development committees. During a 14-day meeting, for which all participants were paid 5 birr¹² per day, Yonas and his colleagues trained the council members about democracy and development and asked them to articulate the government’s previous mistakes. In the end, all were enrolled as party members. In a second meeting, the *kebele* parliament elected among its members committees for women affairs, youth affairs, societal issues, economic affairs, administration, and peace. For every *goth* a committee for watershed management was established. Yonas is responsible for giving technical advice to Michael *goth* and two other *goths* in the *kebele*. With the three watershed management committees, he develops almost identical lists of technical problems and solutions (Table 1). The committee members have little to choose as “*the woreda expects complete coverage—so we have to put these figures*” (Yonas). Once the plan is made, the committee does not meet again. Yonas complains that: “*we [the DAs] end up nagging the farmers. We don’t have any other option really. We are like the messengers of the woreda Bureau of Agriculture and administration office.*”

In 2011 Yonas announced that development activities would become the responsibility of the newly established EPRDF political party cells (*hewas*) established for every *goth*. Its

Table 1. Problems and solutions identified and targets set by the watershed management committee in Michael *goth* (2010)

Main problems identified		Solutions identified				
1	Concerning plants – disease – low fertility/acidity	[Unreadable] Apply fertilizer/lime				
2	Natural resources – water erosion – deforestation – wild animals have left the area	Cut-off drains, terraces, check dams Plantation				
3	Grazing lands – incorrect grazing land management	Advise on grazing land management				
4	Social and economic problems – no clean water available	Clear the sources every month				
Targets						
Item	Unit	Total from 2002* to 2005	2002*	2003	2004	2005
Terrace	Ha	110**	10	20	40	40
Check dams	km (gully)	4	1	1	1	1
Cut-off drain	km	4	1	1	1	1
Outlet	km	4	1	1	1	1
Tie ridging	Ha	110**	10	20	40	40
Lime application	Ha	110**				

* All years in this table are Ethiopian calendar years. The year 2002 in the Ethiopian calendar is 2009–10 in the Gregorian calendar.

** This concerns the whole land area cultivated in Michael *goth*.

members are the people in the *kebele* council. The leading role of the cell members in the implementation of the development agenda was formalized through their appointment as leaders of the “development army”. Cell members were assigned responsibility for the “performance” of five neighboring households through the so called “1 to 5 system”. Every headman reports to the cell leader, who reports to the *kebele* manager on a weekly basis. To ensure that the members attend the cell meetings, Yonas organizes these twice per month on Orthodox holidays, immediately before the religiously oriented local organization—the *idder*—meets. Despite this, participation is usually poor, with less than half of the members participating. The cell meetings follow a fixed agenda. First, the rules are listed and the fines in case of violation thereof. Yonas stresses that the *hewas*—and not the *idder*—is the sole authority for upholding the rules. Then members are invited to report on violations of these rules and other subversive activities. Third, Yonas informs the members about development activities that month. Yet, never in the cell meetings is there mention of the most pressing issue felt by the 620 families who are not represented in the *kebele* council and committees: the expanding group of people who have no land or only a garden plot—many of whom engage in sharecropping.

Although attendance at cell meetings is often poor, its leaders and those who attend engage in the performance. In return, they receive improved seeds, shovels, or steel wire. More importantly, it gives them an advantage in their negotiations with the DA when the implementation of unpopular measures comes up. Government officials are also more likely to provide them support in times of disputes over land or drainage. Together, the members endorse fines for illegal encroachment on grazing land, cutting wood, and blocking drainage, thus producing a peculiar form of community-based participatory resources management. As the “development” activities discussed focus exclusively on the farming domain, the council members model themselves after the image of “the farmer”. As their actions align with party interests, they shape party rule.

The focus on participatory soil conservation—in its equation with development—serves to keep the bureaucracy together. Who can be against sustainable development? Whereas for some, science provides a rationale for party rule, for Yonas it offers hope for recognition of his work. Science is not a naive excuse to justify working for a party that he resents. Yonas is proud to refer to the science of the *Guidelines for Community Based Participatory Watershed Management* (Desta, Carruci, Wendem-Agenehu, & Abebe, 2005) in explaining how he knows the world. For him, science provides a way to legitimize his authority and a possible avenue to BSc education. The walls of his office are full of tables and graphs showing progress. Often he refers to his education at the vocational training center to emphasize the basis of science and policy in his arguments. “If we don’t implement this plan we all go down,” Yonas explains. “We can only escape this if we conserve our soils and transform the economy. Given its good rainfall and high altitude, experts decided that this *kebele* will have to focus on potatoes. Others will provide maize that will be an input for an industry that will boost the economy.” It is in this technocratic agenda that Yonas, the party members, and the international organizations supporting soil conservation in the *woreda* find one another. Upward accountability of a story of a degrading hill to be rescued by modern science thus complements downward privileges of a selected group of farmers.

The expanding network of party members on the development committees in Yeshat celebrates its (s)elections as the fruits of participatory development. Land is the most

important entry criterion for being selected and thus gaining access to state privileges. The focus on the farm in government development activities thus shapes both farmer identity and party rule. As the government presents its development activities as solutions for a homogeneous farming community, the different historical stakes within the state and the community are effectively silenced with the language of development. The performance of the farmer model not only shaped new solidarities between landholders and created a support base for the government, but also reinforced the tension between households with and without land. To see how the increasing differences in the community resonate with a hill slope that is far from homogeneous or static either, we turn to the practices of drainage and soil conservation.

(d) Contemporary practices of reshaping drainage 2: Reconfiguring drainage routes

Whenever faced with a drainage flow from an upstream neighbor, a land user has two possibilities: (1) he allows the flow to pass over his plot or (2) he blocks the flow with stones to divert it down the hill along the plot boundary. If he accepts the water, it flows straight on and the water velocity remains the same. If the water is turned down the plot boundary, the water velocity—and thus the erosive power of the flow—increases with the slope gradient. Although steep drains can convey more water than flat drains, fast flowing water scours the waterway (Monsieurs *et al.*, 2015b) and might, if not protected with stones or grasses, create rills.

Several factors have led to the increase in surface runoff in the rainy season over the past 50 years. First, as only a few trees remain on the hill, less water is captured and water flows directly toward the cultivated area. Second, as more grazing land is now cultivated, the opportunities to dispose of water into safe drainage routes are limited (Teferi, Bewket, Uhlenbrook, & Wenninger, 2013). Third, whereas more than half of the plots were fallow in the 1950s, nowadays almost all plots are drained for cultivation year after year. Fourth, extra furrows are plowed into the fields to prevent the flooding of scarce land and the washing away of expensive fertilizers. Fifth, the hard plow-pan resulting from repeated plowing with oxen hampers the infiltration of rainwater into the soil (Temesgen *et al.*, 2012).

The increase in surface runoff coincides with the growing unwillingness of many to drain their neighbors’ water. As the approaching water is diverted straight down the plot boundaries, the number of vertical drainage routes along the hill has increased (Figure 7). This is especially dangerous on the lower part of the slope, which is flatter and has loamy soils which saturate during the rainy season. This makes this part of the hill susceptible to the collapsing of slopes wherever rills are created. Whereas up the hill, where the slope is steep, protection with stones helps to stop gullies from growing, in the lower part such protection is often undercut and slopes easily collapse (see also Bayabil, Tilahun, Collick, Yitafaru, & Steenhuis, 2010). In the 200-meter zone near the river, numerous gullies have thus appeared, resulting in the loss of land that was previously used for grazing and cultivation.

However, the formation of drainage routes on the hill is not merely the result of more intensive drainage, saturating soils, and slumping gully walls. It depends on understandings of *who* are rightful cultivators of the land and *what* are “natural” drainage routes. When the growing gully started to threaten the house of Yelfin’s family, her deceased husband mobilized an acquaintance from the nearby agricultural office. During his visit, he ordered the people around the gully to dig two



Figure 7. Detail of pattern of furrows (thin lines) and drains (bold lines) above Abebe's house (see Figure 2). Note: The furrows of all but one plot end in "vertical" drains that direct the water straight down the slope. The two dashed lines indicate the remains of two drains dating back to the Dergue period (1974–91).

diversions to change the drainage route. When the extension officer left at the end of the day, they had not finished the southern diversion. Yohannis, embittered by the distribution (1997) of his son's land which he cultivated since his son was forcefully recruited and died in battle, refused to accept the prospect of losing more land. He stated: "Maybe they think I am old, but I am not a fool. Why do they make their problem my problem? Therefore I blocked the flow [and turned it down]." He blocked the flow and diverted it straight down toward the plot that he felt he had lost to Mr. Kassahun during the 1997 land distribution (the plot south of the emerging gully in Figure 4).

In the years that followed, the diverted flow washed away soil from a barren spot of grazing land downstream of Kassahun's plot. Soon, a new gully expanded along the entire boundary with his neighbor. Kassahun appealed to the DA every year but could not convince him to divert the flow. He explained: "You must know we are not equal... I was young and the women on the other land sharecropped out the land. Our plot is in between the plot of the son of the old kebele leader and the plot of a militia." Over the next 10 years, he would lose his whole plot. Kassahun understands well why Yohannis and his son Tadesse do not help him. All surrounding cultivators

know the dangers of the saturated slope.¹³ "Why would [Yohannis] help to protect land that was taken away from him? Or why would [Tadesse] help to protect lands that are not his?"

But Yohannis points out another reason for the growing gully: "The new generation is poor at farming... They have no oxen but donkeys and engage in trade... They make no ditches or stone protections to protect the soil and crop... Moreover they might claim the land... Every year [my son] moves the boundaries of his plot already... That's why I refuse to sharecrop my land to my sons." His judgment does not result only from his frustration with the decreasing willingness of his sons to support their aging father with daily work; it also resonates with the "farmer image" reproduced again and again by landholders and extension agents.

For Tadesse, his father's inability and reluctance to provide him with more land and oxen makes it impossible to engage in farming. Not only does he lack land for cultivation, he is also barred from access to credit because he has no collateral. With soils increasingly requiring fertilizers, the price of which rose 40% in 2010 alone, access to credit is essential for farming. As Tadesse's access to the farming profession is thus severely constrained, for him the meaning of the hill slope has radically changed. Tadesse started trading together with Kassahun, who explains how "the donkey is now even more important than the oxen as we use it all year round for trading."¹⁴ During his latest five-day trade expedition, he bought 24 bamboo baskets from the nearby highland market for 128 birr. The next day, he started his journey to the lowlands, a two-day walk from Michael. Here, he exchanged the baskets for 80-kg wheat and 15-kg maize. He sold the wheat in the *woreda* capital for 296 birr and took home the money and the maize. His wife Anemo sells some of the maize in small quantities in the nearby market. Moreover, she cultivates a small irrigated potato plot and engages in the production sale of *araki* (liquor). Whereas Tadesse's money is used to engage in new trading activities, the money Anemo earns is used to buy sugar, salt, and oil, and to meet other living expenses.

Failing to live up to the farmer ideal, young families in Yeshat have thus created a competing "trader model". Most young families in the *kebele* complement farming of a small garden or sharecropping a grain plot with trade in baskets and lowland grains. Two years ago Kassahun, Tadesse and 33 other young traders¹⁵ established their own *mehaber*, a kind of cooperative society, with its own saving scheme. They saved 4,500 birr and provide loans to individual members at 10% interest per month. The members accompany and support one another during trade trips to distant markets. Kassahun proudly tells me that this *mehaber* is now stronger than any other *mehaber* in the *kebele*.

Changing relations of production in Yeshat are thus closely tied to the thriving lowland economy. In the lowlands the government has started to lease out previously uncultivated communal grazing lands¹⁶ and to provide cheap credits to state selected investors, cooperatives, and development organizations. On market days, most of the donkeys leave Yeshat empty to bring in lowland maize, which is now the cheapest grain available in highland markets. From September to December, these grains bridge the food gap until grains are harvested again in December–January.

Yet, because trading requires walking long distances and wages paid by lowland investors are low, Kassahun and Tadesse still aspire a farming career in Yeshat. They are keen to sharecrop with their parents, especially because this supports their claims to land. This leads to rising conflicts with their parents who are reluctant to sharecrop land with children

who stay away from the land and church. When Yohannis decided not to sharecrop with his son in 2012, Tadesse hit his father with a stick during plowing. Yohannis shouted “*I prefer to die today. You are coming to beat and kill me for land. Don’t forget I am your father who suffered a lot to support you, starting from your childhood.*”

Yonas, the DA, carefully maneuvers in the tense spaces thus created. When Kassahun requests him to divert the drainage water from his eroding land, Yonas refuses to involve in new routings, which he knows will create new conflicts. Instead, he uses the widening gullies to justify his work on the government’s soil conservation program.

(e) *Contemporary practices of reshaping drainage 3: Turning terraces into drains*¹⁷

Every year in January, the *woreda* officials order the soil conservation campaign. Democracy is temporarily put aside as “*the community took no action and was under immediate threat.*” Throughout Amhara regional state (20 million inhabitants), farmers are ordered to work for 40 days on soil conservation. The officials refer to the science of the Swiss-funded Soil Conservation Research Project (SCRIP, 2000) to justify this measure. “*The trick is,*” the natural resources management officer says “*to upscale the good practice of the SCRIP programme.*” Under the SCRIP program, terraces were constructed by digging trenches and throwing the soil up the hill. Thus, local obstructions are created for water flowing down the hill. When the water flows down, the velocity drops, and silt deposits behind the bunds to form a terrace (Figure 8).¹⁸

The soil bunds thus created trap not only soil, but also water. During heavy rain storms this can lead to sudden accumulations that create breakages in the bund. When one bund breaks, this often creates a domino effect in which water flows further concentrate, and multiple bunds are broken. If terraces have not been firmly established and precisely laid out along the contour, there are considerable risks of breakages and flooding. The SCRIP project funded the construction of a medical clinic to compensate the people on the pilot sites for prohibition of grazing for three years to protect the new terraces and for frequent breakages in the two years after terrace construction.¹⁹ Yet as Sinan *woreda* does not have the resources to compensate for losses, extension agents and land users have transformed the design to prevent harmful floods. The soil is thrown downhill from the ditch instead of uphill, thereby creating graded ditches that can drain the water accumulating behind the bund. Although the implicit idea is that the bund will strengthen and benching will take place in the years that follow,²⁰ terraces are constructed in such a way that benching never happens.

From the outset, it was clear that the terracing program was far from popular. Militia are mobilized to ensure attendance at training events at least for the first few days (Figure 9). For example when Yohannis’ youngest son, Demaiferam,



Figure 9. Training for terrace construction on the plateau just north of the hill slope in Michael 3 February 2011.

returned from a trading trip at night, they held him and instructed him to participate in training during the coming days. At the same time the trainers are frustrated by the limited effect of three decades of terracing campaigns. The *woreda* officer says

“*Now I gave a 15-day-long training course. But the farmers say ‘what is new?’ They have been told this for 20 years or longer and every time they get rid of the terraces. That’s exactly the problem: there is not even one terrace (erkan, Amharic) left to serve as an example. The people in the woreda and the region think it is simple but it is not.*”

During pegging, when the exact location and direction of a proposed trench is determined while taking account of the slope of the land and the spacing to neighboring trenches, a second transformation of the terraces takes place. Yonas selected a 55-ha area on which the people of the hill would be working that year.²¹ He knows that most people do not want the terraces. They do not only require a lot of work to construct, but also take up valuable space and make it difficult for oxen to pass during plowing. Moreover, silt might deposit in the drainage ditches in front of the terraces, and this can lead to their overflowing and flooding the plot. The people of the hill understand that Yonas has to implement the programme because he has been instructed to do so. Several mention that “*it is he who benefits from the terrace, because it gives him a good salary and a per diem.*” The space between the terraces is negotiated by the DA, the terrace constructors, and the land users. Although according to the design manual the spacing has to be between 10 m on steep lands and 21 m on land with a slope under 8%, a compromise is reached whereby the space between the bunds differs between 14 m on steep lands and 34 m on flat lands (Bhrane, 2012). During pegging the DA also influences the drainage pattern to reshape relations between neighboring farmers. By outlining terraces with ditches that cross the boundaries of neighboring plots, near-horizontal drains are reinserted into the drainage pattern. Every ditch thus connects two or three plots to collective drains down to the river. As Yonas forcefully reinstates collaborations between neighbors who blocked drainage routes and who saw their drainage routes blocked, the terraces come to embody government-prescribed collaboration over drainage.

The digging of terraces creates further compromises in the terracing program. The first trenches are dug in the presence of Yonas. These are—as indicated in the manual—0.5 m deep. From the moment Yonas stops to attend, both the cross-section of the terraces and the attendance instantly drop. Most

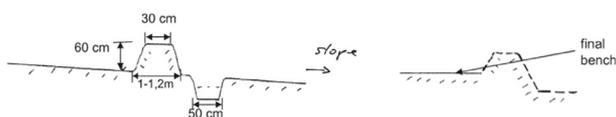


Figure 8. Cross-section of a so-called *fanja juu* for terrace construction as specified in the Ministry of Agriculture and Rural Development guidelines by Desta et al. (2005, p. 76). Note: The figure suggests putting the excavated soil above the ditch to construct the bund and allow it to develop into a benched terrace.

terraces constructed are between 0.2 and 0.3 m deep instead of 0.5 m. Demaiferam and Tadesse and most other landless people leave after two days. Yohannis continues for a week and is then allowed by the cell leader to stay at home because he is old. The remaining group of landholders gathers for three weeks, but not on Saturdays and Mondays when they too go to the market and not on Sundays and important Orthodox holidays. After 15.5 days of communal terracing on 18 ha, all are instructed to terrace the lands they are cultivating. The cell leader reports every week on progress and participation. None of the *kebele* officials responds to the low attendance rates however.²² When Yonas passes the lands the following month, he instructs the land users he meets to dig their “terraces” deeper. All of them promise to do so, but hardly anybody takes action. After the 40-day-long terracing campaign, only a few half terraces have been added. Yonas reports that 80 ha have been terraced in Yeshat, and this contributes to the *kebele*’s top ranking on the *woreda*’s soil conservation list that year. After that, the soil conservation season is over and his boss instructs him to focus on the distribution of improved seeds.

The first heavy rainstorms of the year expose the season’s drainage pattern. In the two months after the onset of the rains, more than 50 people lodge complaints about drainage with the *kebele* court and the DA. Some complain about “terraces” blocked by downstream neighbors. Others complain about damage incurred by new terraces. During light rain showers, the “terraces” result in more horizontal and thus safer drainage, but when the rainfall intensity is high the water accumulating behind the terraces leads to breakages (Bhrane, 2012). These complaints reach the DA. Yonas observes:

“People only come to me after the soil conservation season is over and the rains have started. They come to me for everything, even things they can solve themselves. A lot is because their drains are too few or too small. I learnt that many people do not give me complete information. They present their case and hope I will comment. Then they use my words. They say: ‘The DA decided this so that is why I am doing it.’ Also, if I solve someone’s problem, I might create another one. That is why I do not want to interfere. I reject most of the complaints and tell them that if they come next year (before cultivation of the next crop) there is time to construct terraces.”

Although the yearly construction of terraces does not stop erosion in Yeshat, the state terrace construction program reinstates the “farmerness” of the Yeshat landholders and the *mengisti*’s authority over common property resources management. A yearly cycle has thus been institutionalized in which “draining terraces” appear between January and March, and slowly disappear again between June and September. The *woreda* government does not question its model of terrace construction. Instead, the persistent erosion is used to justify the continuation of the state program for soil conservation. Yet, as we saw, persistent soil erosion is not striking a hapless farming community waiting to be saved by modern soil conservation. As the terraces are made and wash away, the hill and the identities of its users take shape.

4. CONCLUSION

This paper documents the morphodynamics of drainage and soil conservation so as to provide a material reading of popular mobilization programs that make Ethiopia’s “developmental state”. Such a political morphology approach brings into view two elements often absent in political accounts of environmental transformation. First, it recognizes how the

people of Michael engage in the transformation of the landscape and in the shaping of categories through which this landscape is known by government officials. Of course, they are constrained in their actions: a large group of them does not have access to farm land or oxen for crop cultivation. However, by engaging in lowland trade and establishing social institutions to support this, young men and women in the Choke Mountains perform alternative models to (re-)claim their rights. Second, chronicling the changing morphology of drainage and soil conservation networks reveals how the saturation of slopes, the re-routing of drains, and the re-design, layout, and cross-sectioning of terraces redistribute access to land and drainage in ways nobody is able to control.

Our analysis of the processes and practices that transform the morphology of a drainage network sheds light on three points about the power and limits of Ethiopia’s developmental state model. First, the unsustainable cultivation of the vulnerable slopes of the Choke Mountains is not the inevitable result of a so called “backward farming community” that is constructed with the model’s implementation. Practices of drainage and soil conservation are configured by social and physical boundaries that were established by the distribution of land and the appropriation of rents on the hill. Extraction of crops, taxes, and land by subsequent regimes were first accommodated by an expansion of the cultivated area. When this was no longer possible the land was increasingly drained and nutrients in the soil were mined. Involvement of people on the hill in several rounds of - sometimes violent—recruitment for state development programs and distribution of land undercut relations of sharing land, oxen, labor and drainage. People refused to accept their neighbor’s drainage flows, and redirected excess water along vertical plot boundaries, thereby increasing its erosive power.

Second, the power of the developmental state model derives from the exploitation of the increasing social and physical tensions on the hill by a new coalition between landholders and government officials. A landholding class of households which received land before the last land distribution in 1997 benefits from a donor- and government-supported agricultural extension apparatus that is geared to uphold the image of “the farmer in need of assistance for protection of the soil”. Government officials use the ministry’s guidelines for community-based participatory watershed development to mobilize influential landowners to organize the construction of terraces in exchange for representative power over “the community” and support in conflicts over land and drainage. Because the terraces create obstructions that can trigger flooding, landowners convert them into drains. The drainage flows are diverted to plots sharecropped by landless families. Consequently, the yearly mobilization for terrace construction does not halt soil erosion but further aggravates it. Because the landless generation now largely depends on trade or on below subsistence income in lowland areas, they are often not physically present to protect the fields they sharecrop, or claim their rights. The extension service subsequently labels the young generation, unable and unwilling to attend its “farmer tailored” training programs, as inadequate farmers and holds those absent responsible for the degradation of state land: a criminal act used to justify forced recruitment for the state soil conservation program.

Third, the limits of the developmental state model are increasingly visible in the Choke Mountains. While support for a so-called “community of farmers” creates new solidarities across old political divides, the gullies are expanding into the land of powerful landholders and a generation of young

landless families increasingly refuses to contribute labor to a technical development program that seeks to conserve soils on which it no longer depends. Landless families which fail to live up to the model of the “farmer interested in soil conservation” have created a competing “trader model” with its own

institutions. The continuous denial of the trader model by landholders and officials fuels generational conflicts over drainage which deepen the fractures in the hill and pose a challenge to government authority. Land degradation thus embodies both the powers and the limits of the developmental state.

NOTES

1. For exceptions see Ståhl (1990) and Lanckriet *et al.* (2015).
2. In a broader sense the article can also be seen as a contribution to the wide ranging literature on the “material turn” in human geography (see e.g., Bakker & Bridge, 2006; Kirsch, 2015; Whatmore, 2006).
3. Unless otherwise indicated, the information in this article is based on research by the authors and Tefera Goshu, Tesfay Muluneh, Atsbha Bhrane, and Temesgen Tefera who worked with us on their MSc/MA research along the Jedeb River. Quotes in this article come from the interviews held by these researchers. Pseudonyms are used for persons and places except for the Jedeb River, which is a tributary of the Abbay/Blue Nile River.
4. Vertical drainage: drains follow the slope straight downhill, perpendicular to the contour line, thus have a steep gradient. Horizontal drainage: drains follow the contour line with a small gradient.
5. We estimated the increase in the cultivated areas with the help of aerial photographs from 1957 and 1982 and a satellite image from 2009. We estimated the increase in cropping intensity based on interviews with people who have been cultivating in the area for a long time.
6. Field observations and photograph analysis of 24 fields from which harvest samples were taken.
7. Dilnessa’s (1971) study about cultivation on a hill slope at similar altitude 20 km from Michael, in the 1960s, reports yields of 0.5 ton/ha for both *teff* and barley—about half of current yields. Together with the fourfold increase in the cultivated area, this would mean around an eightfold increase in production since the 1960s.
8. This was contrary to the south and east of the country where a food crisis would emerge over 2011—which drove up grain prices.
9. An annual grain whose flour is used to make sourdough-type flatbreads, known as *injera*.
10. Latin name *Triticale*.
11. The year 2010 is considered by the people of South Michael as normal in terms of yield, except for the white wheat crop, for which bad seeds were reported as the reason for a yield reduction of up to a third. These figures were on average 40% lower than those reported to the *woreda* office by the Development Agent.
12. In December 2011, 1 US Dollar equaled 17 Ethiopian Birr.
13. Sadly and ironically, Yelfin’s husband died in a gully less than 500 m from the gully that emerged after his complaint about drainage.
14. The 53 families in Michael *goth* own 58 oxen and 48 donkeys.
15. Almost all households of men born in South Michael who were between 20 and 35 years of age in 2011, control less than 0.3 ha land and do not have a pair of oxen for plowing.
16. This does not happen without resistance: during a violent outburst in 2011, lowland cattle owners killed the oxen of investors plowing their grazing land and put their houses on fire.
17. The data on the terracing program in 2011 were gathered with Bhrane (2012).
18. In the manual for community-based participatory watershed management (Desta *et al.*, 2005), the Swahili term *Fanja Juu* is used for this technology.
19. Personal communication Prof. H. Hurni, 21 June 2010. Most households have more than one plot at different locations. Therefore, the floods do not impact all their land.
20. Personal communication Ato Lakew Desta, 7 November 2011.
21. In the plan in the DA’s office, 100 ha are indicated.
22. Fekadu, one of the farmer leaders, explained: “Cell leaders and *kebele* cabinet farmers gave permission to their friends and relative to be absent from the terracing work. In return, the absentee farmers thresh grains and plow the land of the cell leaders. Thereafter, other farmers started to complain. They would rather pay the fines than make the terraces they do not want.”

REFERENCES

- Adem, T. A. (2012). The Local Politics of Ethiopia’s Green Revolution in South Wollo. *African Studies Review*, 55(3), 81–102. <http://dx.doi.org/10.1017/S0002020600007216>.
- Agrawal, A. (2005). *Environmentality: Technologies of government and the making of subjects*. Durham, NC: Duke University Press.
- Andersson, E., Brogaard, S., & Obsson, L. (2011). The political ecology of land degradation. *Annual Review of Environment and Resources*, 36, 295–319.
- Bakker, K., & Bridge, G. (2006). Material worlds? Resource geographies and the “matter of nature”. *Progress in Human Geography*, 30(10), 5–27.
- Barnes, J. (2014). *Cultivating the Nile: The everyday politics of water in Egypt*. Durham, NC: Duke University Press.
- Bayabil, H. K., Tilahun, S. A., Collick, A. S., Yitaferu, B., & Steenhuis, T. S. (2010). Are runoff processes ecologically or topographically driven in the (sub) humid Ethiopian highlands? The case of the Maybar watershed. *Ecohydrology*, 3, 457–466. <http://dx.doi.org/10.1002/eco.170>.
- Bhrane, A. (2012). *Expertise, positions and negotiations about soil and water conservation: Case study of the government SWC program in the Choke Mountains of Ethiopia* MSc thesis. Delft: UNESCO-IHE.
- Blaikie, P. M. (1985). *The political economy of soil erosion in developing countries*. London: Longman.
- Blaikie, P. M., & Brookfield, H. (1987). *Land degradation and society*. London: Methuen.

- Chinigò, D. (2014). Decentralization and agrarian transformation in Ethiopia: Extending the power of the federal state. *Critical African Studies*, 6(1), 40–56.
- Chinigò, D. (2015). The politics of land registration in Ethiopia: Territorialising state power in the rural milieu. *Review of African Political Economy*, 42(144), 174–189.
- Cosgrove, D., & Daniels, S. (Eds.) (1988). *The iconography of landscape: Essays on the symbolic representation, design and use of past environments*. Cambridge: Cambridge University Press.
- Desta, L., Carruci, V., Wendem-Agenehu, Asrat., & Abebe, Yitayew. (Eds.) (2005). *Community based participatory watershed development: A guideline*. Addis Ababa: Ministry of Agriculture and Rural Development.
- Di Nunzio, M. (2014). 'Do not cross the red line': The 2010 general elections, dissent, and political mobilization in urban Ethiopia. *African Affairs*, 113(452), 409–430. <http://dx.doi.org/10.1093/afraf/adu029>.
- Dilnessa, Z. (1971). *Land use study: Ten selected farmers in Yebrage Hawariat*. Addis Ababa: Haile Selassie I University.
- Ege, S. (2015). *Land tenure insecurity in post-certification Amhara, Ethiopia*. Paper prepared for Workshop on Agrarian Transformations in Ethiopia (Humboldt-Universität zu Berlin and Goethe-Institut), Addis Ababa 29 September–1 October 2015.
- Ege, S. (2002). Peasant participation in land reform. The Amhara land redistribution of 1975. In B. Zewde, & S. Pausewang (Eds.), *Ethiopia: The challenge of democracy from below* (pp. 61–70). Uppsala: Nordiska Afrikainstitutet and Addis Ababa: Forum for Social Studies.
- Emmenegger, R. (2016). Decentralization and the local developmental state: Peasant mobilization in Oromiya, Ethiopia. *Africa*, 86(2), 263–287.
- FAO (1986). *Ethiopian highland reclamation study*. Final Report, Vol. 1. Rome: MoMFA.
- Frankl, A., Nyssen, N., De Dapper, M., Haile, M., Billi, P., Munro, R. N., ... Poesen, J. (2011). Linking long-term gully and river channel dynamics to environmental change using repeat photography (Northern Ethiopia). *Geomorphology*, 129, 238–251.
- Gandy, M. (2002). *Concrete and clay: Reworking nature in New York City*. Cambridge, MA: The MIT Press.
- Gebremichael, D., Nyssen, J., Poesen, J., Deckers, J., Haile, M., Govers, G., & Moeyersons, J. (2005). Effectiveness of stone bunds in controlling soil erosion on cropland in the Tigray highlands, Northern Ethiopia. *Soil Use & Management*, 21, 287–297.
- Haraway, D. (1991). *Simians, cyborgs, and women – The reinvention of nature*. London: Free Association Books.
- Hoben, A. (1973). *Land tenure among the Amhara of Ethiopia: The dynamics of cognatic descent*. Chicago: University of Chicago Press.
- Hoben, A. (1995). Paradigms and politics: The cultural construction of environmental policy in Ethiopia. *World Development*, 23, 1007–1021.
- Hurni, H., Tato, K., & Zeleke, G. (2005). The implications of changes in population, land use, and land management for surface runoff in the Upper Nile Basin area of Ethiopia. *Mountain Research and Development*, 25, 147–154.
- Keeley, J., & Scoones, I. (2000). Knowledge, power and politics: The environmental policy-making process in Ethiopia. *The Journal of Modern African Studies*, 38, 89–120.
- Kirsch, S. (2015). Cultural geography III: Objects of culture and humanity, or, re- 'thinging' the Anthropocene landscape. *Progress in Human Geography*, 39(6), 818–826.
- Lanckriet, S., Derudder, B., Naudts, J., Bauer, H., Deckers, J., Haile, M., & Nyssen, J. (2015). A political ecology perspective of land degradation in the North Ethiopian Highlands. *Land Degradation and Development*, 26, 521–530.
- Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.
- Lefort, R. (2012). Free market economy, 'developmental state' and party-state hegemony in Ethiopia: The case of the 'model farmers'. *The Journal of Modern African Studies*, 50, 681–706. <http://dx.doi.org/10.1017/S0022278X12000389>.
- Li, T. M. (2007). *The will to improve: Governmentality, development, and the practice of politics*. Durham, NC: Duke University Press.
- Meehan, K. M. (2014). Tool-power: Water infrastructure as wellsprings of state power. *Geoforum*, 57, 215–224. <http://dx.doi.org/10.1016/j.geoforum.2013.08.005>.
- Mitchell, D. (2012). *They saved the crops – Labor, landscape, and the struggle over industrial farming in Bracero-era California*. Athens and London: The University of Georgia Press.
- MoA (Ministry of Agriculture Ethiopia) (2013). *Sustainable land management program (SLMP) integrated implementation progress report for the time period 8th July 2012–8th January 2013*. Addis Ababa: Ministry of Agriculture.
- Mol, A. (2002). *The body multiple: Ontology in medical practice*. Durham, NC, and London: Duke University Press.
- Mollinga, P. P. (2014). Canal irrigation and the hydrosocial cycle. *Geoforum*, 57, 192–204. <http://dx.doi.org/10.1016/j.geoforum.2013.05.011>.
- Monsieurs, E., Dessie, M., Poesen, J., Deckers, J., Verhoest, N., Nyssen, J., & Adgo, E. (2015b). Seasonal surface drainage of sloping farmland and its hydrogeomorphic impacts. *Land Degradation and Development*. <http://dx.doi.org/10.1002/ldr.2286>.
- Monsieurs, E., Poesen, J., Dessie, M., Adgo, E., Verhoest, N. E. C., Deckers, J., & Nyssen, J. (2015a). Effects of drainage ditches and stone bunds on topographical thresholds for gully head development in North Ethiopia. *Geomorphology*, 234, 193–203.
- Nyssen, J., Poesen, J., Desta, G., Vancampenhout, K., D'aes, M., Gebremedhin, Y., ... Deckers, J. (2007). Interdisciplinary on-site evaluation of stone bunds to control soil erosion on cropland in Northern Ethiopia. *Soil and Tillage Research*, 94, 151–163.
- Osman, M., & Sauerborn, P. (2001). Soil and water conservation in Ethiopia. *Journal of Soils and Sediments*, 1(2), 117–123.
- Planel, S. (2014). A view of a bureaucratic developmental state: Local governance and agricultural extension in rural Ethiopia. *Journal of Eastern African Studies*, 8(3), 420–437.
- Rahmato, Dessalegn. (2009). *The peasant and the state: Studies in agrarian change in Ethiopia 1950s–2000s*. Addis Ababa: Addis Ababa University Press.
- Robbins, P. (2007). *Lawn people: How grasses, weeds, and chemicals make us who we are*. Philadelphia: Temple University Press.
- Robbins, P. (2012). *Political ecology: A critical introduction* (2nd ed.) Chichester, UK: John Wiley.
- Sauer, C. O. (1925). The morphology of landscape. *University of California Publications in Geography*, 2(2), 19–53.
- SCRIP (Soil Conservation Research Program) (2000). *Area of Anjeni, Gojam, Ethiopia: Long-term monitoring of the agricultural environment 1988–1994*. Bern: University of Bern, Centre for Development and Environment.
- Segers, K., Desseim, J., Hagberg, S., Develtere, P., Haile, M., & Deckers, J. (2009). Be like bees – The politics of mobilizing farmers for development in Tigray, Ethiopia. *African Affairs*, 108, 91–109.
- Shiferaw, B., & Holden, S. (1999). Soil erosion and smallholders' conservation decisions in the highlands of Ethiopia. *World Development*, 27(4), 739–752.
- Smith, N. (1984). *Uneven development: Nature, capital, and the production of space*. Oxford: Blackwell.
- Stähl, M. (1990). Environmental degradation and political constraints in Ethiopia. *Disasters*, 14, 140–150.
- Taye, G., Poesen, J., Van Wesemael, B., Vanmaercke, M., Teka, D., Deckers, J., ... Haregeweyn, N. (2013). Effects of land use, slope gradient, and soil and water conservation structures on runoff and soil loss in semi-arid Northern Ethiopia. *Physical Geography*, 34(3), 236–259.
- Teferi, E. (2015). *Soil hydrological impacts and climatic controls of land use and land cover changes in the Upper Blue Nile (Abay) basin* PhD thesis. UNESCO-IHE Institute for Water Education.
- Teferi, E., Bewket, W., Uhlenbrook, S., & Wenninger, J. (2013). Understanding recent land use and land cover dynamics in the source region of the Upper Blue Nile, Ethiopia: Spatially explicit statistical modeling of systematic transitions. *Agriculture, Ecosystems & Environment*, 165, 98–117. <http://dx.doi.org/10.1016/j.agee.2012.11.007>.
- Tekleab, S., Mohamed, Y. A., Uhlenbrook, S., & Wenninger, J. (2014). Hydrologic responses to land cover change: The case of Jedeb Mesoscale catchment, Abay/Upper Blue Nile basin, Ethiopia. *Hydrological Processes*, 28(20), 5149–5161. <http://dx.doi.org/10.1002/hyp.9998>.
- Temesgen, M., Uhlenbrook, S., Simane, B., van der Zaag, P., Mohamed, Y. A., Wenninger, J., & Savenije, H. H. G. (2012). Impacts of conservation tillage on the hydrological and agronomic performance of Fanya Juus in the upper Blue Nile (Abbay) river basin. *Hydrology and Earth System Sciences*, 16, 4725–4735. <http://dx.doi.org/10.5194/hess-16-4725-2012>.
- Van der Zaag, P. (2003). The bench terrace between invention and intervention: Physical and political aspects of a conservation technology. In A. Bolding, J. Mutimba, & P. van der Zaag (Eds.), *Agricultural*

- intervention in Zimbabwe: New perspectives on extension* (pp. 184–205). Harare: University of Zimbabwe Publications.
- Vaughan, S. (2011). Revolutionary democratic State-building: Party, state and people in the EPRDF's Ethiopia. *Journal of Eastern African Studies*, 5(4), 619–640. <http://dx.doi.org/10.1080/17531055.2011.642520>.
- Whatmore, S. (2006). Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies*, 13, 600–609.

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