

Purpose:

The goal of this research is to understand how and why agricultural land-use decisions are made given different of social and environmental changes. These exercises (mapping and discussions) will address population growth and land availability and climate impacts therein.

Background information:

The Kamiali Wildlife Management Area (WMA) was established as a conservation area in 1996. Although set aside for conservation, is actively used to support the community and provides most subsistence and livelihood needs. Livelihood in Kamiali is subsistence based and includes land (agriculture, forest, animal husbandry, and hunting) and marine (ocean and reef) resources. Swidden agriculture (also referred to as slash-and-burn or shifting cultivation) is practiced and swidden plots are located in a relatively large river delta. Swidden is a form of subsistence agriculture that cycles between crop and fallow periods, where forest cover is cut, burned, crops are planted for a length of time, fields abandoned, and then natural forest cover regenerates (Mertz et al. 2009). In Kamiali the crop-fallow cycles range from less than 3 years to around 10 years, where plots are sequentially rotated among, and little new primary forest plots are cut. The fallow period is an integral part of shifting cultivation because it restores soil fertility and reduces weeds (Van Vliet et al. 2012).

Due to increased soil fertility and ideal soil moisture the majority of the swidden plots, locally referred to as gardens, are located in the Bitoi river delta. No soil amenders, pesticides, fertilizers or irrigation techniques have been applied to the delta. Much of the chemical additives are too expensive and thus unattainable. Traditional land tenure dictate that a new garden plot is acquired by discussing the plot with various community members and assuring that the plot is available for use. A garden plot is claimed when a crop is planted on the land. Families can also subdivide currently used plots for family members and new marriages.

Climate impacts have become more frequent and intense (ocean surges, river flooding). We aim to discuss how the community perceives these impacts and how they might implement different strategies to mitigate the impacts.

Group questions for social/environmental change workshop:

1. Map where resources are located: women's resources, men's resources, fishing, agricultural, and forest resources.
2. List all of the possible strategies that could be used provide enough agricultural land to maintain ample crop harvests for the community with a larger population. List the positive and negative attributes of each strategy. Once you have listed all of the strategies, rank the likelihood of each strategy being used, where 1 is the best option.

3. Draw on the base map where the gardening changes would occur, you can use the ranking number if that seems applicable.
4. Would multiple agricultural strategies be used to accommodate the larger population, if so list the rank number of those used together and describe why these specific strategies are coupled. Discuss and map
5. If the top three agricultural strategies were used by the community, how would other natural resources be affected?
6. Is limiting population growth a feasible solution to the shortage of agricultural land?

Mapping exercise:

Draw on the *group* map where the gardening changes would occur to accommodate enough gardening area.

What difficulties would arise by the changes in gardening location/techniques?

Drought

Increased frequency of drought events has caused a decrease in soil moisture. This causes the swamp area to be drier and agriculture is possible if crocodiles are killed. This also causes the delta to be drier and need irrigation. Commercially available irrigation systems are not an option.

Table 1: Summary of discussion: Known adaptive strategies to increase crop production and the perceived benefits/consequences

Adaptive strategy	Pros	Cons
Shorten Fallow periods	-More continuous crop rotation	-less soil nutrients regenerated -increased pests and weeds
Change crop types/variety	-better adapted to conditions -higher market price	-Not traditional ancestor crop -May take too much space/soil nutrients -seeds cost money -unfamiliar with cropping techniques -could influence increase in mono-cropping
Grow crops more densely	-more harvests	-smaller fruits
Increase crop sales	-more income for market goods/food products -market goods offer food security in times of low harvests	-fewer resources for family
Decrease in crop sales	-ample food for family/relatives -large harvests may cause unused food to rot	-no additional market food sources -fewer supplemental resources when local crops fail
Grow more Sago	-native, wild growing palm -ancestral staple crop -very resilient to extreme storms/salt water infiltration	-takes 3-10 years to mature -labor intensive

Map will show location and information- Land-use details from discussion and mapping activities:

- The majority of gardens are located in the Bitoi river delta, the most fertile land of and most ideal for agriculture
- Smaller gardens are scattered around the village area
- Swamp – crocodile issues and soils are too moist
- Steep terrain – other villages use steeper terrain for agriculture by terracing. The soil nutrients on hillsides is lower and results in shorter cropping periods and longer fallow periods because of lower soil nutrients. Crops are also more susceptible to storm runoff/mudslides.

- Kiwa land – property of other village – no access
- Garden area near village – very sandy – only good for some crops

Table 2: Summary of discussion: Known adaptive strategies to change garden locations – pros/cons

Potential Garden location	Pros	Cons
Garden the Sachen river delta	-has never been cultivated -ample land	-5 km away -would have to build small houses -not near schools, village, church, or other amenities
Swamp area	-close to village and other garden areas -could use soil drying techniques -never been gardened	-crocodiles -very moist soils -floods easily (ocean surge and rain) -may be a good location during droughts -more malaria mosquitos
Gardens in the Bitoi Delta	-good fertility -good soil moisture during typical conditions -experienced with gardening methods	-increased number of pests/weeds -Minimal space -river flooding increased -sea infiltration increased near coast
Gardens near the village	-area available around the village -experienced with gardening methods	-soil is too sandy -would take the place of the soccer fields
Hilly area west of the village	-higher elevation -never been cultivated -large area to develop -close to village	-lower soil fertility = longer fallows/shorter crop phases -inexperienced with terracing methods -harvest firewood, housing materials, and canoes from this location -landslide issues -steeper so more soil erosion/runoff

While population growth has resulted in limited agricultural area, other pressures are further compounding crop productivity. For example, unpredictable weather conditions influence traditional cropping methods for swidden agriculture.

views on population: Change in living situations: about 20 years ago married couples began living in the same house. Prior to this there were separate men and women's houses. Today there are very few married couples that live in separate houses. Believes that traditional, gender separated houses should be re-adopted to reduce birth rates because men and women aren't living in the same house.

views on population: Women should use natural, herbal methods to reduce the number of pregnancies