

# **Water Brings No Harm: Knowledge, Power, and the Struggle for the Waters of Kilimanjaro**

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## **Introductory Note**

The following is a brief synopsis and chapter summary of my book manuscript, and a draft version of its fourth chapter. Thank you very much for taking the time to read them. My project is still very much a work in progress, and I welcome any constructive feedback you have. As this is still preliminary, please do not cite or circulate any of this without my permission.

## **Synopsis**

“Water is Life” is a common phrase in societies around the world, indicating the universal value ascribed to this most important natural resource. Recently, scholars have drawn attention to the growing global crisis of water scarcity, with some even predicting an age of “water wars.” While they have rightfully pointed out water’s importance as a physical resource, much less has been written about water as part of a larger historical process in which its meanings – cultural as well as productive – have been constructed, contested, and negotiated.

This book examines struggles over the control, management, and meaning of water on Mount Kilimanjaro, East Africa from the early nineteenth century to the present. Kilimanjaro is one of the world’s most unique landscapes, a massive freestanding mountain lush with water but surrounded by vast semiarid steppe. It has long been home to an agrarian people known as the Chagga. My book argues that for the past two hundred years, Chagga have faced challenges to their knowledge of water arising from encounters with people from beyond the mountain. These include Maasai pastoralists and Swahili traders, German and British colonial officials, missionaries, settlers, the independent Tanzanian state, non-governmental organizations (NGOs), and climate scientists. I contend that despite pressure from these groups, Chagga have not abandoned their knowledge of water but rather have integrated new ideas as they have proven relevant. This has allowed them to preserve the core tenet of their water knowledge, their claim to exclusive ownership of the resource. My book makes an innovative argument about how knowledge of water is produced and negotiated, and what the nature of negotiation says about relations of power between mountain people and outsiders. In the process it reveals much about the relevance of historical enquiry to current issues.

My book considers water in an innovative way, not merely as a physical resource but rather as a site of competing bodies of knowledge. Over centuries, Chagga life came to be shaped deeply by water. It was not merely a substance that supported life, but a root metaphor for society as a

whole. Knowledge of water was important not only in questions of its physical nature – who owns it, who controls it, how should it be managed – but also in religious beliefs, cultural practices, social relations, and identity formation. Furthermore, these forms of knowledge were not considered discrete but interconnected. An example of this is belief that the Chagga deity Ruwa had bestowed the waters of the mountain on them for their exclusive use. From the nineteenth century, the Chagga began to be pulled into wider communities – at first long distance trading networks, then the colonial state in the 1890s, the independent Tanzanian state in the 1960s, and most recently the scientific community concerned with the recession of Kilimanjaro’s glaciers. These introduced not only external political and economic influence, but also new knowledge such as water being a shared resource over a watershed, water having the capacity to carry disease, and Chagga irrigation practices being wasteful and destructive. Many of these ideas have threatened their physical access to the resource as well as their religious practices, cultural traditions, and social structures.

I argue that in the face of these challenges, Chagga did not abandon most existing water knowledge but rather adopted some ideas, rejected others, and even embedded some within existing ones. People now boil their drinking water, but reject the notion that irrigation is harmful. Perhaps most interestingly, people no longer believe in Ruwa – nearly all have converted to Christianity – yet they still assert that the mountain’s water is a blessing to them, only now from the Christian God. In essence, many ideas have changed but the overall framework of knowledge and its social significance have remained intact. My book thus makes an innovative point, that knowledge of water is dynamic, adaptive, and culturally contingent. It becomes clear that in societies like Chagga, the diverse forms of water knowledge are not discrete but rather part of the same whole, which allows people the freedom to borrow and incorporate ideas selectively. My approach is also innovative in that it shows continuity across the time boundaries – pre-colonial, colonial, and postcolonial – that often constrain Africanist scholarship.

## **Chapter Summaries**

This book is comprised of eight chapters that flow chronologically, with each examining a particular historical moment in the production of water knowledge on the mountain. The first begins by looking at the Chagga communities in the middle of the nineteenth century and how they controlled, used, managed, and generally made sense of water. I assert that the significance of water far transcended its practical uses. It served as a kind of root metaphor for mountain society as a whole. Water clearly provided for an array of physical needs such as cooking, drinking, brewing, and irrigation. Perhaps as importantly, it served as a fundamental part of how people understood their surroundings, their identities, their position in society, and their spirituality. These can best be understood by thinking of water in terms of knowledge. On Kilimanjaro, knowledge of water played a crucial role in defining various aspects of social and political inclusion and exclusion. As residents of a relatively humid space, mountain people viewed themselves as distinctive from the peoples arriving from the arid steppe. Those with specialized knowledge of water – a diverse group ranging from those with rainmaking power to the founders of irrigation furrows – held positions of power and esteem. Yet knowledge of water, as well as the power it conferred, was not limited to a small set of elites. Participating in

the management of water, and knowing one's place within it, was the responsibility of nearly everyone, from young men who at the time of initiation learned the art of water furrow maintenance, to women and young children responsible for procuring water for drinking and brewing. Most everyone also recognized that, though often abundant, water could also at times be dangerously scarce. Thus the resource required many different forms of management – ranging from the spiritual to the technical – as well as constant vigilance. What emerges from the chapter is the extent to which Chagga possessed numerous forms of water knowledge that were deeply interconnected and highly dynamic, and deeply tied to both the physical space of the mountain and their divine right as mountain people.

The second chapter turns to how those from beyond Kilimanjaro viewed the mountain and its waterscape from the 1850s. At this time, Chagga communities came into more frequent contact with a variety of “outsiders” from beyond the mountain. These included not only groups with long-standing economic and cultural connections such as the Taita, the Pare, and the Maasai, but also new players in trade such as the Kamba and the Swahili as well as European explorers and adventurers. These groups developed very different perceptions of the mountain waterscape than that held by the mountain's populations. This is most clear with the Europeans, who came to perceive Kilimanjaro as an otherworldly place, an Eden in the heart of Africa. This chapter shows how these notions arose from the intersection of two elements: the experience of encounter with the mountain – the lush mountain emerging after arduous journeys across the steppe – and the contrast of this experience with prevailing archetypes of the continent as a whole. While the mountain's tremendous size clearly made it distinctive, it was the elements of the waterscape – the white cap and the seeming abundance of rivers and streams – that most captured their imagination. Kilimanjaro, a place of magical snows, seemingly endless water abundance, and mild climate, emerged as the most known and symbolic geological feature in sub-Saharan Africa. It also placed the mountain centrally into European missionary, scientific, and colonial objectives for the continent.

Presumptions of Kilimanjaro as a place of endless water abundance became the basis of European thinking in the early decades of colonial rule, as we see in chapter three. In the last decade of the nineteenth century, Kilimanjaro became a part of German East Africa. The onset of colonial rule led to the arrival of several new groups to the region including German colonial administrators, Catholic and Lutheran missionaries, and settlers from Germany, Greece, and other parts of Europe as well as South Africa and Palestine. Each came to the mountain bringing their own knowledge of water and developed their own impressions of the waterscape. Surprisingly, the first few decades of colonial rule brought relatively little conflict over water to the mountain, and water remained an area in which locals exercised a tremendous amount of power. In fact, most new arrivals relied heavily on local water expertise, negotiating with Chagga specialists for access to water and even hiring them to construct water furrows to their farms and missions. This relationship, which defies accepted notions of relations between Europeans and Africans in the early colonial period, arose from several factors such as the relatively small number of white settlers on the mountain, the lack of hydrological expertise among them, the economy of earthen furrows compared with solutions such as concrete channels, and the limited time they were there combined with major disruptions such as the first World War. The biggest reason for a lack of conflict, however, was general belief among

Europeans in the abundance of Kilimanjaro's waters. After all, why fight over an endlessly abundant resource?

The idea of water on Kilimanjaro as abundant, a critical feature of European conceptions of the waterscape, persisted until the early years of British colonial rule. Chapter four looks at how this belief in abundance met with a swift decline in the 1920s and 30s. Colonial officials of the newly renamed Tanganyika Territory, as well as settlers, and missionaries, for the most part all came to the conclusion that the waters of the mountain were not in fact abundant, but actually dangerously scarce and in need of careful protection and management. This radical rethinking of the waterscape came from demand side factors, such as increasing demand among all users as well as new categories of use such as hydroelectric power and sisal cultivation that lay far beyond the mountain in the Pangani Valley, as well as supply side reconsiderations such as fear of increasing aridity in the region and concern over destruction of water supplies in upper areas due to poor management and excessive usage. The bulk of these latter concerns were aimed at the Chagga population, whose water practices very quickly went from being deemed ingenious to being thought of as prodigal and destructive. The colonial administration, with the help of the mangis, responded through a series of initiatives meant to "gain control" of the region's waters, such as the creation of new water laws and restriction of furrow construction and irrigation. Chagga water specialists, and most of the whole population in fact, vehemently resisted these new initiatives. For them, their perception of the waterscape had always involved volatility and the need for careful management, and thus these new concerns had little resonance. They also rejected the notion that the waterscape extended beyond the mountain, and thus did not consider users from beyond the mountain to be of consequence.

Even as Chagga communities resisted the notion of scarcity and the idea that their long-held water management practices were suddenly harmful and wasteful, they did begin to adapt new water knowledge from their neighbors. Chapter five looks at how new forms of water knowledge came to be incorporated, and how these ideas shaped the overall view of the waterscape held by mountain farmers. It does so by focusing on the adage "water brings no harm," a central tenet of Chagga visions of Kilimanjaro's waters. Between 1930 and 1960, knowledge of water as having the potential to cause harms ranging from soil erosion to the spread of disease emanated from numerous actors: missionaries, lay ministers, schoolteachers, colonial officers, coffee co-op employees, and midwives. Over time, many changes in the everyday practice of water began to materialize. These included a steep decline in the cultivation of eleusine, the abandonment of cultivating steep slopes, increased frequency of bathing, and the boiling of water prior to drinking it. These changes, however, are more complicated than simply indicating an outright acceptance of new water knowledge and a rejection of old. Rather, as the chapter shows, they reflect the careful adaptation of new ideas in response to conditions on the ground. People had never actually believed that harm could not result from water – the desire to control drought and flooding is the most obvious example – but rather held that water came from a distortion of something inherently pure, distortions that could be alleviated with proper control. Thus as new potential threats to water came into play, Chagga responded by empowering new "specialists" to address those harms. This included not only farmers to control erosion, but also women to manage the quality of domestic water within the household.

In the 1960s, Tanganyika emerged from colonial rule as an independent nation. As it entered into an era of socialist nation building known as *ujamaa*, the struggle for water on Kilimanjaro came to involve not only the interests of those in and around the mountain, but also those in the national capital of Dar es Salaam. Chapter six examines the emergence of the idea of water as a “national” resource, and the emergence of government initiatives meant to develop the resource to serve the needs of the state. On Kilimanjaro, the most prominent examples were the development of a system of water pipelines and public taps to serve mountain populations and the construction of the Nyumba ya Mungu dam and reservoir to the south of Moshi. Such projects represented far more than just the heightened involvement of the national government in water development. They challenged two key tenets of local water knowledge: that the waters of the mountain belonged first and foremost to the Chagga, and that water control should rightfully be handled by local specialists, many of whom claim their position based on descent or clan ties. Water development projects such as these thus were not only meant to provide “more and better water” to the people, but were also tools of nation building meant to consolidate national authority over the resource and replace so-called traditional water managers with government employed technocrats. The peoples of Kilimanjaro responded by eagerly accepting water pipes and public taps, as these greatly eased local water scarcity. However, rather than allowing them to replace the existing water sources such as the furrows or rejecting the authority of local water specialists and furrow committees, people simply used the new technology as they saw fit, alongside existing ones. Over time, broader social changes would eventually contribute to the decline of furrows, but not to the usage of the pipes as intended by Dar es Salaam.

By the late 1970s, Kilimanjaro along with the rest of the country had fallen into a steep economic decline. *Ujamaa* had failed to usher in its promised era of economic prosperity, and the mountain found itself struggling with the collapsing price of coffee. This had severe ripple effects on several aspects of life, including access to water. Chapter seven looks at how the decline of African Socialism and the rise of neoliberal economic reforms led to the introduction of radical new knowledge of water and perceptions of the waterscape, both of which created opportunity and conflict on the mountain. Starting in 1977, the government encouraged non-governmental organizations (NGOs) to help develop the water sector. On Kilimanjaro they included Oxfam, the Japan International Cooperation Agency (JICA), the Swedish International Development Agency (SIDA), and the German Technological Cooperation (GTZ). In the years since, these NGOs along with agencies such as the United Nations Development Program and the World Bank have promoted changes in water thinking that have proved very unpopular on the mountain. These include the concept of basin planning, which rethinks the waterscape as not only the mountain but also the entire Pangani system, the concept of stakeholders, which gives water rights to people along the whole river system and does not privilege the mountain, and lastly, but perhaps most importantly, the notion that people should have to pay for water. People on the mountain have responded in highly nuanced and varied ways. Many outright resent the involvement of outsiders in water affairs and vehemently resist new policies, in particular payment for water. Others realize their need for outside technical expertise and financial support, particularly in pipeline redevelopment, and thus embrace some elements of outside knowledge while rejecting others. Nearly everyone, however, rejects the notion that their water use should be subject to the needs of downstream users. Thus a central aspect of their vision of the waterscape, the centrality of the mountain and the inherent right of Chagga people to its waters, remains in play to the present day.

The final chapter closes by returning to what has emerged as the most symbolic aspect of the Kilimanjaro waterscape, the snows atop Kibo. For nearly 100 years, the mountain's glaciers have been shrinking, and several scientists have predicted that the mountain's glaciers will disappear completely as early as within the next twenty years. However, intense debate has ensued as to why it is happening. Some scientists claimed that it is the direct result of human-induced global warming, while others see it as the product of regional factors such as increasing aridity and mountainside deforestation. The debate has spilled over into the political realm, with the symbolic snows of Kilimanjaro being used to promote, or rebuke, policy changes related to the emission of greenhouse gasses. The discourse of the glaciers in the context of debates on climate change is a decidedly globalizing one, and one that has largely ignored its implications for the locality as well as the knowledge of the mountain's own population. This chapter shows how the people of the mountain are producing knowledge to explain the changes to the glaciers, the likelihood of their demise, and the effects that this may have on their livelihoods. Unlike their counterparts in government and science, they interpret the cause of glacial recession in a multifaceted way, drawing on both global and local factors. What this effectively does is allow them to acknowledge the large scale of the problem while retaining a sense of power and agency over the phenomenon. This desire to interpret the changing waterscape in terms of local knowledge, while openly incorporating new ideas, reflects the broader historical trend reflected throughout this book.

## - CHAPTER FOUR -

### **From Abundance to Scarcity? Water Calamity and the Struggle over New Knowledge of Water, 1923-1939**

On September 11, 1907, Moshi District Officer Wilhelm Methner sent a memo to the Colonial Office in Dar es Salaam describing the proceedings of a recent meeting of the district council (*Bezirksrat*).<sup>i</sup> At this meeting, a group of five German settlers came forward to describe serious water shortages afflicting their farms. They said that the preceding year had been a difficult one, with drought conditions leaving much land unsuitable for agriculture. Their concerns, however, went beyond just the present. They claimed, “the wealth of water of Kilimanjaro (in visible watercourses) is not as big as generally assumed.” The District Officer’s letter called on the government to alleviate the situation by providing more money for the digging of wells. Two months later, he followed up with a more descriptive account. He feared an impending “water calamity” caused by “everybody (either native or colonist) taking as much water as possible out of the most comfortably situated stream, without any regard to people living downward.”<sup>ii</sup> He ominously predicted, “if the long rains of 1908 will be insufficient again...there will be some bloody heads.” He called not just for more financial support, but also for some sort of water laws to regulate furrow construction and irrigation.

This correspondence is perhaps the first in the colonial record to challenge the notion of Kilimanjaro as a water-abundant Eden. Over fifty years, Europeans had come to think of the mountain as a miracle in the heart of Africa, with its ample waters and permanent ice in the midst of the harsh steppe. It likewise emerged as symbol of numerous sets of objectives – colonial, missionary, economic. Settlers and missionaries poured into the region until the onset of hostilities in 1914, and then returned in even greater numbers after the war’s cessation and the

colony's transfer to British control. By the 1920s, however, visions of Kilimanjaro as a water abundant wonderland were coming to an end. A series of severe droughts, concern over the dangers of soil erosion, and an increasing number of users (Chagga as well as European) who were in turn using more water led to widespread fear among Europeans that water was being used prodigally and wastefully. If all those living on the mountain did not take immediate steps, the vitality of the mountain would be lost forever. Suddenly, it seemed that Kilimanjaro could be Eden in another sense, a paradise lost.

This chapter analyzes this radical rethinking of the mountain's waters and the effects it had upon the production of knowledge among both Europeans and Chagga. It first looks at how Europeans constructed a notion of water scarcity on the mountain in the early decades of the twentieth century and how it replaced the prevailing opinion of abundance. The chapter then turns to the reactions of the British colonial administration in terms of creating new laws and generating new scientific knowledge of water, in hopes of eliminating informal arrangements and managing the resource more effectively. Lastly, it turns to how the administration attempted to disseminate this knowledge among the Chagga, who had come to be thought of as the most prodigal users of water.

I argue that colonial attempts to gain control of the water situation in essence created distinct, yet overlapping spheres of authority. The government chose to intervene directly in water use by settlers, the missions, and industry, but it took a largely indirect approach toward African users. Relying on the principles of indirect rule, it felt that it could bring about change among Chagga users by funneling new policies and knowledge through the Chagga chiefs, called *mangis*. This strategy failed almost entirely. It assumed that the *mangis* actually had the power to control water in their chiefdoms, and ignored the power of local specialists and furrow



committees. What we see is that these groups triumphed, successfully resisting new forms of control and the erosion of their power. It also reflects a moment of political fissure on the mountain, when people began to look to new sources of power and influence, such as the missions and the Kilimanjaro Native Planters Association (KNPA).

What emerged was a struggle over water management that that was not as much between “tradition” and “modernity” as it was about politically salient knowledge of water. Conflict over water illustrates a shifting of political oppositions and alliances, in which the kinds of knowledge that were accepted were those that worked to people’s economic and political advantage. Mangis embraced new scientific knowledge because, in part, it promised to bolster their authority over water. Their subjects, however, resisted this knowledge as a way of stopping a realignment of power over water – from specialists and the local community to the mangis, government technocrats, and Moshi Town – that was not in their general interest.

### **Rethinking Eden**

European visions of Kilimanjaro as a water-abundant Eden came to be questioned as a result of several factors. One of these was a series of severe droughts. In the first half-century of colonial rule, the mountain experienced significant shortages of rainfall in at least six periods: 1888-1890, 1898-1900, 1907-1908, 1913-1915, 1922-1924, and 1929-1930.<sup>iii</sup> The failure of subsequent long and short rainy seasons had devastating consequences for both the settler plantations and the Chagga homesteads. Many rivers and streams with year-round flows experienced reduced flows or dried up entirely. Those with seasonal flows, particularly those in the Rombo region of East Kilimanjaro, tended to fail outright. This lack of surface water in turn caused the widespread failure of irrigation furrows. Lacking adequate rainfall and irrigation

water, many mountain farmers experienced failure of their lowland crops and reduced yields in the vihamba, which in turn created famine conditions. For Europeans, drought conditions wreaked havoc on fledgling coffee trees and other crops, devastating many farmers struggling to establish themselves.

The drought of 1907-1909, described by Methner, was among the first to be experienced by the German administration, the missions, and large numbers of settlers.<sup>iv</sup> Perhaps the most severe, it serves as a good illustration of the reaching impacts of drought on the mountain. It began with the failure of the short rains in late 1907, intensified with the failure of the long rains in 1908, and continued with lackluster rainfall until the second half of 1909. Poor rainfall quickly translated into problems for the surface water supply. Seasonal rivers, streams, and furrows dried up entirely, and even the voluminous rivers of the south side such as the Kikafu and the Mwona experienced greatly reduced water flows. The human impacts were felt most severely in Rombo, the region most susceptible to drought. According to the journal of the Catholic mission in Mkuu, women and children spent most of their days procuring small amounts of domestic water from remote sources near the forest line.<sup>v</sup> Facing widespread crop failures, some families sought refuge in the Catholic missions at Mkuu and Mashati or chose to flee Rombo altogether for areas such as Kilema and Marangu.<sup>vi</sup> Many men even sought work on the fledgling settler and mission plantations on southern Kilimanjaro. The journal notes the particularly dire plight of the people.<sup>vii</sup>

Famine is felt moreover in this country. At the mission we do not know how to find food for the children. There are no longer any bananas, nor beans, nor millet in the country and our small harvest of maize will soon be exhausted. Oh when will the famine end?

The mission's lone furrow remained dry throughout the period, leaving water neither for domestic needs nor irrigation. The toll was staggering. According to the Mkuu mission records, at least 1,000 people had died there by the end of the famine.

Droughts posed serious challenges for the Chagga and Europeans populations alike. However, the manner in which these groups made sense of them bore striking differences. For Chagga communities, droughts and famine were a clear part of their historical experience of living on the mountain. Over centuries they had developed strategies for understanding them and dealing with their consequences. In many areas, famines were named, based upon features that made them particularly notable. Wimmelbücker notes that the period from 1907-1909 became known in the southeastern chiefdoms as *Njaa ya Mtsimbii*, or Hunger of the People of Rombo, due to the large number of Rombo refugees who ended up in those areas.<sup>viii</sup> In northeast Kilimanjaro, it became known as *Njaa ya kangama*, or famine of the morning, reflecting that it caught people unprepared.

Chagga developed diverse strategies for alleviating drought, reflecting the theme of interconnectivity developed in chapter one. Like other misfortunes, droughts were understood to be the actions of malevolent *waruma* (spirits).<sup>ix</sup> Rainmakers and other healers performed rituals and sacrifices at rivers and waterfalls to appease them, in hopes of restoring rainfall and the flow of rivers. Water specialists and furrow committees, for their part, worked to alleviate conflicts among users by improving access to the water sources that were still viable and adjusting irrigation calendars to compensate for reduced water. Women and children, long accustomed to procuring water from multiple sources, abandoned dry sources and adjusted their schedules to make time for getting water from more distant sources. It also seems likely that people prioritized vital uses for water – cooking, drinking, irrigation – and temporarily abandoned uses

consider less necessary, such as washing and cleaning. Though droughts posed serious, and often deadly consequences for people on the mountain, they were considered natural and unavoidable phenomena.

Among the European populations, however, the droughts sparked tremendous anxiety and an overall rethinking of the waterscape. Initially they were viewed as anomalies, but soon they came to be considered a legitimate problem that was only going to become worse in coming years. As David Anderson's work has noted, droughts of the early twentieth century sparked fear among people that the region as a whole was becoming progressively more arid.<sup>x</sup> Disputes over water among settlers, missionaries, and Chagga became increasingly common and highly virulent. Water sharing agreements, common throughout the early colonial period, became threatened as all parties struggled to maximize their access to precious waters. The settlers, many of whom had only recently established their fledgling coffee plantations, not only experienced crop failures but also had to prioritize the growing of food to feed their laborers. For the missions, the onset of droughts and subsequent famine did have a bright side. As Chagga struggled to secure access to food, many became more receptive to the work of missionaries. The missions responded not only by providing food but also by holding novenas, prayer services, and lighting votive candles.<sup>xi</sup> These were intended to provide for people's spiritual needs, while also providing an alternative to the actions of the local specialists. On the whole, though, droughts greatly challenged European conceptions of Kilimanjaro as Eden.

A second factor leading Europeans to rethink the waterscape was a rise in concern over soil erosion. Erosion emerged at the forefront of environmental concerns in the 1930s, not only on Kilimanjaro but also across much of the world.<sup>xii</sup> Colonial agricultural officers circulated pamphlets and books as early as the 1920s, alerting settlers to the dangers of cultivation methods

that left topsoil loose and exposed to the elements. Real panic, however, arose in the wake of the Dust Bowl of 1930-1936. As David Anderson has noted, the massive devastation of the Great Plains of the United States transformed soil erosion into the “first global environmental problem.”<sup>xiii</sup> Images of the event, portrayed in publications such as Jacks and Whyte’s *Rape of the Earth*, generated concern throughout East Africa that if cultivation and land management methods were not improved – especially in light of the perceived drying up of the landscape – the lush highlands of the country would be transformed into barren wastelands.

As the most symbolic, and lucrative, area of agriculture in the colony, Kilimanjaro drew much attention from agricultural officers concerned about erosion. With its steeply sloping contours, its fast running rivers, and the nature of its rainfall – usually much in short spans of time – the region seemed especially susceptible.<sup>xiv</sup> These natural conditions, they figured, were being compounded by the region’s reliance on traditional forms of water management, in particular the furrows. Once considered an “indigenous wonder,” furrows came to be considered wasteful of water (through seepage and evaporation) and prone to causing erosion due to their dirt construction. The recent development of new high volume furrows reaching to the lower areas (settlers, mission farms, new Chagga lands) further emphasized these problems. The overall problem lay in the system becoming more expansive, but still relying on the limited knowledge of local specialists and not adopting technological advances.

The problem lay not just with the furrows themselves, but also with how they were being used. Both Chagga and European farmers practiced flood irrigation, the flooding of areas of land with furrow water. Initially the Chagga had used this to support intensive cultivation of vegetables, as well as eleusine. By the 1920s, what had originally been a practice adapted to intensive farming had come to be used extensively, for acres upon acres without any terracing of

land to prevent soil wash. The focal point of criticism, however, was the Chagga practice of growing eleusine under irrigation during the long dry season. This had long attracted interest from Europeans, who struggled to grasp why farmers would not simply grow the crop during the rains. By the 1930s, the crop generated ire among colonial officials who saw it as wasteful, environmentally destructive, and not at all contributing to economic development, as well as among missionaries who saw it as contributing to alcohol abuse (eleusine was used almost exclusively in the production of beer).<sup>xv</sup> In 1941, the government summarized its position on eleusine as follows:

It is evident that the growing of eleusine under the conditions at present prevailing in the upper slopes of Kilimanjaro have been largely the cause of the shortage of water in the lower reaches of the rivers during the dry seasons, and of soil erosion with all its attendant evils.<sup>xvi</sup>

A third factor in rethinking the water supply was substantial growth in demand for the resource on the mountain. One dimension to this was demographic. By the 1930s, a growing number of people – both European and African – were making use of the mountain’s water resources. Population growth among the Chagga population, in particular, was extremely high. The first estimates of population on Kilimanjaro were apparently taken as early as the eighteenth century. According to Wimmelbücker, Mangi Ngawondo of Mamba organized a count of all initiated men in areas of his dominion (at the time from Mamba to Mwika, excluding Rombo) around the year 1800.<sup>xvii</sup> Ngawondo concluded a total of 15,000, which Wimmelbücker extrapolates to a total population of around 60,000. In the late nineteenth century, several European explorers made estimates of the population, including Johnston, who figured the population of the whole mountain to be approximately 80,000.<sup>xviii</sup> The first colonial count of

population came in 1913 at the behest of labor commissioner Berthold Freitag, who calculated the population of the Chagga chiefdoms to be 96,834.<sup>xix</sup> In 1921, the first formal census of British controlled Tanganyika calculated the population of Africans in Moshi District to be 158,185.<sup>xx</sup>

A precise calculation of population is difficult, as data before the 1920s is sporadic and inconsistent. It is also likely that due to periodic famine and warfare, the population would have waxed and waned throughout the nineteenth century.<sup>xxi</sup> Nonetheless these figures indicate a consistent estimate of just less than 100,000 before German colonization compared with 150,000 by the 1920s. The next few decades, however, witnessed a tremendous boom in the rate of population growth, a pattern mirrored across much of Eastern Africa and that generated increasing concern among colonial officials.<sup>xxii</sup> By 1948, the government estimated a population of roughly 289,000 Chagga on Kilimanjaro.<sup>xxiii</sup> This represented a growth rate of over 100 percent over a span of less than thirty years, or approximately 3.5 percent per annum. By the 1970s, it had reached 400,000, with a population density of nearly 1,000 per square mile in the densest areas.<sup>xxiv</sup> By 1988, it had nearly doubled to 744,271.

The overall pattern of population growth on the mountain mirrors that of other parts of the continent. Several factors explain the phenomenal rise: the end of warfare among the chiefdoms and between mountain people and Maasai, better overall nutrition and improved fertility, better sanitation practices which led to lower rates of disease, as well as the decline of several practices opposed by missionaries including breast feeding beyond the age of one, the use of birth control methods, and abortion.<sup>xxv</sup> The steep rise in population had a tremendous impact on water use. Simply put, more people meant more consumers of water. If one assumes that for domestic purposes each additional person consumed the same amount of water per day

as the rest, overall mountain consumption would have nearly tripled between 1913 and 1948. More people also meant that lands needed to be opened up for new vihamba, and new furrows constructed to provide water to them. This led to an overall increase in the number of furrows, as well as an expansion in size of many existing ones.

Population growth was also a factor for the mountain's European populations. In the 1880s, only a handful had seen the mountain and most – interested in treaty making and exploration – did not stay for more than a few months. By 1914, Kilimanjaro housed a population of 467, counting settlers, missionaries, and colonial officials.<sup>xxvi</sup> The war and its aftermath led to a decline in these numbers as most of the Germans were subject to deportation. By 1921, the number had shrunk to 209, of whom 155 were men and 54 women.<sup>xxvii</sup> This figure began to rebound in the 1920s. By 1927, the figure for settlers alone (excluding missionaries and government officials) had reached 534.<sup>xxviii</sup> Though by all measures a small population compared to the Chagga communities, Europeans had an unusually large impact on water. The British administration estimated that for domestic uses Europeans consumed at least three times as much per person as their African counterparts.<sup>xxix</sup> For irrigation, the difference was likely much greater. Settler and mission estates were of much greater size and often located in much drier areas than the vihamba, therefore necessitating the use of more water to irrigate crops. Also, many of the crops chosen by Europeans – coffee, cotton, sugar – inherently demanded more water than local varieties.

If one calculates these changing demographics with stable per capita use, there is clearly a growing demand for water resources in the 1920s and 1930s. However, per capita use was far from flat. Rates of consumption rose substantially in the early twentieth century. By the 1930s, Chagga communities were using water much more extensively than they had previously, perhaps



as much as twice as much per capita as in 1900.<sup>xxx</sup> The spread of Christianity was one factor in this trend. Missionaries firmly believed in spreading a Christian lifestyle – of which cleanliness was a key part – as part of spreading the Gospel and building Christian societies. This has been well documented across the continent, for example by John and Jean Comaroff in Southern Africa.<sup>xxxi</sup> Indeed, it could easily be said that missionaries considered cleanliness to be next to Godliness. Both the Catholics and the Lutherans on Kilimanjaro promoted forms of hygiene – regular bathing and the washing of clothes – that necessitated the consumption of more water. These practices were often required of children attending mission schools, particularly in the chiefdoms from Mamba to Mwika. Given the prohibition against bathing in open watercourses, water for bathing had to be procured by women or children and brought to the kihamba in pots.<sup>xxxii</sup> If each family drew an additional two pots of water per day just for bathing, the overall rate of water consumption would have increased by approximately twenty-five percent.

Per capita use also rose due to the introduction of new crops, particularly coffee. By the 1920s, many Chagga farmers had begun to experiment with growing coffee in their vihamba, a practice encouraged by some of the missions and even the District Office. Coffee growing required farmers to use water in new kinds of ways. Existing irrigation furrows were enlarged and expanded to provide more water, particularly for immature saplings that needed to be irrigated until they could survive dry periods. Also, coffee required water for processing. Pulping, the process of separating raw coffee beans from their reddish fruit, required large quantities of water. After being picked, the fruits were soaked in water to help loosen the fruit. Once the beans were extracted from the pulp, they were washed in clean water to remove any remaining residue. Unlike other crops, coffee needed water for processing as well as irrigation,

which in turn placed further demand on the mountain's resources as the crop became increasingly popular.

The last factor in rethinking the water supply lay not on the mountain itself, but rather in more distant areas of the watershed. By the 1920s, new agricultural and industrial interests were being developed along the Pangani River between Kilimanjaro and the river's mouth at Pangani Town. At the foot of the mountain just beyond the settler farms, the Tanganyika Planting Company developed a sugar plantation and factory that opened in 1930. In order to grow the water-intensive crop, the company developed its own expansive network of irrigation furrows. Even more significant than sugar was the development of the sisal industry. Introduced to East Africa in 1893, the sisal plant thrived in the hot, arid steppe, and it quickly emerged as the colony's number one export. The heart of the industry was a series of estates lining the middle and lower reaches of the Pangani. By 1910, the colony's sisal exports had reached 7,000 tons per year, the bulk coming from the Pangani region.<sup>xxxiii</sup> Four years later, it had tripled. The industry suffered through a depressed period during and after the war, but rebounded to 50,000 tons by 1930. In the 1940s, Tanganyika would emerge as one of the world's premier producers, yielding 112,000 tons in 1945. The development of sisal production in the Pangani created the first large-scale demand for the waters of Kilimanjaro outside of the mountain. While sisal is a hardy crop that does not require irrigation even in dry conditions, it does – like coffee – require water to process its leaves into usable fibers, a process called decortication. In his 1958 study of the sisal industry, Claude Guillebaud estimates that 8,000 gallons of water per hour are required to process sisal.<sup>xxxiv</sup> Estates also required water to support the domestic needs of their employees, most of whom were migrants from other parts of the colony, and also to grow food to support them.

Another new industry to arise in the Pangani basin was hydroelectric power. In 1936, the Tanganyika Electric Supply Company opened a power station at the Pangani Falls, 40 miles upstream from Pangani Town in the heart of sisal country. It initially had a capacity of 5,000 kilowatts, most destined for sisal factories, the port of Tanga, and other consumers in the northeast.<sup>xxxv</sup> Over the next three decades, TANESCO expanded the capacity to 12,500 kilowatts, and also constructed two additional power stations on the river: the Hale Power Station just upstream of Pangani Falls in 1964 (21,000 kilowatts), and the Nyumba ya Mungu Power Station just south of Moshi in 1966 (8,000 kilowatts).<sup>xxxvi</sup> Hydroelectric power introduced a new way of thinking about the use of water. Rather than consuming water directly, the turbines depended on the power of the water's flow, demanding a constant volume and rate (measured in terms of cubic feet of water per second, or cusecs). This presented a particular challenge for a river system subject to high degrees of seasonal variability.

A year before the opening of Pangani Falls, TANESCO became concerned about falling flow rates in the Pangani. In a letter to the Chief Secretary in Dar es Salaam, the company's director pointed out that rates had plummeted in a span of just a few years, from 800 cusecs in 1933 to as low as 450 cusecs.<sup>xxxvii</sup> Such a drop served as a cause for concern, since inadequate water flows would keep the station from generating electricity at its designed capacity. The director noted the presence of abnormal drought conditions, but attributed the problem more to a "process of gradual denudation" of the river drainage basin caused by excessive upstream use. He called upon the government to become involved.

You will appreciate that the position may become very serious should the flow continue to diminish, and we should be very grateful if steps could be taken to ensure that an undue quantity of water is not diverted from the river for irrigation purposes in the

upper reaches, and if possible to conserve the natural water resources in the area from which the river draws its supply.

The director's statement is notable in that it not only asks for conservation of water resource areas but also restrictions on the use of upstream irrigation. It represents one of the first calls for planning water on the Pangani in terms of the whole river system, not merely parts of it.

These factors - drought, erosion, population growth, increasing consumption, and rising demand from beyond the mountain – all contributed to changing perceptions among Europeans of the Kilimanjaro waterscape in the early twentieth century. By the 1920s, people increasingly had come to think of water not as abundant, but rather as increasingly scarce. These fears tended to be strongest among settlers on the foothills and the industrial interests along the Pangani River, those furthest from the water's points of origin. Fear of scarcity, in turn, led to more conflicts between users and calls for government regulation of water. Though many settlers were guilty of overusing and mismanaging water, concern among Europeans honed in primarily on the Chagga population. A mere three decades earlier, their furrows had been considered "indigenous marvels," their use of irrigation distinguishing them from supposedly less advanced Africans. Now Europeans called their irrigation of crops such as eleusine prodigal and wasteful, and considered their furrows to be primitive.

Chagga communities certainly were no strangers to water scarcity. Over centuries they had become familiar with drought, and had developed a diverse range of methods for understanding them and dealing with their consequences. However, they did not mirror the sense of concern and even panic felt by many Europeans. One reason for this is that they possessed a much more nuanced, realistic view of the waterscape, a reflection of the mountain being a lived space as well as a symbolic one. Another reason is that Chagga homesteads were

the most upstream users in the watershed. This allowed them to cope with population growth and increasing consumption without feeling the strains on the resource. European users, particularly the settlers, felt scarcity more acutely because of their position downstream of this growing population. Lastly, Chagga peoples viewed the waters of the mountain as belonging primarily to them. They did not consider those from beyond the mountain as having a rightful claim to the resource, and therefore their issues of scarcity were barely acknowledged, much less a concern. They also did not stand to benefit in any direct way from sisal or electricity production along the Pangani, as sisal was an export crop and electricity would not be provided to the mountain for another few decades.

### **Creating a Legal Foundation for Water**

Much of the anxiety about water scarcity stemmed from the lack of an effective legal foundation for water in the colony. Though technically the property of the colonial state and under its control, water was in practice subject to informal, often haphazard arrangements between users. This made it difficult to negotiate disputes, and almost impossible to control prodigal or reckless use. As noted in the last chapter, the Germans never enacted a water law specifically for the colony, though one did exist in draft form. Their only legal attention to water in the Kilimanjaro region concerned protection of the forest watershed above the Chagga vihamba. As long as water was considered abundant, the informal arrangements held with relatively few disputes and there was little call for government action. Rising fears of scarcity became prevalent around the time that the British took control of the colony from the Germans. Having a much longer history as a colonial power, they acted fairly quickly to develop laws and institutions to regulate water management.

The first law related to water was the Natural Water Supply Regulation Ordinance (January 1923). Based upon the law developed for neighboring Kenya, it empowered the Governor to establish water boards for the purpose of controlling and regulating water supplies within specified areas of the colony. The boards, comprised of a chairman and other individuals chosen by the Governor, were responsible for the following:

- a. Prohibiting, restricting, or regulating the diversion, taking, storage, pollution, distribution, and use of water from any natural water supply.
- b. Prohibiting, restricting, or regulating the construction, maintenance, and use of irrigation works.
- c. Empowering any person to construct, maintain, and use irrigation works...on his own land or on public land, or on the land of another person subject to the payment of compensation.
- d. Empowering any person to use irrigation works or any such works as foresaid in common with the owner subject to payment of such contribution towards the cost of construction and maintenance...
- e. Requiring licenses to be obtained from the board for anything by which this Ordinance a board is empowered...to do.<sup>xxxviii</sup>
- f. As to any other matter or thing, whether similar to those before enumerated or not, in connection with the supply, conservation, distribution, and use of water.

The Ordinance thus made regional water boards the primary agents responsible for water in the colony. In turn, it defined water planning in terms of regions, rather than the colony as a whole. It also gave water boards the power to adjudicate any disputes within their jurisdictions. Those refusing to adhere to the decisions of their respective board could be held liable to fines, or even imprisonment.

A notable aspect of the ordinance is that it empowered water boards to delegate authority over water supplies used exclusively or chiefly by Africans. In these cases the boards, at their discretion, could assign their powers to the relevant chief or headman, who would then take

control of regulating the waters used by their subjects according to local custom.<sup>xxxix</sup> This is important for three reasons. One, it in essence allowed for two distinct spheres of control, one for African lands and the other for lands used by settlers, the missions, and government institutions. Two, it conceived of water as a resource that could be managed within discrete localities, not foreseeing how use in one locality could directly affect people in another. Three, it concluded that watercourses in native areas were actually under the control of chiefs, as opposed to others such as water specialists or furrow committees.

On Kilimanjaro, the ordinance laid the groundwork for the Moshi District Water Board, the first regional government institution dedicated to regulating water. Organized just months after the passing of the ordinance, it initially consisted of the District Officer (acting as chairman) and two appointees.<sup>xl</sup> Throughout the 1920s and 30s, the Board regulated water abstractions, monitored the construction of new furrows, and adjudicated disputes for all watercourses used by the European population. These included furrows used solely by settlers and missions, furrows used jointly by settlers and Chagga farmers, and new abstractions from rivers involving Europeans. Watercourses used solely by Chagga remained under their existing forms of control, in practice in the hands of local specialists and furrow committees.

The Moshi Water Board asserted control of the region's water by establishing a system of water rights. Owners of existing furrows were required to register with the Board, providing detailed information on each furrow's length, its point of abstraction, the quantity of water being abstracted, the uses for the water, and the number of users (and their race). Based on this information, the board then granted a legal right to the applicant to use the water as proscribed. Individuals wishing to construct entirely new furrows or to modify existing ones had to file for a new water right, a process that involved not only providing the above data but also detailed

sketches and proof that the new furrow would not hinder existing claims (African as well as European). The Board would then hold a public hearing and, if all information was in order and there were no complaints, a new right would be issued.

The Water Board promised to bring order to the water situation on the mountain. In practice, however, it found itself outmatched by the complex nature of the waterscape and a myriad of conflicts among settlers and between settlers and Chagga farmers. The Board had no specific data on the mountain's water supplies, which made the process of dividing them up very haphazard. It also had no complete listing of the informal rights granted to settlers during the German period – which were protected by the Ordinance – nor a list of all the Chagga furrows which were considered “customary” and protected by the Native Authority Ordinance. Without any information from which to work, the Board was essentially flying blind. A good example of this is a complaint filed by E. Meimarides, a Greek settler who operated a coffee estate in Mweka. In September of 1927 he accused five Chagga men living above his estate of blocking his furrow from the Kitsina River and thus interfering with the water right granted to him by the Board.<sup>xli</sup> The Board investigated the dispute and summoned responses from several individuals, including Mangi Ngilisho of Kibosho. The mangi claimed that the furrow, the intake of which ran through his lands, had been constructed jointly by his people and a prior settler and thus was subject to a sharing agreement.<sup>xlii</sup> The Board agreed, and in October issued a decision that the Chagga users should be granted full use of the furrow four days each week, and Meimarides the remaining three.<sup>xliii</sup>

Facing mountains of complaints and having little information with which to work, water boards came to be criticized as vague, unscientific, and ineffective. Furthermore very few board members possessed any formal qualifications and were often merely political appointees.



Settlers, frustrated with decisions that often appeared arbitrary, accused board members of siding with native users or with their personal friends. Perhaps the most searing criticism came from Governor Harold MacMichael in 1936:

The Water Boards have very little data upon which to base their decisions. They have no expert knowledge. They have no means of carrying out many of the responsible duties laid upon them. There is no adequate water law to guide them in their consideration of the important duties which fall to them to perform. They are quasi-judicial bodies with executive functions, with the result that policy becomes confused with interpretation of rights, and the extraordinary result is seen in appeals to the High Court against an executive order rather than for interpretation of an existing right.<sup>xliv</sup>

The faults of the Water Boards highlighted the core weaknesses of the 1923 Ordinance. First, it provided little legal context and virtually no specific guidelines for how the boards should be run. Second, it conceived of water as a local issue, providing no guidelines for planning or organizing water on a larger scale, such as for a drainage basin (like the Pangani) or for the whole country. Third, it attempted to skirt the issue of conflicting rights – British period, German period, customary – by allowing existing rights to be grandfathered and Native water use to be administered separately. This issue in particular ignored the realities of Kilimanjaro, where virtually all water used by settlers passed through Chagga lands and a large number of settler furrows had their intakes therein. To distinguish a natural resource by the category of its users proved highly problematic. Though inadequate from the beginning, the 1923 ordinance would remain on the books for nearly three decades. This was in part due to the outbreak of war, but mostly due to intense disagreement as to what should replace it.

### **Producing Scientific Knowledge of Water**

A key criticism of the 1923 ordinance was that policymakers lacked sufficient knowledge to make good decisions. In order to create a new water order that would address increasing scarcity, they needed a better understanding of the specific nature of the problem: how much water there actually was, how it was being used (or misused), and the specific nature of water conflicts. What was needed, in their opinion, was new, more scientific knowledge of the waterscape. In the 1930s, the colonial government sponsored numerous studies and reports that analyzed the region's pressing water problems and proposed solutions to them. For Kilimanjaro, the most important of these studies was the *Report on the Investigation of the Proper Control of Water in the Northern Province of Tanganyika Territory*.<sup>xlv</sup> The report, completed by preeminent colonial scientists Edmund Teale and Clement Gillman in 1934, aimed to "review the problem [of water supplies] in all its geographical and technical inter-relationships with the aim...to provide a guide for establishing a suitable controlling organization and a basis on which to adapt the law and regulations to the local conditions." The Teale-Gillman Report epitomized the trend toward the creation of new water knowledge based on scientific observation. The first half summarized the geographical and hydrological features of the mountain, providing statistical data on rainfall distribution, drainage patterns, and users. It then situated this data relative to several pressing questions about the control, distribution, and use of water.

The most pressing question for Teale and Gillman was how the water of the mountain could be used more efficiently. Based on interviews and analysis of the flows of rivers and soil conditions, they found across Kilimanjaro "a very widespread haphazard use of the water."<sup>xlvi</sup> To solve this problem they suggested first the prioritization of the uses of water, with domestic uses given the highest priority, followed by industrial (such as coffee pulping and sisal decortication), irrigation, and finally hydropower.<sup>xlvii</sup> Second, they advocated more regulation of

the design and construction of water furrows. They claimed that the biggest problem with them was wastage and soil erosion occurring because they had been inefficiently located (in porous rock), poorly constructed (either too steep or too wide, resulting in excessive erosion or evaporation), and inadequately maintained.<sup>xlviii</sup> The solution was for wasteful furrows to be relocated and reconstructed, using modern measurement tools, taking account of soil conditions, and drawing upon advancements such as the use of reservoirs (to store water flow during the rainy seasons) and concrete intakes. Finally, they stressed the importance of the rainforest zone as the source of nearly all surface water, and advocated a program of re-afforestation across the mountain.

An interesting aspect of the study is the manner in which it assigns blame for water scarcity. Teale and Gillman directly cite a number of practices used by Chagga farmers, particularly irrigating without the use of terracing and dry season flooding of eleusine fields. However, in their critique of excessive water use and poor furrow design, they hold Chagga and Europeans equally responsible. Furthermore Gillman, in particular, seems to think that Europeans – in particular the settlers – are at the root of these problems. In his diaries, he notes that local people “knew the art of water engineering long before we super clever whites brought ‘civilization’ to them and disturbed their equilibrium with Nature.”<sup>xlix</sup> He sees the problems as the result of European settlement having disrupted the natural balance the mountain people had with their surroundings.

For Teale and Gillman, the solution to the water situation on Kilimanjaro lay in legal, scientific management. They advocated that immediate steps be taken to prevent practices detrimental to the “continued guaranteed water supply.”<sup>1</sup> However, they did not set out a specific plan for legal reform, but rather called for further research. What was needed, in

particular, was a Topo-Hydrographic Survey to calculate the specific irrigation needs of the various users of the mountain's water. At this time, many in government questioned whether irrigation was actually necessary on Kilimanjaro, except in the driest areas near the plains and in cases of severe drought. Gillman felt this question could not be answered universally, but rather the necessity of irrigation depended on the circumstances of specific areas: soil conditions, tree cover, temperature, precipitation, and surface water resources. His term for this was "duty of water," the specific amount needed to irrigate crops in given conditions. Only with this data could the government create better irrigation policy.

Foremost in urgency among these is a very comprehensive series of observations and controlled experiments throughout the area, in order to decide, from place to place, whether or not irrigation is beneficial at all and if so when, how and in what amount it should be applied. In other words the so-called 'duty of water' should be determined in relation to local conditions.<sup>li</sup>

The concept of the "duty of water" was especially notable in that it did not assume that downstream users (European) necessarily possessed a stronger claim to irrigation water than upstream users.

The Teale-Gillman Report received much attention from officials in Moshi and Dar es Salaam and heightened concern about the future of the mountain. Over the next few years, the government commissioned additional studies to follow up on the work. Among these was the *Report on the Control of the Natural Waters of Tanganyika*, written in 1936 by Francis Kanthack. The Kanthack Report, intended to complement the work of Teale and Gillman, focused in particular on the legal challenges related to the mountain's waters. Kanthack, a water engineer with experience in both India and South Africa, noted that attempts to control water were complicated by several factors, most notably the fact that all surface water passed through

lands held by Chagga. This posed problems for both the colonial policy of Indirect Rule and the English Common Law principle of riparian rights (reasonable use to water granted by virtue of being adjacent). Indirect Rule as implemented in Tanganyika held that Native Authorities should control all resources traditionally utilized by Africans. This meant in theory that the colonial government could not directly intervene in Chagga water management practices. English Common Law meanwhile held that any person whose lands were “riparian to a public stream could have the right of reasonable use, subject to the reasonable requirements of other riparian owners being satisfied.”<sup>lii</sup> The problem was that most users of furrows did not possess riparian rights to the streams or rivers from which they drew, and thus had no legal right to use the waters. Kanthack therefore concluded that Common Law was an unsuitable basis on which to design legal code for the region.

He instead proposed a radical alternative: create a single set of water laws for all users, and make all rights to water dependent on a permit from the government rather than grant automatic rights based on land occupancy.<sup>liii</sup> Permits would in turn specify a specific form of abstraction, a specific amount of water to be allocated for use, and the manner in which it could be used. Exemptions would be granted to users who could claim rights that existed before 1923, including ones granted under customary law and those held by some settlers. Among the most interesting aspects of Kanthack’s proposal is that it granted government control over all water abstractions, even those by African populations.

This latter point held enormous significance for Chagga communities. By suggesting that government take control of all water, the report proposed the undermining the power held by the mountain’s water specialists. Kanthack held no qualms about this. He openly chastised Chagga water practices as “primitive, wasteful, and inefficient.”<sup>liv</sup> While he did acknowledge that they

had prescriptive rights to water through Native Law and Custom, this did not preclude the government from devising a formal permit system for their furrows.

In the case of natives, therefore, it appears to me that after a comprehensive survey of native irrigation areas the Government itself will have to take over the task of regularizing the furrow systems and of framing *pro forma* applications for permits. The whole position would, of course, have to be explained to the furrow owners and native chief concerned and their collaboration secured as far as possible.

Only by taking direct control of the furrows could the government create a sensible water order and promote improvements in furrow design. He did make a concession by stating that existing furrows, once registered, should remain under local control beyond the point of abstraction.

Nonetheless, his proposal constituted a radical rethinking of the relationship between Native Law and Custom and water management.

In addition to the Teale-Gillman and Kanthack Reports, a few other studies were undertaken in the 1930s. One of these was a Topo-Hydrographic Survey, a multi-year research study led by Gillman that involved two separate projects: an aerial photographic survey of the available water and a survey of the hydrological conditions of the mountain itself. The survey was abruptly ended in 1941 due to the war, and a report issued later that year. The study provided the first scientific survey of mountain hydrology and the first set of quantitative data about the origins and availability of surface and subsurface water. Another set of studies involved agricultural experiments aimed at determining the 'Duty of Water' for various crops in different locales on the mountain.

After nearly two decades of research and criticism, the government finally created a new water law for the colony. The Water Ordinance of 1948 was a much more comprehensive piece

of legislation than its predecessor and addressed many of its problems. It called for the creation of Water Boards to control water on a regional scale, but it carefully proscribed their functions and duties, limited their powers, delineated specific procedures, provided grounds for the disqualification of board members, and limited the fees that they could charge. The Ordinance called for a set of Water Courts to be established independently of the Boards, to handle all judicial functions and mediate disputes. It also provided a basic legal context for water by defining concepts such as rights and easements, and by placing the ultimate control of water in the hands of the Colonial Governor.

The new law, however, did not implement any major changes with regard to customary water rights. In fact, it ignored the recommendations made by the Teale-Gillman and Kanthack Reports.

Subject to the vesting of ownership of water in the Governor under the provisions of the next succeeding section, nothing in this Ordinance shall apply to any diversion, obstruction, abstraction, or use of water in the lawful exercise of any rights which is conferred – by native law and custom.<sup>lv</sup>

The 1948 Ordinance actually went further than its 1923 predecessor in this respect. It did not leave the question of native water use to the Water Boards; it specifically prohibited them from becoming involved at all. Thus it left control of all Chagga water use and all furrows in existence before 1923 – and therefore considered “customary – in the hands of local specialists. Management of new furrows beyond the point of abstraction was also left to local control. Essentially, the government claimed legal authority over all new abstractions, and thus could require Chagga farmers to apply for permits and submit designs, surveys, usage estimates, and

fees for all new furrows, but it remained without any direct authority to intervene with existing furrows.

### **Triumph of the ‘Specialists’**

Why was this the case? Why did the new law do almost nothing at all about an aspect of colonial water management so heartily criticized by the scientific studies? The answer is not that the government failed to take action. Rather, it is that the government took action in a different way from what the scientists proposed. A crucial tenet to the policy of indirect rule is that local leaders are the base form of governance, subservient to the District Officers under which they serve. The administration faced the question of how to disseminate new, scientific knowledge of water to the general population. Rather than take direct control of local systems, it chose to use its existing agents, the chiefs, as well as other forms of soft power to undermine the influence of water specialists and bring about change. This strategy ended up failing. It overestimated the influence of the chiefs in local life and underestimated the autonomy of water specialists and furrow user groups. What we end up seeing is widespread resistance to most new policies, and the triumph of water specialists over the interests of the chiefs.

The water law of 1948 essentially divided the waters of Kilimanjaro into three spheres of control – urban (all of Moshi Town), rural (settlers, missions, etc.), and African (primarily Chagga). Water in the latter sphere was placed under the control of the Chagga Native Authority and included “customary” furrows, those constructed before 1923, and any water sources that originated *and* ended within Chagga lands. All matters of control, maintenance, and usage of the furrows remained under the jurisdiction of so-called customary institutions including the mangis, the furrow specialists, and furrow committees. However if any Chagga person decided to



construct an entirely new furrow, they had to ask their mangi to file for a permit from the Moshi District Water Board, submit designs and specifications for the new furrow, and upon approval operate, manage, and maintain the furrow as called for by the conditions of the permit.

The strategy of the colonial administration, therefore, was to maintain local management of water while at the same time controlling the future of water by taking direct control of all new water abstractions. In the eyes of the administration, this strategy provided the best and most realistic prospects for ameliorating the water situation on the mountain. It also avoided the hassle of becoming directly involved in the water affairs of the Chagga chiefdoms, something viewed as potentially inflammatory to the population. Direct involvement was also thought to be largely unnecessary. Since the beginning of the century, the mangis had become effective, cooperative agents of the state. They had more or less taken control of many aspects of society formerly held by clan heads, in particular the management of land. Furthermore the Chagga population as a whole had flourished. Profits from the coffee industry had made them one of the most economically successful communities in Tanganyika. These profits had in turn been invested back into the industry, as well as into the development of schools, training facilities, churches, and seminaries.<sup>lvi</sup> By the 1930s many Chagga dressed, acted, and lived as prescribed by the model of indirect rule. Many forms of knowledge were indeed filtering into local communities through colonial actors, with the mangis perceived as facilitators. The prevailing wisdom was that one should not mess with such a successful model. As stated in a government memorandum in 1939, “The policy will be to interfere, as little as possible, with indigenous methods.”<sup>lvii</sup>

To bring about the changes needed, the government called on the mangis to implement reforms through the Chagga Native Authority, thus cloaking them in the guise of customary law

and practice. A good example of this was the “50 Paces Tangazo” ordinance implemented in 1931.<sup>lviii</sup>

All persons are absolutely forbidden to fell trees or to plant any crop other than bananas within 50 paces of any stream or spring. If any clearing exists within 50 paces of any stream or spring those persons responsible for such clearing must plant European trees or bananas, nothing else in such clearing.

Any person failing to carry out this order shall be liable to a fine of Shs. 50/- or one month’s imprisonment.

Objectives:   a. Water conservation for the future.  
                  b. A first step in education against soil erosion.  
                  c. Slight control of excessive cultivation of eleusine.

This order aimed to halt the clearing and cultivation of marginal lands near rivers or streams or on steep ridges, practices deemed especially harmful for contributing to soil erosion and for eliminating tree cover that hindered evaporation of surface water. Other orders of this type were implemented before the 1950s, addressing issues such as water pollution (a problem that was intensified by the increasing population and the pulping of coffee), revised rules concerning soil erosion, and protection of the Forest Reserve.<sup>lix</sup>

One way in which government did become directly involved was in the adjudication of water conflicts between chiefdoms. Disputes over access to rivers, streams, and furrows lying on the borders of neighboring chiefdoms were on the rise in this period, due to the rising population and to people being forced to settle on lands previously considered marginal. In no place was this more pronounced than on the border of Marangu and Mamba, where a long-standing feud over rights to a water furrow led to an outbreak of violence in 1916. Colonial officials managed to placate the tensions temporarily by implementing a water-sharing agreement, but increasing settlement along the border revived tensions a decade later. By the dry season of 1931, the situation had become critical, forcing both the Chagga Council and the District Officer to

become involved.<sup>lx</sup> The Chagga Council unanimously found in favor of Mamba, and required that Marangu share the volume of the furrow on a 50/50 basis. But as Marangu continued to monopolize the waters of the furrow, the Mangi of Mamba appealed to both the District and Provincial Officers. Both found in agreement with Mamba and the Chagga Council, and eventually the people of Marangu were forced to share the furrow.

The government also intervened by using local agricultural officers to encourage ‘modern’ cultivation practices. Government agricultural officers were sent out into the chiefdoms starting in the 1920s originally for the purpose of assisting with the cultivation of cash crops such as coffee and maize. Over time their duties expanded to include advising Chagga farmers about the dangers of soil erosion and the effects of over-irrigating crops, the benefits of terracing, and above all, the benefits of replacing eleusine with alternative crops such as maize. The agricultural officers also led a project to register all of the customary furrows on Kilimanjaro.<sup>lxi</sup> Nonetheless, they remained reluctant to intervene in any way that would undermine the mangis or the existing system of water distribution past the point of extraction. In particular, they were very cautious with regard to issues deemed culturally sensitive.

Government officials in Moshi felt that the Chagga population would quickly accept the new water control initiatives, especially since they left in place much of the existing apparatus (the authority of mangis and water specialists, the idea of ‘customary’ control of existing furrows). Most of all, they felt that the benefits of the reforms were self-evident, and would quickly prove themselves to a populace that was heavily invested in cash-crop cultivation and relatively well-educated. The mangis and the Chagga Council, as might be expected, were most receptive to the government’s efforts.

[We] are mainly agriculturalists and such work is good and profitable to us all. But, for this, two things are necessary – room to cultivate and an adequate supply of water to irrigate our farms....We beg Government to assist us to further these aims. We beg that our soil be conserved and, moreso, our water supplies which are the blood in the veins of agriculture. Without water our farms will be as bodies without blood. We beg Government to consider and apply the best methods of soil and water conservancy.<sup>lxii</sup>

In addition to verbal support, the Council implemented the rules already mentioned, including restrictions on cultivation near watercourses and the forest line and prohibitions on polluting rivers and streams. Several mangis even initiated restrictions on water use within their own chiefdoms. The influential Petro Marealle, for example, prohibited irrigation in the highest areas of Marangu and the growing of eleusine during the dry season.<sup>lxiii</sup> Several also began to require that all large furrows empty back into rivers rather than draining off into the vihamba.

The mangis also enforced the requirement that new furrows and abstractions be carried out with the permission of the Moshi Water Board. This directed benefitted them, since the Board required that all native permit applications be sponsored by the mangi of the chiefdom in which they would be carried out. By the 1930s, many mangis used this power to circumvent the specialists and organize construction of furrows on their own. These furrows, designed to carry water to newly cultivated areas and settlements near the plains, were longer and deeper than existing furrows, and brought water to users who were often many miles from the intake. A good example of such a project was the rightly named ‘Mangis’ furrow, constructed by Mangi Kirita of Kilema to provide water to recently settled areas of the chiefdom at the very foot of the mountain.<sup>lxiv</sup> This immense furrow was nearly 10 miles in length, serving dozens of users in an area where, due to the lack of moisture, maize had become the cash crop of choice. Another

example came in 1952, when Mangi Marealle applied for permission to build a water pipeline to serve the residents of Mkuu in Rombo.<sup>lxv</sup>

Seeking permission from the Board to construct new furrows required the mangis to embrace, to a certain extent, new scientific knowledge of water. Rather than defining a new furrow in terms of men whose families wanted to use the source, and which day and for how long each family would be able to draw water from it, they were forced to describe their projected water use in terms of total users, the type of use (irrigation, domestic, construction, or otherwise), the specific measured location of the intake, the dimensions of the furrow in feet or miles, and the specific quantity to be abstracted in cubic feet per second (cusecs).<sup>lxvi</sup> Mangis thus had to begin describing water in very different – and colonial – terminology. This favored those with formal education or training at the expense of those, such as the furrow specialists, who were mostly of an older generation and lacking in schooling.

The mangis clearly had a strong incentive to support the government's water control initiatives. Most of their subjects, however, resisted them. Throughout the 1930s and 40s, government officials found themselves frustrated by the lack of compliance with water policies, the rise of so-called illegal furrows, and rising suspicion by local communities. The most fervent resistance resulted from the government's most direct intervention: its restriction on new furrows without a permit from the Moshi Water Board. Water specialists quickly found ways to circumvent the new rule. The most common method was to take an existing furrow and expand it by building a larger intake and increasing the width and depth of the canal. Since the 1948 Ordinance only targeted 'new' Chagga abstractions and not modifications of customary furrows, this practice was technically not illegal. Given the government's lack of information about Chagga furrows, it was also difficult to prove. Another technique was for a water specialist to

construct a new furrow but claim that it was not actually new, but rather an ancient furrow being brought back into use. These so-called ‘illegal’ furrows were most infuriating to the settlers, who viewed it as a direct circumvention of the very rules to which they themselves were subject. Colonial officials quickly wised up to the problem but had difficulties addressing it. In 1947, for example, a hydrographic surveyor named M.T. Avery noted the continuing impact of illegal furrows on flow rates in the Pangani.

In fact I am confident that on several occasions during the past seasons the flow has been less than the guaranteed minimum, this is due both to a succession of bad rainfall years and to increased irrigation, mostly, I admit, by illegal native furrows.<sup>lxvii</sup>

The Water Board estimated the number of illegal water extractions to be as high as 50% of the total number of authorized ones.<sup>lxviii</sup> Nonetheless, the spread of illegal furrows continued to be a problem into the late 1960s.

The colonial administration also faced a lack of cooperation with its plans to register the customary furrows on Kilimanjaro. Originally, the government had hoped to have all of them recorded by the end of the 1920s. This deadline was extended into the early 1930s, the mid-1930s, and eventually pushed back after the start of the War. Even by 1960, the task had yet to be accomplished, as noted in the annual report of the colonial water office.

There remains the problem of the recording and control of very large numbers of furrows constructed under [Native] Law and Custom, the problem of which is becoming increasingly important as the knowledge of the benefit of irrigation spreads among the African farmers which, in many areas, means that too many people want to use the too little water available at the same time.<sup>lxix</sup>

The problem with obtaining an accurate list of existing furrows, customary or otherwise, likely stemmed from a perception among colonial officials that they could record accurate data at a single point in time. In essence, they assumed that the furrows in use in July of a particular year were the only furrows ever in operation. This assumption neglected the dynamism of the furrow system. Furrows were frequently opened and closed at different points in time depending upon environmental conditions. Some furrows were apparently even closed for years, only to be opened in extended dry periods. They also did not account for the fact that not everyone would agree with their findings. Therefore their results were often subject to fierce contestation.

This widespread resistance highlights several important issues, one of which is the tendency of most Chagga to side with the traditional water management practices – and the furrow specialists – rather than the mangis. The government had assumed that they could bring about change in water practice on the mountain by using the mangis as intermediaries. While some changes were accepted, such as the prohibition on cultivating near watercourses, the biggest changes in terms of furrow construction were rejected. Why was this the case? One answer that existing methods of managing water – furrows designed and managed by specialists and committees – allowed for tremendous community participation and a sense of ownership. The involvement of the mangis in water management was considered not merely unnecessary, but also inappropriate. People thus responded by ignoring them, and taking advantage of loopholes in the system that allowed them to continue developing new and existing furrows with little chance of being caught. It is more difficult to discern why the mangis were not more active in cracking down on illegal furrows. Likely they found themselves in a precarious situation, feeling pressure from government to control the spread of illegal furrows, yet fearing that direct intervention would erode their authority. Their fears were well founded. In the early 1930s

tensions arose between coffee farmers and the mangis when the government attempted to dissolve the Kilimanjaro Native Planters Association, a cooperative society supporting the fledgling Chagga coffee industry. The government claimed that the KNPA and its leadership, comprised of self-made farmers rather than elites, constituted a political threat to chieftaincy.<sup>lxx</sup> In response to this threat, coffee farmers successfully lobbied the government to leave the KNPA intact and to allow it to run outside the auspices of the Chagga Native Authority. This effectively dealt the mangis a blow to their power and prestige. Given their experience with the KNPA, it seems likely that the mangis' lack of response to widespread water rule violations stemmed from fear of losing further popular support among their subjects.

Resistance also indicates a growing suspicion of colonial motives more generally. The growth of population and land alienations and increasing tensions with the settlers contributed to fear that government wanted to take further resources away from Chagga communities. The presence of agricultural officers in the chiefdoms, conducting interviews and surveying land and water sources, only intensified these suspicions. Government officials worked to placate the problem by appealing directly to the people. For example, in July of 1937 the Governor made a speech in which he tried to clarify several recent happenings.

I have heard that it is said that the Government have sent men with measuring instruments over this Mountain in order that Government may take away your land and give it to the Europeans. Now that is an absolute lie. These men have come on to the Mountain to measure the waters of the Mountain...the waters of the Ruvu and other rivers which run to the sea and to measure how much water is coming down from this country. Later on you will see aeroplanes flying over the Mountain...and when they have finished their work the Council of Chiefs and their elders and those who control the furrows will be able to see what is happening to their water today – whether they are preventing soil erosion, or giving water to the man who does not want so much water, and



less to the man who needs more. The Government will give them the information and they will have to decide how to use it.<sup>lxxi</sup>

In spite of these overtures, people remained highly suspicious that changes in water were the first step toward a more far-reaching grab for their resources. Considering the plans underway to redistribute land on nearby Mount Meru, these fears were definitely legitimate.<sup>lxxii</sup>

It is thus clear that Chagga did not respond to colonial water control initiatives with unanimous support, or a unanimous response of any kind. The mangis generally supported government's efforts to control water abstraction. They also, to some extent, benefited from changing economic and demographic conditions which made them increasingly important figures in water development, especially in the case of long furrows and sources in newly settled areas. Through implementation of new 'rules', they also required Chagga to stop several practices including cultivation near watercourses, deforestation, and pulping of coffee in open watercourses. Yet the public chose largely to ignore government's new restrictions, and remained highly suspicious of those who were supposedly helping them out. Their actions also indicate the beginning of big changes in the nature of authority on Kilimanjaro, beginning with struggles over the nature of chieftaincy in the 1950s and culminating in the abolition of chieftaincy in 1963.

For the colonial administration, the reluctance of Chagga to join wholeheartedly in water control efforts resulted in intense frustration, especially given their success with getting other users, particularly the settlers, to fall in line. It also exposed fault lines in the strategy of local governance through 'traditional' authorities. Yet refusal to engage directly in the internal water politics of the chiefdoms remained. This left few options, at least as long as mountain farmers believed in the necessity of both irrigation and furrows.

## **Conclusion**

The early 1920s marked the beginning of several significant shifts in attitudes toward water control throughout much of East Africa. On Kilimanjaro a series of severe droughts, rising population and demand, fears of soil erosion, and heightened tensions over water among users – European as well as African – led to the decline of the formerly popular notion that water was an abundant resource. The optimism of abundance quickly led to the fear of scarcity. Many began to believe that unless water control and use were brought under control, the natural wealth of the region would be lost forever.

Colonial officials in Moshi and Dar es Salaam moved to install a legal and administrative structure for water control, one that would provide for the “economical” distribution of the resource and ensure that it be protected for the future. These efforts specifically targeted the practices of both European and Chagga farmers, both deemed by the colonial government as prodigal, wasteful users of water. However, the manner in which they were targeted was very different. For the settlers and the missions, all aspects of water use came under the jurisdiction of officials in Moshi. Existing furrows had to be registered, and new furrows were subject to the scrutiny of a Water Board. The quantity of water to be used and for what purposes, along with the specific design of the furrow, had to be approved. For European users, the days of informal access to water supplies were over.

Chagga communities faced a different scenario. The 1923 Ordinance essentially created a separate sphere for water control in designated African areas, leaving the mangis and water specialists to manage the resource as they had. Government chose to use its influence over the mangis, rather than direct action, to bring about change. Under influence from officials in

Moshi, the mangis worked to discourage eleusine cultivation, deforestation, and cultivation in areas prone to soil erosion. Optimism soon led to frustration, and in 1948 a new Water Ordinance brought abstraction under government control. Yet the complete control over all customary furrows remained in local hands.

Water reforms on Kilimanjaro before the 1950s were clearly reflective of competing agendas and differing views within the colonial administration, as well as the power that the economic and social progress of Chagga had over government policy. While the direct intervention advocated by Gillman, Kanthack, and others seemed to hold the potential to solving a host of problems, it threatened to undermine the spirit of indirect rule as well as alienate a population increasingly viewed as exemplar – prosperous, educated, and Christian. Fear of undermining this success, as well as differing viewpoints over the proper direction to take in the reform of water controls, led the colonial government to avoid any serious attempts to take control of furrows away from Chagga.

Most significantly, the colonial government's new forays into water law and science exposed growing political and social divisions on the mountain. For most Chagga, the new knowledge of water being promoted by colonial actors held little appeal. After all, scarcity had long been a lingering fear, and local specialists had developed numerous techniques to deal with such a contingency. Holding power of geography over most European users, they also felt water scarcity later, and often to a lesser extent, than their counterparts. The unwillingness of many Chagga to obey conditions and restrictions on water clearly thus signified a lack of belief in the validity of new knowledge. It also indicated the weakness of chiefly authority and desire among the people for local specialists to retain control over water. The reforms advocated by the government and the mangis held the potential to shift knowledge and power away from the

populace and centralize it in the hands of colonial agents. Resistance to registering furrows, filing permits for new abstractions, and curtailing irrigation thus served as means of defending against a realignment of power that was against local interests.

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<sup>i</sup> *Memo from the Moshi District Officer to the Colonial Office, Dar es Salaam, September 11, 1907.* TNA G4/115.

<sup>ii</sup> *Memo from the Moshi District Officer to the Colonial Office, Dar es Salaam, December 16, 1907.* TNA G4/115.

<sup>iii</sup> Records from the Holy Ghost Fathers mission stations at Kilema, Kibosho, and Rombo indicate that drought conditions were present in these time spans. The observations of explorers and colonial officials corroborate these observations. See *Journal de la Communauté de Rombo (CSEA 2K2.18)*, *Journal de la Communauté de Kibosho (CSEA 2K2.5)*, and *Journal de la Communauté de Kilema (CSEA 2K2.7)*.

<sup>iv</sup> This is developed in greater detail by Wimmelbücker 204-236, 378-400.

<sup>v</sup> *Journal de la Communauté de Rombo*, 1908. CSEA 2K2.18.

<sup>vi</sup> Wimmelbücker, *Kilimanjaro – A Regional History*, 388.

<sup>vii</sup> *Journal de la Communauté de Rombo*, July 12, 1908. Translated from French. CSEA 2K2.18.

<sup>viii</sup> Mtsimbii is a derogatory term for people from the eastern slopes of the mountain. See Wimmelbücker, *Kilimanjaro – A Regional History*, 388-392.

<sup>ix</sup> Anza Lema, “Chaga Religion and Missionary Christianity on Kilimanjaro,” in Thomas Spear and Isaria Kimambo, *East African Expressions of Christianity* (Madison: University of Wisconsin Press, 1999), 46-49.

<sup>x</sup> David Anderson, “Depression, Dust Bowl, Demography, and Drought: The Colonial State and Soil Conservation in East Africa during the 1930s,” *African Affairs* 83, no. 332 (1984), 321-343.

<sup>xi</sup> The first example of missionaries sponsoring prayers for rain occurred during the drought of 1907-1909, when the priests in Kilema began to hold novenas and offer votives as a means of praying for rain. See *Journal de la Communauté de Kilema*, entries for 1908.

<sup>xii</sup> Soil erosion was one flank of a greater surge in worldwide concern about the environment in the 1920s and 30s. The origins of environmentalism in colonial contexts may have even older origins, as has been argued by Richard Grove and others. See Richard Grove, *Green Imperialism* (Cambridge: Cambridge University Press, 1995).

<sup>xiii</sup> David Anderson, “Depression, Dust Bowl, Demography, and Drought: The Colonial State and Soil Conservation in East Africa during the 1930s.” *African Affairs* 83, no. 332 (1984), 327.

<sup>xiv</sup> *Memorandum on the Control of Water Supplies in Arusha and Moshi, 1928.* TNA 472/A-232/1; see also E. Harrison, *A Memorandum on Soil Erosion* (Dar es Salaam: Government of Tanganyika, 1937).

<sup>xv</sup> See Bender, “Millet is Gone.”

<sup>xvi</sup> *Monthly Report of the Topo-Hydrographic Survey, Moshi, for the Month of October 1941.* TNA 69/481.

<sup>xvii</sup> Wimmelbücker, *Kilimanjaro – A Regional History*, 208.

<sup>xviii</sup> Find in Johnston, or cite something else.

<sup>xix</sup> Wimmelbücker, *Kilimanjaro – A Regional History*, 323-324.

<sup>xx</sup> Government of Tanganyika, *Blue Book, 1921*.

<sup>xxi</sup> See Anderson, “Depression, Dust Bowl, Demography, and Drought,” 328-331, also Stephen Maro, “Population and Land Resources in Northern Tanzania, the Dynamics of Change 1920-1970” (PhD Dissertation: The University of Minnesota, 1974).

<sup>xxii</sup> See R.R. Kuczynski, *Demographic Survey of the British Colonial Empire* (Oxford: Institute of International Affairs, 1949) and J.E. Goldthorpe, “The African Population of East Africa: A Summary of its Past and Present Trends,” Appendix 7, *Report of the East African Royal Commission, 1953-1955* (London: HMSO, 1955).

<sup>xxiii</sup> Sally Falk Moore, *Social Facts and Fabrications*, 110.

<sup>xxiv</sup> Maro, “Population and Land Resources,” 76.

<sup>xxv</sup> Moore cites the prevalence of birth control and abortion in the years preceding colonial rule. Though apparently commonplace, both were taboo in public discourse and were only discussed in the private confines of women.

Moore, *Social Facts and Fabrications*, 110.

<sup>xxvi</sup> Munson, “Forest Reserves and Local Rights,” 11.

<sup>xxvii</sup> Government of Tanganyika, *Blue Book, 1921*.

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- <sup>xxviii</sup> This figure included 182 Greeks, 175 Germans, 98 British, and 33 Afrikaners. See Government of Tanganyika, *Northern Province Annual Report, 1927*. TNA 11681.
- <sup>xxix</sup> Applications for water rights required applicants to calculate water use per capita based upon the race of the prospective users. It was figured that African users would consume water at one-third the rate of Europeans. See TNA 474/1022.
- <sup>xxx</sup> This is very difficult to quantify, as the Germans never gathered statistics on native water use and the British did not until the introduction of pipelines in the 1950s. Based upon my field notes and data gathered from interviews, it seems likely that domestic consumption easily doubled. Irrigation use is even more difficult to estimate, as furrow flows varied not just between furrows but also across seasons and year-to-year.
- <sup>xxxi</sup> John and Jean Comaroff, *Of Revelation and Revolution vol 2, The Dialectics of Modernity on a South African Frontier* (Chicago: University of Chicago Press, 1997).
- <sup>xxxii</sup> Interview with Augustina August, Kyou, Kilema, 2004; Interview with Dauseni Massawe, Mokala, Rombo, 2004.
- <sup>xxxiii</sup> Didas Kimaro et al, "Review of Sisal Production and Research in Tanzania," *African Study Monographs* 15, no. 4 (1994), 230.
- <sup>xxxiv</sup> Claude Guillebaud, *An Economic Survey of the Sisal Industry of Tanganyika* (Welwyn, U.K.: James Nisbet & Co. Ltd, 1958), 82.
- <sup>xxxv</sup> Government of Tanganyika, *Blue Book 1940*, also Government of Tanganyika, *Blue Book 1945*.
- <sup>xxxvi</sup> "The Generation of Hydro-Electric Power on the Lower Pangani River," *East African Record* 3, no. 51 (1965).
- <sup>xxxvii</sup> Letter from the Tanganyika Electric Supply Company to the Hon. Chief Secretary to the Government, the Secretariat, February 27, 1935, *Water Problems in Tanganyika 1929-1953*. TNA 69/246/1.
- <sup>xxxviii</sup> Government of Tanganyika, "Natural Water Supply Regulation Ordinance of 1923," No. 4 of 1923, *Annotated Ordinances, Tanganyika Territory, 1923*.
- <sup>xxxix</sup> Government of Tanganyika, "Natural Water Supply Ordinance," paragraph 9, Sections 1-8.
- <sup>xl</sup> Moshi District Office, *Moshi Water Board, 1922-*, TNA 5/177 D.
- <sup>xli</sup> Letter from Meimarides (The Mweka Coffee Estates) to the District Officer, Moshi, September 13, 1927, *Water Disputes, 1925-1928*, TNA 5/69D.
- <sup>xlii</sup> Letter from Mangi Ngilisho to the District Officer, Moshi, September 19, 1927, *Water Disputes, 1925-1928*, TNA 5/69D.
- <sup>xliii</sup> Letter from the District Officer, Moshi, to Mr. E. Meimarides, Esq., October 18, 1927, *Water Disputes, 1925-1928*, TNA 5/69D.
- <sup>xliv</sup> Letter from Harold MacMichael, Governor of the Tanganyika Territory, to the Secretary of State for the Colonies, London, May 15, 1936. TNA 22962.
- <sup>xlvi</sup> E.O. Teale and C. Gillman, *Report on the Investigation of the Proper Control of Water and the Reorganization of Water Boards in the Northern Province of Tanganyika Territory, November – December 1934* (Dar es Salaam: Government Printer of Tanganyika, 1935).
- <sup>xlvii</sup> Teale and Gillman, *Report*, paragraph 71.
- <sup>xlviii</sup> Teale and Gillman, *Report*, paragraphs 174-175.
- <sup>xlvix</sup> Teale and Gillman, *Report*, paragraph 89.
- <sup>l</sup> Clement Gillman, *The Clement Gillman Diaries, v. 13-14*, RHL MSS Afr. S. 1175/13-14.
- <sup>li</sup> Teale and Gillman, *Report*, paragraph 169.
- <sup>lii</sup> Teale and Gillman, *Report*, paragraph 119.
- <sup>liii</sup> Francis Kanthack, *Report on the Control of the Natural Waters of Tanganyika and the Framework of a Water Law on which such Control should be based* (Dar es Salaam: Government of Tanganyika, 1936), 6.
- <sup>liiii</sup> Kanthack, *Report*, 6.
- <sup>liv</sup> Kanthack, *Report*, 11-12.
- <sup>lv</sup> Government of Tanganyika, "Water Ordinance of 1948," no. 23 of 1948, *Annotated Ordinances, Tanganyika Territory, 1948*, paragraph 3. The Ordinance also did not apply to any water right conferred by agreement or license before its implementation, nor for the use of water in the mining sector.
- <sup>lvi</sup> The sudden acquisition of wealth by the people of the mountain is discussed in *Memorandum on the Development of the Chagga Tribe, 1937*. TNA 24898.
- <sup>lvii</sup> *Memorandum on the Expansion of the Chagga Tribe into the Rau-Himo Plains*, July 20, 1939. TNA 26045.
- <sup>lviii</sup> *Native Authority Orders, 1931*, Government of Tanganyika, Annual Reports, Northern Province, 1931. TNA 11681.

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- <sup>lix</sup> A Chagga Native Authority rule prohibiting the pollution of rivers, springs, and furrows was originally passed in the 1940s and revised in 1958. See *Copies of NA Orders*, TNA 5/23/33/2; Revised rules on issues related to soil erosion were passed in 1937, and a more comprehensive version came to light in 1957. An order requiring people to remain outside of the borders of the Forest Reserve were passed in 1942. See *Native Authority Rules*, TNA 5/23/33.
- <sup>lx</sup> Government of Tanganyika, *Northern Province Annual Report, 1931*. TNA 11681.
- <sup>lxi</sup> The registration of all water furrows on Kilimanjaro became an objective of the colonial administration in the 1930s. Due to several difficulties, including lack of staff and the dynamic nature of furrow use on the mountain, it quickly turned into a long-term project that was not completed until the 1960s. See TNA 471/w.2/8 v. 2.
- <sup>lxii</sup> Memorandum written by the Chiefs of Kilimanjaro to the Governor of Tanganyika Territory, July 1937. TNA 24674 I.
- <sup>lxiii</sup> A few other chiefs also prohibited eleusine cultivation in some areas of their chiefdoms. The scope, however, was limited. See TNA 19415.
- <sup>lxiv</sup> Interview with Michael Safari, Maua, Kilema, 2004. The practice of Mangis leading furrow construction projects started out on a very limited scale. Gutmann mentions them briefly but clearly sees them as an insignificant presence. See Gutmann (1963), 413-421.
- <sup>lxv</sup> Mangi Marealle applied to the Moshi Water Board on behalf of the Chagga Native Authority for permission to construct a domestic water pipeline serving the residents of Mkuu. It specified an extraction of .22 cusecs of water from the upper reaches of the Motale River. See TNA 5/45/30.
- <sup>lxvi</sup> Chagga applying for a new water right were required to utilize the same paperwork as settlers, missions, and other prospective users. These forms asked for several forms of data, including the source of extraction, the amount of water to be used in cusecs, the users, and the types of use. See TNA 5/45/30.
- <sup>lxvii</sup> Letter from M.T. Avery, Hydrographic Surveyor, Water Development Department, Arusha, to the Provincial Commissioner, Northern Province, Arusha, 10 December 1947. TNA 26045.
- <sup>lxviii</sup> See TNA 471/w.2/8 v.2.
- <sup>lxix</sup> Government of Tanganyika, *The Water Office, Annual Report, 1960-61*, 3. RHL 754.14 r.5.
- <sup>lxx</sup> *Northern Province Annual Report, 1928*. TNA 20378.
- <sup>lxxi</sup> Extract from a speech by the Governor of Tanganyika presented to the Chagga, 30 July 1937. TNA 24674 I.
- <sup>lxxii</sup> See Spear, *Mountain Farmers*.