NERICA, *Kimaa*, and the Sustainability of Rice Farming in Magbainba Ndohahun Chiefdom, Sierra Leone: An Anthropological Perspective

Christopher M. Thomas – University of Washington, Tacoma

INTRODUCTION

The prospect of a world food shortage is becoming more of a reality. As food expenses rise worldwide and as spending on agriculture research diminishes in developed nations, researchers see a global crisis looming (Bradsher & Martin 2008). Food imports to sub-Saharan Africa have increased from 4.4 million tons per year in the late 1970s to10 million tons by the mid 1980s, and 19 million in 2002, 15% of that being food aid (Paarlberg 2008). In 2001, Sierra Leone was producing only 20% of its domestic annual rice requirement (Maconachie 2008). In 2008, as the globalized world economy shores up national debts through program cuts to increase revenue, it is increasingly important for African countries to strengthen their indigenous, sustainable farming practices. Although Africa has certainly had food crises before, an increase in food scarcity will continue to have devastating consequences in the twenty-first century.

In the Landɔgɔ-speaking northern chiefdom of Magbainba Ndohahun, Bombali District, Sierra Leone, most of the food grown is for local consumption. After a decade-long civil war (1991-2002) that severely disrupted the nation's societal infrastructure and displaced 60% of the rural population (Maconachie 2008), the Sierra Leone government, the United Nations, non-governmental organizations (NGOs), and the villagers are working to bring a sense of normalcy

to the chiefdom through successful food production, developing and securing potable water, establishing a stable infrastructure for education, and observing a policy of non-violence[1]. As a method for moving ahead, many farmers look to the West for cooperation—assistance with ecological research, diverse farming methods, or simple machines and technologies such as tractors—to increase yield[2].

The food crops in the Magbainba Ndohahun chiefdom are diverse, but rice is the most important crop in the chiefdom and is considered to be the only crop that matters—all others supplement it. Because of its paramount food crop status in Sierra Leone, the model of sustainability in rice farming is vital for the nation's food security. Components of the chiefdom's model are diverse but important when looked at as a whole. The history of rice farming and historical fertilizer initiatives in Sierra Leone have played a role in current practices as well as availability of past and current rice strains used by farmers. Local nomenclature of soil reflects perceptions of farmers in fertility and desirability of land use methods such as bush fallowing. Aspects of a socio-cultural nature such as land tenure, labor availability, and education are all integral pieces of the current farming system.

---

[1] While in the chiefdom, I was told by adults and children that non-violent policies included a fine of SL 20,000 (approx. $6.50) for striking another person and a rule against raising one's voice in anger. The only violence I saw during my 3 ½-week stay involved young children striking other young children, but I never saw any sustained fighting between children and only heard adult voices raised in anger twice.

[2] Farmers frequently expressed relief in the University of Washington's Sierra Leone Exploration Seminar's presence to help them on issues such as these.

RICHARDS

In the early 1980s, before the civil war in Sierra Leone, Paul Richards[3] spent time in Mogbuama, Kamajei Chiefdom, Sierra Leone. This Mende-speaking chiefdom is approximately 75 miles south of Kagbere, the village where I conducted most of the research for this paper. Richards's study examines many topics addressed in this paper: land use, rice farming, and the resiliency of villagers (in Richard's case, the residents of Mogbuama) in the face of food shortages. In 1986, Richards published *Coping With Hunger: Hazard and Experiment in an African Rice-Farming System*; I use his text extensively throughout this paper as a tool for validating some of my broader research topics. Richards was in Mogbuama for at least a full farming season to compare the use of Green Revolution methods with those methods native to Mogbuama to see how the local farming systems have adapted to environmental and yield pressures (Richards 1986). In 2008, I spent 3 ½ weeks in June/July in Magbainba Ndohahun Chiefdom as part of an interdisciplinary study program for the University of Washington to study dry and swamp rice farming methods as a participant observer. While most of the research presented here is mine, it is Richards' text that I rely on for historical discussions and scientific data such as Linnaean nomenclature of soils and land types.

HISTORY

The history of rice farming goes back hundreds of years in West Africa and includes

---

[3] Richards is currently Professor of Technology and Agrarian Development, Wagenigen University, The Netherlands.

changes in policy and practice. When Sierra Leone became a British Crown colony at the turn of the 19th century and the British established their settlement called "Freetown" to deposit freed slaves on the coast, the indigenous[4] peoples of Sierra Leone were no strangers to Europeans and African invaders (Shaw 2002). What would be called "the protectorate" by British colonizers—and *upland* or *upline* by many of the Freetown citizens—was a mix of many tribes with ties to Portuguese, Nigerian, and Syrian traders over the following years (Wyse 1991). Portuguese traders called *lançados* intermixed with the "indigenous" people through marriage, producing multi-ethnic children entitled to land-use rights (Wyse 1991). The Portuguese saw the benefits of "browning down"[5] to gain access to land rights only offered through marriage (Speed lecture, spring 2008) and used these land-use rights to secure trading rights before the British colonial presence. Yet it was the British who changed the cultural face of Sierra Leone by introducing past slaves from Canada and West Africa—men, women, and children who were destined for the slave trade but rerouted to the coast of Sierra Leone by the British (Shaw 2002). The existence of the slave trade blended many different ethnicities in Sierra Leone, as the latter was one of the major highways for human trafficking to the Atlantic coast. This deep trading

---

[4] *Indigenous* is an ambiguous word in context of human social and spatial patterns. While it is arguably correct to say that there are indigenous people in most areas, I use it here to mean those native to the area before Portuguese and other European or American traders but later in this text in reference to villagers *after* the presence of Western traders.

[5] While it has been common for colonialists to promote their racial superiority by "whiting up" those whom they colonize, the *lançados* found that trade could be more beneficial by exhibiting the native phenotype for skin color.

history made Sierra Leone very diverse before the British established the Freetown colony (Shaw 2002). Religious missionaries of Islamic and Christian faiths made inroads through the protectorate, and those within the protectorate would be familiar with Freetown's *methods of attempt*[6] of conforming to laws set by the colony—even long after the *physical* presence of the British was gone in the mid 20th century.

During the 1960s, Sierra Leone experienced a drought that affected rice crops, leading the new provincial government to encourage improvement and use of wetland rice farming techniques and rice strains to areas of the country best able to utilize them. During this time, World Bank-sponsored initiatives called Integrated Agricultural Development Projects (IADP), often dubbed *the Green Revolution*, were funded in a large-scale effort to bring new rice strains, fertilization, and modernization to the developing world's agricultural development (Maconachie 2008; Richards 1986). Although *the Green Revolution* was focused primarily on Southeast Asia and India (Paarlberg 2008), this new approach tried to "introduce [to Africa] a package of development measures for inland valley swamps based on intensive wet-rice management techniques practiced by peasants in Taiwan and parts of South-East Asia (double- and triple-cropping of high-yielding varieties in water-controlled swamp environments)" (Richards 1986). Increased use of fertilization throughout the world skyrocketed during this period (Brown 1997) and coincides with *the Green Revolution* efforts. However, this increase in fertilizer use did not

---

[6] Religious indoctrination and rural development (e.g. railways, roads, and other infrastructures).

lead to a relative increase in crop yield. L. Brown's chapter "Facing the Prospect of Food Scarcity" from *State of the World 1997*, reveals that fertilizer use almost tripled between 1950 and 1995. In contrast, world grain harvest area *decreased* approximately 56% during that time; a relative stagnation of per capita world grain production during this period reflects the unequal cost of fertilizer vs. yield (Brown 1997). This may have been the largest driving factor in the "failure" of the *Green Revolution* in Africa. The cost of fertilizer made it unavailable to many poor farmers in Sierra Leone, and thus an unsustainable farming method (Richards 1986). Inland valley swamp farming is also very labor intensive because of nursing, clearing, planting, and upkeep costs—including health hazards (Richards 1986). The needs and preferences of the local villagers further contributed to the failure of *the Green Revolution* in Sierra Leone, and these local techniques were not well understood in the push for the increase of yield (Maconachie 2008; Richards 1986). Farmers saw the benefit of using the preferred, local strains of upland *O. glaberima* while having a yield supplement. They could rely on yields in the traditional, low-input fashion familiar to them while taking advantage of the wet season, inland valley swamp strains of *O. sativa* and treating it as a supplemental yield for the hunger period (Richards 1986). In this manner, they had the benefit of an increased rice yield without the high costs of (fertilizer and labor) methods borne out of *the Green Revolution* (Richards 1986). Some scholars believe that although the *Green Revolution* was a success in much of Southeast Asia and India, it didn't make it to Africa (Paarlberg 2008). R. Paarlberg argues, in his book *Starved for Science: How Biotechnology is*

Being Kept Out of Africa, that the historical absence of a *Green Revolution* in Africa makes the introduction of biotechnology/fertilizer "packages" a top priority in African nation's food security (2008). Documented failures of introduced techniques in Africa during the 1970s suggest that "technology packages" may not prove to be successful in the 21st century.

From 1991 to 2002, a civil war between the Revolutionary United Front (RUF) and the Sierra Leone government (along with government-hired mercenaries) raged throughout Sierra Leone. The RUF swept through the upland districts, taking young, preferably educated, children leading to the recruitment of soldiers while illiterate adults were used as slaves. (Fanthorpe 2001; Richards 1996). The horrors that the rebels inflicted on the villagers included execution, rape, and mutilation, and thus seriously disrupted the villages. Villagers lost family, limbs, labor, and farming resources to RUF rebels who burned most of the villages they swept through (Fanthorpe 2001; Richards 1996). According to the African Development Fund (2004), about 60% of the population has been displaced from their homes due to the conflict, and this shift has aggravated an already high poverty rate. After the end of the civil war, a new emphasis on decentralizing the government aimed to strengthen the power of chiefdoms while allowing for better communication and local understanding of agricultural resources (Maconachie 2008). This new emphasis has led to more attention on inland valley swamp rice farming and the "new agricultural frontiers" they represent (Maconachie 2008). There are many lessons to be learned from Sierra Leone's history of colonialism and the continued impositions laid upon the rural population. Lessons can also be

learned from the failures of an African *Green Revolution*, including imported "technology packages" and the disregard for local preferences, methods, or economic capacities. We should consider these lessons when we analyze farming in the chiefdom and the seat of its paramount chief in Kagbere.

SUSTAINABILITY

The terms "sustenance" and "sustainability" are used synonymously, yet they represent different—but perhaps not independent—components of farming. According to the American Heritage Dictionary, *sustenance* is defined as both a "means of livelihood" and "something, esp. food, that sustains life or health" (2001). Since rice is the main crop for sustaining families in Sierra Leone, followed by cassava (*Manihot esculenta*) or groundnuts (*Arachis hypogaea*), sustenance rice farming encompasses both definitions. Through sustenance farming, the farmer attempts to "sustain" the life or health of the family by producing enough food to feed, trade, and sell to obtain non-farmable items—or livelihood. In this manner, sustenance can also be seen as referring to needs of the current or immediate generation of farmer, family, or primary social group[7]. Sustainability, on the other hand, can be contextually defined to fit the system in question. Let us define sustainability broadly as a system that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). While nature builds its own sustainable system through

[7] A primary social group would include those individuals the farmer interacts with on a regular basis including work groups (*ndɔgɔ na*).

multiple generations and the process of natural selection, human systems frequently break from that natural model, and anthropogenic, large-scale system manipulation often leads to natural system breakdowns. In horticultural farming like in Magbainba Ndohahun, many facets are considered in order to better understand the sustainability and holistic nature of the components of the local farming system. These components include not only the replenishing of nutrients in the soils without outside inputs such as agrochemical fertilizers, but also the balance of seed needed for next year's plots and the farmer's nutritional needs, the ability to maintain soil quality and quantity through microbial biomass, and the energy needed for the farmer to plant, maintain, and harvest crops efficiently year after year. In Sierra Leone, labor is the most limited resource in the farming system (Richards 1986 & 1996). Factors that affect labor include the availability of farmers and family members, which is limited by the costs of education and indebtedness, that in turn is affected by seasonal rain patterns, seed ownership, the difficulty of clearing the land due to invasive plants[8], and the ability to feed one's family. Yet including all facets or holistic components can unnecessarily overwhelm the creation or analysis of a sustainable system. Uncontrollable parts could perhaps include components that are out of the control of a local system such as climate change and national economic or political effects. This paper focuses instead on a few of the many parts that make up a sustainable system and will analyze their role,

---

[8] The existence of a *Mimosa* sp. was found spread throughout the inland valley swamps in Kagbere. It has various local names: *chuk chuk* ("thorn" due to its brambly thorns), sensitive mimosa, and *binge o haa* ("your mother is dead" because its leaves fold up when disturbed).

effectiveness, and interrelationship.

In general, perceptions of sustainability have a large influence on the practice of sustainable farming. There exist multidimensional as well as one-dimensional ways in which neoclassical farmers and scholars perceive a sustainable system, and these can be grouped into *systems of concern* (von Wirén-Lehr 2001). These systems of concern are usually local and often evolve around three fundamental aspects of the sustainability paradigm (von Wirén-Lehr 2001):

1. Productivity is maintained in the long run;
2. Direct or indirect resources are utilized or preserved; and
3. Profitability of production is guaranteed.

These aspects of *systems of concern* are basic enough—albeit with economic motives[9]—that they can be used cross-culturally in the complex perceptions of farming in Africa and Western nations like the United States. When perceived in a one-dimensional fashion, each one of these "concerns" is taken as a goal for achieving sustainability, but when approached multi-dimensionally, each "concern" is encompassed into a single goal (von Wirén-Lehr 2001). This multidimensional approach draws on these three vital components creating a single goal: the

[9] These *systems of concern* generally focus on the sustainability of something in economic terms. Economic motives vs. esthetic or biocentric motives appeared to be what Magbainba Ndohahun farmers directly related to. Through my observations, value of land only presented itself through instrumental (economic/resource) terms (e.g. medicinal plants, crop yield, etc.) without visible concern for an esthetic or biocentric relation to the land. Non-biodegradable trash and manure were (what seemed as carelessly) discarded. Pieces of sandal, plastics, and small strips or swatches of women's clothing were found in and around areas of traffic and in smaller the soil of smaller farm plots within the village.

three concerns must be addressed before the aggregated goal can be realized. Possible farmer's perceptions of sustainability in Magbainba Ndohahun can be summarized in these aspects: 1) the ability to feed the family through maintaining yield and creating a surplus; 2) forest, soil, and labor being strong and plentiful enough to produce healthy crops and harvest the land; and 3) the yield will be large enough that socio-economic payments will not reduce surplus below the level of annual use for the purchase of non-food items (sandals, batteries, *poyo*[10], cigarettes, etc.). The goal of sustainability is much stronger when all of these concerns are considered as one goal, and in my conversations with farmers, anthropologists, and local informants, I believe this is the goal of Magbainba Ndohahun farmers.

Social scientists and an increasing number of Western economists employ another, more interdisciplinary model for sustainable development. This very basic, three-pillar approach to sustainable development incorporates not only resource sustainability, but social sustainability as well (Keiner 2005):

1. Environment (conservation)
2. Economy (growth)
3. Social (equity)

This three-pillar approach to social sustainability effectively takes into account the importance of social health and gender equality issues. Farming practices are largely gendered, but work

---

[10] *Poyo* is a palm wine collected from naturally fermented palm tree sap. It is an important part of a farmer's toolbox as it may be the only nutrition that farmer gets during a day of farming.

parties of both genders are important, and women are educated along with the men[11] Facets of sustainability that only take into account the health of material capital often lose sight of the perpetual change in cultural demands and desires of a community. A village or chiefdom is not a factory for food; it is a dynamic sphere that exists in a postmodern reality that must also feed the souls of its inhabitants through music, art, social organization, education, and just "existing." Instead of bringing in the testament improvements of *the Green Revolution*, the sustenance rice farmers of Sierra Leone in the Bombali district have retreated from promised methods of a "modern" agricultural model to a more sustainable, traditional, and realistic model that allows farmers' ideas of labor management, land use, and freedom of mobility.

Another important consideration of sustainability is the resiliency of the system under scrutiny. After neglect, abuse, or overuse, it is how the particular facets are able return to a state that reflects conditions similar to those prior to human use or abuse that demonstrates its resiliency. Most land has been altered by humans at one point in time and most likely cannot return to a "natural" state (Berkes 1999). Trying to return to a "pristine" state or capture a specific moment in ecological change is "as unnatural as it is impossible" (Callicott 1991). Yet the ability of land to return to a state that is not fully utilized by humans *is* possible, and this resiliency is necessary to continue the health of the land. One way that farmers use this resiliency to their advantage is by letting the land lay fallow. Not using the land for horticulture farming allows the

---

[11] In primary school, the M/F ratio is approximately even. Female attendance drops after age 13 (World Bank 2005).

land to build up the nutrients removed by the crops planted—or opportunistic weeds—during each crop harvest. Land fallowing does more for the land than just replenishing nutrients in the soil. Fallowing allows ecosystems once broken or absent, due to the activities of horticulture, time to propagate and flourish upon what is left of the land. Nearby grasses could return, opportunistic weeds could invade, grasscutters (*diɛ golo/chɛ igolo* or *Thryonomys swinderianus*) would no longer be fenced out, and termites, ants, and other types of flora and fauna would be allowed to flourish. Biomass would die and encourage the decomposing fungi to break down the nutrients needed to increase soil health. Understory cover would increase water retention and decrease soil erosion.

But in this sustainable system, it is important to consider at which point the land has been so depleted that it passes a "threshold of irreversibility" and cannot return to its earlier, untrammeled conditions (Hobbs 1999). Is the system in question a fragile one that has "crossed the Rubicon," or is the system elastic enough to allow for further human manipulation? Although "defining the baseline ecosystem" (Hobbs 1999) can be difficult and entirely subjective, the baseline in Kagbere can be gauged by qualitatively measuring existing fields at different fallow lengths in and around the village.

Fig. 1 – Examples of understory diversity by fallow length in Kagbere

*(**A**)>50-year fallow (**B**) 20-year fallow (**C**)~10-year fallow (**D**) current cropping system (lower field)*

All of the factors involving farmed land history and the scientifically formulated conditions of soil are unknown, so I gauged the fertility of soil by sight, smell, presence/absence of worms, and visibility of fruiting bodies of fungi in relation to fallowed plots in Figure 1. Humus smelling soil was not found in random areas. Plot (D) and plot (C) did not have humus-smelling or dark, organic-rich soil, but other plots not shown that Alimamy T. Conteh (pictured) stated were of 10-year or 15-year fallow indeed had humus-like soil when randomly sampled and had a thick understory. Plots (B) and (A) were plentiful in humus soil. Worms were not found, and farmers stated that they are found in "strong" plots of 10-15 year fallow plots. Fruiting bodies of fungi were rarely seen after rains, but some were seen in 10-year fallow and >50-year fallow plots. Because of this difference, it is assumed that some crops were in a constant cropping system longer than

others and thus took much longer to have healthy soil and a thick understory. According to Alimamy T. Conteh's memory of farmed/not farmed areas, some hillsides next to the main road into Kagbere, which appeared to have an identical grade to the land in production *immediately adjoining* them, had not been farmed. In the "unfarmed land," understory was sparse. This may indicate those sections of hillsides in question had been pushed past the "threshold of irreversibility" thus changing their baseline to match the landscape with a much steeper grade similar to the upper slope in (D) in Figure 1[12].

RICE FARMING

The use and availability of improved strains of rice is an issue at the heart of sustenance rice farming. NERICA (New Rice for Africa), is a recombinant strain of African rice (*Oryza glaberrima*)—a preferred upland variety—and the previously introduced Asian, wet soil variety (*Oryza sativa*). This new strain of rice takes the best of both varieties. *O. glaberrima* has been cultivated in West Africa for thousands of years and has developed vital resistance to pests and diseases with a tolerance to drought, excess water, iron toxicity, acidic soils, and fluctuations in temperatures (Jones *et. al.* 1997; Sweeny & McCouch 2007). *O. sativa* is a high-yield strain, and genetic crosses have performed well under controlled conditions to withstand the upland soil

[12] It may also be that Alimamy T. doesn't recall those areas being farmed, but as one of the major landowners in the village, I trust his memory of land use to be exceptional.

conditions. NERICA varieties have been in development since 1992 (Jones *et. al.* 1997), and can actually increase rice strain biodiversity as many different NERICA strains are developed in congruence with local conditions (Africa Rice Center 2008). According to Jones *et al* (1997), the yield that the NERICA strain can produce is between 2.0-4.7 tons per hectare (t/ha) with an average of between 3.7-3.8 t/ha. This amount is at least twice the average yield of *O. glaberrima,* estimated at 1 t/ha (Kijima *et. al.* 2006; Africa Rice Center 2008), 1.4 t/ha with multiple cropping (Gupta & O'Toole 1986), or even a ten-year Sierra Leone average from 1987-1996 of 1.3 t/ha (Rhodes 2003). It is imperative for West Africa to achieve sustainable farming by having as few inputs as possible into their farming systems. Monty Jones, a founding NERICA breeder from Sierra Leone, has stated that 2.5 t/ha is possible with low inputs and the higher yield of 5.0 t/ha is achievable only with “prudent fertilizer use” (Kijima *et. al* 2006). In this respect, the lower number of 2.5 t/ha should be used as the highest NERICA yield when future planning of sustainability is considered. In lieu of NERICA's high-yield potential, farmers in Côte d'Ivoire look to NERICA for "varietal attributes such as its short growth cycle, height, and consumption and grain qualities (Africa Rice Center 2008). Since NERICA was developed by African breeders, preferences other than yield may have been addressed by breeders reflecting a contrast between the desirability of NERICA and *O. sativa*. But even though the NERICA seed has been shown in numerous test plots to produce extraordinary yields and has multiple attributes desired by African farmers, the seed is not readily available to small farmers.

A "class hierarchy" is in place that covers the development, maintenance, and distribution of many seed varieties. The hierarchy follows the transition of the seed class from breeding to certification and availability. In the case of rice, *breeder*-class seed is the seed produced by a sponsored plant breeder or under their direct control; *foundation*-class seed is the breeder seed taken to an agricultural experiment station (such as the Rokpur station in northwest Sierra Leone) where it is then strictly monitored and controlled to produce certified and/or registered seed (Allard 1960); *registered*-class seed is the progeny of foundation or other registered seeds thus producing certifiable seeds that can be distributed to the farmers. Registered seed allows the specific seed strains such as ROK3, ROK5, NERICA, etc. to be documented. Finally, *certified*-class seed can then be massively produced and made available to the farmers as a highly monitored and viable seed (Allard 1960; Ryoichi, *et. al.* 2007). The resulting certified seed has a more "reliable" yield" due to strict observation, and the fortunate farmer receives a seed that fits the soil conditions ensuring optimal growth.

Each of these steps in the "class hierarchy" is an obstacle between rice and the farmer and is a process not conducted within the realm of the average farmer's control or input. Each step must therefore be cleared before the seed reaches distribution and accessible to the farmer. This loss of local control is an issue for local farming's sustainability and presents a drawback to strict use of NERICA rice by village farmers—if that option was available to them. Reliance on one specific crop not native to the soils and which tends to thrive in more optimum conditions

could bring harvest yield below that produced by the more adapted *O. glaberrima* (Richards 2006). Distribution is also no longer local in Sierra Leone. There are two major forces behind NERICA rice distribution: Africa Rice Center (WARDA-West Africa Rice Development Association) and its African Rice Initiative (ARI). WARDA is an intergovernmental research association that works with over 15 countries to improve food security and eliminate poverty in sub-Saharan Africa through the promotion of agriculture research and cooperation for the profitability of new technologies (Africa Rice Center 2008). Headquartered in Benin[13], WARDA conducts research at stations in two other West African countries: Senegal and Nigeria.

LAND

Kagbere is the largest village in the chiefdom, with approximately 250 residents. It is also the village where the chiefdom's paramount chief and a large landowning family reside. It is located approximately 40 miles south of the Guinea border, at the southern point of the Bombali District in the northern part of Sierra Leone. Its people belong to the Landɔgɔ language group. Kagbere is at an elevation approximately 500ft above sea level, nestled in the escarpment zone where a crystalline plateau to the east meets the western "ancient metamorphosed sediments" of the Rokell River Series, where much of the land is covered by flooded grasslands called, collectively within the country, the *bolis* (Richards 1986). The lower part of the Bombali District lies with the lowlands to the west and plateaus to the east, and the village is situated in an inland

[13] WARDA relocated its headquarters to Benin in 2005 after the destruction of the Côte d'Ivoire station (Africa Rice Center 2005).

valley swamp area, where much of the soil derives from Ancient Crystalline rocks that are mostly granites (Richards 1986).

Both upland rice farms (*mba nhee)* and inland valley swamp rice farms (*mba njaa*) are used to supply the villages with the staple crop (Figure 2). Numerous other crops are planted alongside rice (*mba)* fields and apart from them: okra (*bɔndɔ*), cassava (*tanga*), corn (*ŋɔɔ*),

Fig. 2 – *mba nhee* (left) and *mba njaa* (right)


pumpkin (*tɛ ana*), groundnut (*njagaa*), potato (*bɔɔgu*), millet (*peeni*), beans (*wonjo* & *tɔgɔ*), yams (*ngau*), cucumber (*kɔkumba*), garden eggs (*kɔhɔ*), hot peppers (*gbegbe njegele*, *nɛ nɛ kɔlɔ*, *nje sugɛ* , *sebe sugɛ* , & *sugɛ gbɔu*) and various fruits largely kept separate from rice. Different types of rice—both imported and native species—are used by most farmers. Upland, or dry, rice farming involves planting on both hillsides with very rocky soil and less steep land close to the villages and valley swamps. The upland soil is filled with large to small stones *(kɔtu*) comprised primarily of a metamorphic rock with ~60% quartz called *kɔtu haa*. Many farmers interviewed said *kɔtu* is good for the soil because it retains heat from the sun and warms

the crops—especially groundnuts (*ŋjagaa*), but larger granite boulders (*faha*) are bad for the soil because they interfere with the usability of fields[14]. Inland valley swamps do not have the large amount of *faha* that the upland fields have, and the oft flooded, fertile soil provides a more silty soil for crops such as cassava (*tanga*), garden eggs (*kɔhɔ*), and potato (*bɔɔgu*) that can be planted as the swamp rice is being nursed and before the rainy season floods the swampland. These crops will then be harvested and the soil mounds scattered in preparation for the flooding of the riverbanks in June/July by natural rains. Two different—but not exclusive—methods of farming: swiddening, or the "clearing, planting, harvesting, and fallowing of small areas over a multiyear cycle" (Berkes 1999), and slashing/burning, also known as "shifting cultivation" (Berkes 1999), are jointly used in most farming plots. Soils have a great effect on the crop yield and are an integral part of the bush fallow length (*mɔɔtu*) and its resiliency. Fallow length increases biodiversity of soil, welcoming fungi and worms to supply nutrient breakdown and increase biomass, thus increasing the diversity of a healthy soil food web (Lowenfels & Lewis 2006). As mentioned earlier, the average fallow length in Sierra Leone has consistently been shortened throughout the late 20th century to the current average of 6 years (Gleave 1996), and this current average coincides with the 5-year average (*ŋjɔpɔ -"young bush"*) in the Magbainba Ndohahun

[14] Due to linguistic similarities of Landɔgɔ and Mende, *kɔtu* and *faha* are most likely *kɔtu and faama* (Richards 1986), respectively.

Chiefdom. Alimamy T. Conteh stated that a *strong* [15] fallow is 15 years, a good fallow is 10 years, and 5 years is the average for farmers. Observation revealed that much of the land directly around Kagbere was not in a regular fallow cycle. The land not fallowed would be primarily rotated between rice (*mba*) and groundnut (*njagaa*) to replenish the soil. According to farmers, the two plants "work well together," but the nitrogen-fixing properties of the groundnuts were not given as a primary reason. Fallow lengths were also very hard to visually gauge. Upland areas older than 10 years looked similar to hillsides that were not farmed in the memory of Alimamy T. Conteh—a man in his mid thirties. These areas looked much like an overgrown orchard. An average fallow of 5 years, if continued for a decade, could instill a sense of "status quo" in later generations of farmers and could amplify a future crisis in sustainability.

Farmers in Magbainba Ndohahun chiefdom classify soil into a number of types, each with its respective importance:

- *Kɔkɔ bɔlɔ* - termite mound which becomes a tiered, mushroom-like mound or a tall, round mound. The termites live on the inside and are not often visible on the outside. The color of the termite mound is very dark brown or black. When hit, the mound sounds semi-hollow, most likely due to the many small catacombs that comprise the mound. When

[15] *Strong* soil is a local term most likely indicating a humus-like soil rich in biodiversity. Even after a plot has been cleared of its brush and the soil has been burned and hand plowed, this soil remains *strong.* The more years a *strong* field has been planted, the *weaker* it becomes. Some farmers consider the second-year yield of land with *strong* soil as higher than first-year yield, but this is not a universal concept amongst the farmers with whom I spoke.

pieces are broken off to expose the inside, termites are seen from approximately 2.5 cm beneath the shell. The catacombs are visible when the pieces are broken off, and the termites can be seen in both mature and larvae stages. Samson (pictured in Figure 3), a farmer from Kagbere, explained that termites (*ngelia*) gather surrounding soil to build their mound. This may explain why a *kɔkɔ bɔlɔ* near cassava mounds or inland valley swamp soil (both very dark in color, *nyugua bɔlɔ,* appeared to be darker in color) than *sigi bɔlɔ* mounds found in upland, dry rice or groundnut farms where the soil is sandy or very rocky. Farmers have said that it is better to get rid of the mounds found on farm plots because once they mature into much larger mounds (*sigi bɔlɔ*), they are very difficult to get rid of. Once the *kɔkɔ bɔlɔ* has been broken apart, the pieces are left to sit until the termites leave. Once the termites leave, Samson explained that farmers break the *kɔkɔ bɔlɔ* into small bits to spread over the crops in a manner similar to manure.

Fig. 3 - *kɔkɔ bɔlɔ* near inland valley swamp

- *Sigi bɔlɔ* - a mature termite mound. These mounds are much larger than the *kɔkɔ bɔlɔ* and are deep red in color. *Sigi bɔlɔs* were visible on most dryland farms. According to M.C., Samson, Philip Kamara, and Ishmael B. Kamara, soil of a *sigi bɔlɔ* is desired for

making mud bricks for the houses in Kagbere. When mixed with sandy soil (*nyea bɔlɔ*), *sigi bɔlɔ* can produce a fine cement-like compound that helps hold up bricks (*pele bɔlɔ baheinye*). Although different farmers said the two types of termite mounds were related by age, no transition from *kɔkɔ bɔlɔ* to *sigi bɔlɔ* were observed, but different stages of *kɔkɔ bɔlɔ* (small, mushroom-like mounds to the large, round mounds) and two stages of *sigi bɔlɔ* (one very small, covered with grass on and another that was approx. 5 feet tall) were found on farms.

- *Mbemaa* – swamp soil. Before the waters come and fill the rivers (May-August), the flood zone is used to plant a variety of crops while the soil is relatively dry. As the waters come and the soil is churned by the farmers stomping their feet, the soil becomes *njobo*.
- *Mɔ mɔ nyie* – freshly burned soil. After burning the land (*ndɔ gbɔ nwɔ ndaa*), farmers leave the soil for a month to dry.
- *Ngoho na* – white clay, or kaolin clay that is white in color. Not seen in the heavily trafficked areas of Kagbere, *ngoho na* is said to be found on hillsides where deeper soils have been exposed or underneath the beds of rivers. *Ngoho na* is below *mbemaa* or *nyea bɔlɔ*. The non-farming benefits of *ngoho na* are many. It is used as a body application by women's society in ritual, eaten as a nutritional supplement by women, children—and some men, applied as a topical relief for chickenpox, and used as a wash for the interior walls of mud brick homes.

- *Ngugua bɔlɔ* - manure. Manure from different sources—whether human excrement, animal excrement, or termite mounds—adds nutrients to the soil and gives it a dark color.
- *Nyugua bɔlɔ* - loamy soil. It felt and looked like silty loamy soil. Farmers both young and old in Kagbere often referred to *Nyugua bɔlɔ* and *Ngugua bɔlɔ* interchangeably.
- *Njogbo* – swamp mud. When the rainy season comes and starts to fill the rivers (May-August), cropland that has been harvested close to the riverbank line (in the flood zone), is spread with the help of the rising water and human foot stomping. Before the water comes, the soil is called *Mbemaa* and is full of sediments and nutrients from the seasonal river that helps the crops to grow. Once the waters have come and farmers have stomped the soil, *mbemaa* becomes *njobo*, where swamp rice is planted.
- *Taabingaa bɔlɔ* - When a stone building comes down but the foundation remains, the plot may be used for farming instead of rebuilding a house. These plots are used to plant spices and nurse swamp rice. Within Kagbere, there were a handful of these plots that were used as rice nurseries (Figure 4). The buildings that once stood there were burned down by the rebels during the war and were not rebuilt. The soil within the area of the house is given its own classification.

Fig. 4 – rice nursery growing in *Taabingaa bɔlɔ* on a destroyed home

- *Tauɔhanh bɔlɔ* - The uprooting or destruction of villages is a notable occurrence in Sierra Leone, and the reasons for the abandonment, razing, or moving of a village are complex (Ferme 2001). In the land immediately around Kagbere, there have been two relatively recent village abandonments. If this happens, the land is used for a myriad of uses understood, perhaps, only by the village elders or all of the villagers. In the areas around Kagbere, the soil is given its own classification (*Tauɔhanh bɔlɔ)* and is used for fruit orchards or other tree farms, but there was no ground farming on these soils.

The process of rice farming is long and laborious. For upland farming (*mba nhee*), the fallowed land (*mɔɔtu*) is slashed (*ndɔgbɔ logendaa)* with cutlasses and axes (*mbɔɔlee na* and *konh na* respectively) and left to rest before burning (*kɔɛ au*). This allows much of the vegetation to dry out, and for farmers to remove other green shoots.

This process begins in January (*Nuugbuau kolo*, according to Kempson Fornah, but *Kɔɛ au—"the time of cold,"* according to Alimany T. Conteh) if the bush has been fallow for 15 or more years. Other start periods are February (*Baongee kolo—"the sun starts to hit"*), March (*Baagee mbaa—"worse for sun"*), or June (*Woolo—"left behind"*) for fallow lengths of 10, 5, or 0 years respectively). The Landɔgɔ names for months reflect the importance of rice farming. For example, the name for June, *Woolo*, which means "*left behind*,*"* symbolizes the farmer's tardiness in planting crops. The name for August, *Laanwa—"sleep without washing*,*"* refers to the rains that

fall on farmers, taking place of the more traditional, meditated washing the farmer enjoys upon returning to the village, and the name for September, *Muɛ mindenhu—"we are of the same family,"* symbolizes the absence of grain in the village during the months before harvest and the need for a socialized form of sharing to withstand hunger.

The length of time for resting depends on the "strength" of the fallowed bush (fallow length (yr.)/rest period (mo.): >15/3, 15/2, 10/2, 5/1.5, 0/1). After this period, the land is burned (*ndɔgbɔ nwɔndaa*). If it is a good and/or timely burn, the soil is left to rest until rain falls to pull the nutrients into the soil, but it is then burned again soon after the first rain so that the nutrients to not leach away thus ruining chances of a good yield. If it is a poor and/or untimely burn, there is no rest period. After the burn, Kempson Fornah explained, magic is applied to the crop. Three poles are placed as a tripod and tied at the top. In the crotch of the tripod, a "magic basket" is nested and filled with *Kɔkɔ bɔlɔ* and possibly other things. This is called *nhɛ ɛ laa nhuanda.* There is a private night ritual to bless the crop and the *nhɛ ɛ laa nhuanda* is placed somewhere that is not readily visible to others. This talisman-type guardian protects the field from harm, including theft of crop[16]. Once the rain has fallen and the *nhɛ ɛ laa nhuanda* has been installed, the farmers scatter the seed (*mba nhainndaa*) by hand before the field is plowed (*mba bundaa*) with hand plows (*kai na*), which are steel blades upon wood handles measuring approximately 60cm-1yd.

---

[16] This type of talisman is not restricted to farms. It is also used for homes and villages, but the name changes to *pɛ lɛ laa nhuanda* and *tɛ ɛ laa nhuanda*, respectively, and is less hidden from others.

Weeding after plowing is done at slightly different periods depending on the type of seed planted. Both hoe and hand weeding are used, depending on the physical abilities of the farmers and availability of tools. When I observed weeding events, hand-weeding was performed by solo, elderly women on small, inland valley swamp plots before the rains, and hoe-weeding was used on upland farms by multiple male farmers. I believe it depends on the availability of labor—both children and women labor groups. The average time for weeding is around 30 days after sowing. This number agrees with high-yield assessments in Nigeria where two hoe-weeding events take place at ~14 days and ~28 days after sowing and in India 30-40 days after sowing (Gupta & O'Toole 1986). Pest management is done after plowing by young boys throwing pebbles at birds and bats that prey on the young plants and seeds (*nɔnia kpɛ ndaa*). Harvesting (*mba leendaa*) also depends on the type of seed planted. According to Alimamy T. Conteh, the most common types of upland rice used in Magbainba Ndohahun chiefdom are ROK3, ROK5, and *baifette*—a native strain presumably *Oryza glaberrima*. According to Albert Kamara, an average yield is 5-6 bushels per acre (300-360 lbs or 0.75-0.90t/ha).

Swamp "wet" rice farming (*mba ŋjaa*) is significantly more labor intensive than the shifting cultivation practices of upland "dry" rice plots and differs in its approach and management (Berkes 1999). Before the rains come in April, tuber crops such as cassava (*tanga*) and potato (*bɔɔgu*) are planted in mounds (*mbimbi tɛ ndaa*). After the crops have been harvested, the mounds are left or scattered using a hand plow (*kai na*). Rice is planted in dense, upland nursery

plots (*mbana hufuunda*). The swamp field (then dry) is slashed and burned similar to upland fields if the farmer feels the need for added nutrients. As the rains come and the rivers swell and overflow, farmers scatter the heaps with their feet (*mbimbi na yaijanda*), creating the soil *njobo*. The nursery rice is then taken and hand-planted in threes throughout the swamp (*mba hufuu na nhindaa*). As the rice stalks are much taller after planting (approximately 60cm or more), weeding can be done as needed. Children are still active in scaring birds (*nɔnia kpɛ ndaa*) and checking the palm leaf fences (*kokou gɔandaa)* built to keep out grasscutters (*diɛ golo/chɛ igolo* or *Thryonomys swinderianus*), a large rodent. The combination of *mba njaa* and *mba nhee* gives the villagers a supply of rice not reliant on one method of farming. Men, women, and children have stated that upland rice, *baifette*, is the most flavorful and preferred variety. Although these methods of farming are important to crop production, other factors are vital to the stability of yield, and surplus, other factors. In Magbainba Ndohahun chiefdom, land is privatized through a long history of family use rights.

LAND TENURE

Kimaa is an important tenure system of land ownership and land-tax payment scheme. Landowners often own more fertile or farmable land than what their families can farm, and the landowners represent a small percentage of the farmers working the land. A landless farmer can work land he or she does not own and reap much of the harvest if these conditions are met:

1. the landless farmer must approach the landowner about the specific area in which

the farmer wishes to farm

2. the farmer and the landowner (or landowner representative – in a Kagbere case, a member of a land-rich family who does not have skills in farming but has skills in negotiation) visit the land to examine the size and soil quality of the requested plot. In a social perspective, this examination of soil would be vital in how transactions will take place over a several-year period. The manipulation of farmland by landless farmers through the observations of fallow practices would be key in not depleting the soil quality (thus renegotiating *Kimaa* each year). Yet the landless farmers may be unwilling or unable to invest in land with a stronger fallow thus trapping them in a continual cycle of low yield. If less healthy land is affordable but produces scant yields, the farmer may not see the option of dedicating future funds to land with longer fallow and considered "stronger"
3. an amount of money (*kola*) is passed at this time to show the landowner that the landless farmer is in earnest about his desire to work that plot
4. an agreement is then made on the amount of the harvest to be paid by the landless farmer to the landowner at the end of harvest. Multiple farmers (landowners among them) have used 10% of harvest as a rough estimate when gauging the amount of *Kimaa*. During the growing season, the landless farmer is able to work the land, build on it, and make arrangements for work parties (*ndɔgɔ na*) to work the land

Kempson Fornah, a Wesleyan pastor, master farmer, and one who comes from a landowning family, states that at the beginning of harvest but before the *Kimaa* is given, a very small amount of rice is given to the landowner to test the quality of the crop, which the landowner will pound to make rice powder (*mba gbɔnhu*). This powder will then be used to make bread or cake (*mba lɛ gɛ*). Instead of sampling the bread to make sure there is a quality harvest, it is traditionally placed in a saucer with a kola nut and water then either left in a corner of the landowner's home or taken to the family graveyard and placed on the grave. This is said to be an offering to the deceased landowners who have passed down the land to the children and is a way to pay respect to land-holding traditions.

Kimaa is expected after the farmers have all harvested their rice crops. The *Kimaa* is paid to the landowner with whom the farmer had made the original agreement. If the farmer does not pay *Kimaa* within 2-3 months after the harvest, the landowner comes to the landless farmer and asks why the *Kimaa* has not been given. If the farmer cannot pay *Kimaa*, the farmer has a few options. The farmer can claim humbleness (*mayieyaa*) where the amount of *Kimaa* is "forgiven." This means that the *Kimaa* can be paid over increments agreed upon by the landowner. If a farmer claims *mayieyaa*, he or she rarely does so twice in a row. According to Alimamy T. Conteh, master farmer, landowner, and instructor of farming at the Kagbere primary school, many who claim *mayieyaa* are newfound widows who are strained by the many duties and struggles of rice farming and those who have a poor harvest, male or female. Another option for the landless

farmer is to pay *Kimaa* but borrow seed for next year's harvest by entering into a trust or loan system (*baa bii nya lɔndɔ/baa bii kwe binyaa*). Those with extra seed are frequently the landowners collecting *Kimaa* and have a surplus of seed, and this can lock the landless farmer into another debt. A third option is to let the courts decide whether the landless farmer is under obligation to pay after considering the farmer's circumstances. According to Alimamy T. Conteh, there are a few steps necessary for this process. If farmer and landowner disagree on *Kimaa*, the first public official to be notified is the town chief. According to Dirk Heniges, a student studying village structure and census information, an elder of each village has authority as a town chief. This is a de facto title, and it is unclear whether the elder bestowed with the title of town chief was looking for the responsibility of managing small problems of the village. If the town chief cannot resolve the *Kimaa* issue, Alimamy T. explained that the next public official would be the section chief who resides in Kagbere. If the section chief cannot resolve a disagreement, the paramount chief becomes involved. The paramount chief is the highest public official of a specific chiefdom. For the Magbainba Ndohahun chiefdom, Kande Finnoh III is the paramount chief and resides in Kagbere. By this point, it is a local courts issue, and the court chairman has the power to imprison the farmer for not paying *Kimaa*. According to Alimamy T., this process is not easy and is rare.

The landowner can make many different uses of the seed that comprises the *Kimaa*. Alimamy T. Conteh recounts some ways in which the Conteh family uses the *Kimaa* seed:

- When electing officials such as section chiefs, the seed from *Kimaa* is used to prepare the

food for meetings involving public officials. These meetings often involve discussion of endeavors that would improve the village such as road brushing and toilet building[17].

- If a Conteh family member dies, The *Kimaa* seed is sold for the cash needed to handle the burial expenses[18].
- If a family member is unable to farm his or her own land due to old age, the *Kimaa* seed could supply him or her with the necessary staples to survive the year[19].
- If there are farmers who need to enter into the trust or loan system (*baa bii nya lɔndɔ/baa bii kwe binyaa*), the *Kimaa* seed is the surplus that is loaned out to them. This "seed trust" must be paid at the end of the year. If the farmer is landless, he/she has to consider the yearly *Kimaa* to pay as well[20].
- If someone were sick, whether a family or village member, the Conteh family could sell the *Kimaa* seed to help that person. Because of the small size of the village (approx. 220), everyone is related in one way or another, and deeds that are done (whether good or bad)

---

[17] While the Conteh family is not the traditional and political ruling family (in the case of Kagbere, this is the Kanu family), *Kimaa* usage in this respect reflects their political power.

[18] This could be a substantial expenditure. In 3 1/2 weeks during June/July 2008, at least two Contehs died. In that same time period, there were 4 total deaths in the chiefdom known to me. Villagers expressed that this year's mortality rate was higher than usual, the use of *Kimaa* needed for funeral costs could possibly outstrip surplus, and the actual cost of funerals is unclear.

[19] To keep a family from having to let the land become unused, *Kimaa* allows elderly people to live in a village, while letting the land farmed by others.

[20] Whether or not a farmer would have to pay both *Kimaa* and seed trust at the end of the year is questionable. When discussing this concept with landowners, there were conflicting answers—even by the same landowners but on different days.

will not be forgotten through the passing of time.

While the Conteh family of Kagbere has many uses for the *Kimaa* seed, other landowners from neighboring Nwagolonwa have a simpler view on what to do with the seeds from *Kimaa*. Albert Kamara and his brother Philip who reside in Nwagolonwa, a small village about half a mile north of larger Kagbere, both stated on different occasions that the *Kimaa* seed was sold for various family needs. The Kamara family appears to be the largest land-owning family in Nwagolonwa, yet their interests or goals may or may not be different from the Contehs[21].

It is possible to marry into a landowning family, but the marriage entitlement does not mean one is free to do as one wishes. According to representatives of the Conteh family, those who marry into the family must prove themselves good stewards of the land. They may use the land without paying *Kimaa*, but there is a watchful eye from the existing Conteh family in the village on how this new branch of the family treats the land. The children of the new branch are entitled to work the land without paying *Kimaa* as well; they will be considered "new" members of the family for generations, perhaps, and surely there are social implications surrounding the treatment of both the land and the other members of the Conteh family. As for those members of the Conteh

[21] The Kamara's agency through landownership is not as large as the Conteh's agency in the region. The Conteh family owns much more land, and it has been stated by members of Kagbere and Pbendembu—a large village southwest of Kagbere and outside of the chiefdom—that the Contehs are the landholding family and the Kanu family holds the political power. Nowhere was the Kamara family mentioned, which indicates the landholding differences between the Kamaras and the Contehs. No landowner interviewed said they save *Kimaa* for prestige or to have more money. This indicates that the concept of surplus is different than in the West.

family who return to the Magbainba Ndohahun chiefdom after years abroad or family members who lived elsewhere and wish to move to the chiefdom for the first time[22], they must pay a fine to work the land. Furthermore, they would continually be "under the thumb" of the residing Conteh family who have been stewards of the land within that chiefdom for generations.

Kimaa is not used for planting by the landowner. The landowner will not mix the *Kimaa* seed with his or her own seed on the farm. Pastor Fornah states that this ensures a reliable harvest through intimate knowledge of one's seed stock[23]. In addition to *Kimaa*, Pastor Fornah also states that the landless farmer also pays a tithe to the church. This 10% is in addition to *Kimaa* and is paid around the same time. This could be a significant factor in amount of surplus available to both landless farmers and landowners alike[24].

LABOR

While *Kimaa* has an important impact on landless farmers, successful use of labor on the farm is vital in achieving harvest. In his book *Fighting for the Rainforest: War, Youth, and Resources in Sierra Leone*, Richards stated that when looking at causes for war or reasons for hunger, one

---

[22] According to Y.Y. Conteh and Alimamy T. Conteh, there is a significant number of Contehs all over Sierra Leone. They did not mention any member who had migrated, but there is a strong possibility that members have scattered due to the civil war.

[23] I am unsure whether the case of *Kimaa* seed and seed trust seed, if it comes from the same source, would be treated in this fashion as well.

[24] It is important to know where the seed from the tithe eventually goes. There is a large difference between the church selling the seed for church-type activities and self-improvement and socialistic-type distribution schemes within the village. It is also uncertain whether the churches act with autonomy in the usage of both the money and tithe seed.

may not want to look at usual causes of resource depletion like forest degradation or loss of farmland. Richards points out that shortage of labor is the major issue (1996). Through the practice of government subsidies of imported food to urban and mining areas (Richards 1996), combined with the loss and displacement of people during the war, farmers in the chiefdom—and perhaps all over Sierra Leone—have developed a management system that utilizes the existing labor within the village while allowing the flexibility for outsiders to participate.

Ndɔgɔ na[25] (the work party) is a group of laborers, usually farmers, who form a work detail to accomplish farm tasks that are too laborious or time sensitive for an individual farmer's family. According to Momodou Kamara, the practice of *ndɔgɔ na* has been used by farmers for at least 30-40 years[26]. *Ndɔgɔ na* allows many workers to get strenuous and vast farming jobs completed in a relatively short period of time, thus insuring a successful yield in step with the seasons. And since labor in Sierra Leone is a scarce resource while arable farmland is plentiful (Richards 1996), being able to work the farm and feed the family is a battle most farmers face. The availability of *ndɔgɔ na* helps in handling this issue. *Ndɔgɔ na* allows as many fields to be worked on as there are members. Each member of the work party has the attention of the full party for

---

[25] In the Landɔgɔ language—according to Kempson Fornah—the use of "*na"* is an article that represents the English article "the." I have used it here to represent both "a" and "the" since there were no definite/indefinite or singular/plural differences I could indicate when speaking with farmers.

[26] It may be interesting to note that the age of Momodou is about 40 years. Many people in the Chiefdom were unsure as to their exact ages due, in part, to the unimportance placed on legal documents or exact ages and also the RUF insurgency that swept the country between 1991 and 2003. This insurgency reached Kagbere in the late 90s and early 00s.

one day in a cycle. For each day, the whole party will come to the farm of a member of their *ndɔgɔ na* to perform whichever tasks are needed for that part of the season (clearing, burning, planting, harvesting, etc.). Agreements are made through *profo na* and *ndɔgɔ mo na* (*ndɔgɔ na* officials) on which order the farms will be worked. In this case, most of the work for one task can be completed on a scale relative to the size of each *ndɔgɔ na*. For example, if there is *ndɔgɔ na* of 10 workers, each member of that *ndɔgɔ na* would have their own specific farm worked by 10 workers twice in one month, taking into account that there is no work on Friday and Sunday of each week to observe the holy days for Muslims and Christians, respectively.

If the specific *ndɔgɔ na* is the type that works all day (*Tu baa pɛ ɛ li*), the representative of the land the party works on must provide water and quality food to all members. The food often consists of rice and palm oil (*mba* and *kua* respectively) and must be of good quality and of sufficient amounts. It is up to *profo na* to monitor these details. As *ndɔgɔ na* members work, they are separated into twos (another job of *profo na*), and these two-person teams are rotated each day to pair hard-working members with those not as diligent, while minimizing animosity (i.e. one only has to work with a particular person for the day and/or until the next cycle passes).

Many members of *ndɔgɔ na* are farmers who wish their land to be worked by many people. In this way, their crops can be managed at a quicker pace. A 15-adult member *ndɔgɔ na* working a farm in one day is more efficient than a 2-adult, 3-children family working the same land in a 15-day period. But it is also common for non-landholders to work alongside their farming

neighbors. In this case, a landowner may wish to hire out *ndɔgɔ na* to work his farm by offering a cash payment. The landowner will negotiate the terms with one member of *ndɔgɔ na*. This is the landless member (representative)[27]. Costs for renting *a Tu baa pɛ ɛ li* is Le 2,000/person/day or Le 3,000/person/day—a significant amount, since many farmers do not have much to sell throughout the year. To better understand the intricacies of *ndɔgɔ na*, some key mechanisms of this system should be explained:

- *Ndɔgɔ mo na* - head of *ndɔgɔ na* who is hierarchically above the *Profo na*. It is uncertain whether the *Ndɔgɔ mo na* actually visits the farm or is part of the active *ndɔgɔ na.*
- *Profo na* - also known as a P.R.O. or public relations official. *Profo na* is an elected official[28] to enforce *ndɔgɔ na* rules to keep it running smoothly. *Profo na* is in charge of the quality of food being served by the farmer and his family (*nge nge belaa ti nwɛ nhɛ ɪ*) and the quality of work done by the members of *ndɔgɔ na*. *Profo na* is also in charge of water distribution to the workers[29]. If there is an incident that may keep *ndɔgɔ na* from performing their duties for the day or for a future day, it is *profo na's* duty to inform *ndɔgɔ*

[27] It is uncertain whether a farmer who owns land or pays *Kimaa* for land to accept payment for their specific *ndɔgɔ na* as well as work. It is understood that this would represent their land and they would not be allowed to work land twice in one cycle. If a farmer wished to hire out *ndɔgɔ na*, they would not be able to work the land in which they manage for at least a cycle.

[28] While it is stated that *profo na* is an elected official and is voted in, it has been also stated that *profo na* is appointed by the paramount chief. How this works out is unclear.

[29] Although I never accompanied *ndɔgɔ na*, I never saw water being carried anywhere other than to a cooking hut—only poyo. It is unclear if the host of the farm would be in charge of poyo or if *profo na* would be in charge. There is most likely poyo available since this is what many farmers use to sustain them throughout the day when they are farming alone.

na. Usually these incidents are told in the morning before *ndɔgɔ na* sets out to start working or in advance to a specific event. Events that are often deemed important enough to stop work are politically related (voting) or family related (funeral). Before the members of *ndɔgɔ na* sets out to work, *profo na* rallies the workers by blowing a whistle (*ndɔpa logo*) in the center of the village so that the whole party may leave together. It is also the duty of *profo na* to inform the members of *ndɔgɔ na* of the order of farms they would be going to. *Profo na* can be either male or female in either work party. This would probably fit in with the gender of *ndɔgɔ na* in the field.

- Types of *ndɔgɔ na*
    - *Ngɛ nda logo na* - work done early in the day. To beat the heat, *ndɔgɔ na* of this type are utilized to capitalize on the cool mornings. It is also called a *Humbu logo*. Food is not prepared for *ngɛ nda logo na* as it is for the *Tu baa pɛ ɛ li*.
    - *Kpokolo lo* - evening work. Teenagers who have school obligations during the day but can work as soon as they are finished do this work. This time slot is not necessarily dedicated to teenagers, but their work parties primarily fill this slot. Food is not prepared for the *kpokolo lo* as it is for the *Tu baa pɛ ɛ li*.
    - *Tu baa pɛ ɛ li* - whole day work. This is reserved primarily for adult workers who do not have other job obligations and have the constitution to perform strenuous, manual labor throughout the day in temperatures reaching 90 degrees F plus

humidity. A full workday would be from 8am-5pm. This is a very common *ndɔgɔ na*, and food prepared for all workers is conditional to each day's work (to be done by the farmer/representative of the land for that specific day).

- *Ndɔgɔ nwulu* - *ndɔgɔ na* consisting of a small number of workers. This would range from around 4-10.
- *Ndɔgɔ waa* - *ndɔgɔ na* consisting of a large number of workers. This would average between 20-30 workers. *Ngogo na* will not get larger than 30 but will instead form a new *ndɔgɔ na*[30]. These numbers are not absolute, and the transition between *ndɔgɔ nwulu* and *ndɔgɔ waa* is fluid.

OTHER FACTORS

Religious tithing equals another 10% of crop yield. It is unclear how many farmers pay this tithe, but Pastor Kempson Fornah did not really see it as an option when describing the debts owed by farmers to the church. The inclusion of money on each Friday or Sunday services may increase the tithe significantly.

Another component in the sustainability of the labor unit is education expectations and education costs. In Kagbere, there is one primary and one secondary school in the village. These schools serve children living in surrounding villages who often walk many miles to school each

[30] This is interesting for the average days in a month are 30. While there is no direct correlation between that and the days of the week, it seems that there are limits to growth that could correlate to it.

morning. Secondary school children around age 13 take aptitude tests in Makeni, Sierra Leone's second most populous city of approximately 85,000 (World Gazetteer 2004) and approximately 25 miles south of Kagbere. Education is encouraged by the government and in the villages, and it is customary for at least one child from a family to attend school at a given time. There are probably two reasons for this: firstly, the cost of sending a child to school for a year ranged from Le 20,000 to Le 60,000[31]. The median cost for a primary education is Le 31,600 and includes uniforms, books, tuition, food, and extracurricular activities (World Bank 2005). As the rural villagers in the Bombali district are 90% poor (World Bank 2005), this is a significant sum for most farmers and their families. Secondly, attending school well into teenage years limits the amount of work a child can perform on the family farm, resulting in severe expenditure on both money and labor power. Although youths desire education and parents expect to send at least one child to school, it is very taxing on the family with a low number of family members working the farm. *Kpokolo lo*, evening work parties, are one way this issue is handled. Children can attend morning and afternoon classes with the ability to work at night. Smaller children not attending school work throughout the day on family plots. According to a report by the World Bank, child labor was not a major reason that parents keep their child out of school (2005). In the World Bank's report, the

[31] This number is fluid and is listed here as an approximate amount. The amount that was requested by students from UW students varied per person during my conversations with the UW students. The needs of each student asking the UW students for assistance may have included other outside costs personally calculated into their family's school budget. This amount is reinforced by a World Bank study on education where the median cost of a primary education for a poor family is Le 31,600 (2005). The cost of secondary school is significantly higher

two main reasons reported—by the community—for parents in the Bombali District were the economic difficulties and the parents not caring about the child's education (2005). The latter could embrace any number of reasons and were not expanded on in the report.

CONCLUSION

The sustainability of the land is a complex issue because there are more factors in play than simple concepts of land productivity or profitability. Sustainability encompasses issues of the environment such as upland and swamp rice strains, soil health, and intercropping techniques. Land use rights and labor work group practices, as well as education opportunities reveal the economic and equity complexities within the Northern Sierra Leone farming system. Historical attempts to improve rice yield by encouraging costly, higher-input fertilizer methods supplanted from methods found in Southeast Asia were largely unsuccessful, but new emphasis by the government to increase inland valley swamp farming methods in an increasingly decentralized government may avoid some of the pitfalls earlier attempts did not foresee.

Both lowland and upland rice varieties have sustained farmers for decades. Newer strains of rice, such as NERICA, could help farmers increase their yield beyond the low yielding—yet preferred—strains of *O. glaberrima* and the inland valley swamp-thriving varieties of *O. sativa*. But NERICA needs to be available to poor farmers for testing to have realizable benefits. NERICA rice must be made available by the government through WARDA and IRI. Now that there is a large UN presence in Sierra Leone's capital, Freetown, and stable peace after a long

and bitter war, a WARDA research station similar to the Rokpur research station would benefit the farmers if the certified seed became available—possibly at a highly subsidized rate. A WARDA research station in Sierra Leone would compliment the WARDA stations already in Senegal and Nigeria (Africa Rice Center 2005). While the Sierra Leonean government works to improve on poverty by allowing farmers increased revenue (African Development Fund 2004), access to improved strains by small-scale, sustenance farmers may be just as important for food security as giving strain access to large-scale, monocrop agriculture within the country. But the historical failure of *The Green Revolution* in bringing development packages to the rural areas of Sierra Leone suggests that the prospect of future high-yield rice strains made available to rural farmers might be slim. According to Richards (1986), new innovations in rice strains, when not properly tested in local conditions and given to farmers, have made farmers wary in the past and have kept their morale low. Access to rice strains such as NERICA may be difficult across all of Sierra Leone, for many villages are only accessible by poor roads (if roads exist at all) and distribution of seed could be too sparse for annual effectiveness—and increased wariness. If the seed were given to the paramount chiefs in each of the 196 chiefdoms[32] (Sawyer 2008), it is possible that the seeds would be easier to distribute to the more remote places within the chiefdoms. Unfortunately, corruption is not uncommon in the recent incarnations of Sierra Leone

[32] According to Sierra Leone Web (unknown date), there are 148 chiefdoms currently in Sierra Leone. According to Sawyer (2008), there are 196. While the Sierra Leone information system (2001) lists 150. As time goes on, some chiefdoms get aggregated into others making borders slightly fluid. I believe it would currently be 196.

government (Sawyer 2008). Corruption could make distribution of seed unreliable in chiefdoms that have little accountability and could increase distribution costs.

Soil health and improvement is one area over which the landowners and farmers currently have control. With improvement of soil health through sustainable farming methods, crop yield could increase without expensive inputs from the government, and information distributed to paramount chiefs may fall into the hands of farmers more reliably. The benefits of fallowing is well known and practiced for centuries, but with an overabundance of land around Kagbere, allowing plots to fallow longer than the 5-year average could help increase soil fertility and thus yield. Methods of "improved fallow systems" (Barrios, Cobo, Rao, Thomas, Amézquita, Jiménez, & Rondón 2005) such as slash/mulch fertilization in addition to the traditional slash/burn, or shifting cultivation, practiced in Kagbere could increase soil fertility in a shorter period of time. This could make the traditional 5-year fallow more effective, and thus better avoid the *threshold of irreversibility* which shorter fallowed land promotes. In the long run, an increased land resiliency would buffer unexpected environmental or social changes that would affect current methods of farming. It is not assumed that slash/burn methods are so destructive to the biodiversity and health of the soil that slash/mulch methods should replace the shifting cultivation. Shifting cultivation practices have been successful in the history in this region and, when performed in indigenous fashions—not large scale abuses—shifting cultivation has proven to be resilient (Berkes 1999). But the success of slash/mulch methods in other parts of the world

indicates that an increasing number of methods could improve the sustainability of the farming systems while putting more immediate technology in the hands of the farmers. This strategy could help curb hunger in the chiefdom, but it would not create the highly coveted revenue that governments need to sustain their own national and personal agendas or pull the farmers out of poverty (Paarlberg 2008). Although usually in opposition to a struggling economy in a globalized market economy, protectionism may not be in opposition to the government's goals: while it does not build a strong GDP, it perhaps would rebuild a much shaken rural base after war.

The land tenure system of *Kimaa* has a very important role in the structure of rice farming in the chiefdom. The amount of money (*kola*) given before and the amount of food given after the harvest is around 10% of crop yield. As much of the population of this chiefdom is not from the landowner family, *Kimaa* is a debt that needs to be paid every year whether the farmers can afford it or not. If they cannot pay this debt each year, they go into an agreement system that affects their children and future offspring. Seed trusts also increase debt, since most of the seed that is available is seed collected as *Kimaa* or other surplus collected by the landowners. This debt can only be paid off on a yearly or seasonal basis similar to *Kimaa*. If *Kimaa* is also rated on the health of soil, more farmers may opt out of farming *strong* soil (≥15-year fallowed land) due to initial investments agreed upon by the landowner and the landless farmer[33]. This magnifies the

[33] It is uncertain as to whether the *stronger* soil is even available for land tenure. Future studies should include whether landless farmers are interested in farming this land, whether the

vulnerability of a good crop on climate change shifts and unpredictable weather patterns that strain the resiliency of the land. If the rains come earlier than usual, the hunger period is more pronounced because of this socio-economic indebtedness. If slightly revised, the *Kimaa* system of land tenure may better benefit both farmers and landowners. For instance, an increased length in land fallow combined with a lower amount of *Kimaa* paid for that land could make *stronger* land available to landless farmers who have low funds or less access to the help of *ndɔgɔ na* and family members. Under such a system, initial clearing costs would likely be higher, but a cycle of land *resting* may be encouraged. Landowners may then be more inclined to fallow land closer to the village that is currently only *rested* for a few years. Fallow is the not the only criteria in determining the value of land. Attributes such as type of soil, elevation, spatial relationship to the village, history of land use, neighboring farm plots, number of termite mounds, palm trees, and possible yield history[34] are all important contributing factors.

While the system of *ndɔgɔ na* helps ease the issues of labor, there are expenditures that accompany the rewards. The amount of food needed to satisfy *profo na* and the members of the work party is a significant amount regardless of whether the farmer is feeding five workers four times a month or 22 workers once a month. The food offered to work groups also feeds those who cook the food for the party. Yet it may only feed one, two, or three members of the farmer's

---

landowning family deems it available, the strong:weak ratio of land available in the chiefdom, and how far farmers are willing to go for stronger soil.

family per day (self, wife, and smallest child not in school or working elsewhere). Other family members need to be cooked for separately.

Once these monetary and labor expenditures are included in the overall cost of farming, the concept of surplus becomes much more complex. In a Western sense, surplus often indicates success after inputs have been matched with outputs (or supply over demand), representing little understanding of a savings. The Magbainba Ndohahun chiefdom does not appear to have a Western concept of surplus. All surpluses are accounted for and used—even the *Kimaa* of the Conteh family. The *Kimaa* does not stay idle, for it goes to many things deemed important by each landowning family. As the *Kimaa* is sold, the money is not stored in a bank but used for purposes as they come up[35] or given to family members in need. If there is extra, then there is more for seed trust. Landless farmers do not have surplus. Some feel that the pressures of *Kimaa* are the reason their family starves each year.

My research was admittedly limited due to the time constraints of my visit. If I had had more time in the chiefdom, a fuller conceptualization of the processes by which farmers acquire and use land, the gender dynamics and work, and the perceptions of yield and surplus. Had I been able to spend longer time with both female and male farmers—instead of predominantly with male farmers that were available to talk with me—female perspectives would reveal

[35] In my 3½ weeks in the chiefdom, I did not see evidence of excess except scant alcohol and cigarette use by adults and the occasional lollipop given to a child. All other things were of immediate, practical use.

differences in land value, child participation, and the relationship between crops and soil. Much of my knowledge was acquired through master farmers, educators, and landowners to whom I was introduced. The dynamics of land value and villagers' perceptions of surplus are issues that deserve deeper insight. When further explored, these dynamics will reveal a multitude of characteristics that make up the value of land and the decisions for farming specific plots. Characteristics between land such as palm tree density (and the palm oil, poyo benefits thereof), termite mound density, and the spatial relationship with the village are just a few that will be important.

Clearly, further research into the sustainability of rice farming in Sierra Leone needs to take into account the myriad of variables discussed above. Without considering these, only specific "concerns" would be addressed instead of the more holistic approach that addresses the whole. These variables include the *strength* or resiliency of the land and soil (not just physically, but the myriad of cultural values placed on these properties), the types of rice available to the farmers, and the accessibility of that land in regards to land tenure practices and landownership. They include the human resources necessary to make the land productive for farming, the education opportunities and drawbacks for women and children, and the cultural heritage that makes the villagers of Magbainba Ndohahun so resilient after years of national turmoil and hardship. Sustainability of the farming system depends on many more components than what I have laid out here, but the understanding of these components—those directly in control of the

farmer—is necessary to build a solid base for growth and prosperity for farmers and the villagers as a whole. Keeping the future of land and labor management in the hands of those who live and work locally is key to successful government development schemes, and increased access to biotechnology (with indigenous preferences and needs at the forefront) may offer a recovering country the pivotal tools in this increasingly insecure world.

Acknowledgements:

I would like to thank the following for their generous patience, guidance, and help: Clarke Speed, John E. Banks, Brook Kelly, Kempson Fornah, Alimamy Thomas Conteh, Momodu Kamara, Abu Sisay, Y.Y. Conteh, Safie Conteh, Phillip Kamara, Albert Kamara, Morie Bangura, Stevens Kanu, Ishmael B. Kamara, Foday Kamara, Victor S. Kanu, Usman D. Sanu, Simple Man, Samson, and Alex Kanu. I give a special thanks to Paramount Chief Kandeh Finnoh III for his graciousness in letting me study in his chiefdom and reside in his guesthouse.

Works Cited

Africa Rice Center (WARDA). 2005. Highlights: Strategic Plan 2003-2012. Benin. Retrieved March 14, 2009, from http://www.warda.org/publications/brochure/splan.pdf.

Africa Rice Center (WARDA). 2008. NERICA: the New Rice for Africa – a Compendium. Somado, E.A., R.G. Guei, and S.O. Keya, *eds*.. Rome: FAO.

African Development Fund. 2004. Republic of Sierra Leone Agricultural Sector Rehabilitation Project (ASREP) Appraisal Report. Agricultural and Rural Development Department, Central and West Region. Retrieved January 28, 2009, from http://www.afdb.org/pls/portal/docs/PAGE/ADB_ADMIN_PG/DOCUMENTS/OPERATIONSINFORMATION/ADF_BD_WP_2004_174_E.PDF

Allard, R.W. 1960. Principles of Plant Breeding. New York: John Wiley & Sons.

Barrios, E, J.G. Cobo, I.M. Rao, R.J. Thomas, E. Amézquita, J.J. Jiménez, & M.A. Rondón. 2005. Fallow management for soil fertility recovery in tropical Andean agroecosystems in Columbia. Agriculture Ecosystems, and Environment 110.

Berkes, F. 1999. Sacred Ecology: Traditional Ecological Knowledge and Resource Management. Philadelphia: Taylor & Francis.

Bradsher, K. and A. Martin. (2008, May 18). World' s Poor Pay Price as Crop Research is Cut. *New York Times*. Retrieved May 24, 2008, from

<http://www.nytimes.com/2008/05/18/business/worldbusiness/18focus.html?scp=2&sq=food+security&st=nyt>.

Brown, L.R. 1997. Facing the Prospect of Food Security. State of the World 1997. L. Starke (Ed.). New York: W.W. Norton & Company.

Callicott, J.B. 1991. The Wilderness Idea Revisited: The Sustainable Development Alternative. The Great New Wilderness Debate. J.B. Callicott and M.P. Nelson (Eds.). Athens: University of Georgia Press.

Dries, I. 1991. Development of wetlands in Sierra Leone: farmer's rationality opposed to government policy. Landscape and Urban Planning: 20.

Fanthorpe, R. 2001. Neither Citizen Nor Subject? 'Lumpen' Agency and the Legacy of Native Administration in Sierra Leone. African Affairs: 100.

Gleave, M.B. 1996. The Length of the Fallow Period in Tropical Fallow Farming Systems: a discussion with evidence from Sierra Leone. *The Geographical Journal*: 162 (1).

Gupta, P.C., J.C. O'Toole. 1986. Upland Rice: A Global Perspective. Los Baños: International Rice Institute.

Hobbs, R.J. 1999. Restoration of Disturbed Ecosystems. In L.R. Walker (Ed.). Ecosystems of Disturbed Ground. Amsterdam: Elsevier.

Jones, P.M., M. Dingkuhn, G.K. Aluko, & M. Semon. 1997. Interspecific *Oryza Sativa* L. X *O. Glaberrima* Steud. Progenies in upland rice improvement. Euphytica 92: 237-246.

Keiner, M. 2005. History, definition(s) and models of sustainable development. ETH Zürich. Retrieved January 7, 2009, from http://e-collection.ethbib.ethz.ch/view/eth:27943?q=keiner

Kijima, Y., D. Sserunkuuma, & K. Otsuka. 2006. How Revolutionary is the " NERICA Revolution" ? Evidence From Uganda. The Developing Economies. XLIV-2, June.

Lowenfels, J., W. Lewis. 2006. Teaming with Microbes: A Gardener's Guide to the Soil Food Web. Portland: Timber Press.

Maconachie, R. 2008. New agricultural frontiers in post-conflict Sierra Leone? Exploring institutional challenges for wetland management in the Eastern Province. Journal of Modern African Studies: 46 (2).

Paarlberg, R. 2008. Starved for Science: How Biotechnology is Being Kept out of Africa. Cambridge: Harvard UP.

Rhodes, E.R. 2003. Trends in Food Crop Production in Sierra Leone and Options for Meeting Food Energy Requirements. Journal of Sustainable Agriculture. Vol. 22 (4).

Richards, P. 1986. Coping With Hunger: Hazard and Experiment in an African Rice-farming System. London: Allen & Unwin.

Richards, P. 1996. Fighting for the Rain Forest: War, Youth, & Resources in Sierra Leone. Oxford: James Curry.

Richards, P. 2006. The history and future of African Rice: Food security and survival in a West African war zone. Afrika Spectrum 41 (1).

Ryoichi, I., Y. Sokei, and I. Akintayo. 2007. Reliable multiplication of seed for NERICA varieties of rice, *Oryza sativa* L. Genetic Resources and Crop Evolution 54.

Sawyer, E. 2008. Remove or Reform? A Case for (Restructuring) Chiefdom Governance in Post-Conflict Sierra Leone. African Affairs 107/428.

Shaw, R. 2002. Memories of the Slave Trade: Ritual and the Historical Imagination in Sierra Leone. Chicago: University of Chicago Press.

Sierra Leone Web. Chiefdoms. Sierra Leone Web, Retrieved February 7, 2009 from <http://www.sierra-leone.org/chiefdoms.html>.

Speed, C. 2008. Lecture. Spring Quarter HA&S-263c.

Sustenance. 2001. American Heritage Dictionary Fourth Edition. New York: Bantam Dell.

Sweeney, M., S. McCouch. 2007. The Complex History of the Domestication of Rice. Annals of Botany 100.

von Wirén-Lehr, S. 2001. Sustainability in agriculture – an evaluation of principal goal-orientated concepts to close the gap between theory and practice. Agriculture, Ecosystems and Environment 84.

World Bank. 2005. Education in Sierra Leone: Present Challenges, Future Opportunities. Washington DC: World Bank.

World Commission on Environment and Development. 1987. Our Common Future. Oxford: Oxford UP.

World Gazetteer. Sierra Leone: Largest Cities and Towns and Statistics of their population. Accessed January 17, 2009, from <http://www.world-gazetteer.com/wg.php?x=&men=gcis&lng=en&des=wg&srt=npan&col=abcdefghinoq&msz=1500&geo=-195>.

Wyse, A. 1991. The Krio of Sierra Leone: An Interpretive History. Washington DC: Howard University Press.