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Working in the Mangroves and Beyond: Scientific Forestry and the Labour Question in Early Colonial Tanzania¹

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ABSTRACT

Germans arrived in Tanzania with a vision of scientific forestry derived from European and Asian templates of forest management that was premised on the creation of forest reserves emptied of human settlement. They found a landscape and human environment that was not amenable to established practices of rotational forestry. In particular, a general labour dearth and resistance from Tanzanian peasants and labour migrants forced German foresters to compromise their forestry blueprint. The backdrop of the Maji Maji rebellion of 1905 led colonial authorities to back away from the unbridled use of force to muster labour for forest work, and land abundance in most of the colony stymied the introduction of *taungya* methods of forest squatting as practised in Asia. Early priority given to managing mangrove forests for revenue generation further undermined established precepts of scientific forestry, seen in the trend toward granting concessions to private entrepreneurs for mangrove bark exploitation rather than for timber. The persistence of an African and Asian consumer demand for mangrove poles and fuel wood subverted a vision of rotational forestry based on timber milling. Problems of labour procurement and retention furthermore undermined efforts to demarcate and conserve inland dry canopy forests, and obviated the expansion of managed forestry into woodland savannahs. By the end of German rule managed state forestry had therefore failed to reshape the landscape according to a Eurocentric and Asian model of development.

KEY WORDS

Tanzania, forestry, colonialism, labour, mangroves.

INTRODUCTION

In June 1906 a Manyema man named Kombo appeared at the Dar es Salaam district office to answer charges that he had neglected to work in the coastal mangrove forest at Shungubweni, the district's main mangrove cutting station. Kombo testified, 'It is true that I have not before helped with cutting forest roads. I am not obligated to do so, since it is wage work, and anyone can freely accept work or not'.² Kombo's refusal to do wage work is remarkable, coming toward the end of the Maji Maji war in German East Africa, when German troops used tremendous force and brutality to bring rural communities suspected of being supportive of rebels back under German authority. Germans had recently regarded refusal to do wage work, including forest work, as a sign of sympathy with rebels. While other villagers were intimidated into obeying the orders of district foresters, Kombo held his ground. Kombo was joined by another villager named Kawamba who, like Kombo, paid his taxes, performed mandatory corvee labour, but refused to work in the forest. This was perhaps because the forester, Jungfer, used a whip to discipline workers, and therefore had a reputation as *kali* (cruel), which was often enough to prevent people from showing up for work. The government decided the case in favour of Kombo and Kawamba, demonstrating the sea change in labour relations that had come about in part because of the Maji Maji war. The district officer Boeder emphasised that as long as villagers paid taxes and performed corvee work, they had freedom of movement, therefore could not be compelled to do wage work and could move about the colony freely. Indeed, Boeder, who a few years earlier had approved another forester's request to discipline workers with corporal punishment, requested that Jungfer's abuse of workers be investigated with a view to removing him from his position. Boeder wrote, 'I cannot tolerate that district residents who earlier received evil treatment from government officials are beset with mistrust and fear, if not incited, so soon after the recent rebellion'.³

In spite of the disavowal of force in obtaining workers, German officials were intent on mustering labour for forest work. By April 1907 Chief Forester Otto Eckert lamented the forest department's inability to obtain sufficient workers, and sought to recruit expensive long-distance migrants from the interior. Eckert wrote, 'The training and retention of a useful labour force is a life-and-death question for the forest economy'.⁴ This statement came as the forest department was gearing up to declare tens of thousands of hectares of the colony's forests as reserves, closed to African use, and regulated according to German principles of scientific forestry. This was a labour-intensive undertaking, one that German officials regarded as a prerequisite to reshape the Tanzanian landscape in order to make it suitable for intensive agriculture and cash crop production. In many respects colonialism was premised on scientific forestry, since forests were fundamental to basic colonial endeavours, providing the fuel that powered railways, steam ships, cotton gins, sisal processors, and consumer industries. The potential export of African hard woods to European markets, alongside other

forest products including mangroves, copal, and rubber offered hope of proving the economic worth of colonies to the metropole, and enabling colonialism to pay for itself. Some believed that scientific forestry had the power to reshape African landscapes in such a way as to make them suitable for European settlement on a wide scale, not just in isolated highlands. State-managed forestry was furthermore viewed as a means of curbing African shifting agriculture and subsistence-oriented crop production, thereby reversing the supposed deforestation of the environment that had been going on for centuries.

Scientific forestry did not live up to these expectations in German East Africa for several reasons. Scientific forestry was premised on managing forests for a profit, the proceeds of which could be used to reforest exploited stands and to create new plantation forests growing exotic tree species. However, it was difficult for East African timbers to compete on a world market with established wood suppliers from Scandinavia, Russia, even the Dutch East Indies. The competition from coal and increasingly petroleum as basic fuels limited the wood fuel market outside of the colony. The ability of European industries to substitute steel for wood for such uses as railway sleepers limited one possible massive market in German East Africa as well as elsewhere in Africa and Europe. Even within colonial Tanzania, it took decades before European-style construction using milled lumber replaced African mangrove poles for urban and rural housing. European knowledge of African timbers and their possible uses was poor from the start, leading many to import their lumber from Europe or Asia at expensive prices. Forestry in Tanzania was thus hard pressed from the start to make a profit. This failure to enter into world timber markets was exacerbated by the high prices of Tanzanian timbers created by high labour costs that limited the possibilities of scientific forestry and sustainable management. This was a factor of demographics – low population density – and resistance.

Using the mangroves and dry lowland forests of Tanzania as a case study, this paper will argue that colonial forestry in German East Africa was forced to accommodate itself to labour scarcity. While problems of labour procurement have been noted as a limitation on colonial forestry in Tanzania and elsewhere, they are generally not central to analyses of why scientific forestry took the shape that it did. Most studies of forest labour are concerned with managed forest squatting, usually called *taungya*, which traded access to land for seasonal labour in forests.⁵ However, *taungya* assumed situations of land shortage, access to land being an incentive for peasants to do forest work. During German colonial rule in Tanzania, indeed for most of Tanzania's history in most of the territory, land was not scarce, thus peasants had little inducement to add a work burden in forests to their regular farming activities. The forest department thus relied on coerced labour – penal and sometimes corvée labour – or wage labour, putting it in competition with other waged enterprises in the colony. The forest sector's labour bottleneck was a microcosm for labour constraints in the colony as a whole. This is also a story of African agency, since in situations of labour scarcity African men and women were in a position to pose limits on

the colonial system by withholding their labour from colonial projects, as the case of Kombo and Kawamba above demonstrates. In so doing, they altered the German vision of scientific forestry in the colony, and even the definition of what constituted a forest.

THE EUROPEAN AND ASIAN ORIGINS OF COLONIAL SCIENTIFIC FORESTRY

Scientific forestry as it emerged in eighteenth-century Germany was based on the premise that forests were scarce resources that were essential for state revenue.⁶ Forestry evolved in the most industrial regions of Germany, such as Saxony, where the demand for timber and fuel was high. Scientific forestry started with the premise that the state should regulate forest use and sharply circumscribe rural people's access to forests for fuel, pasture, construction materials, fodder, and game, activities which foresters portrayed as *raubwirtschaftlich*, predatory and destructive.⁷ The goal of early forestry, therefore, was to quantify how much wood was available for immediate and future needs since timber was an economic resource vital for industrial development. The science of forestry developed as a means of calculating wood quantity so that timber harvesting could mesh with fiscal and economic needs. Spurred by the fear that wood consumption was outstripping supply, German foresters spearheaded forest regeneration by dividing forests into plots that could be harvested and replanted in long-term rotations. This *Schlagwaldwirtschaft*, 'the wood-production forest' or rotational planting and harvesting of trees, viewed forests solely as an economic resource, and aimed to create uniform, non-diverse forests that could be methodically and easily harvested and monitored. While by the mid-eighteenth century scientific opinion pointed to the additional importance of forests for preserving watersheds and regulating climate, economic management was a far greater priority than preservation throughout the nineteenth century.⁸ Nevertheless, nascent conservationist thinking was the basis for degradation narratives that portrayed German state forestry as necessary for the common good. Regulated forestry furthermore brought significant revenue to German states. In the last quarter of the nineteenth century, for example, Prussian state forests brought in net revenue of about 25 million marks annually.⁹ Some quarter million foresters were employed in Germany at the turn of the nineteenth century whose upkeep was 'more than repaid by the sales of timber'.¹⁰

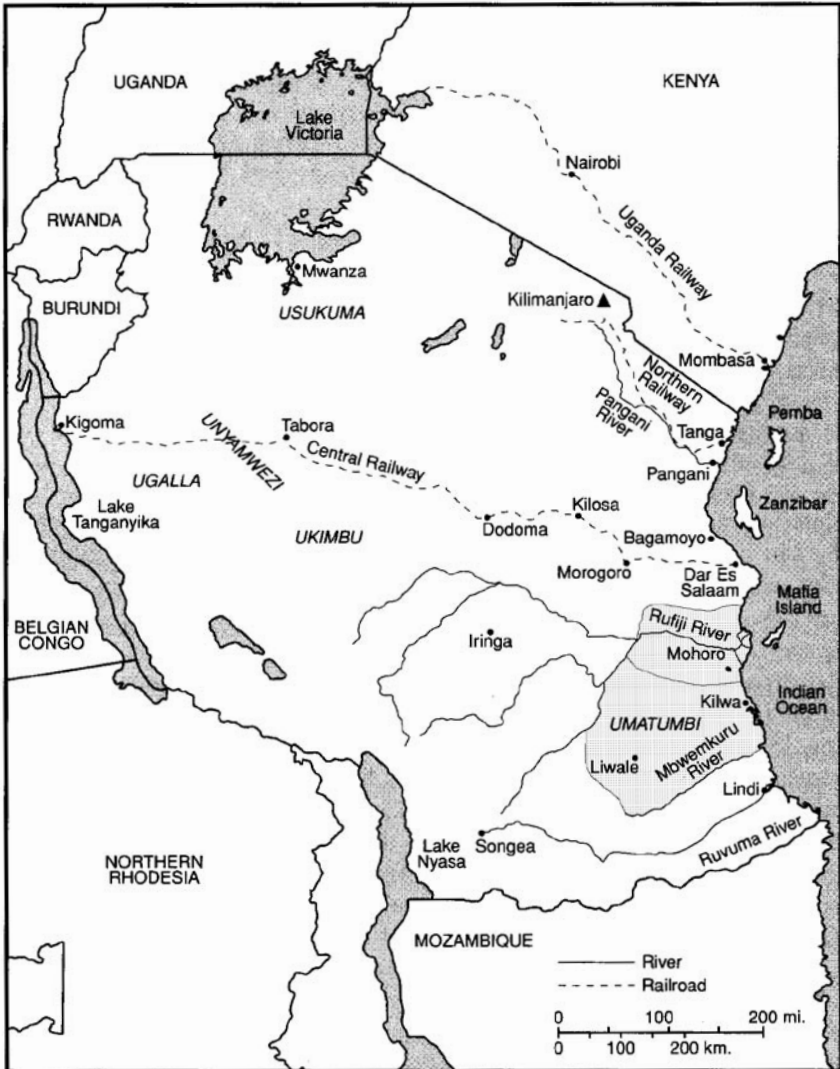
By the nineteenth century German scientific forestry was identified by a *Hochwald* (high forest) policy of reforestation using long-term rotations, considered the most efficient means of obtaining as much good-quality timber and firewood as possible over the long term, as opposed to the French predilection for *Niederwälder*, short-term rotations to obtain fuel wood as quickly as possible.¹¹ The *Hochwald* path had repercussions for the organisation of state

forestry that would one day be applied to Germany's overseas colonies. It necessitated a state bureaucracy and professional forest administration that could oversee forests over many generations. It made exceptional a liberal free trade access to forest resources, including private forests, and also superseded local, communal stewardship of forests. Finally, it strictly regulated peasant access to forests and their resources, and 'in comparison to past times, the forest biotope was constructed entirely according to different social interests', i.e., state and industrial interests.¹²

Long before the advent of Germany's empire in Africa, German foresters studied forest and social conditions in South and Southeast Asia and brought the knowledge they acquired back to German forestry schools. Germans oversaw Indian forests in the nineteenth and early twentieth centuries, and helped to create the forest departments in British Burma and Dutch-ruled Indonesia.¹³ Arriving in Asian forest environments, Germans adapted their traditions of scientific forestry to colonial and tropical conditions. While foresters in Asia were confronted with far more diverse forests and landscapes than in Europe, their major goal remained the quantifying of timber for fiscal and commercial exploitation and the curtailing of rural peoples' access to forests. As Dietrich Brandis, Inspector-General of Forests in India after 1863, wrote, 'Climate and species of trees are different in India but the principles upon which systematic forestry is based, are the same in all countries ...'¹⁴ While principles of forest management could be adapted from European templates, principles of social control that dovetailed with forestry were new to European foresters in Asia. In particular forestry officials came up against peasants who practised shifting cultivation in forests.¹⁵ More than just a means of clearing the land, shifting cultivation was a way of life bound up with spiritual beliefs, foraging for subsistence and commercial purposes, and hunting. Pastoralists also used fire in forests to promote grass growth so as to increase pasture.¹⁶ Forestry officials viewed shifting cultivation and other human use of fire as one of the most pressing threats to rational forestry, hence 'it was a tenet of colonial foresters that shifting cultivators jeopardised forest conservancy'.¹⁷ Colonial foresters developed policing powers in order to bring farmers and pastoralists in line with scientific forestry.¹⁸ Colonial forestry as developed in Asia was applied to German East Africa, and some German colonial foresters, such as the Chief Forester after 1907, Otto Eckert, had prior service in Asia.¹⁹

SCIENTIFIC FORESTRY IN GERMAN EAST AFRICA

Germans arrived in East Africa with a vision of forestry based on their European and Asian experiences, and they set out to remodel the landscape accordingly.²⁰ [See Map 1] A tiny proportion of the landscape – less than 1 per cent – was composed of montane rain forests and lowland dry forests dominated



MAP 1. German East Africa with Rufiji and Kilwa Districts shaded.

by tropical hardwood tree species. Almost 50 per cent of the landscape was composed of savannah woodlands known as *miombo*. While in modern times miombo is considered to be a crucial part of the forest estate, German foresters and policy makers did not deem miombo worthy of conservation because its trees were too scattered to be managed fiscally and because it harboured tsetse

flies, the main vector of sleeping sickness, which stymied a cattle economy in half of the territory. German foresters also initially privileged coastal mangrove swamps for reservation because of their established place in Indian Ocean trading networks.²¹ While Schabel argues that German forest reservation in East Africa was mainly environmental and 'only secondarily fiscal', this assertion cannot be sustained on a case-by-case basis. Following the Maji Maji rebellion, for example, German foresters targeted many forests for reservation that had been battle grounds during the war, apparently to deprive rebels of refuge and spiritual grounding.²² While many forest reserves established under German rule protected water catchments, scientific forestry in many cases inaugurated managed exploitation, even in highland environments. The reservation of the mangroves, discussed below, also belies the assertion that environmentalism was the cornerstone of German forest policy in East Africa.

Although German foresters arrived in East Africa with an established template for regulating forests, they encountered unique environments and conditions that shaped colonial forest policies and the colonial state itself. A key difference between Asian and African colonialism was the population dynamic of German East Africa. Excluding the territories of Ruanda-Urundi in the Great Lakes region, where 40 per cent of the population resided and which were virtually closed to labour extraction during German rule, the colony had only four million people for an area twice the size of imperial Germany, and population levels declined steadily throughout German rule.²³ This paucity of labour had far-reaching consequences for the political-economic development of Germany's biggest colony. German rulers began with the assumption that German East Africa would become a colony based on large-scale agricultural production and white settlement on the model of Kenya or South Africa. By 1907 most policy makers concluded that white settlement should be discouraged, in large part because labour costs were too high for independent settlers to make a living. Plans to create a major cotton plantation zone to feed Germany's textile factories shifted to favour peasant cotton production after most cotton plantations failed to make a profit, largely because of labour resistance.²⁴ What wage labour was available instead shifted to sisal and rubber plantations until the latter collapsed with the plunge in world prices by 1913. Labour scarcity led Germans to refrain from abolishing slavery in the colony outright, opting for a system of gradual emancipation that channelled slave men and women to wage labour. Some producers clamoured for the import of Asian indentured labourers, and some actually came to work in the colony before it was recognised that this option was far too costly. Labour controls themselves were fundamentally different from other colonies by the time a comprehensive labour ordinance was passed in 1909. Africans in German East Africa were not legally confined to reserves, as in Kenya or South Africa, paid one fifth the head tax of South Africa, and had freedom of movement within the colony. On the other hand, fearing the loss of labour to other territories, Germans prohibited external re-

cruiters, even though they could not prevent Africans from slipping across the borders. While land shortages in other parts of Africa and the world allowed for squatter schemes that succeeded in anchoring peasants as labour reserves, as was the case in forest reserves of India, in most of German East Africa land was not scarce, and peasants preferred to work on their own rather than participate in 'forest squatter' schemes during this time period.²⁵ German East Africa furthermore lacked animal power in much of the colony owing to the presence of sleeping sickness and other animal diseases that killed oxen and horses. In contrast, South and Southeast Asia had high populations and were regions where elephants, bullocks, horses, and water buffalo could be used in production.²⁶ It took almost a decade before German foresters understood that the dearth of labour and animal power would be a major hindrance to the development of scientific forestry in their biggest colony.

In the first decade of German rule, which began formally in 1891, forestry officials were preoccupied with two main issues. One was to circumscribe African shifting agriculture, dubbed 'wild burning', which was perceived as a direct threat to Tanzanian forests, the cause of desertification in the colony, and a brake on intensive agriculture and German settlement. Second was to identify and take control of the forests as quickly as possible with the goal of providing the colonial state with needed revenues. Colonial officials sought to accomplish the first beginning in 1893 by mandating an end to peasant field burning in proximity to administrative centres and by requiring peasants to first cut and rake grass and brush into piles before burning rather than setting fire to open parcels.²⁷ The ordinance prohibited villagers from burning around the banks of rivers and made rural communities collectively responsible for preventing fires in proscribed areas, subject to fines as high as 100 rupees or penal labour.²⁸ The 1893 ordinance protected settler agriculture in its infancy by giving planters the extraordinary right to request that a three km-wide strip be cut around their lands as a buffer against African field burning, which would undoubtedly be cut using African corvee or penal labour.²⁹ While not enforceable in areas distant from administrative towns, the ban on field burning was widespread enough that peasants mentioned it as a grievance at the time of the Maji Maji rebellion in 1905.³⁰ Colonial officials believed that in time they would be able to prohibit field burning completely, not only near administrative towns, and in so doing force Africans to farm intensively, growing cash crops of value to the colonial state.

The 1893 forest ordinance also aimed to circumscribe and regulate African wood use and tree cutting. The first forest assessor, Krüger, warned that in light of growing construction around the colony's towns, forests were disappearing.³¹ Furthermore, most construction timber was imported from Europe while Africans were said to cut down a whole tree just to obtain one plank.³² With this supposed wood shortage and expense in mind, the ordinance required a five-rupee permit to cut wood for household and commercial use near government

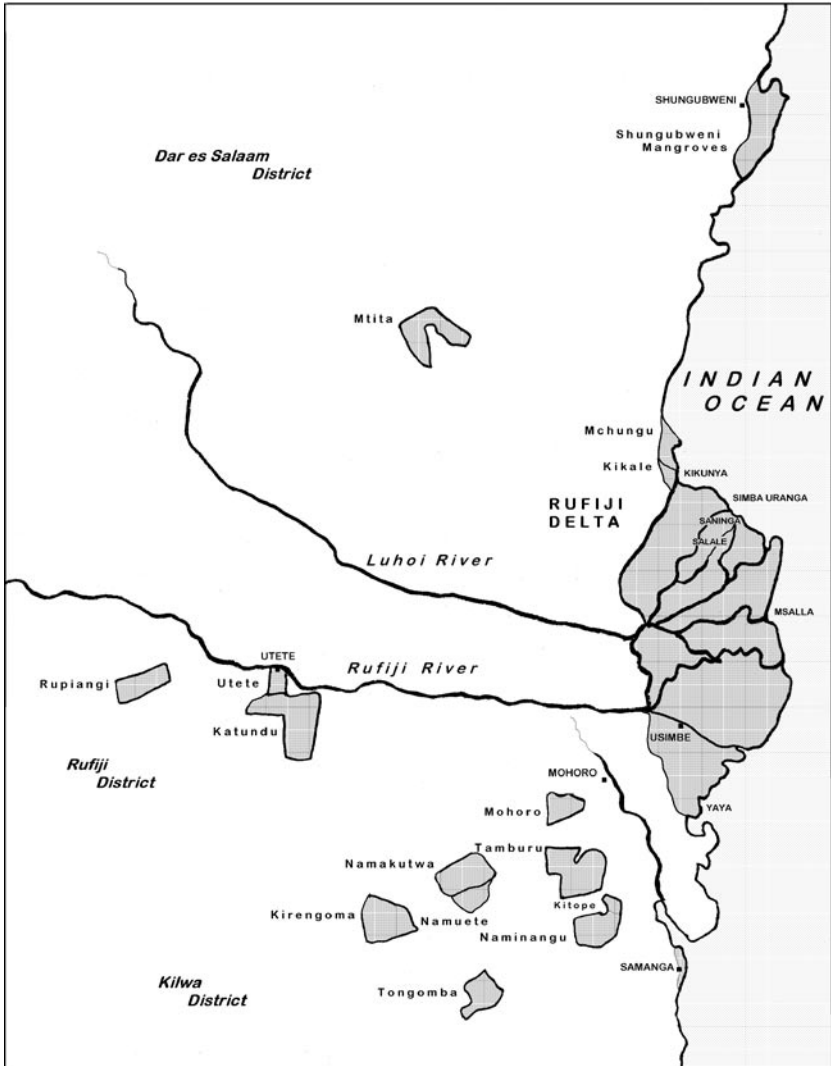
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stations, and mandated prescribed markets to monitor wood sales. No more than one permit could be issued for every 15 adults, and the colonial administration co-opted African *majumbe* (village headmen) to act as salaried forest wardens and police, remunerating them at the rate of 3 Rp per permit.³³ The 1893 forest ordinance evinced the weakness of the two-year-old colonial state in most of the colony by targeting only areas around administrative centres where wood for construction was necessary and oversight was feasible. However, drawing on Dutch models of commercial forestry in the East Indies, Krüger was clear that the 1893 ordinance was the first step toward establishing a regulated scientific forestry aimed at protecting and extending all of the colony's forests and making them commercially viable.

THE FOREST ECONOMY OF THE RUFJI DELTA

In tandem with attempts to circumscribe African forest use were early colonial plans to make the forests profitable by managing them according to principles of rotational planting and cutting. While modest efforts were made to control dry lowland forests on the periphery of the capital, Dar es Salaam, forest management before 1904 focused on the coastal mangroves, especially those of the Rufiji delta, East Africa's biggest waterway. [See Map 2] For centuries ocean-going dhows had arrived from the Arabian Peninsula and India to take on loads of mangrove poles that could be used in construction.³⁴ In the nineteenth century Zanzibar island was also a major destination for Rufiji and other coastal mangroves, and continued to be an important mangrove market under German rule. By that time, and in all probability centuries earlier, the importance of mangroves for local industry and for the export trade led people to occupy the islands of the Rufiji delta in perhaps fifty settlements to both farm and cut trees for sale in a landscape known in Swahili as *kapa*. While some people farmed lands located in the middle of delta islands, others, such as the village of Bumi, grew rice adjacent to the river, relying on its floods to develop a semi-intensive cropping regime.³⁵ Delta farmers grew maize and millet down to the river banks, and interspersed their fields with coconut and banana groves and mango trees.³⁶ Fruit trees bestowed de facto land ownership according to Swahili traditions, an important fact in light of eventual German occupation and conversion of the delta into a forest reserve. Delta farmers established cutting stations on the banks of the myriad delta rivulets, particularly along the eight major arms of the Rufiji, where mangrove poles were transported by dugout canoe to the river mouths to be picked up seasonally by dhows.

The German colonial administration sought to usurp the well-established mangrove trade while managing the delta according to principles of rotational forestry. The forest assessor Krüger set the ball rolling with a degradation narrative that justified state control of the mangroves. Africans, wrote Krüger, cut down



MAP 2. Rufiji Delta and nearby Forest Reserves shaded

ten mangrove trees in order to acquire one, in the process destroying saplings needed to reforest.³⁷ They cut mangroves from the edges of delta islands rather than from the centre, thus facilitating erosion and denuding. Over time this would lead to the silting up of delta arms and the creation of a swamp environment that would spread fever and make large tracts of land uninhabitable. Therefore a 'state forest oversight' was needed that would enable two to four times as

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much wood to be extracted without doing any damage to the mangrove stands. Regulated forestry could double the extent of the delta mangroves, which Krüger estimated at 60,000 hectares. Instead of a few thousand marks that accrued to the state through wood cutting fees, 600,000 Mk. per year would be earned if the state set up 15-year cutting and planting rotations in the mangroves.³⁸

With this ideal in mind, in 1898 a governor's ordinance introduced managed forestry to the Rufiji delta, the first part of the colony to be so regulated.³⁹ The delta mangroves were divided into three forest districts based at the delta mouths of Salale (Simba Uranga), Msalla, and Yaya, the first two of which were overseen by European foresters and the last under an African warden. Each forest district was further divided into parcels that were to be managed on rotational cutting-and-replanting schedules that ranged from thirty to sixty years. The administration thus fully intended to practise scientific forestry in the delta with a strict schedule of controlled management before problems of cost subverted this goal. The new system eliminated independent commercial logging in the delta. Private firms or individuals – especially Africans and Indians – could cut wood only under direct supervision of forest officials. Government foresters would henceforth employ Africans to cut and transport mangroves to collection sites where foreign dhows or government steamers could load them. Prices for a variety of wood grades were meant to be low enough to attract business, but still included a 30 per cent cutting fee on top of the wage costs, so that delta mangroves became a much more expensive commodity than in precolonial times. The forest administration recorded mangrove species, their African names and uses, their growth patterns, and the extent of forests on delta islands. Problems in the forest ideal developed quickly when it was determined that the delta had far fewer mangroves than expected – only 15,746 hectares – since Rufiji villagers had in times past cleared the centres of delta islands for agriculture. After the introduction of hut taxes in 1898 the government believed that forest personnel needed wider political authority to regulate working and living conditions in the delta and along the Rufiji. Therefore in 1900 a new Rufiji administrative district with headquarters at Mohoro was created, severing the delta and the entire Rufiji flood plain for two hundred km up the river from neighbouring Kilwa and Dar es Salaam districts.⁴⁰ This was the only case in German East Africa of a political district being created from a forest district. For a decade the forester Karl Grass served as the Rufiji district officer.

The new Rufiji forest administration was market driven. As Grass wrote, the duty of the forest administration was wherever possible to bring all types of wood onto the market to make a profit 'at least as fuel wood' so that wood processing would be more economical than in the past.⁴¹ The forest administration expected to continue to market mangroves to dhow traders while supplying the colony's growing fuel wood and construction pole needs. The administration also sought to market Rufiji mangroves as railway sleepers and mine shoring in Europe and South Africa. In addition, German foresters attempted to develop a

timber industry from milled delta mangroves that could substitute for expensive lumber imports that served the modest, but growing, European settler community. Toward this end, a 1000-hectare concession was granted to the Rufiji Industrial Corporation to establish a sawmill at Saninga in the delta to process and market 4800 cubic metres of mangrove timber annually.⁴² The forest administration agreed to supply the sawmill with 15 cubic metres of timber per day.

The forest economy was quickly overwhelmed by the demand for mangroves. In 1899 the government flotilla converted its steam engines to burn mangroves rather than expensive imported coal, creating an ongoing, extraordinary demand while obtaining the wood at below market value since it was a government sector. In a five-month period from 1902 to 1903 the flotilla demanded some 14,000 *coria* (score) of *maboriti* (mangrove poles), altogether 280,000 logs of varying lengths. By January 1903 the Salale forest district, which encompassed about half of all Rufiji delta mangroves, was preoccupied exclusively with supplying firewood to the flotilla, with a standing order of 1200 *coria* per month.⁴³ The Rufiji forest district also supplied firewood to government trial plantations at Kurasini in Dar es Salaam and Usimbe on the delta periphery, and to the hospitals in Tanga and Dar es Salaam. Seventy-two per cent of Rufiji wood provided to government sectors was used for fuel rather than timber. By the turn of the century a German entrepreneur named Schultz opened up the first beer brewery in Dar es Salaam, demanding a steady supply of fuel wood – 80 to 100 cubic metres per month – which the Rufiji forest administration was anxious to provide. The government was also intent on maintaining the foreign dhow market, which created seasonal pressures on the forest economy in spite of the fact that dhow visits had decreased as Rufiji wood became more expensive and alternate sources were available in Kenya and Zanzibar.⁴⁴ The months from February to April saw the highest demand as vessels arrived with the northeast monsoons to load up and return with the southwest monsoons, large dhows carrying loads as valuable as 2000 Rp, or about 8000 rafters. The demand for mangroves coming from so many sectors put extraordinary strain on the forest economy, and made the labour question of crucial importance.

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State forestry eliminated delta villagers' precolonial practice of cutting wood on their own and negotiating terms of exchange with local Indian merchants or buyers from overseas. By targeting delta peasants as forest workers, aided by the introduction of a three rupee annual hut tax in 1898 that created pressure to work, the administration introduced the labour question into the forest economy. The forest administration was intent on expelling peasants from their lands and moving them to cutting stations where their labour could be controlled.⁴⁵ Unlike taungya forest squatting, which offered landless peasants land access in exchange

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for labour, the Rufiji system moved delta residents from established villages to less desirable lands on the delta periphery. However, the department's early dependence on resident labourers prevented wholesale expulsions, thus created an awkward accommodation that satisfied neither foresters nor villagers.

From the beginning delta farmers refused to work for the forest administration as regularly as the state desired. Governor Liebert complained in 1899 that delta men worked two to three days per week for the forest administration and then returned to their household farms, and therefore 'constant pressure is needed from the district station to get people to work'.⁴⁶ As a result the forest department immediately enlisted expensive migrant workers from the hinterland to do forest work. As the forester Grass described it, the attempt misfired completely because the migrants deserted after they experienced living and working conditions in the delta. Gilbert writes in the case of the Lamu archipelago and Pemba Island that mangrove work was monopolised by specialist immigrant cutters from coastal Kenya known as *wagunya*.⁴⁷ In the Rufiji delta local villagers remained the mainstay of the workforce. The work required people to traverse delta mud and to locate appropriate mangrove species for myriad consumer demands – hut construction, rafters, firewood, dhow building, and so on. Wood had to be cut to specified lengths, and buyers were even particular that firewood be neither too light nor too heavy. Cutters needed dugout canoes to reach inaccessible stands, but could only do so at high tide. Large logs had to be transported by several men working together in a difficult terrain of mud and tangled roots and vines, eight to ten men needed to bring one trunk to a cutting station.⁴⁸ Sometimes the forest administration agreed to lay an 1800-metre forest rail to facilitate transport that often had to cross several rivulets, thus was expensive, time consuming, and used sparingly. Each year 150 Rp were spent to build bridges over creeks. Because mangroves were too dense to float, the forest department commissioned two flat-bottomed barges to convey wood from cutting points to the toll stations.

The absence of willing labour migrants to work in the mangroves led the forest department to meet the wage demands of delta dwellers. The administration resorted to paying workers piece rates to cut, transport, and load wood to be brought to the toll stations for sale. In about 1900, when workers received 5½ to 9 Rp per cubic metre of wood, the district officer Grass, undoubtedly exaggerating, complained that wage rates in the Rufiji delta were higher than they were in Germany.⁴⁹ However, by applying the hut tax strategically and by putting pressure on majumbe headmen to supply workers at especially busy times, which facilitated seasonal recruitment of workers from the middle Rufiji, and by 'judicious use of the whip' the forest department succeeded in lowering the average wage rate to 3–5 Rp per cubic metre by 1903.⁵⁰ Despite the clear use of force in mustering labour in the years preceding the Maji Maji rebellion, it was also certain that if conditions were too harsh, and if wages were pushed too low, workers disappeared. When wages for casual labour declined from 16

to 12 pesas ($\frac{1}{4}$ to $\frac{1}{5}$ Rp) per day in 1903, many regular forest workers deserted.⁵¹ Grass reported that workers were difficult to procure when agricultural demands were at their peak and in the period of post-harvest rituals. As a result, the forest office was hard pressed to meet the flotilla's orders for fuel wood, and even the attempt to warehouse various wood types at the cutting stations in anticipation of high seasonal demand did not alleviate the shortage since sufficient labour was not on hand to respond to sudden large orders. Wood already cut and stored often rotted on the ground before buyers could be found, and buyers often demanded wood grades that had not been stored.⁵² In 1902 the labour shortage made the forest administration unable to meet an order from the Wilken Mandelsloh firm in Durban, South Africa for 20,000 mangrove rafters to be used for mine shoring.⁵³ This demonstrates that a market opportunity existed in South Africa even as foresters and private concerns there sought to supplement timber imports with silviculture.⁵⁴ However, the Rufiji labour bottleneck stymied this market outlet. The Rufiji Industrial Corporation, which milled large logs into boards and planks, was liquidated already in 1901 in large part because it was unable to suppress labour costs, in part because the forest administration was unable to meet its daily timber quota owing to its own labour dearth. With the demise of the RIC came the virtual end of the lumber branch of the mangrove industry, always a tenuous undertaking owing to the difficulty of milling dense mangrove wood, which fell from 33 per cent of production in 1900 to .33 per cent by 1910.

While the use of mangroves for wood fuel clearly dominated the forest economy, making up about 70 per cent of all sales by 1903, almost all of the remaining demand was for mangrove poles used in African- and Arab-style construction. The 'most marketable' woods were various grades and sizes of construction poles that Africans used in hut construction. One hut required as many as 1500 poles of various lengths and widths. There was also an ongoing demand for mangrove wood suitable for dhow construction and repairs. As the African and Arab demand for mangroves came to far outweigh demand from the European settler sector, the forest economy shifted to target immature mangroves that had more resilient construction uses.⁵⁵ In so doing, it undermined the German 'high forest' ideal that was predicated on long-term rotations. In the Msalla forest district – at 2712 hectares the smallest of the three Rufiji delta forests (about 17 per cent of the total) – District Officer Grass initially projected that with a 60-year rotation, 45 hectares of mangroves, or 12,982 cubic metres, could be marketed per year based largely on demand from the sawmill industry.⁵⁶ However in 1899/1900 a total of 12,015 cubic metres of wood of all sorts was marketed from *all three* Rufiji delta forest districts, and by 1901/02 the output fell to 8886 cubic metres.⁵⁷ As output failed to meet early expectations, the colonial administration began to diversify the forest economy in ways that conflicted with the ideal vision of scientific forestry.

CONCEDING MANGROVE FORESTS

From their experience in Asia, German foresters had learned to be sceptical of private entrepreneurs' use of the forests, whose commercial undertakings were often at the expense of sustainable forestry. However, the Rufiji forest administration's early failure to make a profit and its ongoing problems with labour procurement led the colonial state to embrace forest concessions as a means to generate revenue and rescue the mangrove industry. Whereas the attempt at a sawmill industry in the delta theoretically operated hand-in-hand with forest management, the concessions granted after 1903 were for bark exploitation, which had no relationship to sound use of the mangroves.

Beginning in 1896 the Denhardt Bros. firm that had traded mangroves from Lamu on the Kenyan coast for over a decade discovered that the bark of two species of mangrove, *Rhizophora* and *Bruguiera*, had an extraordinarily high content of tannic acid, making it suitable for leather dye.⁵⁸ [See Figure 1] The tannin content of East African mangrove bark, at 40–52 per cent, was far higher than its main competitor in the German market, quebracho wood from South America (at 24 per cent), or mangroves outside of East Africa (20 per cent), and could be imported into Germany toll free, unlike bark or dyewood from non-German lands.⁵⁹ The bark industry therefore offered a way to make the



FIGURE 1. Mature Mangroves (*Bruguiera gymnorrhiza*) Rufiji Delta, German East Africa. Source: Heinrich Schnee (ed.), *Deutsches Kolonial-Lexicon* (Leipzig: Quelle & Meyer, 1920), Figure 123.

mangrove economy more financially sustainable, especially since, as German foresters pointed out, mangrove wood had to be decorticated before it could be sold as poles or fuel wood, thus the bark was simply a by-product. However, the bark industry presented several obstacles to sound forest management. Bark from young mangroves was deficient in tannin. Yet, as the mangrove lumber industry fell steadily after 1900, the forest sector relied increasingly on immature mangroves that were suitable for African construction or for the dhow trade. Foresters recognised early on that the timber economy and the bark economy were dysfunctional. As Karl Grass wrote, 'The goal of the [forest] economy is the raising and obtaining of timber and the bark is a by-product. An economy that has bark as the main use is not compatible with the principles of a regulated forest economy'.⁶⁰ For their part, prospective concessionaires, led by Denhardt Bros., had no desire to trade in timber or fuel since the government exacted high tolls and cutting fees on this industry and monopolised the major trade outlets through its own forest economy. Mangrove logging furthermore incurred much higher labour costs. It was far cheaper to pay African villagers on a weight basis to peel bark from living mangroves, much as they had tapped rubber or dug copal in times past, than to hire and manage wage labourers, especially in an era when wage rates in the colony as a whole pushed steadily upward. In contrast to government foresters, the bark merchants viewed the 80–87 per cent of the tree that consisted of wood mass as the by-product, which they preferred to leave lying in the forests.⁶¹ This made the mangrove bark business anathema to professional foresters.⁶²

In spite of these fears, the colonial government, directed by the Colonial Office in Germany, readily granted concessions to bark exploiters. This was in part because lease agreements included modest guarantees that the mangroves would be exploited according to rotational harvesting and replanting schedules. Concessionaires were required to divide their parcels into five divisions, one fifth of which could be exploited annually (far less than the minimum ideal of fifteen-year rotations). Within two years each exploited parcel was to be reforested. Concessionaires were required to exploit mangroves for both bark and timber, so that stripped trees were not simply left to rot, and colonial wood needs could be met. This increased the labour costs greatly, requiring concessionaires not only to hire local casual labour, who were largely women and children, but to hire men, whose labour was more expensive as they otherwise could work on private plantations, as porters, or on the railways. The colonial administration was geared to profit immensely from the concessions. Apart from paying annual leases in the range of 20,000 Rp for about 2000 hectares, concessionaires paid the government 2–3 Rp for every tonne (1000 kg) of bark and 3 Rp per cubic metre of timber exported, as well as a 10 per cent export duty. Since the forest department was not in a position to exploit all the mangroves itself owing to the ongoing labour dearth, it in essence leased what otherwise would have been unused forests, apart from African peasant use, which brought no profits.

By 1906 the government drastically reduced its calculations of total mangrove tracts along the coast of German East Africa, estimating a total of only 34,600 hectares, not the 60,000 hectares once projected.⁶³ One firm, Denhardt Bros., leased 16 per cent of the total in 1906. By the end of German rule as much as 27,000 hectares or 78 per cent of all mangroves of German East Africa were leased to bark exploiters, about 90 per cent alone to Denhardt Bros.

The virtual privatisation of the mangroves was especially shocking given that Denhardt Bros. did not abide by principles of sound forestry. By 1910 the company was found to be far too undercapitalised to manage their concessions for both bark and timber exploitation. The company's managers made no attempt to cut mangroves in rotations. Rather than paying workers to transport logs to collection sites to be stripped, the Denhardts paid local villagers, men and women, for bark according to weight. Bark collectors in many cases did not fell the trees, rather they stood on the exposed tree roots stripping the bark as high as they could reach – about two metres – before moving on to another tree.⁶⁴ Five to six metres of bark was left on the trunk to dry out and die along with the tree, which was also not exploited for fuel or poles in spite of contract obligations. In those cases where trees were first felled before being stripped, they were left decaying on the ground, obstructing reforestation. Characterising this method of exploitation as *Raubwirtschaft* – the term commonly used to castigate peasant use of the forests – the forester Bewersdorf wrote, 'The formerly very good, closed 40–50 year-old tree stands now make a thoroughly discouraging impression with standing, half-stripped, dried-out trunks'.⁶⁵ Governor Rechenberg accused the firm of exaggerating its assets and potential earnings in order to attract investors, calling it one of the biggest swindlers in the history of German East Africa.⁶⁶

Rechenberg furthermore condemned the firm for its labour relations, a sore issue because he viewed labour abuses as a cause of the Maji Maji war, and he feared that continued abuses would incite another rebellion. Workers had deserted the Denhardts' Lindi concession in 1905 a few months before the rebellion broke out because the firm was in arrears of wage payments already in its first year of operations.⁶⁷ The following year the dispute still had not been settled, so that no workers were forthcoming, and some of them were likely rebel supporters. In later years Rechenberg predicted that with such unsound wage practices the firm would not be able to expand its operations. In the northern coastal concessions at Tanga and Pangani, where the firm had to compete with higher-paying portering and plantation and railway work, the Denhardts imported 'experienced mangrove workers' from Lamu until the British prohibited labour to be exported from their colony. Rechenberg pronounced the company to be a detriment to sound forest management in the colony, and recommended against extending their contracts. In spite of these objections, the colonial administration in Germany not only upheld the Denhardts' privileged access to mangroves to the end of German rule, they ameliorated their annual

payments in light of the firm's inability to obtain sufficient workers.⁶⁸ This was because many in the colonial administration regarded the Denhardtts as heroes of early German colonialism in East Africa because their early operations on the Kenyan coast had given the German government great leverage in negotiating favourable borders with the British in 1890. The Denhardtts' near monopoly of coastal mangroves was at the expense of other entrepreneurs, such as the Carl Feuerlein firm of Stuttgart, which had mastered the extraction of leather dye from mangrove bark, and was therefore intent on leasing as many hectares of mangroves as possible.⁶⁹ Despite greater capital, better labour relations, more direct profits to the colonial government, and apparently sounder forest management on its small 1600 hectare concession in the Rufiji delta, the Feuerlein firm was not able to extend its concessions because the Denhardtts controlled most of the available mangroves.

Forest labour conditions continued to decline in the decade before World War One. In 1906 a massive flood hit the Rufiji river, destroying crops and leading to a temporary mass exodus of Rufiji people to the north that impaired forest work. Increasingly the plantation districts to the north, the construction of the Central Railway, and work opportunities in Dar es Salaam offered more desirable wages for Rufiji people. In 1906 twenty-nine wood cutters from the Rufiji delta deserted to Dar es Salaam with their wage advances.⁷⁰ In 1910 Rufiji foresters complained that wood cutting was impaired by low numbers of workers, who often worked only because of local pressure, thus were inclined to desert. While the forest office was forced to raise wages in an attempt to attract workers, they were far below the going plantation rates, and lower than they had been at the turn of the century. A Rufiji forester reported, 'Even last year's strong wage increase for cutting has not deterred the departure [of forest workers]. Even though industrious labour can bring in 40 or more heller [0.4 Rp] per day, new wage demands are always made. As a result the forest administration has to turn down orders, such as recently for the Guenter Firm in Dar es Salaam, which wants 100–200 Rp worth of fuel wood monthly'.⁷¹ Attempts to reforest harvested mangrove stands, which relied on casual labourers from Rufiji villages, also suffered despite a further wage increase in 1911.⁷² 60 per cent of the Rufiji forest department's costs were for its work force, and especially as wages were below going rates in the colony despite the shortage, the forest department was perpetually faced with a production bottleneck as people simply refused to work.⁷³ This meant that far more trees were cut down than the administration was able to replant, while the goal of producing enough revenue for the forest department to pay for itself was hindered by the inability to meet wood orders. While after 1910 the Rufiji forest office became a major supplier of wood fuel for some sixty locomotives on the Central Railway – 3000 cubic metres of mangrove wood alone was supplied from April through October 1913 – it was not able to supply enough to compete with imported steel sleepers for the construction of the railway, even though mangroves were considered

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ideal for this purpose.⁷⁴ Mangroves were less ideal as milled timber. Owing to problems of output and suitability, the Rufiji forest district could not act as the sole fuel and timber reserve for colonial needs.⁷⁵ This shortfall led the colonial administration to turn to inland forests to help meet the wood demand. As the forest department stepped up its annexation of dry lowland and montane rain forests as state reserves, the labour squeeze was intensified as the tasks of forest management became more complex.

THE ERA OF FOREST RESERVATION, 1904–1914

The era of forest reservation began in 1903 at a time when forestry in German East Africa was perceived to be in a state of crisis. In that year Moravian missionaries reported to the Foreign Office in Germany that many forests were destroyed with no effort to reforest.⁷⁶ The forest assessor Eckert admitted that ordinances regulating wood use and field burning had failed to protect the forests, even though ‘the forest question is a life-and-death matter for the colony’.⁷⁷ Governor Götzen agreed that almost nothing had been accomplished to date to preserve the colony’s forests, let alone to increase their extent, whose endangerment stemmed primarily from ‘native practices antithetical to civilisation’.⁷⁸ Drawing on the 1895 Crown Land ordinance, which allowed the colonial state to assume control of all ‘ownerless’ land in the colony, Götzen promulgated the 1904 forest reserve ordinance that aimed ‘to occupy as state property with all due haste as much reserved [forest] land as possible’.⁷⁹ If done promptly with sufficient trained personnel, officials expected the forest reserves to become a ‘perpetual source of income’ for the government. Götzen wrote, ‘I consider the retention of the forests, as well as the founding of new forest stands in the denuded parts of the country, to be not only the foremost, but also the most urgent task of the government’.⁸⁰ Eckert, soon to be Chief Forester, stressed that to date colonial foresters had not received sufficient means to create regulated forestry in the colony, which required far more labour than the forest office could afford. While the coastal mangroves were the first parcels to be declared as reserves, renewed emphasis would be given to lowland canopy forests and highland forests that enclosed watersheds.⁸¹ Much energy of the forest department would go to identifying exploitable forest stands and replacing them with exotic tree species that could be managed according to scheduled harvesting and planting rotations. In the Usambara Mountains, for example, foresters granted a concession for the rapid exploitation of African cedar that would ultimately be replaced by Japanese camphor and other exotics.⁸² Exotic softwoods were faster growing than indigenous hardwoods, and their uses were known and market demand established.

Outside of the northeastern mountains, forest reservation radiated outward from administrative districts or followed the line of the Central Railway that

began construction in 1905.⁸³ By the end of 1904 land commissions declared four dry lowland forests in Dar es Salaam district as reserves that were perceived to be vital for the capital city's fuel and timber needs, and a further eleven parcels were identified for future reservation. In 1904 the first non-mangrove forests of Rufiji and Kilwa districts were also taken over as reserved forests. In all cases, peasants who lived in the forests and had cleared land for cultivation or planted coconut or mango trees (which traditionally accorded one *de facto* land ownership), and who cared for ancestral graves in the forests, were expelled with minimal compensation and directed that henceforth use of the reserves was prohibited. The forest administration attempted to establish rotational forestry in some of the new forest reserves, notably Pugu forest 22 km west of Dar es Salaam. However, it was extraordinarily difficult to muster workers from the villages surrounding the reserve, in part because the forester, von Bieberstein, had a reputation for disciplining workers with a whip.⁸⁴ By early 1905 his successor, Reich, still struggled to obtain workers despite repeated demands that local *maakida* (sub-district officials) and majumbe exert pressure on their villagers.⁸⁵ The akida at Kisarawe stated that no people were available for forest work because they were busy working on government-mandated cotton estates or protecting their own fields from the wild pigs that had emerged as a major scourge of peasant farming in the region, in part because they could use the forests for refuge.⁸⁶ Hundreds of local people preferred railway work, which offered higher pay, greater autonomy, and a daily ration. While the forest assessor Eckert sought to have 50–100 Nyamwezi families settled from the distant interior for forest work at Pugu – an attempt that failed – by April 1905 Reich succeeded in obtaining 165 workers after great pressure on local village headmen. However, when the people had not been paid by May, they deserted the forest, some going to Dar es Salaam to request their overdue wages from government authorities. By August forest labour relations were in a state of disarray. The Maji Maji rebellion had already broken out to the south just a few weeks earlier, leading to a general exodus of villagers from centres of colonial power. When the forester Reich refused to accede to worker demands for higher wages at this moment of crisis, his superior, Eckert, directed him to use any available workers even at high wages as there was no alternative.

By the end of the rebellion in 1906 the labour situation had moved even more decidedly against the forest administration. Believing forced labour to have been one of the causes of Maji Maji, newly-appointed Governor Rechenberg adamantly pushed for a free labour market on a willing seller-willing buyer basis that was enshrined in the 1909 labour ordinance.⁸⁷ Those best able to compete for African labour – the railway and large plantation corporations – pushed wages upward to 12 Rp per month with *posho* food rations, draining labour away from small-scale settlers or undesirable activities such as forest work. By February 1906 the new Pugu forester, Mehrhardt, reported that a work force of 30–40 men and 25 children was all he could muster as most available villagers – most

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likely women – were busy working on their own farms.⁸⁸ Attempts to foster rotational forestry in other parts of the district suffered a similar fate as African men learned that they could refuse wage work as long as they paid taxes.⁸⁹ While several hundred penal labourers were available temporarily because of wartime indemnities, they were allocated to the railway and to plantations of the northeast rather than to forestry.

The effect of the labour shortage on forest policy is best illustrated in the Rufiji Forest Office that included all reserved forests of Rufiji, Kilwa, and Lindi districts, which were also the first parts of the colony to rise up in the Maji Maji rebellion.⁹⁰ Altogether 116,132 hectares were targeted as forest reserves in the three districts by 1911, about half in Rufiji district alone owing to its small size, its proximity to the Mohoro forest seat, and its accessibility via the Rufiji River. A primary goal of forestry in this region was to claim hilltop forests as reserves, and in so doing channel local Matumbi and Kichi farmers to river valleys where they could be directed to participate in peasant cotton schemes in the fertile Rufiji floodplain.⁹¹ The designation of forest reserves in Kilwa district fell to the Kibata station chief Thurmann, who led the German forces against the leader of the Maji Maji rebels around Liwale.⁹² A policeman rather than a trained forester, Thurmann apparently targeted forest parcels as reserves that were battle grounds during the war, including Kitope, Kisangi, and Tongomba forests.⁹³ One of his main tasks was to reverse the penetration of the forests by the Matumbi people, who had used the forests as havens during the war, by laying out boundary markers and publicising the fines or penal labour that came with border violations. There was an ongoing fear that malcontents used the forests of Kilwa district as havens to hunt elephants illegally, to tap wild rubber, to evade wage labour and taxes, and to plot another rebellion against the government.⁹⁴

Forestry in the southeast suffered from lack of personnel for a large territory and the high wage costs for workers needed to carry out forest work. Altogether eleven African forest wardens were employed in the three south-eastern districts in 1912, two in Rufiji, four in Kilwa, and five in Lindi.⁹⁵ They patrolled the reserves against prohibited use of forests or peasant field burning near forest stands. In Rufiji district the two wardens oversaw workers on trial tree plantations near Mohoro and regularly walked the boundaries of the small Mohoro forest reserve. Wardens were not available to supervise regularly the approximately twenty other forest reserves in Rufiji district, although they required local headmen to perform this task. Of the four wardens in Kilwa district, two oversaw the mangroves of Kilwa Kisiwani, which the Denhardt firm stripped for bark, and the other two oversaw a forest parcel that adjoined a rubber plantation. While the forest administration was intent on adding new wardens to oversee the Kilwa forests so that their rich *liana* rubber stands could be brought under thorough state control, no more than five forest reserves (apart from the mangroves) were created in this large district at the end of German rule.

The Rufiji forest department's most arduous and expensive task was to cut fire strips around reserves to protect the trees from peasant bush fallowing, a seasonal activity that coincided with the dry season. In 1912 the unprotected Namakutwa forest reserve was reported to have burned completely, while the neighboring Namuete and Tamburu complexes, protected by strips, were free of fires. Fire strips were cut five to seven metres wide, and completely surrounded reserves except where water courses formed the borders.⁹⁶ The Mohoro forest reserve, at 2350 hectares, had a 20-km border that could be cleared of foliage in ten days by fifty people at a cost of 13.7 Rp (0.25 Rp per worker) per day. The Tamburu reserve, although 2½ times larger than the Mohoro reserve, had borders only 28.5 km long because it was enclosed by more rivulets. Fire strips required daily patrolling to prevent peasant encroachment, and demanded constant upkeep, including frequent burning, to keep the bush down.

Workers in the lowland forest reserves were conscripted locally as casual workers, tax collection being timed to coincide with the labour needs of the forest department. Pressure from chiefs and village headmen on local people was needed because forest work was extremely arduous and dirty, therefore was unpopular. Wages were low compared to working on the railway or on private plantations. Four days of back-breaking labour earned only 1 Rp with no food ration, since casual workers were expected to house and feed themselves locally. It took 48 days in the forests to earn the equivalent of a month's plantation wage, thus forest work paid about half the wage level with no food ration. It is likely that women were the primary recruits for cutting fire strips, as they dominated in the casual labour markets, and most able men preferred to work for higher wages in other parts of the colony. The cost of labour for the annual activity of cutting fire strips was a severe burden on the forest department. Four reserves alone in 1911 cost the department almost 1000 Rp just for fire strips in a year when a total of about 25,000 Rp was spent on reserve maintenance and infrastructure throughout German East Africa.⁹⁷ As more reserves were demarcated each year, some in thoroughly inaccessible mountain landscapes, the labour dearth hampered the forest department's ability to manage forests according to scientific principles. With rough calculations, if a 2400-hectare reserve such as Mohoro required 500 man days annually to clear fire strips, the 116,000 hectares of forest reserves in Rufiji, Kilwa, and Lindi districts in 1912 would require 24,167 man days annually. Since this was seasonal activity it was concentrated in two or three months of the year, between the two rainy seasons, so that 300-400 people were needed to cut fire strips during the season when most villagers were intent on clearing their household farms for planting. The forest department did not have sufficient staff to oversee all the forest reserves in the region, and draining labour from peasant fields furthermore conflicted with the colonial goal of fostering peasant cotton growing in this and other regions of German East Africa. With willing wage labourers in short supply, the Rufiji forest office used penal labourers for some forest work.⁹⁸

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The goal of planting and harvesting trees in long-term rotations did not achieve much success in the south-eastern districts before the end of German rule.⁹⁹ Since the early days of German colonialism the Rufiji forest administration attempted to develop rotational forestry in the delta and near Mohoro town. The delta mangroves were divided into rotational districts, and trial plantations were founded at Mohoro and Usimbe on the periphery of the delta. Trials were made with various East African tree species as well as exotics, many from India, such as bamboo and teak.¹⁰⁰ Indeed, the forest department hoped over time to get local people to substitute the fast-growing bamboo for mangroves as their primary construction wood.¹⁰¹ Ceara rubber was among the trees grown on the Mohoro plantation, showing the commercial aspirations of colonial forestry. The tiny Mohoro River trial plantation was often beset with rats that destroyed young plants, necessitating protection with fences. It was discovered that the sandy soils of the river region were not conducive to some exotics, while alluvial soils were bad for ceara rubber. Fire from peasant fields often destroyed some trial sections even when they were protected with border strips, and the forest department suspected that arson was often the cause of forest fires. The business of exploiting Rufiji forest hardwoods, such as *mpingo* blackwood or *mvule* East African teak, was never achieved on a meaningful scale under German rule. While the forest department struggled to manage the coastal mangroves profitably, with respect to inland forests it could do little more with available resources than to identify which parcels warranted state control, often guided less by principles of scientific forestry than by the dictates of social control.

CONCLUSION

Forestry, like other branches of the colonial government, was expected to pay for itself, and this meant that it had to adapt to specific challenges. These included identifying forests that could be managed for a profit in a large territory with an undeveloped infrastructure. The forest department was called upon to create a market for hardwoods that were difficult to extract and whose timber characteristics were little known. Managed forestry required the construction of boundaries to protect forests from peasant field burning, regular patrolling against wood theft and incursions, and re-forestation of stands that had been cut down. These activities were often against the wishes of peasant communities who learned that forest reservation meant a loss of access to trade goods like rubber, copal, and mangroves, as well as curtailed use of forests for agricultural land, grazing, hunting, fuel, and building poles. Peasants resisted reservation throughout colonial rule by classic 'weapons of the weak', including wood theft, boundary destruction, illegal squatting and grazing, feigning ignorance of forest laws, and migration to regions where colonial oversight was weak.¹⁰² Peasants also resisted in overt ways. Many cases of forest fires were suspected

of being arson. The Maji Maji rebellion had many connections to forest and hunting controls that have only recently been noticed, and many battles of the war were fought in forests that rebels used as hideouts, some that were designated as reserves before the war. The spate of forest reservation that followed the war appears to have specifically targeted reserves that had been Maji Maji battle sites, some in completely inaccessible regions that could not have realistically been brought under managed forestry in the foreseeable future.

To work or not to work in colonial forests also lay within the continuum of covert and overt resistance. The case of the villagers Kombo and Kawamba that opened this article make very clear that some peasants consciously refused forest work, understanding the limits of colonial coercion at a specific historic moment. While other villagers could sometimes be called upon to provide corvée labour for forest work, it was never regular enough to create a foundation for managed forestry on the metropolitan model. Tanzania peasants generally knew that as long as they paid their annual hut tax they could not be forced to do wage work. Sufficient labour was thus not available for the widely-despised, low-paying work in the forests, so that even the basic task of maintaining forest boundaries was not done on a regular basis except in close proximity to administrative towns. In 1914 a little more than one hundred European foresters and African forest wardens and police oversaw about 250 forest reserves on 750,000 hectares in German East Africa.¹⁰³ This compared to approximately 25 per cent of Germany under tree cover overseen by a quarter million foresters and wardens. The compromise of taungya forest squatting that had been used successfully in Asia would take decades to introduce on a sound footing in Tanzania owing to a general land abundance that made peasants loath to combine tree planting with subsistence agriculture. The result was that labour for forest work in colonial Tanzania was costly, and created an obstacle to making Tanzanian timbers competitive in export markets.

Many policy makers in Germany were sceptical that East African timbers offered any value to the metropole. Germany had no particular shortage of wood, and if outside sources were needed, Russia, Scandinavia, and Austria-Hungary had ample supplies.¹⁰⁴ East African timber furthermore could not compete with established trade networks that brought West African timber (mostly from non-German colonies) to Germany. The need to pay transport fees through the Suez Canal increased costs to levels unacceptable to many German timber consumers. Furthermore, German consumers were unfamiliar with how exotic East African woods could be used in industry. The unclear economic benefits of East African forests for Germany prevented policy makers from prioritising colonial forestry over other endeavours, such as railway construction and cash crop agriculture, which were better able to compete for costly African labour.

At the end of German rule in East Africa forest policy had been modified significantly since the early years of colonialism when a vision of scientific forestry guided by German and Asian models had dominated the discourse.

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The Rufiji Forest Office that oversaw the three south-eastern coastal districts was preoccupied mostly with the economic management of the mangroves, with the Rufiji delta receiving highest priority. This was because this decidedly un-German landscape had a well-established economic value, supplying the colony and overseas traders with fuel wood and building poles. Nevertheless, even in this landscape the colonial vision of a managed forest economy did not materialise. Mangroves were difficult to mill into lumber, thus could not compete in the colony with imported lumber or steel. While the forest office thus concentrated on selling mangroves as fuel and rafters, it leased substantial mangrove parcels – perhaps as much as 75 per cent – to private concessionaires who had no interest in sound forestry. In the competition between *Raubwirtschaft* and *Schlagwaldwirtschaft* – plunder forestry as opposed to managed rotational forestry – the former appeared to be winning out as the German colonial administration sought to accrue revenue as quickly as possible.

At the end of German rule in East Africa the state had gazetted about 1 per cent of the landscape as forest reserves. This percentage remained virtually intact for over two decades under British rule of what became Tanganyika Territory following World War One and Germany's loss of its overseas colonies. The post-World War Two period would see a revival of forest reservation, and then with a vengeance, bringing under state control an additional 14 per cent of the landscape by the time of Tanzanian independence in 1961. This second phase of reservation would target the miombo woodlands that German foresters had not regarded as worthy of managed forestry, and in any event labour shortages would have made it impossible to police their use. British foresters and those of independent Tanzania would struggle as well with the problem of forest management according to scientific principles under a situation of general labour scarcity and high cost.

NOTES

¹ My thanks to two anonymous *E&H* referees for their comments on an earlier draft of this article.

² Tanzania National Archives (hereafter TNA) G35/1, Michels to Government, 26 June 1906.

³ TNA G35/1, Boeder to Referat VIII, 9 July 1906; Dar es Salaam District Office to Bieberstein, 17 Nov. 1904.

⁴ TNA G35/1, Eckert to Government, 25 April 1907.

⁵ On the relationship between land scarcity and *taungya* in colonial South-east Asia see Nancy Lee Peluso, *Rich Forests, Poor People: Resource Control and Resistance in Java* (Berkeley: University of California, 1994), 62–4; Raymond L. Bryant, 'From Laissez-faire to Scientific Forestry: Forest Management in Early Colonial Burma, 1826–85', *Forest and Conservation History* 38 (1994): 160–70, here 167.

⁶ Henry E. Lowood, 'The Calculating Forester: Quantification, Cameral Science, and the Emergence of Scientific Forest Management in Germany', in *The Quantifying Spirit in the 18th Century*, ed. Tore Frängsmyer, J.L. Heilbron, and Robin E. Rider (Berkeley and Los Angeles: University of California, 1990), 315–42; Ravi Rajan, 'Imperial Environmentalism or Environmental Imperialism? European Forestry, Colonial Foresters and the Agendas of Forest Management in British India 1800–1900', in *Nature and the Orient: The Environmental History of South and Southeast Asia*, ed. Richard H. Grove, Vinita Damodaran and Satpal Sangwan (New Delhi: Oxford University Press, 1998), 324–71; James Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 11–12.

⁷ Joachim Radkau, 'Wood and Forestry in German History', *Environment and History* 2, 1 (1996): 63–76, here 67.

⁸ Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge: Cambridge University Press, 1995).

⁹ 'The Revenue of the Prussian State Forests', *Indian Forester* 19 (1893), 298.

¹⁰ 'The Forest Lands of Germany', *Indian Forester* 31, 6 (1905): 729–30. This figure compares with about 665,000 people employed in mining in 1905. Volker Berghahn, *Imperial Germany, 1871–1914: Economy, Society, Culture and Politics* (Providence and Oxford: Berghahn Books, 1994), 306.

¹¹ Joachim Radkau, 'Das "hölzerne Zeitalter" und der deutsche Sonderweg in der Forsttechnik', in *Nützliche Künste': Kultur- und Sozialgeschichte der Technik im 18. Jahrhundert*, ed. Ulrich Troitzsch (Münster: Waxmann, 1999), 97–117; idem, 'Wood and Forestry', 70–72.

¹² Christoph Ernst, 'An ecological revolution? The "Schlagwaldwirtschaft" in western Germany in the eighteenth and nineteenth centuries', in *European Woods and Forests: Studies in Cultural History*, ed. Charles Watkins (Wallingford: CAB International, 1998), 83–92, here 91.

¹³ Germans served as inspectors-general of the Indian Forest Department from 1864 to 1917. Rajan, 'Imperial Environmentalism', 343–62; Indra Munshi Saldanha, 'Colonialism and Professionalism: A German Forester in India', *Environment and History* 2 (1996): 195–219; Gregory Barton, 'Keepers of the Jungle: Environmental Management in British India, 1855–1900', *The Historian* 62, 3 (2000): 557–74; Peluso, *Rich Forests, Poor People*, 63, 65; Peter Boomgaard, 'Forest Management and Exploitation in Colonial Java, 1677–1897', *Forest and Conservation History* 36 (1992): 4–14; Raymond L. Bryant, *The Political Ecology of Forestry in Burma 1824–1994* (Honolulu: University of Hawai'i Press, 1996).

¹⁴ Quoted in Rajan, 'Imperial Environmentalism', 344.

¹⁵ M.D. Subash Chandran, 'Shifting Cultivation, Sacred Groves and Conflicts in Colonial Forest Policy in the Western Ghats', in Grove et al, *Nature and the Orient*, 674–707; Jacques Pouchepadass, 'British Attitudes Towards Shifting Cultivation in Colonial South India: A Case Study of South Canara District 1800–1920', in *Nature, Culture, Imperialism: Essays on the Environmental History of South Asia*, ed. David Arnold and Ramachandra Guha (Delhi: Oxford University Press, 1996), 123–51.

¹⁶ Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (Berkeley and Los Angeles: University of California, 2000), 51.

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- ¹⁷ Bryant, *Political Ecology*, 67–71.
- ¹⁸ Ramachandra Guha and Madhav Gadgil, 'State Forestry and Social Conflict in British India', *Past and Present*, 123 (1989): 141–77.
- ¹⁹ T. Siebenlist, *Forstwirtschaft in Deutsch-Ostafrika* (Berlin: Paul Parey, 1914), 1.
- ²⁰ Hans G. Schabel, 'Tanganyika Forestry under German Colonial Administration, 1891–1919', *Forest and Conservation History* (July 1990): 130–41; Christopher A. Conte, *Highland Sanctuary: Environmental History in Tanzania's Usambara Mountains* (Athens, OH: Ohio University Press, 2004). For Tanzania after World War One see Roderick Neumann, *Imposing Wilderness: Struggles over Livelihood and Nature Preservation in Africa* (Berkeley and Los Angeles: University of California, 1998); idem, 'Forest Rights, Privileges and Prohibitions: Contextualising State Forestry Policy in Colonial Tanganyika', *Environment and History* 3 (1997): 45–68.
- ²¹ Philip D. Curtin, 'African Enterprise in the Mangrove Trade: The Case of Lamu', *African Economic History* no.10 (1981): 23–33; Erik Gilbert, *Dhows and the Colonial Economy of Zanzibar, 1860–1970* (Athens, OH: Ohio University Press, 2004), Chapter 5.
- ²² Thaddeus Sunseri, 'Reinterpreting a Colonial Rebellion: Forestry and Social Control in German East Africa, 1874–1915', *Environmental History* 8, 3 (2003): 430–51.
- ²³ Juhani Koponen, *Development for Exploitation: German Colonial Policies in Mainland Tanzania, 1884–1914* (Helsinki/Hamburg: Finnish Historical Society, 1995), 588–9.
- ²⁴ Thaddeus Sunseri, *Vilimani: Labor Migration and Rural Change in Early Colonial Tanzania* (Portsmouth, NH: Heinemann, 2002).
- ²⁵ K. Sivaramakrishnan, *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India* (Stanford: Stanford University Press, 1999), 157–60. Under British rule in Tanganyika forest squatting was introduced in some regions as early as the 1920s where fertile mountain land was in short supply. Conte, *Highland Sanctuary*, 79; Neumann, *Imposing Wilderness*, 72–3.
- ²⁶ Bryant, *Political Ecology*, 79, 104; Nancy Lee Peluso, 'A History of State Forestry Management in Java', in *Keepers of the Forest: Land Management Alternatives in Southeast Asia*, ed. Mark Poffenberger (West Hartford: Kumarian Press, 1990), 31; Paul Greenough, 'Naturae Ferae: Wild Animals in South Asia and the Standard Environmental Narrative', in *Agrarian Studies: Synthetic Work at the Cutting Edge*, ed. James Scott and Nina Bhatt (New Haven and London: Yale University, 2001), 141–85; Anthony Reid, 'Humans and Forests in Pre-colonial Southeast Asia', in Grove et al, *Nature and the Orient*, 106–26; Michael Mann, 'Timber Trade on the Malabar Coast, c. 1780–1840', *Environment and History* 7 (2001): 403–25.
- ²⁷ A copy of the ordinance is found in Bundesarchiv Berlin (hereafter BAB) R1001/7680, Forstwesen in Deutsch-Ostafrika, 3–5.
- ²⁸ The rupee was the currency of German East Africa, divided into 64 pesas before 1904, after which time one rupee was worth 100 hellers. One rupee was equal to about 1.33 marks. The annual hut tax, introduced in 1898, was three rupees.
- ²⁹ BAB/R1001/7680, 1893 Forest Ordinance, 3; Eugen Krüger, 'Die Wald- und Kulturverhältnisse in Deutsch-Ostafrika', *Deutsches Kolonialblatt* 5 (1894/95): 623–9, here 629.
- ³⁰ BAB/R1001/726, Booth report, 17 Jan. 1906, 111b.
- ³¹ BAB/R1001/7680, Krüger report, 3 Oct. 1894, 30b.

- ³² BAB/R1001/7680, Erläuterung zu der Verfügung vom 12. Dezember 1893, 10; Krüger, 'Wald- und Kulturverhältnisse', 626.
- ³³ The Swahili version of the 1893 forest ordinance as applied to Rufiji district is found in TNA G8/19, untitled document 1581/94 (1894), 60–61.
- ³⁴ Gilbert, *Dhows and the Colonial Economy*.
- ³⁵ TNA G8/687, 'Bumi' Forest Reserve, Crown Land Protocol No. 40, 12 Oct. 1911; Prüssing, 'Ueber das Rufiji-Delta', *Mitteilungen aus den deutschen Schutzgebieten* 14 (1901), 106–13, here 108.
- ³⁶ G.L. Sullivan, 'Survey of the Lower Course of the Rufiji River', *Journal of the Royal Geographical Society of London* 45 (1875): 364–7.
- ³⁷ Krüger, 'Wald- und Kulturverhältnisse', 627–8.
- ³⁸ BAB/R1001/7680, Die Wald- und Culturverhältnisse in Deutsch-Ost-Afrika, von Krüger, 3 Oct. 1894, 37b.
- ³⁹ TNA G8/588, Rundererlass an alle Bezirksämter, 30 September 1898. The forester and long-time Rufiji district officer, Karl Grass, wrote an overview of the first five years of the Rufiji forest administration. Karl Grass, 'Forststatistik für die Waldungen des Rufiyideltas, angefangen im Jahre 1902', *Berichte über Land- und Forstwirtschaft* (hereafter *BLF*), II (1904–06): 165–96.
- ⁴⁰ BAB/R1001/7680, von der Decken to Foreign Office, 18 Nov. 1898, 196–8.
- ⁴¹ Grass, 'Forststatistik', 186.
- ⁴² BAB/R1001/7723, Forest Administration in Rufiji, 22 April 1901, 167–70.
- ⁴³ TNA G8/529, Grass to Government, 7 Jan. 1903; Grass to Government, 11 March 1904.
- ⁴⁴ Gilbert, *Dhows and the Colonial Economy*, 118–20; idem, 'Sailing from Lamu and Back: Labor Migration and Regional Trade in Colonial East Africa', *Comparative Studies of South Asia, Africa and the Middle East* 19, 2 (1999): 9–15.
- ⁴⁵ TNA G8/588, Eberstein to Governor, 6 May 1897.
- ⁴⁶ BAB/R1001/489, Liebert to Foreign Office, 5 Sept. 1899, 106.
- ⁴⁷ Gilbert, *Dhows and the Colonial Economy*, 118–19.
- ⁴⁸ BAB/R1001/490, Grass to Government, 8 Oct. 1901, 7b.
- ⁴⁹ BAB/R1001/490, Grass to Government, 8 Oct. 1901, 6b.
- ⁵⁰ BAB/R1001/490, Grass to Government, 8 Oct. 1901, 7; Grass, 'Forststatistik', 189; BAB/R1001/489, Liebert to Foreign Office, 5 Sept. 1899, 106.
- ⁵¹ TNA G8/514, Forstverwaltung Rufiyi 1902/03.
- ⁵² TNA G8/531, Mohoro Forest Station to Government, 13 July 1908, 23–4; Grass to Referat VIII, 10 March 1904.
- ⁵³ TNA G8/530, Stuhlmann to BA Mohoro, 16 Oct. 1902.
- ⁵⁴ Karen Brown, 'The Conservation and Utilisation of the Natural World: Silviculture in the Cape Colony, c. 1902–1910', *Environment and History* 7 (2001): 427–47; Harald Witt, 'The Emergence of Privately Grown Industrial Tree Plantations', in *South Africa's Environmental History: Cases and Comparisons*, ed. Stephen Dovers, Ruth Edgecombe and Bill Guest (Athens, OH: Ohio University Press, 2003), 90–111.
- ⁵⁵ BAB/R1001/490, Grass to KG, 8 Oct. 1901, 3.

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- ⁵⁶ TNA G8/539, Forsteinrichtung Rufiyi Msalla, 1902.
- ⁵⁷ Grass, 'Forststatistik', 195.
- ⁵⁸ Gilbert discusses the mangrove bark industry after World War One in *Dhows and the Colonial Economy*, 124–9.
- ⁵⁹ BAB/R1001/673, Stracke report, (1911), 139. The British forester D.K.S. Grant put the tannin content slightly lower at 35–45% in 'Mangrove Woods of Tanganyika Territory, their silviculture and dependent industries', *Tanganyika Notes and Records* 5 (1939): 5–16, here 11.
- ⁶⁰ BAB/R1001/7723, Grass report, 22 April 1901, 167.
- ⁶¹ BAB/R1001/526, 'Prospekt', Sept. 1908, 3. Alternately, 15000 cubic metres of wood produced about 2200 tons of bark. BAB/R1001/7725, Haug report, 1908, 92.
- ⁶² BAB/R1001/7723, Mangrove Bark in DOA, 1900–1901.
- ⁶³ BAB/R1001/672, Uebersichtliche Zusammenstellung der an der Küste Deutschostafrikas vorhandenen Mangrovenbestände, n.d. (1906?).
- ⁶⁴ These methods were still used during the 'bark mania' of the 1930s and beyond. Gilbert, *Dhows and the Colonial Economy*, 125.
- ⁶⁵ BAB/R1001/673, Bewersdorf to Government, 3 Feb. 1910.
- ⁶⁶ BAB/R1001/673, Rechenberg to Colonial Office, 2 Sept. 1911, 135.
- ⁶⁷ BAB/R1001/673, Rechenberg to Colonial Office, 8 Oct. 1910, 93.
- ⁶⁸ BAB/R1001/673, Schnee to Colonial Office, 14 April 1914, 209–10.
- ⁶⁹ BAB/R1001/7725, Haug to Feuerlein, 1908, 87–93; BAB/526, Deutsch-Koloniale Gerb- und Farbstoffgesellschaft, 'Prospekt', 1908; 'Die Verhältnisse im Pachtgebiet der Deutsch-Kolonialen Gerb- und Farbstoff-Gesellschaft', (1910), 60.
- ⁷⁰ *Jahresbericht über die Entwicklung der deutschen Schutzgebieten in Afrika und der Südsee. Beilage zum Deutschen Kolonial-Blatt* (hereafter *Jahresbericht*) (1907), 115; TNA G8/888, Bewersdorf to Government, 30 Oct. 1906.
- ⁷¹ 'Sonderberichte der Forstverwaltung von Deutsch-Ostafrika für das Jahr 1909: Forstbezirk Rufiyi', *BLF* 3, 5 (1911), 293–4.
- ⁷² TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912.
- ⁷³ TNA G8/529, Grass to Government, 7 Jan. 1903. In that year about 6000 Rp were paid as wood cutting and hauling wages out of a total cost of 10,000 Rp.
- ⁷⁴ TNA G8/589, Verkaufsliste, Salale Waldreservat to OAEG, 23 Dec. 1913, 37–40; Helmut Schroeter and Roel Ramaer, *German Colonial Railways* (Krefeld: Röhr Verlag, 1993), 32; 'Daressalam-Morogoro Eisenbahn', *Deutsches Kolonialblatt* 17 (1906), 11.
- ⁷⁵ TNA G8/529, Grass to Referat VIII, 10 March 1904.
- ⁷⁶ TNA G8/609, Foreign Office to Imperial Government DOA, 31 May 1903.
- ⁷⁷ TNA G8/609, Eckert report, 16 Jan. 1904.
- ⁷⁸ BAB/R1001/7681, Götzen to Foreign Office, 8 March 1904, 111.
- ⁷⁹ 'Forstwirtschaft', *Jahresbericht*, 30–31. The provisions of the Crown Land ordinance are found in 'Kaiserliche Verordnung über die Schaffung von Kronland', *Landesgesetzgebung des Deutsch-Ostafrikanischen Schutzgebietes* (Tanga/Dar es Salaam: Kaiserliches Gouvernement von Deutsch-Ostafrika, 1911), 212–14. Except for land held privately or occupied by 'chiefs or native communities', all other land could be declared to be the property of the German Reich. Harald Sippel, 'Aspects of Colonial Land Law in German

East Africa: German East Africa Company, Crown Land Ordinance, European Plantations and Reserved Areas for Africans', in *Land Law and Land Ownership in Africa*, ed. Robert Debusmann and Stefan Arnold (Bayreuth: D. Gräbner, 1996), 3–38.

⁸⁰ BAB/R1001/7681, Götzen to Foreign Office, 8 March 1904, 111–12.

⁸¹ TNA G8/630, Eckert to District Officers, 26 June 1904.

⁸² Conte, *Highland Sanctuary*, 74–5; Schabel, 'Tanganyika Forestry', 133.

⁸³ A map of forest reserves at the end of German rule is found in Koponen, *Development for Exploitation*, 534–5.

⁸⁴ TNA G35/1, von Bieberstein to Ref VIII DSM, 24 Oct. 1904; KB DSM to Bieberstein, 17 Nov. 1904.

⁸⁵ TNA G35/1, Reich to Akida Kirumbi, 8 March 1905; Akida Kirumbi bin Kirumbi to Reich, 11 May 1905.

⁸⁶ I have discussed the relationship between wild pig devastations, labour shortage, and the cotton programme in Thaddeus Sunseri, 'Famine and Wild Pigs: Gender Struggles and the Outbreak of the Maji Maji War in Uzaramo (Tanzania)', *Journal of African History* 38 (1997): 235–59.

⁸⁷ Verordnung, betreffend die Anwerbung von Eingeborenen in Deutsch-Ostafrika, 27 Feb. 1909, *Landesgesetzgebung*, 311–17.

⁸⁸ TNA G35/1, Mehrhardt to DSM Forest Administration, 21 Feb. 1906.

⁸⁹ TNA G35/1, Jungfer to DSM District Office, 2 April 1906.

⁹⁰ TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912.

⁹¹ TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912, 2.

⁹² Adolf Graf von Götzen, *Deutsch-Ostafrika im Aufstand* (Berlin: Dietrich Reimer, 1909), 231.

⁹³ TNA G8/655 Tongomba; G8/656 Kisangi; G8/609, Waldreservate Allgemein.

⁹⁴ 'Videant consules', *Deutsch-Ostafrikanische Zeitung* 14, 3 (8 Jan. 1913): 1–2.

⁹⁵ TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912, 12.

⁹⁶ TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912, 15–17.

⁹⁷ Siebenlist, *Forstwirtschaft*, 5.

⁹⁸ TNA G8/589, Mohoro Forest Office to Government, 20 Feb. 1913.

⁹⁹ On this point I differ from Schabel's conclusion's in 'Tanganyika Forestry', 135.

¹⁰⁰ TNA G8/887, Caprivi to von Schele, Berlin, 30 Sept. 1894.

¹⁰¹ TNA G8/516, Jahresbericht des Forstamtes Rufiyi, April 1912, 29.

¹⁰² James Scott, *Weapons of the Weak: Everyday Forms of Peasant Resistance* (New Haven: Yale University Press, 1985); Neumann, *Imposing Wilderness*, 44–50.

¹⁰³ M. Büsgen, 'Forstwirtschaft in den Kolonien', *Verhandlungen des Deutschen Kolonialkongresses* (Berlin: Dietrich Reimer, 1910), 811.

¹⁰⁴ BAB/R1001/668, Wirtschaftliche Erschliessung der Waldungen der deutschen Schutzgebiete, May 1909, 174–5.