

Resettling Displaced People in a Coastal Zone Mining Project: Evaluating the Agricultural and Land use Potential of the Proposed Resettlement site –A Case of Titanium Mining in Kenya

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Abstract

Preparations to mine titanium in Maumba and Noma areas of Msambweni District, Kwale County are in progress, and farmers affected by the project are to be resettled in another area. The displaced people have made it a condition that they should be settled in area where their farming activities are enhanced; and that adequate land is availed for social infrastructure. The identified site for resettlement site lies between latitudes 4^0 28' and 4^0 32' South, and between longitudes 39^0 16' and 39^0 20' East, and extends from Kiruku and Mwangwei to Kigombero. It receives an annual rainfall of 1,200-1,400 mm and is therefore suitable for rain-fed agriculture. About 75% of the land is low-lying and 50% of this is prone to flooding. Both communities are worried about the land allocation process, fearing about the quality and size of the land to be allocated to each, and the likely disintegration of existing socio-cultural structures. As good practise in integrated coastal zone management, the proposed resettlement site was evaluated to assess its suitability for crop and livestock production to sustain the livelihoods of the communities. The results of the evaluation show evidence of soil; the nitrogen, phosphorous, potassium, and organic carbon contents in the soils were generally low. To reverse the situation, inorganic and organic fertilizers should be used for crop and forage production to encourage build up of nutrient and organic matter levels in the soil. Drainage canals should be reconstructed to control flooding. Due to the low lying topography of the resettlement site, the portion on raised ground should be set aside for the homesteads. And other social infrastructure as demanded is be availed so that the communities continue with their life, despite the displacement.

Key words: Titanium Mining, Displacement of Communities, Resettlement

1.0 Introduction

The Kwale County is one of the six counties in the Kenya Coast. It is located in the Southern part of the country. It borders Kilifi and Mombasa counties in the North, Taita Taveta County in the West, Tanzania in the South, and the Indian Ocean in the East. The county is divided into five agro-ecological zones (AEZs); Coastal Lowlands (CL) zones 2-6. The first three AEZs, CL 2-4, are the dominant zones and extend about 35 km from the sea to the hinterland (Jaetzold and Schmidt, 1983). These AEZs usually receive an annual rainfall of over 800 mm and are suitable for rain-fed agriculture. Average temperatures of 24-26.6 ^{0}C are experienced in the first three AEZs. The last two AEZs, CL 5 and 6, form the Livestock-Millet and Ranching zones, respectively. These AEZs are found deep in the hinterland and form the semi-arid and arid zones of the Kwale County, usually receiving less than 800 mm annually. The average temperatures of the arid and semi-arid zones of the district range from 24.3 to 27.5 ^{0}C.

The Maumba/Noma area of Msambweni District of the Kwale County was found to have underlying rocks that are rich in titanium, and the Government planned to evict and resettle the people in an area between Mrima and Kiruku hills, and Ramisi River (Kiruku/Mwangwei/ Kigombero area). The proposed resettlement site falls within AEZs CL2 and CL3 (the Lowland Sugarcane Zone and the Coconut-Cassava Zone, respectively). The climate is described as warm and humid (Nyandat and Oswago, 1970). The area receives an annual rainfall of 1,200-1,400 mm and has two cropping seasons per year. The first season (long rains) starts in March or April while the second season (short rains) begins in October. About 75% of the annual rainfall is received during the long rains season.

According to Jaetzold and Schmidt (1983), the area is suitable for growing the following crops and forages:

1. *Food crops*: Maize, cassava, cowpea, dolichos bean, green grams
2. *Cash crops*: Sugarcane, coconut, mango, citrus, cashewnut, banana, bixa, avocado, sweet potato, pawpaw, guava, pineapple, groundnut, sunflower, soy bean, simsim, vegetables (chillies, sweet pepper, pumpkin, melons, cucumber, garlic, okra, egg plant, brinjals, tomato, onion, kale, and cabbage)
3. *Forages*: Napier grass, and legume supplements (sirtro, centro, and Leucaena)

In preparation for the resettlement process, an evaluation was conducted in the Kiruku/Mwangwei/Kigombero area to assess the suitability of the resettlement site for certain crop and livestock production.

The specific objectives were to:

- Describe the climate of the region, primarily from an agricultural perspective.
- Undertake a broad scale reconnaissance soil survey of the study area.
- Evaluate the land capability of the area at a reconnaissance level, and comment on the potential of the area for agricultural production and grazing.
- Identify suitable crops, bearing in mind both climatic and edaphic constraints of the landscape, as well as economic considerations such as proximity to potential markets and other constraints related to the production of cash crops, including tree crops.
- Identify the major impacts that result from present agricultural practices.
- Identify and assess any significant impacts on the soils and land use that could result from the more intensive occupation of the land by host settlers.
- Provide recommendations on how to mitigate any negative impacts and how to enhance the agricultural potential of the area.

2.0 Methodology

A multi-disciplinary team was constituted to carry out the evaluation. The team consisted of a soil scientist (Team Leader), a chemist, an agronomist, a socio-economist and laboratory technologists. The evaluation was conducted in the following four stages:

1. Acquisition of secondary information on the resettlement site
2. Field work:
   a. General observation of the site
   b. Digging soil profile pits and soil sampling
   c. Field survey to interview: i) current settlers on the site; the farmers to be resettled
3. Laboratory analysis of soils and interpretation of the results

2.1 Secondary information

The sources of secondary information included the Farm Management Handbook of Kenya (Vol. II), Poverty and Development: Analysis and Policy, Personal communication with farmers and key informants at the proposed resettlement site. Other sources of information included reports of previous soil surveys conducted in the area covering Ramisi, Mrima and Kikoneni, in Kwale district. The following reconnaissance soil maps were used during the field work:

1. Map sheet 200 and 201 (Appendix 1a to Report No. 3 “Soils of the Kwale-Mombasa-Lungalunga area”)
2. Map sheet 202 (Appendix 1b to Report No. 3 “Soils of the Kwale-Mombasa-Lungalunga area”)

2.2 General observation

A transect was identified, running East-West from the slopes of Mrima hill to Kigombero (Plate 1). A GPS was used to determine the position of the proposed settlement site on the world map. This equipment was also used to determine the position of the soil profile pits. An observation was made on soils, vegetation, current settlement, infrastructure, and present agricultural practices. In addition to making observations along the identified transect, the team drove around the proposed settlement site to gather more information about the site and the current settlers.

2.3 Soil profile pits

Three profiles were dug along the identified transect (Plate 1). The profile pits were located within different soil types based on physical observations made on the soil and information on soil maps for the area. The first two pits were on land that had grey soils but one of these was located in an area with stronger evidence of soil cracking than the other. The third profile pit was dug on land that had red soils. The geographic positioning of the soil profile pits is as shown in Table 1.

SOIL MAP FOR THE RESETTLEMENT SITE - KIRUKU/MWANGWEI AREA

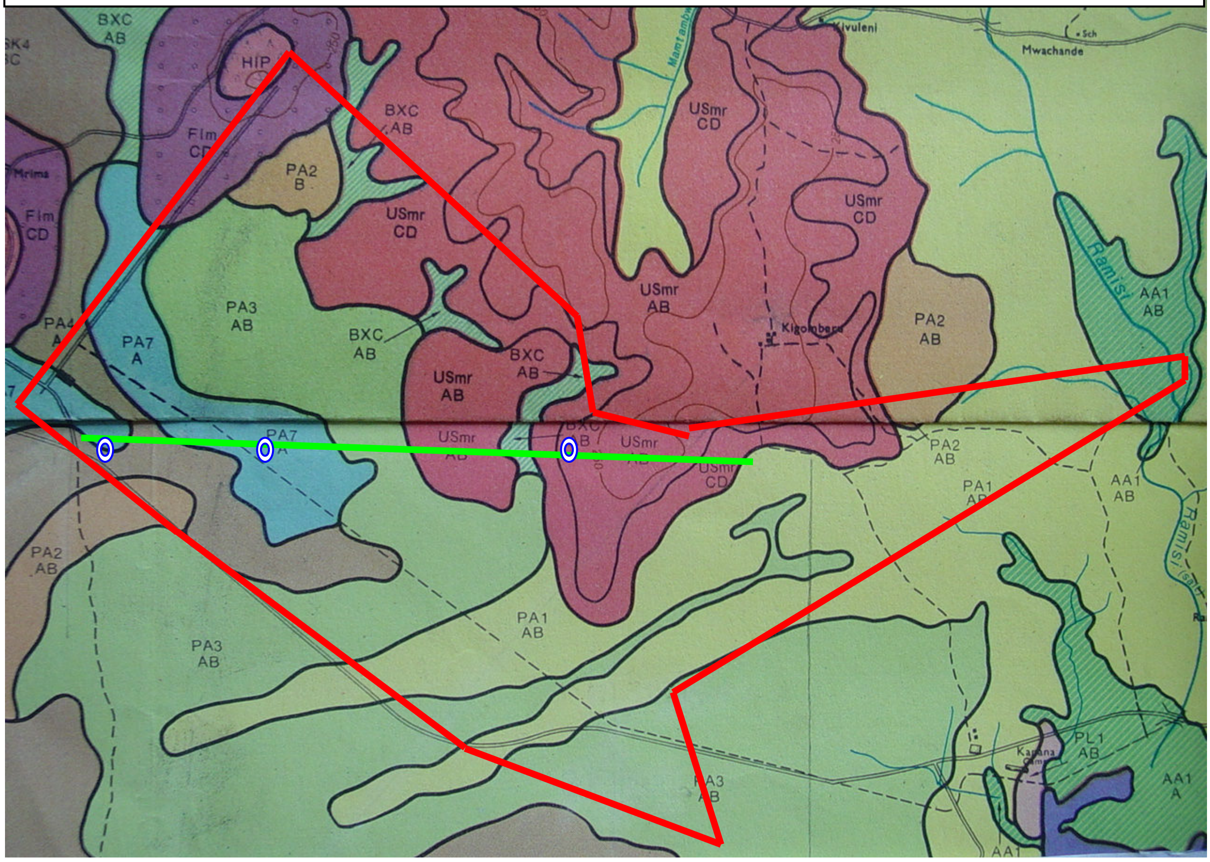

Plate 1: Soils and positioning of profile pits in the resettlement site

Key:

PA1:	Very deep, well drained soils with reddish yellow to white colour and sand to loamy sand texture.
PA3:	Very deep, moderately to imperfectly drained soils with light grey to yellow colour and sand to loamy sand texture. There is evidence of mottling in the sub-soil.
PA4:	Very deep, moderately to imperfectly drained soils with brown to grey colour and sandy loam to sandy clay texture. These soils are mottled.
PA7:	Very deep, imperfectly to poorly drained soils with brownish grey to brown colour and clay texture. In some places, cracking is evident.
USmr	Very deep, well drained soils with red to dark red colour and sandy clay loam to sandy clay texture.

Boundary of the resettlement site

Transect

Soil profile pit

Table 1: Positioning of soil profile pits in the proposed settlement area

Soil profile No.	Altitude (m asl)*	Latitude	Longitude	Remarks
1	35.0	4^0 30.024' S	39^0 16.700' E	There was evidence of cultivation in the recent past.
2	29.5	4^0 30.078' S	39^0 17.568' E	Land covered by grass that had been burnt recently. The land seems to have remained uncultivated for some time.
3	81.5	4^0 30.574' S	39^0 19.887' E	Land covered by bush that had been burnt recently. There was no evidence of recent cultivation.

* Metres above sea level

Five soil samples were taken within each profile pit; one sample was taken from each of the following depths: 0-20, 20-40, 40-60, 60-80, and 80-100 cm. These samples were used to assess variation in physical and chemical soil properties with depth. Ten more soil samples were taken from five positions, at depths of 0-20 and 20-40 cm, surrounding each profile pit to assess spatial variability in the surface soil. A total of 45 soil samples were therefore taken from the proposed settlement site.

2.4 Field survey

The specific objectives of the survey were:

(i) To characterise farmers and the farming systems in Kiruku/Mwangwei/Kigombero and Maumba/Noma areas.

(ii) To establish the farmers perceptions to the resettlement initiative.

(iii) To solicit suggestions from the affected communities on what they would consider as workable approaches that will enhance success of the resettlement process.

Data was collected through personal interviews with the aid of a structured formal questionnaire (Annex 1). A total of 23 respondents were interviewed in the Kiruku/Mwangwei/Kigombero area while 29 respondents were interviewed in the Maumba/Noma area. Data was then coded and entered into an Excel file. This data was then cleaned and analysed using the Statistical Analysis System (SAS Inst., 1990) software. Descriptive statistics, frequencies and cross-tabulations were generated for interpretation.

2.5 Laboratory analysis

The samples were air-dried and ground to pass a 2 mm sieve. Sub-samples of about 250 g were then analyzed for: nitrogen, phosphorous, potassium, calcium, magnesium, organic carbon, pH, and particle size (i.e. texture). Critical levels of nutrients described by Okalebo *et. al.* (2002) were used to determine whether the nutrients were sufficient or inadequate for crop and fodder production.

3.0 Results

3.1 General observation

The proposed resettlement site lies between latitudes 4^0 28' and 4^0 32' South, and between longitudes 39^0 16' and 39^0 20' East. The altitude of the area ranges from 25 m to 85 m above sea level. The site was covered by different types of vegetation, including natural grass (mainly *Panicum* spp), bushes consisting of mixture of shrubs and palms (mikoma), and natural forests. The natural forests were mainly found around Mvumoni along the Mombasa-Lungalunga road.

About 75% of the land is low-lying and 50% of this is prone to flooding. The low-lying land was previously used for sugarcane growing by the Ramisi Sugar Factory. Most of the drainage canals constructed by the factory to remove excess water from the fields have since collapsed due to neglect by the host community. There was evidence of an elaborate network of murrum roads that had been constructed by the sugarcane factory but most of the roads were impassable because either they have been overgrown by bushes or culverts had been washed away by flood water. There were only two primary schools and no health facilities at the proposed resettlement site.

Population at the proposed settlement site was sparse. The residents had their homesteads on raised ground but carried out farming activities both around their homes and in the low-lying areas. A few homesteads were found in the low lying area. The communities residing in the area mainly consisted of subsistence farmers, relying on cassava, maize and rice for food. Tree crops were concentrated around the homesteads and sale of produce from the trees was the farmers' source of cash. The farmers practice mixed farming: they grow crops as well as keep livestock. Uncultivated land is usually used for communal grazing.

The farmers use traditional agricultural practices, with no regard to environmental concerns. Such practices as burning of grass and bushes for ease of land preparation or to encourage fresh growth of natural pastures has led to severe destruction of the environment. Soil left bare is exposed to climatic forces such as wind and raindrop impact. Bare soil is prone to loss through wind erosion, while raindrop impact causes soil capping and thus interferes with the infiltration of water into the soil profile. Soil organisms (important components of soil life) are usually destroyed by burning. This interferes with organic matter breakdown and, hence, the release of plant nutrients from such material.

3.2 Soil characteristics

3.2.1 General observation

The soils showed colour variations down the profiles. While the top soil was grey or brown, the underlying soil was either yellow or red. The soils are very deep and there were no rock outcrops in the entire area. Land can therefore be prepared by tractor or animal-drawn implements without problem. The arrangement of soil aggregates in pits 1 and 2 showed evidence of well aerated profiles. The deep soil profiles are suited for deep-rooted crops such as the coconut and cashew nut. Grass roots were observed up to a depth of about 60 cm.

When attempts were made to dig profile pits 1 and 2 beyond one metre, moisture in the soil increased drastically. This was clear evidence of a shallow water table around the area where the soil profiles were dug. Observations made at the nearest well showed that the water surface in the well was about 1.8 m from the soil surface.

3.2.2 Physical and chemical analysis

Laboratory results showed that the soils at the proposed settlement site have sandy surfaces (Table 2). The texture of the underlying soil horizons varies from sandy loam to clay loam. As expected, the surface soils had lower clay content but higher levels of organic carbon than those of the underlying horizons (Table 3). The soils' organic carbon content was much lower than adequate. Soil organic matter (measured indirectly as organic carbon), influences a number of physical and chemical processes in the soil. An increase in soil organic matter (SOM) improves water holding capacity and the ease with which soils release nutrients. A decline in SOM in cultivated soils (caused by practices such as burning or removal of crop residues) is an effective measure of the extent of chemical and physical soil degradation. Farmers in the resettlement site will, as a matter of necessity, have to ensure build up of organic matter in the soil by stopping the burning of plant material and by continued application of organic fertilizers (animal manures) on their farms. An improvement in organic matter content of the soil will lead to improved soil structure (better aggregate formation), in addition to the other benefits mentioned above. Mineralization of the organic matter will contribute nitrogen to the soil and, therefore, improve the soil's chemical fertility.

Table 2: Soil texture by depth within the profile

Soil depth (cm)	Soil profile		
	1	2	3
0-20	Sand	Sandy loam	Loamy sand
20-40	Sandy loam	Clay loam	Sandy clay loam
40-60	Sandy loam	Clay loam	Sandy clay loam
60-80	Sandy loam	Clay loam	Sandy clay loam
80-100	Sandy loam	Clay loam	Sandy clay loam

The soils around profile 1 had a sand content of 44-94% while those around profiles 2 and 3 had sand contents of 52-77% and 68-86%, respectively. Soils with relatively high clay (and high SOM) contents are known to have a better water holding capacity than those with relatively high sand (and low SOM) content. The soils around profile pits 2 and 3 are therefore likely to hold more water than those around pit 1. The latter will dry up faster than the former. A short dry spell is therefore more likely to cause wilting in maize grown on soils with properties similar to those of profile 1 than in maize grown on soils similar to those of profiles 2 and 3.

Table 3: Soil organic carbon and clay contents

Soil depth	Profile 1		Profile 2		Profile 3	
(cm)	% Organic C	% Clay	% Organic C	% Clay	% Organic C	% Clay
0-20	0.43 (vl)	6	1.09 (L)	15	0.82 (L)	12
20-40	0.42 (vl)	16	0.20 (vl)	33	0.77 (L)	29
40-60	0.17 (vl)	17	0.08 (vl)	32	0.44 (vl)	30
60-80	0.18 (vl)	18	0.04 (vl)	37	0.31 (vl)	30
80-100	0.14 (vl)	19	0.05 (vl)	36	0.22 (vl)	26

Key: L = low; vl = very low

Soils at the proposed settlement site were highly variable in their chemical properties. The levels of all the three major nutrients were below the critical levels required for profitable production of most crops, thus signifying low soil fertility. The soils in the low-lying area (Profile pits 1 and 2) had very low to low nitrogen level in the top 40 cm (Table 4). Soils on raised ground (Profile pit 3) had low to moderate nitrogen level in the top 40 cm. The top 30-40 cm of soil forms the layer mostly exploited by roots of annual crops and the feeder-roots of some tree crops such as citrus. Inadequate levels of nutrients in this soil layer will therefore have a negative impact on crop and fodder production, leading to low crop yields and poor performance of livestock. Under situations as those shown by the soil data from the resettlement site, farmers will have no option but to supplement the soil nutrient levels by applying fertilizers.

Table 4: The soils' nitrogen (g kg^{-1}), phosphorous (mg kg^{-1}) and potassium (mg kg^{-1}) content

Soil depth	Profile 1			Profile 2			Profile 3		
(cm)	N	P	K	N	P	K	N	P	K
0-20	0.5	9.1	11.7	0.8	4.3	37.6	1.2	3.9	25.4
20-40	0.6	3.1	8.7	0.3	0.7	66.5	0.9	1.6	10.2
40-60	0.4	2.4	10.2	0.4	0.3	63.5	0.5	1.1	9.7
60-80	0.3	1.7	8.7	0.2	0.7	75.7	0.3	1.1	5.9
80-100	0.2	17.7	10.2	0.8	0.2	80.2	0.3	1.0	5.9

N < 0.5 = very low, 0.5-1.2 = low; P < 10.0 = very low, 10.0-20.0 = low;

K < 50 = very low, 50-100 = low

Soils at the proposed settlement site had highly variable pH (Table 5). The soils around profile 1 had a pH of 4.9-7.5 while those around profiles 2 and 3 had pH of 4.9-9.1 and 5.1-6.5, respectively. Soils with pH in the lower range (4.9 or 5.1) tend to be acidic and this, therefore, calls for the application of lime to the soil to raise its pH. The soils around profile pits 1 and 3 had very low calcium levels but those around profile 2 had low to very high levels of the nutrient. Magnesium levels ranged from low to very high.

Table 5: The soils' pH, calcium (mg kg^{-1}) and magnesium (mg kg^{-1}) content

Soil depth	Profile 1			Profile 2			Profile 3		
(cm)	pH	Ca	Mg	pH	Ca	Mg	pH	Ca	Mg
0-20	5.4	67.7	32.3	6.1	574.0	348.8	6.5	242.4	77.0
20-40	4.9	164.0	134.9	7.9	852.2	994.8	5.3	228.1	61.8
40-60	5.1	149.7	136.0	8.1	909.2	808.2	5.4	174.7	45.4
60-80	5.4	149.7	165.4	8.4	2160.8	1127.9	5.5	228.1	53.0
80-100	5.4	235.3	209.1	9.1	3480.1	1156.3	5.1	253.1	69.4

Ca < 500 = very low, 500-1000 = low, 1000-1600 = Moderate, 1600-2400 = high, > 2400 = very high;

Mg < 20 = very low, 20-40 = low, 40-80 = medium, 80-180 = high, > 180 = Very high

3.2.3 Potential of the 5-acre plots providing sufficient food for a household

The results of thee laboratory analysis showed that soils in the resettlement site are generally poor. Past research in coastal lowland Kenya has shown that optimal yields of maize grown on soils that are deficient in phosphorous and nitrogen can be obtained by applying the two major nutrients at the rates of 40 kg P ha^{-1} (16 kg P per acre) and 60 kg N ha^{-1} (24 kg N per acre), respectively. This can be achieved by applying 1.6 bags of 20:20:0 per acre (that supplies 16 kg P and 16 kg N) and 0.7 bag of CAN per acre (that supplies 9 kg N).

The expected yield of maize in the region, when grown as recommended, is 20 bags (90 kg each) per acre (50 bags per hectare). If the expected maize yield is achieved, a household of 10 members (as is the case at the resettlement site) requires 1.5 acres of land to produce enough maize (30 bags) for one year. At farm level, a farmer applying agronomic recommendations will get at least 75% of the expected maize yield. Thus, a farmer following agricultural advice will need 30-40% of the 5 acres allocated to provide subsistence to the household. The rest of the land (3-3.5 acres) can be used for the homestead, cash crops and other enterprises.

Other studies conducted in coastal lowland Kenya showed that farmers can use fertilizer at half the recommended rates in combination with farmyard manure and nitrogen fixing legumes to obtain maize yields that are nearly as high as those produced by applying the full fertilizer rates. By using such combinations, farmers would cut the cost of fertilizer input by half from about Ksh. 4,000/= per acre. This would be a good option for farmers who cannot afford to apply the full rates of fertilizer.

At the current soil fertility status, farmers can only expect maize yields of about 4.5 bags per acre (1.0 t ha^{-1}). The farmers, therefore, would not be able to produce adequate maize on their 5-acre farms without applying soil amendments. Instead, a family of 10 would require 7 acres of such poor land to meet their maize demand per year.

3.3 Results of the field survey

3.3.1 Introduction and general information

Data captured from key informants within the migrating community showed that there are a total 133 farm families whose land was surveyed and 265 farm families with un-surveyed land. Farm household sizes, period of stay and peoples' ethnic groups varied between the host and migrating communities as shown in Table 6. Most (92%) of the Maumba/Noma residents, who were mainly *Kambas*, have stayed for over 20 years in the area. Agro-forestry practices were evident in most farms; Casuarina and Eucalyptus were the common tree species. Farm household sizes were above the district average of 7 people per household thereby giving per-capita land sizes of 0.49 and 1.34 acres for the Kiruku/Mwangwei and Maumba/Noma areas, respectively. The host community (in the Kiruku/Mwangwei area) was dominated by members of the *Mijikenda* ethnic group. Farms in the Maumba/Noma area were more developed than those in the Kiruku/Mwangwei area, a clear evidence of different farming experiences between the two communities. The mixing of these communities in the resettlement site will offer opportunities for sharing the valuable farming experiences for improved agricultural productivity.

3.3.2 Water sources

The survey results showed that the host and migrating communities had different sources of water for domestic use. In the Kiruku/Mwangwei area, 100% of households got water from shallow wells in both wet and dry seasons while rivers (16%), wells (44%) and roof catchments (32%) were major water sources in the Maumba/Noma area. Springs accounted for only 8% of the water sources. In the Kiruku/Mwangwei area, each water source supplied water to 49 households as compared to 23 households in the Maumba/Noma area. To sustain households' water requirement after the resettlement process, there is need for interventions to improve the water situation. Farmers walk for 0.87 km in Kiruku/Mwangwei to fetch water in both wet and dry seasons compared to 0.36 km in the wet season and 0.66 km in the dry season in Maumba/Noma area.

Table 6: Household features for the two communities

Variable	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
Mean household size	9.0	13.0
% Households < 10 years stay	31.6	4.0
% Households 10-20 years stay	42.1	4.0
% Households > 20 years stay	26.3	92.0
% Households whose members are *Mijikendas*	94.7	28.0
% households dependent on farming	72.2	68.0

3.3.3 Farming systems

Farmers in both sites practised mixed farming: they grew crops and kept livestock (Table 7). Complex intercrops of different tree/plantation crops and food crops were observed. Most farmers had one piece of land of varying size but in some cases ownership of more that one parcel was guided by a preference for growing rice on river-beds or swamps. Most farmers in Maumba/Noma area had title deeds for their land as opposed to farmers in Kiruku/Mwangwei/Kigombero area who were squatting on land previously owned by the Ramisi Sugar Factory.

Major annual crops in the Kiruku/Mwangwei/Kigombero area include maize (grown by 100% of the households) and cassava (95%). In the Maumba/Noma area, the annual crops included maize (in 67% of the households) and vegetables (57%) that include egg plant (*tunguja*), tomatoes and kales. About 31% of the farmers in this area grew passion fruit. The annual crops were all produced by under smallholder system in both areas. The average maize yields in the Kiruku/Mwangwei and Maumba/Noma areas were 3 and 6 bags (90-kg bags) per acre, respectively. The mean acreage under maize was 1 and 2 acres for the Kiruku/Mwangwei and Maumba/Noma areas, respectively. These yield figures are in agreement with those reported earlier for the Coast Province (Waaijenberg H. 1994). In the Kiruku/Mwangwei area all the maize produced was for household consumption whereas in the Maumba/Noma area 76% was consumed and the rest sold dry. A fair number (36%) of farmers in the Maumba/Noma area used external inputs (fertiliser and/or pesticides) for maize production while in the Kiruku/Mwangwei area none used such inputs. Passion fruits had emerged to be a very promising cash crop in the Maumba/Noma area, with a ready market and high returns. In the Kiruku/Mwangwei area, cassava was the main food crop but some of it was sold for cash generation.

Crop-livestock farm level relationships were mainly in the provision of labour by draught oxen, ploughing back of incomes generated from livestock sales and utilisation of crop residue as feed. The use of manure from livestock on-farm contributed to soil fertility improvement and therefore substituting inorganic fertilisers.

Table 7: Household resource profiles aggregated by site

Variable	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
% Households with more than one farm	36.8	20.0
Mean farm size (acres)	4.4 (1-11)	17.4 (3-36)
Mean area under maize (acres) per household	1.0	2.4
Mean no. local chicken per household	16 (0-50)	41 (6-200)
Mean number of goats per household	5 (0-50)	12 (0-45)
Mean number of cattle per household	1 (0-8)	3 (1-18)
Mean h/hold monthly income (KSh.)	2,987/=	23,818/=

Note: Figures in parenthesis are the minimum and maximum stretches for the different variables

3.3.4 Constraints

Major constraints to farm livelihoods were classified into four categories: those constraints related to (i) infrastructure (roads and transport for farm produce) and public institutions (hospitals, school, markets for farm produce), (ii) resources (clean water, soil, income, wildlife), (iii) disease incidences (malaria and water-borne diseases), and (iv) others (crop pests, job opportunities and food security situation) (Table 8). The problem of poor road network, lack of public service vehicles or transport for farm produce, inadequate public utilities such as hospitals, schools and markets was a major concern to both the host (Kiruku/Mwangwei) and the migrating (Maumba/Noma) communities. In the Maumba/Noma area, lack of transport was reported to affect access to farm inputs as well as transportation of farm produce to markets. Lack of farm inputs and markets for farm produce were critical problems that need intervention. Lack of clean water and low soil fertility were critical constraints in the Kiruku/Mwangwei area while wildlife damage was the major problem in the migrating site (Maumba/Noma). Wildlife damage on crops has led to major shifts in the cropping systems of the migrating community with some members abandoning the growing of maize. The problem of high disease incidence was mentioned, particularly regarding malaria prevalence in the Maumba/Noma area. Other problems mentioned included high incidences of crop pests and inadequate food due to poor maize harvests. Low household incomes and lack of job opportunities was of concern in Kiruku/Mwangwei area and this was confirmed by resource-poor households. Table 4 shows the rating of the livelihood constraints in the two sites.

Table 8: Agro-related livelihood constraints

Constraints	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
	--------------- % of respondents ---------------	
Poor infra-structure/institutional set-up	47.4	68.0
Resource based constraints	31.6	84.0
High disease incidents	21.1	56.0
Other (crop pests, food shortages, unemployment, ...)	21.1	12.0

3.3.5 Expectations from the resettlement initiative

Farm households expected some benefits from the resettlement initiative (Table 9). The most crucial among the expected benefits was the hope that land ownership will be resolved in the Kiruku/Mwangwei/Kigombero area where the farmers have been living as squatters. The farmers expect that the resettlement initiative will consider them for land allocation followed by subsequent issuance of title deeds. The problems of lack of infrastructure and institutions such as markets for farm produce were among the problems that the farmers expect will be solved through the resettlement of both the migrating and host communities, thereby creating an input-output market that will lead to economic growth of the hybrid (host/migrating) community. Table 9 shows the positive expectations of both communities as demonstrated by the percent responses for market creation or growth, and development of infrastructure and institutions. The resource-poor host community looks at the resettlement initiative as a blessing for employment creation (53%) that will enable them raise their household incomes. The assumption by both communities was that the Government was putting in place security measures for the success of the resettlement initiative.

Other expectations were also cited by both communities. The host community expected that they would be given the first consideration during land allocation, and that the authorities will avoid relocation of the current residents. On the other hand, the migrating community expect that land allocation will be based on family size and that every adult household member will be compensated. This expectation by the migrating community is one that needs careful interpretation to the affected people. There is need for an intensive education on land compensation procedures.

Table 9: Farm household expectations expressed as benefits from the resettlement initiative

Expectations	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
	--------------- % of respondents ---------------	
Resolved land ownership	47.4	8.0
Input/outputs market creation or growth	68.4	48.0
Development of infrastructure and institutions	68.4	60.0
Employment creation	52.6	0.0
Guaranteed security by the Government	15.8	32.0
Other (first consideration, avoid relocation, ….)	10.5	16.0

On the other hand, the same scenario serves as a message to all land owners that it is important for household heads to share out land to their adult children and the necessary documentation made, otherwise the only recognised land owner is the one whose name appears on the title deed.

3.3.6 Fears by the communities

As much as there were some expected benefits, the communities still expressed fears that the resettlement will affect their livelihood (Table 10). The most notable among the stated fears was the issue of security as raised by the migrating community. This community fear, in the event of them being paid their compensation, the possibility of attacks by burglars who may come for the compensation money. On the other hand, the host community fear that burglars targeting the migrating community may also attack their homesteads or the surrounding environs. The fear of being displaced or relocated to another site (leading to loss of previous efforts on land development and total loss of land) was more crucial to the host community than the migrating community which was more worried about possible allocation of small and infertile pieces of land.

A close look at the socio-economic structures of the communities revealed that various associations were in place in the Maumba/Noma area. These structures included funeral and educational and health fund-raising committees. These committees have had considerable scio-economic impact among community members; thereby enabling households meet successes in solving their education, health and burial problems. It is out of these successes that the affected community fears that the resettlement initiative will completely destroy these socio-economic structures. It is also feared that faith-based structures may be destroyed, when members of one church or mosque are separated by allocating them distant land parcels.

Table 10: Fears expressed by both affected communities on resettlement initiative

Fears	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
	---------------- % of respondents	--------------
Insecurity	21.1	64.0
Allocation of inadequate or poor land	10.5	48.0
Displacement or relocation	89.5	N/A
Degeneration of socio-cultural structures	5.3	68.0
Total loss of livelihoods (yields/incomes)	16.8	36.0
Others (unwelcoming hosts, conflicts, …..)	5.3	12.0

Tree crops take a long time to establish and the community in the Maumba/Noma area felt that the resettlement initiative will lead to total loss of livelihood that will render them unable to neither educate their children nor meet most basic needs. Other fears expressed include the possibility of meeting an unwelcoming host community, possibility of conflicting development agenda, possible health problems associated with climatic or environmental change, and the absence of basic facilities such as fuel-wood.

3.3.7 Possible Impacts

Short and long term impacts of the resettlement initiative were examined by both host and migrating communities and two levels (positive and negative impacts) were identified. The two communities expressed opposite views except for the belief that the resettlement plan predicts positive growth of institutions (educational and health) and improved infrastructure (Table 11). The possibility of market creation and expansion, job and income creation, and resolving land ownership issues was a belief shared by the host community who felt that the coming of the migrating community was a blessing as they were more resourceful and probably had a better treat from the Government and Tiomin Company.

The issues of destroyed livelihood was given weight by the migrating community as do other negative impacts such as possibility of insecurity, changing life styles leading to poor school performance by their children.

Table 11: Likely/expected short and long-term impacts of the resettlement initiative

Impact	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
	----------------- % of respondents	---------------
Market creation/expansion	68.8	28.8
Job/income creation	75.0	14.3
Growth of institutions/infra-structure	62.5	66.7
Land ownership guaranteed	37.5	19.1
Destroyed livelihoods*	6.3	52.4
Increased crime rates*	6.3	4.8
Other*	6.3	6.8

* Negative impacts of the resettlement initiative

Since the relocation plan was hatched over 5 years ago, members of the migrating community stopped further land development because of the uncertainty caused by the decision to resettle the affected households. The uncertainty has caused changes in cropping patterns and the halting of the construction of permanent houses by the migrating families.

3.3.8 Suggestions by the communities for a successful resettlement initiative

For the success and fairness in resettling the affected households, the two communities raised some suggestions (Table 12). The common suggestion by the two communities was that a participatory approach to the land allocation process be applied through the formation of a special committee with representatives from both the host and migrating communities. The need to recognize village institutions was emphasized as a basis for ensuring community participation. The overall participation of different development partners would lead to synergy in the development of institutions. Consideration of household size during land allocation and giving priority to the host community are among the opposite suggestions between the host and migrating communities. These suggestions, therefore, send a message of caution to the resettlement plan that could be eased through the earlier suggestion that the process be overseen by a hybrid committee composed of members from the host and migrating communities.

There is need to first develop the necessary infrastructure and facilities for basic human need including roads, clean water, hospitals and financial institutions that could provide credit was raised by the migrating community.

Table 12: Suggestions floated by the affected communities for a successful resettlement exercise

Suggestion	Survey site	
	Kiruku/Mwangwei/Kigombero (n = 23)	Maumba/Noma (n = 29)
	----------------- % of respondents	---------------
Enhance dialogue with affected (through local village reps)	47.4	48.0
Consider h/hold sizes	26.3	16.7
Consider host community first	52.6	4.4
Develop infra-structure first	N/A	26.1
Prepare migrating farmers for the resettlement	N/A	60.7
Other (livelihood support facility, …)*	5.3	14.8

* Other suggestions as listed below:

-Need to allocate equal land parcel sizes to both communities

-Need to take affected communities to a trip of any successful settlement scheme

-Need to provide livelihood support during the lag/acclimatization time especially for the Maumba/Noma community

-Need to speed up the resettlement programme

-Compensate all affected household members

The need to prepare the people for the resettlement was raised and this calls for exposure trips for members of the migrating community to existing settlement schemes, allowing them to tour the resettlement site and holding joint training/workshop between host and migrating communities to enable them establish links, commonness and coping strategies. The need for provision of a livelihood support facility was also suggested by the migrating community, especially in recognition of the lag-time between resettling and when new agricultural systems become sustainable.

5.0 RECOMMENDATIONS

Among both the host and migrating communities, uncertainty had loomed for quite some time since the issue of resettlement was first mentioned. As a result of this uncertainty, members of both communities have been exposed to speculation. It is hoped that the recommendations of this report will be a basis for a good co-existence among the affected communities. Given the current state of the proposed resettlement site regarding the land, infrastructure and facilities to support livelihoods, the following issues need to be attended to:

- The affected communities should be empowered to clearly understand short and long term implications of the resettlement initiative so that they do not perceive themselves as either as losers.
- Since a large part of the proposed resettlement site is prone to seasonal flooding, land on raised ground should be set aside for homesteads. It might be necessary to allocate two pieces of land per household: one for the homestead (on raised ground) and the other for farming activities (on the low-lying area).
- The drainage canals in the low-lying area should be reconstructed and mechanisms be put in place to ensure their maintenance.
- Both host and resettled farmers are strongly advised to always use both organic and inorganic fertilizers in order to facilitate nutrient and organic matter build up in the soils since they are currently degraded.
- The soils at the resettlement site tend to be acidic; most of them have pH of about 5. Continuous use of the fertilizer DAP (di-ammonium phosphate) to supply phosphorous to crops and fodder should be discouraged since this can lead to increased soil acidity. Instead, compound fertilizers such as 20:20:0 or 20:10:10 should be use for crop and fodder production. Liming is necessary for acidic soils but farmers should do this under expert guidance.
- The farmers should be advised against poor agricultural practices such as burning of bush that has caused both chemical and physical degradation of the soils at the proposed resettlement site.
- Infrastructure (including roads) and public institutions (market centers, schools and hospitals) should be developed in order to march the population increase in the resettlement site. Good health facilities are crucial for the communities since a healthy labour force for farm activities is necessary for improved agricultural productivity.
- Increased agricultural activity at the resettlement site is likely to cause increased use of organic and chemical farm inputs. This may, in turn, cause contamination of ground water which is currently the only source of water in the area. A reliable water supply, free from potential contaminants, should be put in place at the site for use by the increased population.

5.1 Other issues to consider

- Ensuring fair representation of both host and migrating communities in all matters to do with land allocation.
- Any existing social structures should be given special consideration during land allocation to ensure long-term socio-economic development.
- There may be need of alternative options in case some of the farm households earmarked for resettlement opt to buy land elsewhere.

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