

4. BASELINE INFORMATION

This chapter provides the main features of the baseline biophysical and socio-economic information of the TISP project area. Detailed assessment of baseline conditions of the project area relevant to TISP and methods used are provided in Appendix 8.

4.1 Identification of the project sites

The area to be developed for the Tana integrated sugar project is contained within the 30,000ha “concession” area. This land includes 12,000ha intended for rice cultivation of which only 4000ha formed the interim cultivated area. The water intake works at Sailoni were designed to deliver 28cumcs. However the main canal to serve the initial phase of the rice scheme has a design capacity of 9.2 cumecs. A protection dyke was constructed with 1:50 year design capacity. This dyke was broken several times during the 1997 El Nino rains leading to a total collapse of the irrigation project.

The TISP area will comprise the land to the south of road C112 and as indicated above, will consist of 16,000ha of estate cane and 4,000ha of outgrower cane – see Figure 3.2. The proposed sugar outgrower areas are to be found outside the “concession” area at around Idsowe, Kipao, and Galili. The livestock component will be confined to the southern part of the TISP area.

The rice project land confined to the area north of road C113 will remain. TARDA has plans to revive the existing rice scheme as well as trying to utilize the entire capacity of 12,000ha.

4.2 Physical environment

4.2.1 Physical features

The major physical feature in Tana River District is the undulating plain, which is interrupted in a few places by low hills. The main hills are Minjila in Garsen Division, Bilbil in Bura and Madogo divisions. These are the highest points in the district. The land in Tana River District generally slopes south-east wards with an altitude that ranges between 0m along the coast to 200m above the sea level at the top of the mentioned hills.

The river Tana Delta traverses the district from Tharaka District in the north to the Indian Ocean in the south, covering a stretch of approximately 500km. As the river transverses the expansive coastal hinterland, it starts to meander in its lower course forming a large basin whose width ranges between 2 – 42km. towards its mouth between Mnazini area and the Indian Ocean, the river creates an extensive delta, which is characterized by wetlands.

The extensive delta created by River Tana presents great potential for agricultural development in the district. It is a natural habitat to an enormously diverse flora and fauna, which forms an ideal ecosystem for promotion of tourism. It also provides grazing areas during the dry seasons and its water is used for irrigation. The main crops grown in the district are; rice, mangoes, maize, bananas and soya beans. Fishing, forestry and agro forestry are also important activities in the delta.

Besides the Tana River, there are several seasonal rivers in the district. These are found in the area west of River Tana in northeastern part of the district. Popularly known as “lagas”, these rivers flow in a west-east direction from Kitui, Makueni and Mwingi District draining into River Tana and eventually into the Indian Ocean. Their beds support livestock as well as wildlife during the dry season as they retain water when there is no

water elsewhere. They are the best sites for shallow wells and sub-surface dams as well as earth pans. However, these lagas are also major bottle necks to road transport as they cut off roads during the rainy seasons making the district virtually land locked at such times.

The District has a coastline, which is characterized by sandy beaches interrupted by the Tana delta where the Tana River enters the ocean. These features present ideal condition for beach tourism.

4.2.2 Agro-ecological Zones (AEZ)

The agro-ecological potential of the TISP area is obtained from the work of Jaetzol and Schmidt (1982) which correlates reasonably well with the agro-climatic zonation of Sombroek et al. (1982). The South-eastern Tana River district and parts of Lamu district around Witu are characterized by four agro-ecological zones. The north and north-western parts of Tana River district are in the Lowland Ranching Zone (L6). The mean annual rainfall here is less than 500mm and bimodal. The area around Garsen, Kibusu and Ngao are in the Livestock-Millet Zone (L5). The mean annual rainfall here varies from 500-600mm around Garsen to about 700-800mm in the south-eastern parts of Ngao. The area around Matapani and Witu is in the Coconut-Cassava Zone (L3) with 1000-1100mm of annual rainfall. Kipini area lies in a transition between L3 and L4.

4.2.3 Climate

Meteorological data of the project area are collected from different stations like Garsen, Gamba and Ngao. The average monthly records on rainfall, temperature, relative humidity, wind speed, sunshine hours and pan evaporation are based on 28 years' record from the Meteorological Station at Garsen. Available monthly rainfall data from the stations Gamba and Ngao located closer to the project show higher average annual rainfall compared to those of Garsen. Mean annual rainfall at Garsen is about 523 mm while the mean annual rainfall at Gamba and Ngao is 733 and 714 mm respectively, showing a difference of some 200 mm per annum. Mean monthly rainfall data of the stations show two rainy periods being April/May and November/December. Annual rainfall varies enormous from year to year and is found between 372 mm and 1148 mm at Gamba station. More than 770 mm of rainfall was recorded during a very short period in October/November 1997, when the whole area was inundated and the rice project was destroyed.

The average annual evaporation as measured by a Class A Pan is about 2,480 mm or an estimated $0.7 \times 2,480 = 1,736$ mm crop water requirement for sugar cane while the annual rainfall is 724 mm resulting in a water shortage of around 1,012 mm per annum. As the monthly rainfall in the area is insufficient for optimal cane growth a supplementary irrigation is therefore recommended.

The average temperature is about 27.1 °C throughout the year with an average minimum temperature of 22.5 °C and average maximum of 31.6 °C. Monthly temperatures vary moderately from one month to another. Ripening of sugar cane will be limited due to these sub-optimal conditions. The low temperature amplitude is not conducive for good sucrose contents in sugarcane. Especially during the two rainy seasons May/June and November/December the pol % cane will be low.

Relative humidity is high during the different months of the year ranging from 73 to 79 % with a mean annual of 76 %. However, the number of sunshine hours is somewhat on the low side ranging from a monthly average of 7.4 hours/day during May to 8.9 during February, September/ October and December with an annual average of 8.4 hours/day.

The average annual wind speed is about 2.5 m/s and varies during the different months between from 1.7 m/s in December to 3.1 m/s in August.

The climatic conditions in the area are very favourable for good cane growth when sufficient moisture is supplemented (irrigation) during periods with water shortage but less favourable for cane ripening in general. The vigorous growth has been demonstrated in the sugar cane trials in the project area. Growth rates of around 1 cm/day or 30 cm/month have been measured. The ripening of sugar cane at Lower Tana is, however, a limiting factor due to sub-optimal conditions, the relative humidity and the sunshine hours. As cane ripening is a limiting factor in the area, an attempt is to be made to induce cane ripening by reducing the cane growth before the cane should be harvested by either moisture stress or the use of chemical ripeners. The growth rate and sucrose content are inversely related. Monitoring of cane ripening through direct cane analysis before harvesting is strongly recommended. Examples of significant improvement by spraying chemical ripeners have been demonstrated.

It is anticipated that the introduction of estate and out-grower sugar cane fields will create micro- and meso-climates in the area. Parameters to be affected include the energy balance, moisture and temperature (soil and air) conditions due alterations of surface cover and irrigation.

4.2.4 Hydrology and Water Resources

Surface and ground water in relation to the current proposal

The major water resources in the district are the Tana River, seasonal rivers (lagas), ground water, water pans and water holes in the interlaga areas. Tana River is the only river flowing through the district with a permanent source of water for domestic and livestock use, especially during the dry season when other water sources dry up. *It is also a source of water for a number irrigation schemes along its course.* The river carries a large volume of water all year round and has the potential to support a large industrial sector in the district. For domestic purposes, water from the river requires treatment.

During rainy season, seasonal lagas cover extensive areas. They flow from Kitui district to Tana River district and supply sufficient run-off for livestock and domestic use. As the lagas usually maintain a subsurface flow in their loose sand beds, during the dry season, pastoralists obtain water by making hand-dug water holes in the sand beds. The major lagas include Hilimani in the north, Galore in the central and Kokani to the southern part of the district, besides numerous other small ones flowing onto the main lagas during the rains. The quality of water in lagas is good in dry seasons but becomes turbid during rainy seasons. If water from the lagas could be harnessed, the district would have adequate source of water for domestic, livestock and industrial use. There are numerous natural depressions and water holes spread throughout the district especially the area between the major lagas. Some of the depressions store water which lasts 3-4 months during which time they are important watering points for livestock.

Very little is known of the sub-surface water resources of Tana River district. Bore holes in the interior of the district are either saline or of poor quality. The only areas with promising ground water resource are those close to the bank of river Tana where the depth of water varies between 3-15 meters. Water quality is generally good in wells close to the river. Since the district is generally a flat plain with the loose sands, harnessing of water from river Tana for hydro-electric power generation is almost impossible. However, dams for hydro-electric power have been constructed upstream in Mbeere district (Masinga, Kiambere and Gitaru dams).

The planned water abstraction from the diversion at Sailoni is 28m³/s, with agriculture (incl. rice being allocated 22m³/s, wildlife 5m³/s and other users 1 m³/s. The important

question here is whether the proposed abstraction of 28m³/s can be maintained during dry months and drought periods? A preliminary inspection of the discharge data shows that planned abstraction of water from the Tana river can account for up to 1/3 or more of the discharge during dry months e.g. September or even during the drought periods. This will reduce the Tana flow substantially which could lead to water scarcity particularly for livestock and wildlife. There will also be negative impacts on downstream ecosystems and ecosystem processes. Reduced river flow leading to loss of stream competence, will increase sedimentation rates in the river channel as has happened a few kilometers south of the bridge at Idsowe. In turn, this will probably mean that fish breeding areas and fisheries in the ox-bow lakes, Tana River and possibly marine fisheries will be negatively affected. Reduced river flow also has the potential to enhance the human-wildlife conflicts and/or exacerbate inter-tribal conflicts in the project area.

The potential negative environmental and social impacts can be mitigated if the recommended release of water in the dams upstream of the project area during dry periods works when the need arises. Siltation of the water reservoirs which reduces dam capacity and recurrent droughts could defeat the implementation of the water releases to downstream users, wildlife and ecosystem processes. Project design should therefore factor this possibility if the project has to be sustainable from water availability point of view.

4.2.5 Surface and ground water quality

Irrigation water

Water samples for analysis for suitability for irrigation were collected at representative sampling points using the services of Polucon Services (Kenya) Ltd., a NEMA-accredited laboratory based in Mombasa. The samples were analyzed for physical, chemical and biological characteristics as specified in the Water Regulations (2006).

Methods of analysis

Fluoride, Chloride and pH were analyzed using "Standard method for examination of water & wastewater method No. 4500" while Al, Ar, B, Cd, Co, Zn, Fe, Pb, Se, chromium and Cu were analyzed using "Standard method for examination of water & wastewater method No. 3500". TDS was analyzed using "Standard method for examination of water & wastewater method No. 1030". E.Coli was analyzed following KS 05 459. SAR was obtained by calculation.

The samplings points were as follows:

- Upstream at the water intake point at Sailoni
- At Ngao, which is downstream of the proposed factory site
- At Arith, the southern end of the project area before the channel changes at Handaraku
- At Tana River delta at Kipini
- At the beginning of Matomba brook
- At Moa lake and
- At Samicha, the lower end of Matomba brook after traversing through the middle of the proposed sugar Estate

The analytical results are shown in Table 4.1 below.

Table 4.1 Waste water quality parameters for irrigation for various sampling points

Sampling point	pH	Aluminum (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Fluoride (mg/L)	Iron (mg/L)	Zinc (mg/L)	Lead (mg/L)	Selenium (mg/L)	SAR (mg/L)	TDS (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	E.coli (nil/100)
NEMA Standard	6.5-8.5	5	0.1	0.1	0.5	1.0	1.0	2.0	5.0	0.19	6	1200	0.01	1.5	0.1	0.05	Nil/100
Sailoni	7.1	Nil	0.01	Nil	Nil	0.80	0.4	0.63	0.04	Nil	4.9	70	16.46	0.08	Nil	Nil	5
Matomba Junction	6.8	Nil	0	Nil	Nil	0.72	0.5	1.05	0.09	Nil	5.2	80	18.99	Nil	Nil	0.06	3
Ngao	7.0	Nil	0	Nil	Nil	0.98	0.06	1.7	Nil	Nil	5.6	80	15.83	Nil	Nil	Nil	Nil
Samicha	7.0	0.02	0	Nil	Nil	0.46	0.46	1.4	Nil	Nil	11.6	120	31.66	0.005	Nil	0.08	Nil
Moa Lake	6.9	Nil	0	Nil	Nil	0.96	0.40	1.14	Nil	0.06	6	90	12.66	Nil	Nil	Nil	Nil
Arithi	7.0	Nil	0.06	Nil	0.003	0.80	0.40	1.62	0.07	Nil	7.4	80	12.66	0.02	Nil	0.14	Nil
Kipini	7.0	Nil	0.01	Nil	0.006	1.40	0.40	2.1	0.09	Nil	13.3	70	19.0	0.01	Nil	0.25	Nil

Considering the pH and electrical conductivity of the water as measures of likelihood of development of sodicity and salinity conditions, the analytical results indicated the water is suitable for irrigation purposes.

Domestic water

Water samples for analysis for suitability for domestic water were collected at representative sampling points as indicated in the Table 4.2 below. There were 6 wells (Sailoni, Wema, Gamba Guest House, Gomesa, Gamba Village, and Handarako village), and 7 river sampling points. The samples were analyzed 19 parameters specified in Water Regulations (2006).

Methods of analysis

Fluoride, pH, nitrate, nitrite and ammonia were analyzed using “Standard method for examination of water & wastewater method No. 4500” while arsenic, cadmium, copper, lead, selenium, zinc and PV were analyzed using “Standard method for examination of water & wastewater method No. 3500”. TDS was analyzed using “Standard method for examination of water & wastewater method No. 1030”. E.Coli was analyzed following KS05 459 method. COD was analyzed using ASTM D 1252.78 method. BOD, SS, phenols and Alkyl benzyl sulphonate were analyzed using AOAC 973.44, “Standard method for examination of water & wastewater method No. 2540”, “Standard method for examination of water & wastewater method No. 6420”, AOAC 932.22 methods respectively.

The results are presented in Table 4.2 below.

Table 4.2: Analytical results for sources of domestic water at the sampled points

Sampling point	pH	Arsenic (mg/L)	Cadmium (mg/L)	Copper (mg/L)	E.coli (nil/100)	Fluoride (mg/L)	Lead (mg/L)	Selenium (mg/L)	TDS (mg/L)	Zinc (mg/L)	SS	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Phenols (mg/L)	ABS	PV	BOD (mg/L)	COD (mg/L)
NEMA Standard	6.5-8.5	0.1	0.5	0.05	Nil/100	1.0	5.0	0.19	1200	2.0	30	10	3	0.5	Nil	0.5	1.0	30	50
Wema (w) ²	6.8	Nil	Nil	Nil	Nil	0.4	0.003	Nil	230	0.81	10	0.53	Nil	Nil	Nil	Nil	0.48	7	20
Gamba GH (w)	7.8	Nil	Nil	Nil	Nil	0.6	Nil	Nil	390	1.06	10	1.5	Nil	Nil	Nil	Nil	0.26	6	17
Gamba Sch (w)	7.0	0.002	Nil	Nil	Nil	0.4	0.16	0.001	670	1.2	9	1.52	Nil	Nil	Nil	Nil	0.93	2	8
Gomesa vill (w)	7.3	Nil	Nil	0.06	Nil	0.80	Nil	Nil	240	1.4	8	Nil	Nil	Nil	Nil	Nil	0.8	4	34
Handarako vill (w)	7.1	Nil	Nil	0.04	Nil	0.80	0.003	Nil	170	1.3	12	0.8	0.82	Nil	Nil	Nil	0.96	3	8
Sailoni (r) ³	7.1	0.01	Nil	Nil	5	0.80	0.04	Nil	70	0.63	15	1.9	Nil	Nil	Nil	Nil	0.28	40	120
Matomba Junction (r)	6.8	0	Nil	0.06	3	0.72	0.09	Nil	80	1.05	11	1.2	Nil	Nil	Nil	Nil	0.37	32	90
Ngao ®	7.0	0	Nil	Nil	Nil	0.98	Nil	Nil	80	1.7	16	1.5	Nil	Nil	Nil	Nil	0.42	46	168
Samicha (r)	7.0	0	Nil	0.08	Nil	0.46	Nil	Nil	120	1.4	18	1.53	Nil	Nil	Nil	Nil	0.42	80	280
Moa Lake	6.9	0	Nil	Nil	Nil	0.96	Nil	0.06	90	1.14	17	1.52	Nil	Nil	Nil	Nil	0.32	70	190
Arithi ®	7.0	0.06	0.003	0.14	Nil	0.80	0.07	Nil	80	1.62	18	0.82	Nil	Nil	Nil	Nil	0.42	80	280
Kipini ®	7.0	0.01	0.006	0.25	Nil	1.40	0.09	Nil	70	2.1	12	1.6	Nil	Nil	Nil	Nil	0.86	48	144
Sailoni (w)	6.9	Nil	Nil	Nil	Nil	Nil	Nil	Nil	110	0.42	12	0.35	Nil	Nil	Nil	Nil	0.76	2	8

² (w) stands for a well/borehole sampling point

³ ® stands for a river sampling point

National Standards were exceeded for copper at Gomesa village well and river sampling at Matomba junction, Samicha and Arith. E.Coli values at Sailoni and Matomba junction also exceeded the Standards. Fluoride values exceeded the Standards at Kipini. The BOD and COD values were significantly above the Standards at Sailoni, Matomba junction, Ngao, Samicha, Arith and Kipini River sampling points. These elevated BOD and COD values are probably due to human and animal wastes finding their way at the designated water sampling points. Mitigation measures will therefore be required to reduce cumulative effects as a result of activities associated with the proposed project.

4.2.6 Cumulative impacts of other developments along the Tana River

Besides the already established projects in upper Tana, notably the hydroelectric dams, there are plans by the National Irrigation Board to revive collapsed irrigation schemes particularly in the Lower Tana. According to the DC Hola, the Government has allocated 80,971.6 ha from Galana ADC ranch to the west and north-west of the proposed project area for grazing by the pastoralists. To serve as an effective measure to reduce pressure in the delta region, water will have to be supplied to the candidate ranch. This water will have to come from the Tana River as well. There are reports that MAT International is interested in growing irrigated sugar cane in close proximity to the current proposal. They too will have to depend on water from the Tana River to a large extent.

While opening up the Lower Tana for development, the potential negative cumulative effects of all these developments will be reduced water in Tana River, more erosion and sedimentation, and water competition amongst different users including wildlife.

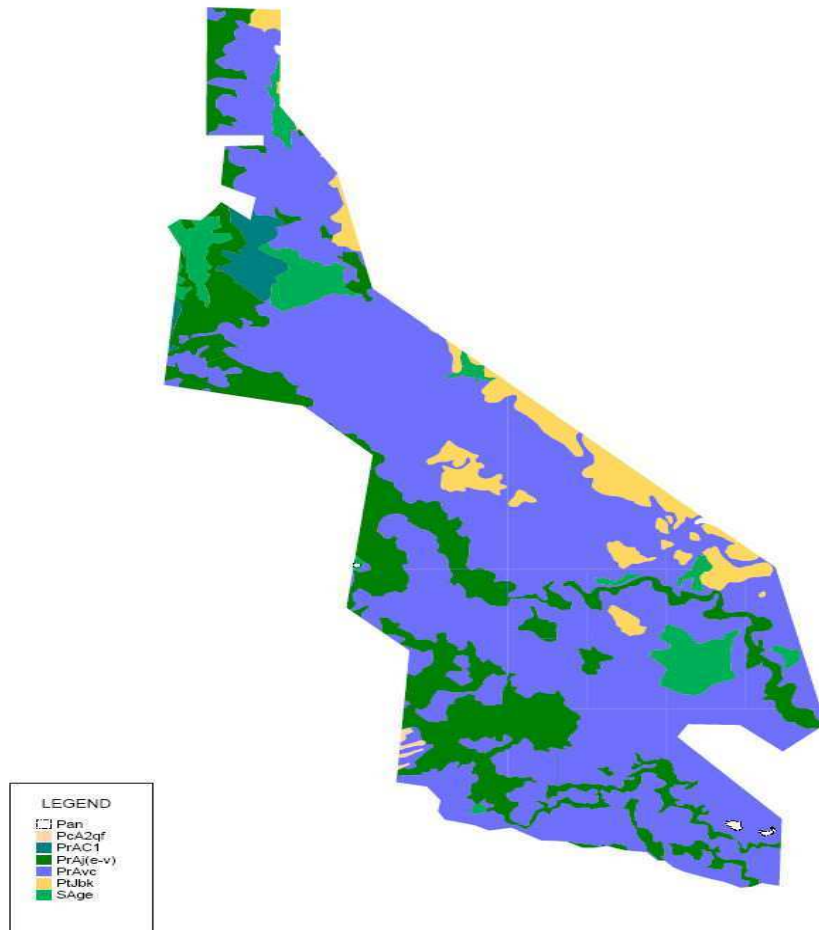
4.2.7 Soils

The soils of the project area have been studied before by Haskoning of the Netherlands (Haskoning, 1982). They consist of eutric and vertic Fluvisols, mollic Gerysols, ortho-luvic and vertic Luvisols (saline-sodic phase), gleyic Solonetz, chromic Vertisols and ferralochromic orthic Acrisols (sodic phase with Solodic Planosols). Their major characteristics are as indicated below:

Table 4.3: Major characteristics of the soils in the project area

Soil type	Soil description	remarks
eutric and vertic Fluvisols PrAj(e-v)	well drained, very deep, stratified cracking soils of varying color, consistence and texture, in places slightly calcareous and moderately sodic	Landform: river alluvial plains (slopes 0-2%) Parent material: recent alluvial deposits
Calcic Cambisols, sodic phase PtJbk	Moderately well drained to imperfectly drained, very deep, brown, very firm, strongly calcareous, moderately sodic, sandy loam, to silty clay loam	Landform: plains of river terraces (slopes 0-2%0 Paarent material: lagoonal sands and clays
Eutric Gleysols Sage	Imperctly drained, very deep, pinkish gray, mottled, friable, slit loam to clay	Landform: swamp Parent material: recent alluvial deposits
Complex of chromic Vertisols and eutric and vertic Fluvisols	Moderately well drained, very deep, brown, mottled, very firm, cracking silty clay Well drained to moderately well drained, very deep, stratified cracking soils of varying color, consistence and texture; in places moderately calcareous and sodic	Landform: river alluvial plains Parent material: recent alluvial deposits
Ferralic Arenosols	Somewhat excessively drained to well drained, very deep, red, loose to friable, sand to sandy loam; in places slightly calcareous	
Chromic Vertisols PrAvc	Moderately well drained to imperfectly drained, very deep, dark brown, mottled, very firm, cracking clay; in places slightly calcareous and moderately sodic	Landform: river alluvial plains Parent material: recent alluvial deposits

Figure 4.1: Soil map of the project area



4.2.8 Soil physical and chemical properties

The soil physical and chemical properties of the soils of the project area are documented in the soil study by Haskoning (1982) and in the Tana Delta Irrigation Project by Nippon Koei Ltd (1988). The prevailing soil types in the Project Area are Vertisols and Vertic Fluvisols. Their physical and chemical characteristics are as indicated below (various sources) and analytical data for top-soil composite samples taken during the feasibility study.

Moisture content

The soils are low lying and are usually wet during the rainy seasons, when the soils swell and water ponds. When dried up the soils start cracking and with time the soils dry out by their cracks. The moisture content when wet may be as high as 40% on volume basis.

Field capacity and wilting point

For an average vertic soil within the project area it is of interest to know the Available Moisture Content (AMC). That is the quantity of moisture between the FC (Field Capacity) and PWP (Permanent Wilting Point). The quantity of moisture (in situ) is calculated with help of the bulk density and the typical soil-water retention curve for vertic soils. The amount of available moisture ranges from 20 to 24 volume %. The amount of soil

moisture available to the plant without growth restriction is less and may range from 140 to 180 mm for a rooting depth of 100 cm of soil.

Bulk density

The typical vertic soils have a low bulk density in situ and ranges from 1.1 to 1.3 g/cm³.

Pore volume

Vertic soils are known for their great variation in pore volume depending on the degree of wetness.

Particle density

The particle density is 2.65 g/cm³ and the porosity can be calculated with help of the bulk density

Texture

Vertic soils are clay (smectite) soils and the soils within the Project area vary a great deal. However an average clay (< 0.002 mm) 60%; silt (between 0.002 and 0.05 mm) 25% and sand > 0.05 mm 15%.

Organic carbon

Most of the soils within the project have a appreciable amount of C, within the range of 4-6%, other places 10% (Walkley-Black). The contents depend very much on the season and the location.

Aggregate stability

The common practical way of showing the stability is taking a aggregate and letting it down in water. It just falls apart.

pH

The pH (in 1:2.5 soil: water suspension) varies considerably; from 6.0 to 8.0 in the subsoil.

Electric Conductivity

The E_c (in extract) under the conditions within the Project Area may vary in such a way that the top soils are all low in EC < 2 mS per cm. However there places whereby in the subsoil EC values may reach 6 mS per cm (slightly saline)

Hydraulic conductivity

When vertic soils are dry and heavily cracked, the hydraulic conductivity is high. However the relevancy is when the soils are wet. Then the conductivity is very slow.

Soil fertility

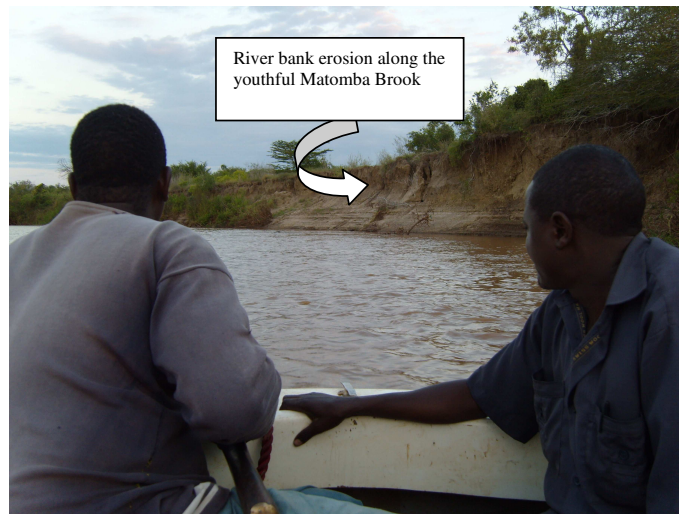
All vertic soils have a high degree of fertility; they are rich in P and K. The relevance for growing crops and in this case sugarcane is the quantity of N. Like in all cases of high yielding operations a good amount of N fertilizer is required. There are no symptoms of minor elements in deficiency. Any new plantation initially requires a good set of fertilizer experiments on the different type of soils for determining the correct fertilizer rates.

4.2.9 Status of soil erosion

Project activities which might promote soil erosion include activities associated with land development and preparation: these include land clearing, land levelling, land preparation, infrastructural development, and farming operations.

The area does not have a major problem with soil conservation since most of the terrain has gentle slopes. The most significant form of soil erosion in the area is river bank erosion (Divisional Agricultural Officer, September, 2007).

Figure 4.2: Riverbank erosion along the Matomba Brook



It can be expected that existing and proposed canals, dykes and drains are potential areas of soil erosion. The bulk of the soils of the project area are the “black cotton” soils or Vertisols, which have low infiltration and hydraulic conductivity rates when wet. Vertisols are highly susceptible to all forms of erosion, even on slopes of 5% or less may develop deep gullies in a very short period (Fitzpatrick, 1986). This means that erosion hazard exists even though the slopes are very gentle in the project area.

Good agricultural practices therefore that cover and bind the soil, such as the sugar cane cover, will be desirable.

4.2.10 Nutrient cycles and food chains

Commercial sugar cane is usually grown with high levels of inorganic fertilizers and relatively low pesticides inputs. Contamination of ground and surface waters is a major concern, particularly in areas with shallow water tables. For growth sugar cane requires optimum rates of nitrogen, phosphorus and potassium. The soils of the project area generally have adequate potassium. Only the application of nitrogen and phosphorus is therefore recommended. Vinasse from the Ethanol plant which contains nutrients will be returned to the cane fields.

Most common nitrogen and phosphorus fertilizers are very soluble and are designed for soils that can retain these nutrients. In the high moist areas, especially on sandy soils, these nutrients can be leached into the groundwater and washed into waterways, even after short periods (months and years, rather than decades). Nitrogen and phosphorus can remain dormant in the sediments of watercourses and estuaries until used as food for

algae when conditions are favorable. Nitrogen in a nitrate form can cause health problems when it accumulates in groundwater used for drinking. It may be particularly harmful to young children and has been known to combine with food to make cancer-forming compounds. Excessive use of phosphorus fertilizers has already contributed to eutrophication, algal blooms and proliferation of water hyacinth in lakes and rivers in East Africa. The algae and water hyacinth can create a range of problems to ecosystems and livelihoods. Economic impacts include damage to fisheries and lowering the value of real estate and tourism in affected areas.

4.2.11 Potential ecological problems due to increased soil erosion and siltation leading to decrease in stream capacity of the Tana River

Already the damming of the river upstream has reduced the river competence leading to siltation of the river bed in the lower parts. This is partly the reason why the river frequently breaches its banks causing river course changes and widespread flooding. Already the effects of upstream soil erosion are evidenced by large deposits on stream banks and raised river bed. Sound land management in both the nucleus estate and in the outgrower land as well will need to be observed to reduce the possibility of cumulative soil erosion impacts. At the same time, there will be need for the promotion of good land management practices upstream of the project area and indeed the entire watershed, to reduce the amount of soil load in the Tana River. The proposed regulation of the Matomba brook will have effects not only on water flow in the brook, but also on downstream areas such as the ox-bow lake at Moa and the Tana Delta itself. This action also has the potential to affect sediment to the delta with consequences on the habitats and biological life in this critical habitat.

4.2.12 Presence of project activities that cause pollutants to accumulate in the soil profile, air and water

Various agricultural inputs will be used in the production of sugar cane and livestock. These will include fertilizers, chemical ripeners, pesticides, and herbicides. Application methods and rates as well as the properties of the selected inputs are important to ensure that only products with minimal effects on humans and the environment are used.

There will also be a sugar processing plant with a 8,000 TCD crushing capacity. White sugar manufacturing comprises a number of distinct process steps each with its own inputs and outputs. The process steps are as described above.

Thus, it is expected that the sugar manufacturing process will lead to the generation of liquid and solid wastes as well as gaseous emissions.

Other industrial activities with potential to pollute the soil include co-generation of electricity from bagasse and agricultural residues, and the plant which will convert molasses from the factory to ethanol.

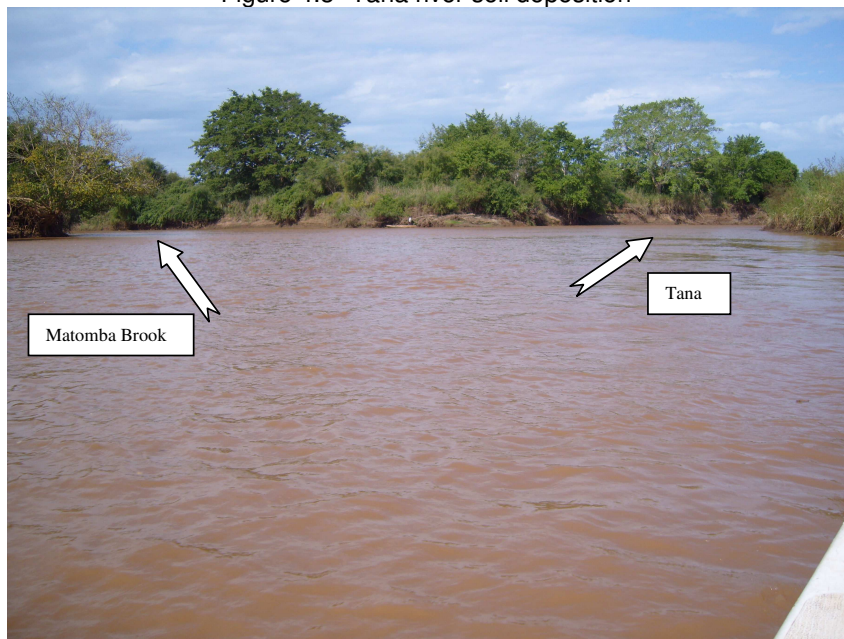
4.2.13 Alteration of the natural capacity of hydraulic regulation in river basins (flood levels, deposits) in the vicinity of the delta

The following activities have the potential to affect flood levels, the fresh water/marine water dynamics at the delta and deposition in the flood plain and delta:

- a. Cumulative soil erosion and deposition as a result of the project
- b. Regulation of Matomba Brook
- c. Construction of a dyke around most of the project perimeter

The soil load in the Tana River is considerable as evidenced by deposition layers in the flood plains and in the river bed itself. In several places, the river is so shallow that it is difficult to sail by a small motor boat.

Figure 4.3 Tana river soil deposition



The point where the Tana separates from Matomba Brook a few kilometers below Idsowe bridge. Matomba Brook seems to have more discharge than the Tana implying that the latter is at a higher level due to a raised river bed as a result of siltation

4.2.14 Agriculture, Pests and diseases

The main crops in the project area include maize, rice, mangoes (an important cash crop) and bananas. Other crops include cassava, greengrams, beans, peas, melons, cowpeas, papaws, tomatoes, kales, onions, cabbages and some sugar cane. The production of these crops is associated with the use of different farm inputs such as fertilizers (at the TARDA farm), pesticides and herbicides.

The major pests in the project area include: aphids (affecting vegetables and cowpeas), red spider mite (affecting greengrams and tomatoes), and cutworms (affecting all crops especially in the flood plains at planting time). Panama disease mainly affects bananas.

At the TDIP, the types of fertilizers, pesticides and herbicides used are indicated below. The pests and weeds found in the area are also given.

FERTILIZER	:	For TDIP Hewani Scheme	Urea 133.5 Kg/Ha Urea 50.0 Kg/Acre	Twice annually Twice annually
		Other farmers	No use of fertilizer	
PESTICIDES	:	Mainly used	Sumithion Queleatox on rice	
		Fungicide - Cercobin		
OTHERS	:	On horticulture	Karate, Thurude, Duduthrin, Buldock	
PESTS	:	Caseworm, Hispa Quelea Quelea, maize Stalk Borer, Early Blight, Late Blight, Anthracnose, Rust, Wilting.		
WEEDS	:	Black Jack, Nut Grass, Ipomoea Aquatica, Echnochloa Species, Cyperus species, Ludwigia octovalis, Monochoria vaginalis, Amaranthus Spinosus, Cyperus Rotmndus		
		HERBICIDES	:	Satunil
		Roundup mainly used at TDIP farm not the local farmers		

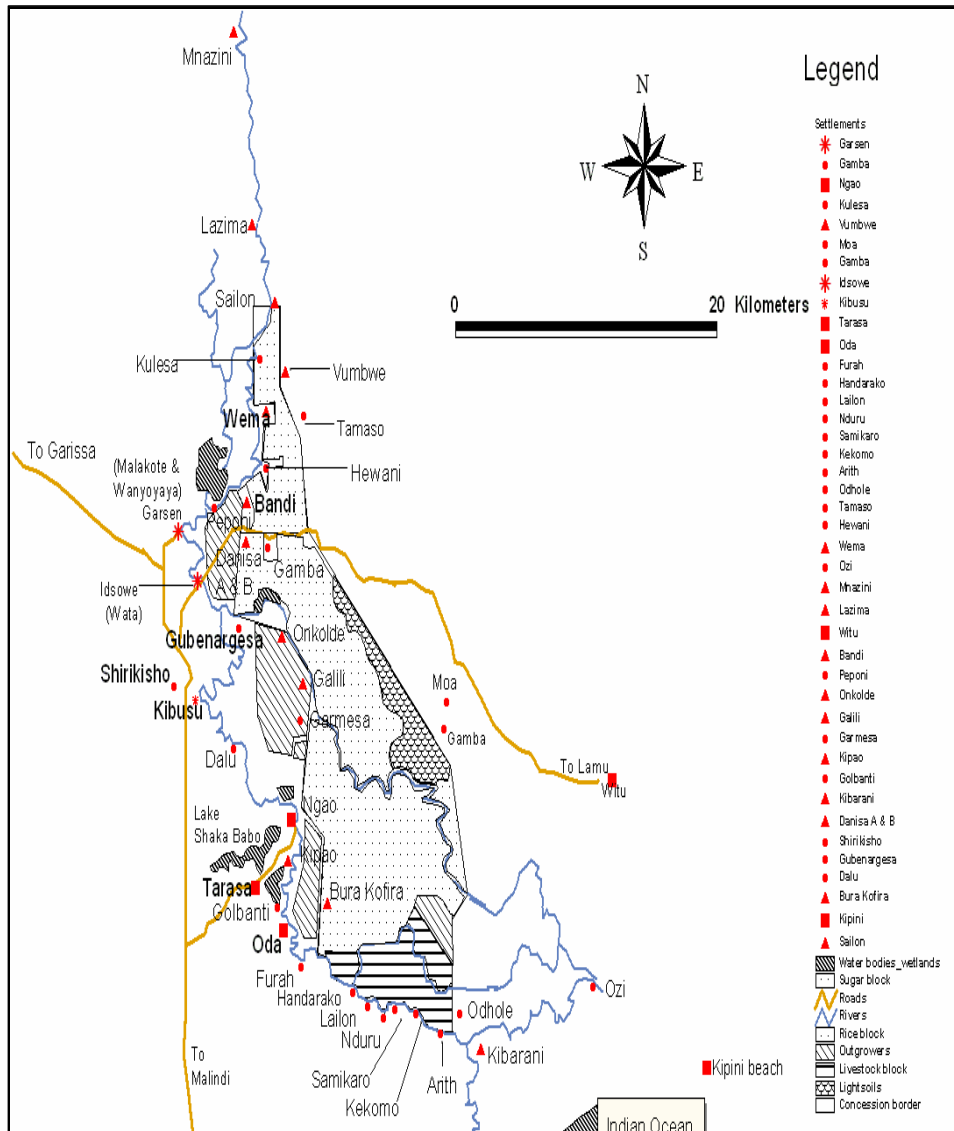
4.3 Social-economic environment

Tana River is one of the seven districts of Coast Provinces in Kenya. The area under the study covers a wider scope than the TARDA designated area. It stretches from Mnazini and Lazima villages in the North and to river estuary at Kipini in the South. The map below shows the villages covered and the area.

Tana River District has 43 locations and three constituencies. These constituencies are Bura Constituency, which covers, Bura, Madogo and Bangale Divisions; Galole Constituency covering Galore and Wenje Divisions and Garsen constituency covering Garsen, Tarasaa and Kipini Divisions. There is one Local Authority namely Tana River County Council.

The villages in the TISP area covered in the socio-economic survey are show in Fig. 4.4.

Fig. 4.4: Map of the TISP area covered by the socio-economic survey



4.3.1 Basic Socio-Economic Data

Table 4.4 below shows the basic socio-economic data for the whole of Tana River District.

Table 4.4: Basic socio-economic data for Tana River District

Number of public Primary Schools	122
Number of Private Schools	2
Number of Public Secondary Schools	1
Number of colleges and Universities	0
Enrolment in Primary Schools by Gender	Boys 16137 Girls 11627 Total 27764
Enrolment in Secondary Schools by Gender	Boys 1106 Girls 723 Total 1829
Enrolment in colleges and Universities by Gender	Not Computed
Number of Public/Private Hospitals	2(GOK, Hola/ Ngao), No private hospital
Number of Health clinics	5h/c (37 dispensaries, 9 registered clinics) Dispensaries; 25 GOK, 9 Mission, 3 Schools
Number of major rivers	No streams, but there are 4 seasonal rivers (Lagas)
Number of boreholes	27
Average distance to nearest source of water by household (km)	1.22km
Source of Domestic Energy (Fuel)	Firewood

Source: Poverty Reduction Strategy Paper (PRSP) 2000-2004

Tana River is one of the poorer Districts in Kenya and the above table demonstrates the need to provide more social facilities.

4.3.2 Population Characteristics

Distribution

Tana River district has an area of 38,466 km² with a projected population of 227,317 for the year 2007. The district's area is about 46.4% of the total area of Coast Province. Table 5 below presents the current administrative units, area, and projected population and density for Tana River district.

Table 4.5: Tana River District Profile

Division	No. locations	No. sub-locations	Area (km ²)	2006 projected population	Population density
Bangale	4	8	6,125	18,246	3
Madogo	4	8	1,836	26,695	15
Bura	4	9	4,834	35,438	7
Galole	11	22	9,100	42,932	5
Wenje	5	11	557	15,584	28
Garsen	7	16	11,412	45,369	4
Tarasaa	4	10	838	22,610	27
Kipini	4	8	715	15,354	21
Tsavo NP	-	-	3049	-	-
Total	43	92	384,466	222,228	5

Source: Kenya National Bureau of Statistics, Tana River District, 2006

Tarasaa is a new division with one of the highest population densities. Most of the TISP area lies within Garsen division which, with an area of 11,412 km², is the largest in Tana River District but with one of the lowest population densities.

The table below shows the population in the locations by sex, households, area and density;

Table 4.6: Population by sex, No. of Households, Area and Density

	Male	Female	Total	Households	Area in Sq. Kms	Density
GARSEN DIV.	25,990	25,602	51,592	10,000	12,123	4
Locations in Lower Tana Area						
NDERA	3,239	3,269	6,508	1,200	1,112	6
MWINA	2,380	2,124	4,504	786	467	10
SALAMA	2,108	2,059	4,167	725	96	43
BILISA	3,729	3,767	7,496	1,572	185	40
KIPAO	1,677	1,562	3,239	586	72	45
GALILI	3,667	3,790	7,457	1,437	152	49
SHIRIKISHO	2,877	2,796	5,673	1,296	285	20
NGAO	3,416	3,372	6,788	1,274	128	53
WACHU-ODA	2,344	2,289	4,633	887	511	9
Sub Total	25,437	25,028	50,465	9,763	3,008	3
KIPINI	3,115	3,081	6,196	1,178	297	21
KILELENGWANI	1,452	1,476	2,928	599	98	30
CHARA	1,900	1,845	3,745	632	127	29
Sub Total	6,467	6,402	12,869	2,409	522	5
Grand Total	57,894	57,032	114,926	22,172	15,653	7

Source: 1999 CBS population census.

The lower Tana region comprising of Garsen, Tarasaa and Kipini has an area of 12,966 km², a population of 83,333 and a population density of 5 persons per square kilometer⁴.

Lower Tana Communities

⁴This excludes parts of Tsavo National Park

The estimated total permanent population at the delta is 25,000 people of which 44% are Pokomos, 44% Ormas, 8% Wardei while other Ethnic groups account for the remaining 4%. The Wardei are a smaller group originating from Ethiopia who are also pastoralists. The Pokomo are mainly subsistence farmers who farm along the River Tana.

Other minority groups

These include the Wataa, (Sanyes), Malakote and Munyoyaya. Their way of life is close to that of pastoralists Orma and Wardei. They have diversified to mixed farming that involves:

- cultivation along the river
- bee keeping
- fishing
- trade/business

It should be noted that the area is home to other Kenyan ethnic groups. These include the Luos, Kambas, Taitas, Giriomas, and Kikuyus.

Education Levels of Respondents

The education levels of respondents from the survey are summarized below;

Table 4.7: Education Levels of the Respondents

<i>Education</i>	<i>Percentage (%)</i>
No education	41.80%
Primary Education	39.4%
Secondary Education	14.4%
College	4.4%
Total	100%

Source: Socio economic Survey Data

The 41.8% figure with no education shows that access to education is generally low in the area. Among the Pokomo 21% have no education and 38% among the Orma and 85% among the Wardei.

On Education levels by gender, the table below summarizes the respondents' levels by gender:

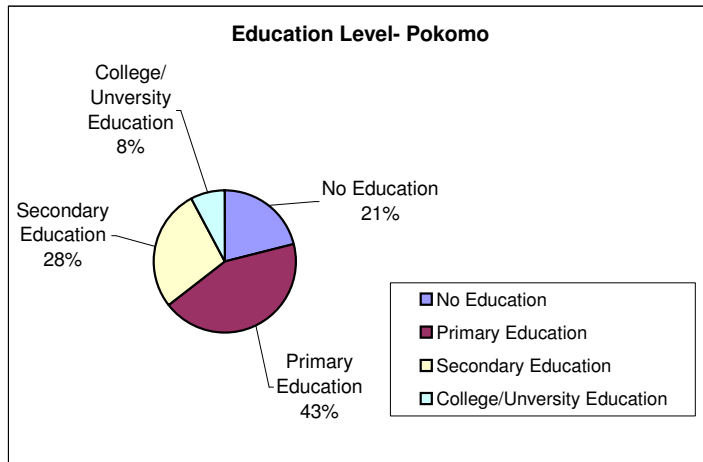
Table 4.8: Education Levels of Males and Females (household heads)

Education	Female	Male
No education	43%	35%
Primary Education	39%	42.77%
Secondary Education	14%	16.00%
College	4%	6.23%
Total	100%	100%

Source: Socio economic Survey Data

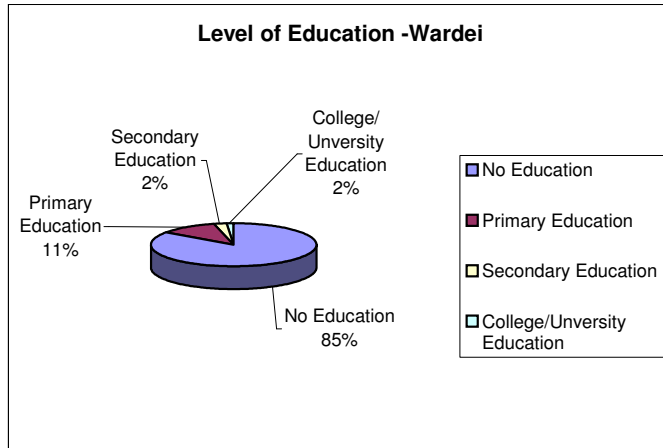
From the research a breakdown of education by ethnic group was established as shown in the pie charts below;

Figure 4.5: Education Level – Pokomo
 Source: Socio economic Survey Data



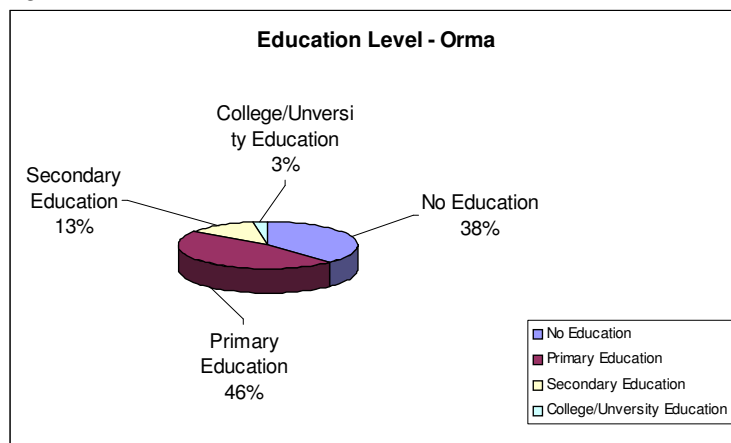
The Pokomos have a higher average level of education than the rest of the ethnic groups in the area. They however still have a few people who have never gone to school at all 21%. This shows that there is a very high probability of Pokomos embracing the project and being easily actively involved. Therefore the project have to put up a mechanism of ensuring that it balances the reaping of benefits.

Figure 4.6: Education Level –Wardei
 Source: Socio economic Survey Data



The Wardei have the lowest literacy levels 85% have no Education and only 11% have Primary Education. Although they are the lowest population wise they should be considered proportionately on any activities in the area.

Figure 4.7: Education Level – Orma



Source: Socio economic Survey Data

The Ormas have low literacy levels as shown in the diagram above but a least 46% have Primary Education. The indications are that the literacy levels in the area are low and there are many cases of the elderly people having no formal education especially among the Ormas and Wardeis. The level of literacy among women is also very low but it appears higher here because the women who answered our questions are usually the outgoing and they have gone to school. The illiterate ones who are the majority are very passive and shy with strangers.

Literacy levels dictate the uptake of any innovation of intervention. Therefore where literacy levels are low it is important that ways of using existing indigenous knowledge are sought. It also means that skills enhancements programme have to be an integral component of the project.

In general despite the free primary education school enrolment and attendance rates are poor especially among the pastoralists. This is due to long distances to schools, high pupil teacher ratio, limited resources to run schools, dilapidated incomplete buildings, gender disparities, lack of school feeding programme, early and forced marriages etc. It is important to note that these challenges have to be addressed with the communities affected before other intended corporate social responsibility structures are put up.

4.3.3 Average Household Size

The average household size as reported by the respondents in discussions was Orma 10.36 persons, Wardei 8.87 persons and Pokomos 6.52 persons. The table below shows the number of households and their population as reported by Assistant Chiefs and Elders.

Table 4.9: Number of Household in the Sampled Villages and Population

Village	Household	Population
1. Onkolde	130	680
2. Kibarani	105	407
3. Kipao	450	2,700
4. Bura Kofira	180	1,000
5. Galili	260	1,600
6. Danisa 'A' Orma	186	800
7. Danisa 'B' Wardei	176	750
8. Vumbwe	100	400
9. Lazima	71	614
10. Mnazini	450	2,500
11. Sailoni	140	1,000
12. Wema	375	2,280
13. Bandi	208	1,102

Source: Focus Group Discussions and Chiefs

Table 4.9: Special Groups

Village	Household	Population
1. Malakote	150	583
2. Wata	10	80
3. Wanyoyaya (Korokoro)	50	200

Source: Focus Group Discussions and Chiefs

The number of households and population size above shows an area with average population. The area also is characterized by a migratory population consisting of livestock herders who migrate to the lower plains during the drought months of January and February as reported by the community during focus group discussions. The young people have also left the area to look for employment in urban areas of Mombasa, Malindi and Nairobi and this has reduced the number of youth in the area. Despite all this the population has grown and only decreases during drought and floods.

4.3.4 Existing Skills among Pastoralists and Agriculturalists

Literacy levels in reference to agri-business were assessed in reference to existing skills as one of the ways of assessing literacy standards. Most of the skills in the area are mainly based on life-skills that improve livelihoods. Among the pastoralists the main skills reported that exist are herding and trading for men and for women it is mainly rearing the children and household chores like milking, fetching water and simple trading.

The above do not require literacy but there were also few cases of drivers and teachers. In FGD the community members reported that they would require skills in mechanics, artisans, nurses, teachers, etc. both for the proposed project and for use in their communities. The table below shows the skills analysis of Danisa 'B' and Wardei settlements representing the pastoral communities;

Table 4.11: Existing skills in the Project area (Danisa 'B' village)

DANISA 'B' VILLAGE				
Existing Skills			Required Skills/ Foreseen	
Provided by women	by	Provided by men	Skill	Availability

Management			Locally	Outside
-Milking	-herding	-mechanic	√	
-fetching water	-trading	Information officers		√
-Milking	-community work -Drivers -Madrassa teachers	Doctors		√
-Trading		Nurses		√
		Traders		√
Technological		Artisans for sugar	√	
Migratory Labour	-Herding			
-The women work force is not fully utilized in productive roles, they need to be empowered.				

Source: Focus Group Discussions

Table 4.12: Existing skills in the Project area (Onkolde village)

ONKOLDE VILLAGE				
Existing Skills		Required Skills/ Foreseen		
Provided by women	Provided by men	Skill	Availability	
Management			Locally	Outside
	-Teacher	-Professional teacher		√
	-Accountants	-Veterinary skills		√
	-Veterinary	-Nurses		√
		-Adult pre-primary teachers		√
Technological				
	-Driver	-Computer skills		√
	-Computer	-Mechanics		√
		-Engineers		√
		-Tailoring		√
		-Masonry		√
Migratory Labour	-Security e.g. police and Administration Police			

Source: Focus Group Discussions

The table above shows lack of technological skills especially among the pastoralists. Special preference needs to be given to them when planning for the future if they have to be integrated into the proposed project.

Among the agriculturalists, there are many existing skills reported as shown in the analysis of Wema village below;

Table 4.13: Existing Skills in the Project (Wema Village)

Existing Skills		Required Skills/ Foreseen		
Provided by women	Provided by men	Skill	Availability	
Management			Locally	Outside
- Community development	- Administration Chief	- Management	√	
- Nurses	- Teachers	- Agriculture	√	

- Teachers	- Nurses	- Livestock	√	
	- Veterinary Officers	- Mechanics	√	
	- Catechists	- Artisans	√	
	- Agricultural Specialists			
Technological				
	- Mechanics			
	- Carpenters			
	- Masons			
	- Electricians			
Migratory Labour				
- Nurses				
- Community workers	- Administrators			
-	- Teachers			
-	- Veterinary Officer			
-	- Hotel personnel			
Conclusion				
- Wema has high capacity of skilled personnel with many working outside Wema in other towns.				
- Others are trained but jobless and inexperienced				

Source: Focus Group Discussions

The agriculturalists reported that they have many skills, their biggest problem is unemployment. Those working outside the area were reported to be ready to come and work at home if the project will be successful.

The analysis shows that the area has a lot of youth who have no skills and for those that have they are limited to clerical, police and life skills. There are no technical skills except for those employed in the TARDA rice scheme earlier.

For the communities in the area to benefit in employment from the proposed project there will be need for training incorporating basic literacy, technical duties and managerial skills. For those trained there is need to re-orient them to the project at hand.

4.3.5 Literacy Level and Existing Skills in Reference to Agriculture

The literacy levels are low as stated in other sections of this report. Skills base in regard to agriculture and livestock is also low. All the groups reported that existing skills are trading, driving, madrassa teaching, nursing etc. These skills are among the educated and not the huge number of pastoralist and farmers. Therefore it is important to note that indigenous knowledge on herding, subsistence farming exists. This can be enhanced through the focused education in line with the NALEP approach in Kenya. This follows a focal area approach whereby the existing skills among men, women and youth on production of specific crops or livestock keeping practices are enhanced in total.

Primary schools, secondary schools and colleges are very few in this area as shown elsewhere in this report. This then confirms that literacy levels are low and hence impact poorly on development of agriculture skills.

4.3.6 Main Economic Activities

The main economic activities in the area are mainly centred on crop production for the agriculturalists and livestock keeping and herding for the pastoralists. There are also other cases of agro-pastoralism and the rest a small minority are in employment either

locally or outside the area. The respondents reported the main economic activities as shown in the table below;

Table 4.14: The Economic Activities of the Communities

Occupation	Percent (%)
Herdsmen (pastoralists)	38.9
Keeping livestock	8.3
Business man/woman	1.7
Farming and livestock	8.9
Farming	35.6
Employed	6.7
Total	100.0

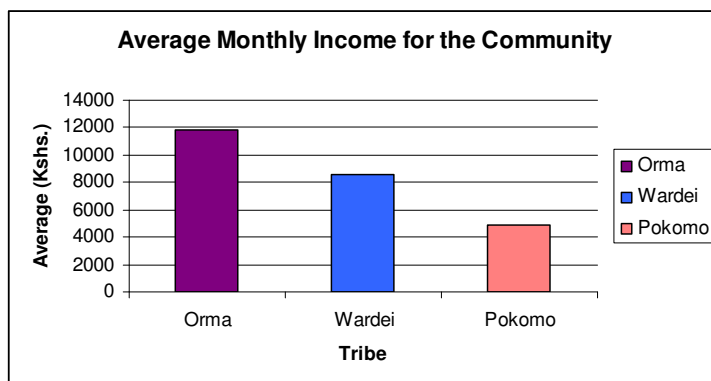
Source: Socio-economic Survey Data

To obtain the support of all the communities it will therefore be essential that the project community support activities focus on both agriculture and livestock improvement. Focusing on agriculture alone would alienate the pastoralists.

Monthly Household Incomes

Sources of family income were deduced from the earnings given by the respondents on daily or monthly basis. The average household monthly incomes are as shown below;

Figure 4.8: Average Monthly Household Incomes



Source: Socio economic Survey Data

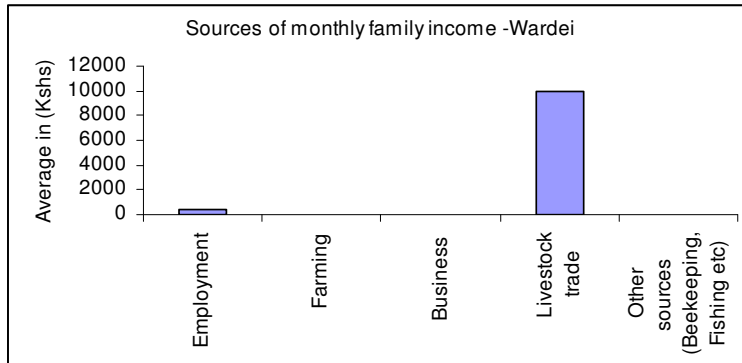
According to the average incomes shown above the Pokomo ethnic group have the lowest average income of roughly about KES 5,000, hence having a majority of the people living below the poverty line. The above figure shows that the Orma have higher monthly incomes this is because they trade with cattle whose unit prices are high unlike the agriculturalists whose returns are seasonal. Income figures however should be treated with caution because most respondents are reluctant to give actual figures.

The above clearly shows that Ormas are more economically stable than the Pokomos. Therefore economic uplifting of both communities needs to focus on their areas of strength for the Ormas and areas of weakness for the others.

Sources of Income

The sources of income for the people of Tana delta according to the respondents is farming, business, beekeeping etc as shown in the three figures below;

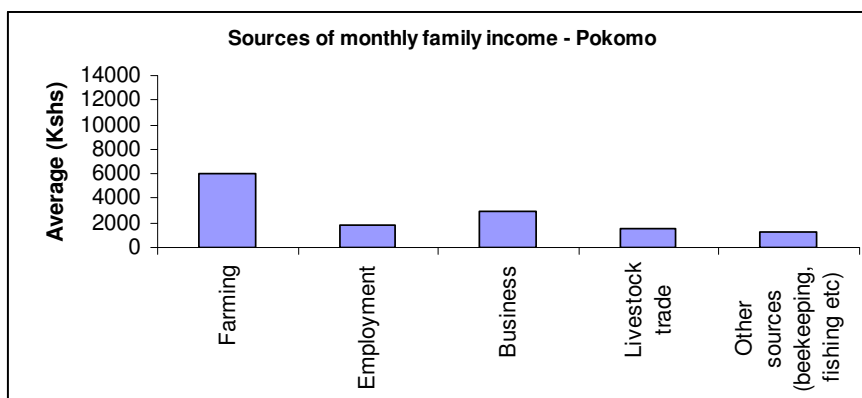
Figure 4.9: Sources of Monthly Family Income – Wardei



Source: Socio economic Survey Data

Figure 4.9 shows that employment as a source of income among the Wardei is non-existent. This has to be critically addressed in the new intervention together with their farming practices which are negligible but significant. They have to be made visible. The project therefore must not only focus on the traditional sources of income but facilitate also other small sources like business improvement, beekeeping etc. These IGA will help in diversifying basic source of income and catalyse poverty alleviation measures discussed in other sections of this report.

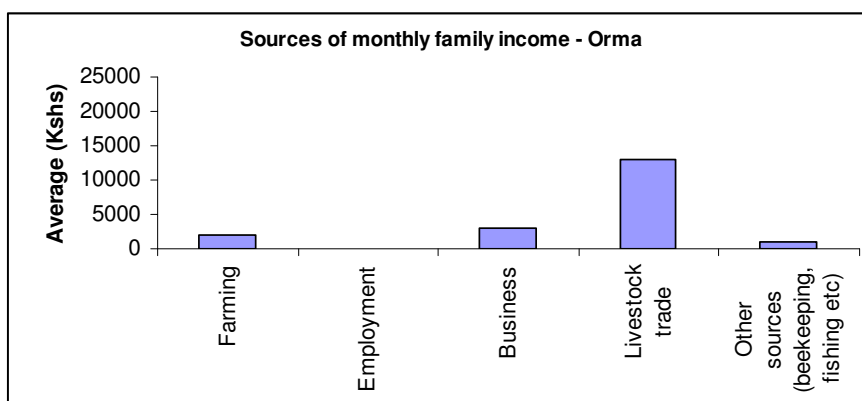
Figure 4.10: Sources of Monthly Family Income – Pokomo



Source: Socio economic Survey Data

The agriculturalists as seen above have diverse sources of income and these should be harnessed and strengthened where possible.

Figure 4.11: Sources of Monthly Family Income - Orma



Source: Socio economic Survey Data

A few pastoralists among the Ormas have adapted to farming as a source of family income as shown above. Therefore the farming section of Ormas can also participate in agricultural activities since this will not call for a total re-orientation, it will be a continuation of a practice that they have already adopted.

4.3.8 Household Expenditure Patterns

To understand the household expenditure patterns the respondents gave the amounts they spend per day and the results are analysed in on the next page:

Table 15: Average monthly household expenditures (all Ethnic groups) and percentages

Expenditure items	Average amount (Kshs.) per month	Percentage (%)	Average Household expenditure (Kshs.) per year
Household e.g. paraffin, food etc	1,859	30.85 %	10,326
School fees	1,340	22.24%	7,443
Uniform	584	9.10%	3,245
Clothes	835	13.85%	4,637
Medical	459	7.71%	2,549
Transport	506	8.39%	2,810
Water	68	1.13%	0,379
Other e.g. livestock drugs,	411	6.82%	2,281
Total expenditure (Kshs.) per month	6,025		33,670

Source: Focus Group Discussions

From the table above it is clear that the highest expenditure from all household goes to food items followed by school fees, clothing and school uniform in that order. The cost of livestock drugs 6.8% is also significant among the pastoralists. The 1.1% on water is the amount levied from the community for using dams and pans.

To further analyze household expenditure patterns analysis was done using the ethnic groupings as shown on the next page:

Table 4.16: Household Expenditure -Orma

Expenditure items	Average amount (Kshs.) per month	Percentage (%)	Average expenditure (Kshs.) per year
Household e.g. paraffin, food etc	1,504	26.45%	22,306
School fees	903	15.88%	16,078
Uniform	612	10.77%	6,577
Clothes	1,009	17.766%	10,018
Medical	488	8.6%	5,506
Transport	642	11.3%	6,070
Water	94	1.6%	820
Other e.g. livestock drugs,	430	7.6%	4,929
Total expenditure (Kshs.) per month	5,682		72,304

Source: Focus Group Discussions

The average expenditure per month among the Orma is about Ksh. 5,700 The main expenditure per month as shown above is mainly on clothing, education and food which takes a lot of money. They spend 7% on livestock drugs. This means that this is the only money that they spend on to support their productive activities which means that there has been very little or no change in production. Therefore the Project has to focus in increasing productivity in livestock keeping.

Table 4.17: Household Expenditure -Wardei

Expenditure items	Average amount (Kshs.) per month	Percentage (%)	Average expenditure (Kshs.) per year
-------------------	----------------------------------	----------------	--------------------------------------

Household e.g. paraffin, food etc	579	17.05%	6,948
School fees	67	1.96%	804
Uniform	76	2.23%	912
Clothes	920	27.10%	11,040
Medical	630	18.56%	7,560
Transport	117	3.44%	1,400
Water	0	0%	0
Other e.g. livestock drugs,	1006	29.64%	12,072
Total expenditure (Kshs.) per month	3,394		40,736

Source: Focus Group Discussions

The average expenditure per month among the Wardei was Kshs.3,394. It is worth noting that a Wardei household uses more money per month Ksh.1,006 for livestock drugs than what they use for food Ksh.578. It should be noted that they get a lot of relief food. The monthly medical bill is also reasonably high at Ksh.630 per household. This could be due to the nature of livestock keeping skills among them.

Table 4.18: Household Expenditure -Pokomo

Expenditure items	Average amount (Kshs.) per month	Percentage (%)	Average expenditure (Kshs.) per year
Household e.g. paraffin, food etc	3,529	47.54%	4,234
School fees	1,685	22.70%	20,218
Uniform	472	6.36%	5,660
Clothes	626	8.44%	7,512
Medical	361	4.87%	4,335
Transport	525	7.08%	6,305
Water	70	0.9%	840
Other e.g. livestock drugs,	153	2.06%	1,838
Total expenditure (Kshs.) per month	7,421		89,052

Source: Focus Group Discussions

The average expenditure per month among the Pokomo is Kshs.7,421. Their expenditure is higher on food items, followed by school fees, clothes and transport in that order. The household budget is high on food because of the essential items like salt, oil, sugar and paraffin which they have to buy. Where they grow food, the yields are usually low and this means that they have to supplement by buying foods such as maize, beans and rice. For the pastoralists they buy all the food items except meat and milk products. They however get food supplements from the government and other relief agencies.

4.3.10 Wealth Ranking

Wealth ranking was used to measure who the members of the community perceive to be poor, rich or in the middle. The perception of wealth differs among the pastoralists and agriculturalists and so does their way of life. Among the agriculturalist wealth is measured

in terms of housing, education and sources of income and size and types of farm as shown in the table below;

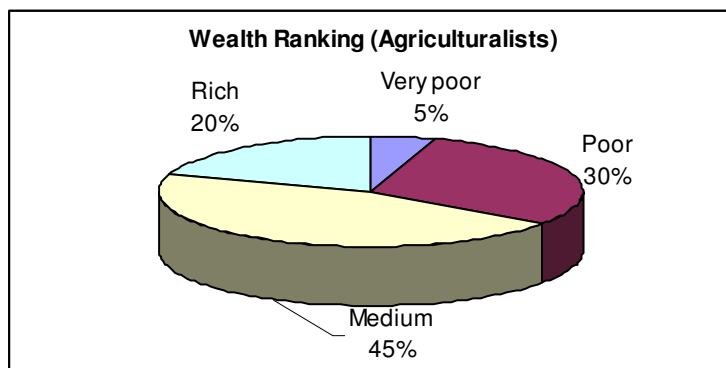
Table 4.19: Agriculturalists wealth ranking results

Very Poor	Poor	Medium	Rich
5%	30%	45%	20%
- Squatter	- Owns grass thatched House	- Owns a semi permanent house	- High yield of paw paw
- Children don't go to school.	- Not employed	- Employed	- Owns a permanent house
- Children infested with Jiggers	- Gets low yields from Farm	- Peasant farmers	- Owns a vehicle
- Wears tattered clothes	- Owns a small piece of Land	- Children attends School	- Children attends good boarding school
- Cannot afford 3 meals per day			- Has more than 10 acres of land
- Works on other people's land to earn a living			- Has a business

Source: Focus Group Discussions

According to the agricultural community the breakdown of the percentages of the people who are wealthy in their community is as shown in the figure below;

Figure 4.12: Wealth Ranking (Agriculturalists)



Source: Socio-economic Data

As indicated in the above figure 30% of the farmers are poor while poorest are 5%. The medium households are the majority rated at 45%. Therefore during project implementation the very poor and poor must be given a chance to participate and benefit from the project at all levels. The majority medium level families have also to be given an opportunity through balance to that of the poor households.

Among the pastoralists wealth is measured by the number of cattle and wives one has. Due to the large herds of cattle in the area, they consider themselves wealthy as shown below;

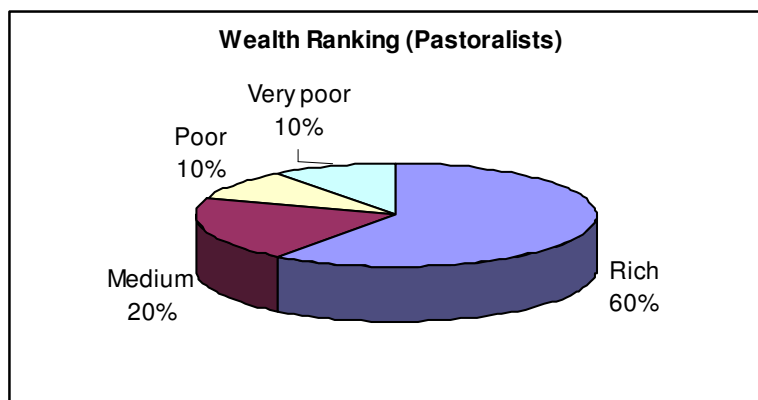
Table 4.20: Pastoralists wealth ranking results

Very Poor	Poor	Medium	Rich
10%	10%	20%	60%
- Cattle (1-5)	- Cattle (more than 20)	- Cattle (1000)	- Cattle (2000)
- Goats and sheep (50)	- Goats and Sheep (100)	- Goats and sheep (800)	- Goats and sheep (1600)
- Donkey (none)	- Donkey none	- Donkeys (5)	- Donkeys (10)
- Wives (1-2)	- Wife (1)	- Wives (2-3)	- Wives (4)
- Children (5-10)	- Children (5)	- Children (15)	- Children (20)

Source: Focus Group Discussions

According to the pastoral community the breakdown of the percentages of the people who are wealthy in their community is as follows;

Figure 4.13: Wealth Ranking (Pastoralists)



Source: Socio-economic Data

There is a high percentage of wealthy pastoralists than agriculturalists. These shows that the majority of the pastoralist will value their present source of livelihood more than a new project. However the poor pastoralists will welcome the project as a way of changing their lives. Therefore it is recommended that the poor pastoralists be sought after and enabled to participate in the project, without neglecting their pastoral sources.

Assets Acquired in the Last One Year

This analysis helps to understand the trends in acquisition of assets and what they consider to be important assets.

Table 4.21: Assets acquired within last three years

Assets acquired	Ethnic group of Community Members			Total and percent (%)
	Orma	Wardei	Pokomo	
Bicycle or radio	53	28	30	61.67%
Goats	8	2	0	5.55%
Had them all before	6	0	0	3.33%
House	2	0	0	1.11%
Beehives	0	0	25	13.88%
None	6	0	20	14.44%
Total	75	30	75	100%

Source: Focus Group Discussions

Table 4.10 shows that 61.67% bought bicycles and radios which are about Ksh.4, 000 and Ksh.800 respectively. This shows that their spending habits are limited on items of leisure. Investments in productive assets were found only in beehives and household goods. This shows that the people do not have funds to invest in tangible assets. Therefore their ability to acquire new assets or seedlings has to be considered as low in the project. Therefore ways of encouraging contribution in kind have to be created, so as to increase their capacity to acquire more tangible assets.

4.3.11 Resource Analysis

During the interviews and focus group discussions the respondents listed what they thought are the most important natural resources in the area. All the villages without exception quoted the River Tana as a major resource for agriculture, food, livestock and

all their livelihoods. Other resources quoted are trees, land, goats, poultry, and beehives mainly by agriculturalists. The pastoralists quoted pasture, wild fruits, cows, wildlife, livestock, forest and medicinal trees and shrubs. The table below shows the resources of three villages in the area, their current state, use, control, perceived problem and solution.

Table 4.22: Village Resources for Lazima Village (Pokomo)

Type of Resource	Current State	Use	Control	Perceived Problem	Perceived Solution
- School Primary	- Operational	- Learning	- School Committees	- No public library	- Library services needed
- Land	- Arable	- Agricultural	- Individuals	- Risk of crossing River Tana	- Building a bridge across River Tana
- Boreholes (2)	- Clean water	- Water for domestic use	- Community	- Leaking boats used for crossing River Tana	- from Ngumu to Lazima
- River Tana	- Contaminated		- TARDA	- Excreta disposal in the bush	- Purchase new boats
- Boats	- Poor conditions	- Crossing over River Tana	- Community	- Lack of medical care in the village	- Construction of toilets
					- Construction of a health facility in the village

Source: Focus Group Discussions

Table4.23: Village Resources for Danisa 'B' Village (Wardei)

Type of Resource	Current State	Use	Control	Perceived Problem	Perceived Solution
- Cows	- Operational	- Minimal agriculture	- School Committees	- Conflict between the others and Wardei over grazing land. - Conflict over uses of the river - Contaminated water in the dams - Low education standards. - Lack of nursery school teachers	- Peace meetings needed - Communities to respect and elders should resolve all the issues - Compensation and building of bridges. - Fencing of the dam sites - Employment of more teachers
- Land	- Virgin - Fertile	- Agricultural	- Individuals		
- Goats		- Milk - Skins - Hides. - Butter	- Family		
- Sheep					
- Primary school - Chiefs office - Nursery. - River Tana - Dams - Boreholes	- Poor state - Poor state. - Burst bank - Salty water	- Crossing over River Tana	- Community		

Source: Focus Group Discussions

Table 4.24: Village Resources for Kibarani Village (Orma)

Type of Resource	Current State	Use	Control	Perceived Problem	Perceived Solution
Fish	Plenty		Community	- Wildlife attacks and loss of farm produce - Crocodile attack on livestock - Poor levels of education	- Loss of life and no compensation - KWS to protect people by restraining wildlife - Hire teachers for the primary school
Wildlife	Plenty		KWS		
Forest	Plenty		Ministry		
Land	Plenty		Committee		
Honey	Little		Women		
River	Plenty		Community		
Livestock	Plenty		Men		
Primary school	Average		Needs more teachers		

Source: Focus Group Discussions

The results above show that the respondents in the area are aware of the potential of the natural resources found in the area. Their only concern is the depleting resources e.g. pasture and wildlife and also the frequent bursting of the River Tana banks. Therefore it is important that the planned project interventions incorporate the conservation of the natural resources, which are useful to all the communities.

4.3.12 Institutional Analysis

According to the respondents there are several institutions working in the area. They are summarized below:

4 Table 4.25: Institutional Analysis

NGOS	GOVERNMENT DEPARTMENTS AND PARASTATALS	COMMUNITY BASED ORGANIZATIONS
WORLD VISION	ASAL PROGRAMME	AFRICAN MUSLIM AGENCY
CRS	TARDA	MOSQUE
RED CROSS	KWS	SUPKEM
KWAHO	SCHOOLS	COUNCIL OF IMAMS
OXFAM	KARI	CHURCH GROUPS
ACTION AID	AFC	
KWS	KEMRI	
FOREST CONSERVATION	MUMIAS SUGAR	
AMREF	MIN OF AGRICULTURE	
RED CRESCENT	CDTF	
NCCK	COUNTY COUNCIL	
GTZ	COAST WATER SERVICES BOARD	
ICIPE		
WFP		
BAMA KO		
GOLBNI ADP		
YWCA		
KWFT		

Source: Focus Group Discussions

Most of the NGOs and government departments mentioned above although working in the area operate from outside and only come to visit when they are working. It is only the Community Based Organizations (CBO) and the Churches that are found at grass-root level. Therefore for the NGOs working in the area there is need to develop a strategy to encourage and develop societal structures that enable the communities to change. These will also be essential in resolving disputes and managing conflicts.

The CBOs which exist in the area need to be fully developed so as to be able to steer development in the villages. They are the best vehicles for mobilizing communities and organizing possible civil society institutions.

4.3.13 Livelihood Analysis

The focus groups identified the things they are sufficient in and what they need from outside their community. The agriculturalists grow food and yet it is not sufficient for their needs. Other services like banks, post office and market are also outside the area. The table below shows the livelihoods analysis results report from Mnazini village.

Table 4.26: Mnazini Village (Pokomo)

Partially Self Sufficient	Sufficiency	Outside the community insufficiency	Perceived Problems	Perceived Solutions
- Water	- Firewood	- Postal services	- Minimal water for irrigation - Lack of dam to check floods	- TARDA to open channels - Tana River to return to its original course - Construction of dams
- Food	- Charcoal	- Banking services		
- Land (Agriculture)		- Bridge construction		
		- Mnazini village and Junction		
		- Dam		

Source: Focus Group Discussions

The sufficiency of firewood and charcoal in the table above is worth noting since it shows there is forest degradation through charcoal burning. As the Project will create new job opportunities and sources of income, this will reduce the need to produce and sell charcoal and therefore could reduce the forest degradation.

Table 4.27: Danisa 'B' Village (Wardei)

Partially Self Sufficient	Sufficiency	Outside the community insufficiency	Perceived Problems	Perceived Solutions
- Boreholes	- Milk	- Grazing land	- Poor markets for the local products. - Poor transportation - Poor farming methods.	- Construction of the market. - Good prices for farm produce - Improvement of the roads - Introduction of modern farming methods
- Tobacco	- Meat	- Building poles		
- Maize	- Honey	- Ruffia		
- Rice	- Firewood	- Herbal medicines		
- Bananas	- Fish	- Clothes		
	- Wild fruits			
	- Thatching grass			

Source: Focus Group Discussions

The pastoralists do not have sufficient grazing lands and their food is not enough as shown in the table above. However they are self sufficient in animal products. Consequently there is a need to develop/improve the pastures (e.g. remove the mathenge) so that the grazing productivity can be enhanced.

4.3.14 Water Resources Utilization

Types of Water Sources and their Uses

The respondents reported the water sources in the area are as shown in the table 26 on the next page:

Table 4.28: Types of water sources

Water Sources	Percentage (%)
Tana River	63.9%
Other Streams	1.7%
Ponds/pans	11.0%
Springs	0.3%
Wells/ boreholes	18%
Roof catchment	4%
Mixture of all	0.9%
Total	100%

Source: Socio economic Survey Data

The Tana River is the major source of water. Water is utilized for all socio-economic activities i.e. domestic, irrigation, livestock, fishing, etc. There are several dams situated in the pastoralists' areas which have been constructed by Arid Lands and Drought Recovery and National Water Corporation for the watering of livestock and they are mainly far from River Tana. Roof catchments, boreholes and ponds are also used for drinking, cooking and washing. The River Tana is also used for leisure canoeing in some sections but this is mainly combined with fishing. Therefore River Tana is highly valued by all the members of the community. Utilization of this water should therefore not deny the people equal use. The plans for utilization should also consider peoples and livestock watering points.

4.3.15 Waste Disposal, Sanitation

The waste disposal methods in the area are poor or non-existent as shown in the table below;

Table4.29: Refuse Disposal Methods

Method of disposal	Percent (%)
Thrown in the garden	74.4
Rubbish pits	14.4
Burning	11.1
Total	100.0

Source: Socio economic Survey Data

The disposal methods are lacking as can be seen that 74.4% throw the rubbish about and only 14.4% and 11.1% throw in rubbish pits or burn accordingly. Therefore environmental sanitation should be a component in the project.

Existing Sanitary Facilities

The table below indicates that the project area communities have yet to have sound sanitary facilities. Currently over 80% of the household do not have pit latrines and they use the bush.

Table 4.30: Sanitary Facilities Present

Type of sanitary facility used	Percent (%)
Pit latrines	20.0
Bush	80.0
Total	100.0

Source: Socio economic Survey Data

The above scenario shows that there is an urgent need for Participatory Hygiene and Sanitation Transformation training in the area.

This is very important considering that refuse and sanitary needs will increase with the introduction of the proposed project.

4.3.16 Energy Uses and Sources

The main sources of energy in the area are mainly firewood, charcoal and kerosene. There are two homes that reported to be using solar and the generator in Gamba TARDA as shown below.

Table 4.31: Energy uses and sources

Existing source of energy	Energy Uses	Where its obtained from	Current problems	Future problems	Solution
- Firewood	- Cooking and warming	- Bushes - Forests	- Depleting forest	- Deforestation	- Reforestation
- Charcoal	- Cooking and warming	- Bushes - Forests	- Insecurity - Rape - Wildlife attack KWS patrols	- Deforestation - Wind erosion	- Reforestation
- Paraffin	- Cooking and lighting	- Purchase from shops			- Lower prices of fuel
- Solar	- Lighting	- Solar (sun) through solar panes	- Stealing of solar panels	- Expensive high maintaining costs - Unreliable rainy Seasons	- Low costs - Electricity way forward
- Cow-dung	- Cooking	- Open fields	- Smoke	- Smoke	- Alternative clean source of energy
- Generators	- Lighting	- Purchased from shops	- Running costs and maintenance	- Running costs and maintenance	- Alternative cheap and low cost source of energy

Source: Focus Group Discussions

The urban centre of Garsen has electricity but it is mainly used for lighting. The households interviewed are getting worried of the growing scarcity of firewood and charcoal due to deforestation, therefore there will be a need to address the issue of alternative sources of energy i.e. solar power or crop based fuel e.g. Jatropha.

4.3.167 Housing

Types of houses

Majority of the houses 70% are temporary, 28.9% are semi-permanent and permanent are only 0.6%. The semi permanent houses are mainly among the agriculturalists who build their houses with mud walls and corrugated iron roofs. The pastoralists both Wardei and Orma live in structures made of thatch on the roof and poles on the side and they are uniform in all the villages, hence the big percentage on temporary structures.

The housing structures are such that they are easily dismantled for relocation although they reported that these days, they rarely move except during floods.

After the sugar project takes off it is anticipated that housing structures will become more permanent. However they all have fears of relocation/resettlement to create space for the factory. The type of housing in the area is shown in the table on the next page:

Table 4.32: Type of Housing

Type of housing	Frequency	Percent (%)
Permanent	1	.6
Semi permanent	52	28.9
Temporary	127	70.6
Total	180	100.0

Source: Socio economic Survey Data

Among the pastoralists the houses are all similar hence not an indication of wealth but shelter. Therefore in case of any relocation there will be a need to first map/document the types of existing house structures in order to determine compensation.

4.3.18 Infrastructure

Infrastructure in the project area is poor. The only tarmac road that transects the area is the Malindi-Lamu Road. The access roads to the settlement areas are very poor having been destroyed by floods. The road to Ngao and Tarasaa is an all weather road. The area in the formerly designated rice project area had access roads which are totally broken down and in very poor conditions. Access to most villages in the area is through paths and 98% said their villages are only accessible by foot throughout the year. The household survey showed that only 2.8% of households had electricity. Telecommunication is mainly accessible through the mobile telephones as 66% had mobile phones.

4.3.19 Occurrence of human diseases

The causes of diseases and its occurrence in the project area were outlined by the respondents through discussions and questionnaires. The most prevalently reported disease was eye infections reported by 81.7% followed by malaria 40.6%, diarrhoea 16.7%, respiratory diseases 16.1%, bilharzias 8.3% and the rest as shown in table below:

Table 4.33: Most common diseases in the project area

• Typhoid	3.9%
• Diarrhoea	16.7%
• Vomiting	-
• Eye infection	81.7%
• Kwashiorkor	

• Malaria	40.6%
• Jiggers	-
• Bilharzia	8.3%
• Tuberculosis	0.6%
• HIV/AIDS	0.6%
• Skin diseases	3.9%
• Ulcers	2.8%
• Respiratory diseases	16.1%
• Anaemia	7.2%
• Cholera	5.6%
• Measles	1.1%

Source: Socio Economic Survey Data

*Multiple responses were allowed.

The respondents reported that the diseases were as a result of using unsafe water, human contact with the river, existence of breeding ground for mosquitoes and inadequate sanitation services.

All liquid waste disposal, combined with bathing, watering of livestock, washing of clothes and utensils all end up in the Tana River and this poses severe contamination and spread of water borne diseases. Therefore although many villages needs included dispensary, or staffing of the existing facilities, it is important that issues of hygiene and sanitation be given priority in the project either through capacity building or provision of sanitation demonstration facilities in strategic places like market places and schools. The existing dispensaries should also be equipped and expanded to serve as public health awareness campaign centres for the community. The above scenario also shows that health and sanitation practices are low and to understand the situation further views were collected and collated as demonstrated ahead.

To also capture health and sanitation practices a checklist of sanitation and health behaviour as reported by the communities is shown below;

Table 4.34: Average Health and Sanitation Assessment results for a Pastoralist Village

Expected Behaviour	Rating Conformity			Issues	Possible Solution
	Low	Medium	High		
HYGIENE					
Use of clean containers		√		- Water not covered	- Provision of containers
Covering water containers		√		- Not washing Utensils	- Observe high standards of hygiene
Boiling water before drinking	√			- Contaminated water	- Treat drinking water
Filtering water before drinking	√			- Use of contaminated water	- Observe high standards of hygiene-provision of filtering equipment.
Upkeep of compounds and houses		√			
SANITATION					
Solid waste disposal		√		- Waste is scattered	- Burn waste

Expected Behaviour	Rating Conformity			Issues	Possible Solution
	Low	Medium	High		
Excreta disposal methods	√			- No use of latrines	- Latrine construction
Latrines at household level	√				- Construction of latrines
Type of latrines	√			- Use of bush	- Construction of latrines
Disposal of children excreta	√			- Poor disposal	
Cleaning of latrines	√	√		- Poorly kept	- Training on good latrine Keeping
Washing hands after using the latrine	√		√		
NUTRITION					
Protein intake			√	- This is high due to milk and meat	- Continue encouraging people to take milk and meat and fruits
Carbohydrates		√	√		
Vitamins	√		√		
OCCURRENCE OF DISEASES					
Typhoid			√	- Contaminated Water	- Boil water and treat before drinking
Diarrhoea			√	- Contaminated water	- Protect the water points
Vomiting	√			- Contaminated water	
Eye infection	√			- Dirty households	
Kwashiorkor	√			- Poor nutrition	
Malaria			√	- Not using nets	- Use mosquito nets
OTHERS					
TB			√	- Taking raw milk	- Boil milk.
HIV/AIDS	√				

Source: Focus Group Discussions

The standards of health and sanitation coverage among the pastoralists are very low due to lack of awareness creation on safe hygiene practices.

Therefore awareness creation on hygiene and sanitation practices should be given priority in the project areas especially among pastoralists. The approach to sanitation and hygiene practices should use a participatory method as shown above so that the community comes up with in-bred solutions that will take care of cultural myths and beliefs.

The table below shows the health and sanitation assessment among the agriculturalists whose behaviour differs with that of pastoralists;

Table 4.35: Average Health and Sanitation Assessment results for an Agriculturalist Village

Expected Behaviour	Rating Conformity	Issues	Possible Solution
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	Low	Medium	High		
HYGIENE					
Use of clean containers		√			- Drink clean treated water
Covering water containers		√			
Boiling water before drinking	√			- Drinking direct from Boreholes	
Filtering water before drinking	√				
Upkeep of compounds and houses		√		- Mosquitoes - High cases of malaria	- Draining stagnant water - Cut tall grass
SANITATION					
Solid waste disposal		√			
Excreta disposal methods	√			- Disposal in bushes	- Sanitation service levels is low
Latrines at household level		√		- Poorly constructed Toilets	- Building VIP latrines
Type of latrines	√			- Traditional pit latrines	
Disposal of children excreta	√			- Use of jembes to dig holes for excreta disposal	
Cleaning of latrines	√			- Poor cleaning of the few latrines - Poor ventilation of the latrines	
Washing hands after using the latrine		√			
NUTRITION					
Protein intake		√		- Cases of kwashiorkor - Scarcity of milk	- Provision of foods rich in proteins: fish, beans, milk
Carbohydrates			√		
Vitamins			√		
OCCURRENCE OF DISEASES					
Typhoid			√	- Eating uncooked food	- Observe hygiene rules
Diarrhoea			√	- Drinking untreated water - Leaving food Uncovered	- Eat well cooked food, if raw clean thoroughly - Wash hands before and after meals
Vomiting					
Eye infection		√			

Expected Behaviour	Rating Conformity			Issues	Possible Solution
	Low	Medium	High		
Kwashiorkor	√				
Malaria			√		
OTHERS			√		
Jiggers					
HIV/AIDS	√				
TB					

Source: Focus Group Discussions

The above results were reported by the community members themselves after lengthy discussions. The health and sanitation practices among the agriculturalists are relatively higher than pastoralists. These results furthermore show that the actual health and sanitation situation in the area is low and it should be an integral part of any improvement in the area. The Participatory Health and Sanitation Training for Transformation has to be introduced to take care of this.

4.3.20 Health facilities in the Area

Health services are mainly obtained from the District Hospitals in Garsen and Witu. There are also dispensaries in Gamba, Idsoe and the Wema Catholic Mission although it was found closed during the study. There are other dispensaries in Ngao and Tarasaa but they were reported to be short of medical personnel. 6% of the respondents supplement their medical needs through traditional herbs sourced from the forests and the river bed. Another 5% combined hospital drugs and herbs. Private clinics and laboratories are also found in Garsen and other urban centres but are way out of reach for the poor community due to high charges. The community was hopeful that the proposed project is going to impact positively on their health issues through training, services and awareness creation as shown in the table below;

Table 4.36: Health benefits of the Project

Health benefits	Percent (%)	Cumulative Percent (%)
improved health services and facility	25.0	25.0
clean surrounding environment	17.8	42.8
building of pit latrines will reduce water borne diseases	41.1	83.9
increased HIV awareness through VCT will reduce disease spread	9.4	93.3
increased boreholes to provide clean water	6.7	100.0
Total	100.0	

Source: Socio-economic Survey Data

Improved health facilities and a clean environment are real needs for the people in the project area. Therefore a health intervention needs to be part of the project components and it is not necessarily building of structures, but a component that will take advantage of existing facilities.

4.3.21 HIV/AIDS

HIV/AIDS and TB were reported to be prevalent in small numbers but only after prodding where it is reported that the affected get sick elsewhere and only come to the villages to die. However it was reported that the cases of HIV/AIDS are increasing within the urban centres. HIV/AIDS awareness among most of the community members (97%) was evident. However, the VCT facilities are far and wide and they are only in the government hospitals in Gamba, Ngao, Garsen, Kipini and Witu, and since the infrastructure is challenging they are not fully utilized. Therefore there is need for more sensitization on HIV/AIDS occurrence and provision of VCT services closer to the people.

Views on HIV/AIDS Occurrence

Most women have heard about HIV/AIDS but have not seen infected persons in the community. Men said that they have heard of the disease and some have seen infected persons but not in their location.

The respondents reported that their major information sources is through the radio KBC mostly and Citizen and from this they could identify a few signs of HIV/AIDS infected persons. Some men admitted that they had seen protective items like condoms in their nearby health centre but they have not used them because their religion does not allow. They said that they instead opted to stay faithful. Most community members are not aware of ARVs neither have they seen them. During FGD the members identified the major modes of transmission of HIV/AIDS in the area to be unprotected sex and multiple sex partners through polygamy. The HIV/AIDS prevalence was mainly attributed to unprotected sex during social events. Some community members still hold the belief that infection from HIV/AIDS is caused by witchcraft and misfortunes. Other views in the community were that most HIV/AIDS infection occurs elsewhere and people only come home to the village when they are infected. The VCT centres however reported that a sizeable number of youth the active labour force are victims. This then calls for creating awareness on HIV/AIDS through;

- Educating people on use of condoms and Sexually Transmitted Diseases treatment
- Introducing HIV/AIDS awareness education in schools and towns
- Addressing the role of care givers by empowering them on how to give the needed care.
- Increase access to medical care and in turn HIV/AIDS awareness by improving access roads in the area and also concentrated and deliberate awareness creation.

The community members are afraid of HIV/AIDS spreading further with influx of people due to the proposed project but the above interventions should be enforced to take care of this.

4.3.22 Nutrition

The project area is endowed with all types of food that constitute a healthy diet. There is fish, milk and meat for protein. There are all types of fruits including wild ones for vitamins. Many vegetables are grown although in small quantities and for starch, maize and rice are cultivated abundantly. Honey is available both from the wild and as a commercial enterprise. While this is the case not everybody eats everything because of cultural beliefs and practices. The Ormas and Wardeis do not usually eat fish. Below is a breakdown of the number of meals per day and type of food consumed;

Table 4.37: Number of meals and Food Value

Ethnic Group	Number of meals per day	Type of Food Value
Orma	1 - 2 meals per day	Starch – Rice* and minimal ugali Protein – Milk and meat Vitamins – Minimal

Wardei	1- 2 meals per day	Starch – Rice and minimal Ugali Protein – milk and meat Vitamins – Honey and wild fruits
Pokomo	1- 3 meals per day	Starch – Rice and ugali Protein – Milk, meat, fish Vitamins – Vegetables and fruits

Source: Focus Group Discussions

*The rice consumed by the Wardei and Orma is from Government of Kenya and Relief Agencies. This is a clear indication that food supply is not sufficient in the area and its gradual increment has to be part of the wider scope of the project.
Below are some of the types of food reported by the community that are found or grown in the area;

Table 4.38: Types of foods

• Fish	• Meat
• Milk	• Rice
• Water melons	• Beans
• Maize	• Green grams
• Fruits- mangoes, bananas, paw paws	• Vegetables – tomatoes, kales
• Honey	• Potatoes
• Wild fruits	• Wild animals (<i>crocodiles, gazelles, wild rabbits, birds, etc.</i>)

Source: Focus Group Discussions

The food production is fair. The project should ensure that people do not stop producing these subsistence crops in favour for cash crop. There should be a serious balance created and maintained between the growing of the sugarcane and other types of food crops.

Other Products Eaten from the River

Other products eaten from the river are the crocodiles, the alligators, the water lilies and the hippos. The Pokomo interviewed reported that they eat crocodiles and also consume a lot of marine resources. The pastoralists do not culturally eat food from the river although a few are acquiring the new tastes.

Food Security

The food security in the area is quite erratic due to alternating floods and drought. The community members have at times to resort to relief food from the government and NGOs. Factors determining food security in the area include: poor weather, damage by wildlife, and poor farming methods.

Food security is a big concern to the community members and once the proposed project starts there will be need to contain the problems of drought and floods that aggravates this problem.

4.3.23 Agricultural Production

The Pokomo and a few Orma's and Wardei's practice subsistence crop growing. The crops grown are mainly;

Table 4.39: Agricultural Production

	Subsistence	Sale
Maize	74.4%	25.6%
Millet	88.3%	11.7%
Cassava	85.6%	14.4%
Beans	82.8%	16.7%
Groundnuts	97.8%	2.2%
Banana	85.0%	15.0%
Vegetable	96.1%	3.9%

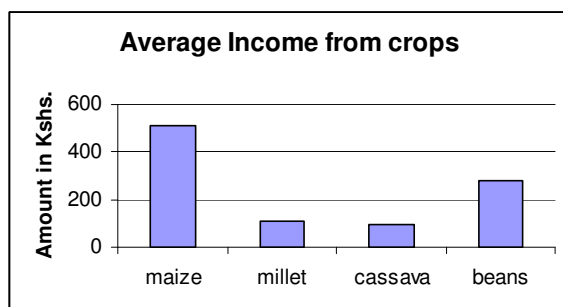
Source: Socio economic Survey Data

From the above analysis it is clear that most of what is grown is for subsistence use. However the variety of crops grown in the area is wide and better farming methods should be introduced to increase the amount for sale or for human consumption.

4.3.24 Crops Grown, Yield and Income

The crops grown include maize, millet, cassava, bananas etc.

Figure 4.14: Average income from crops per season
 Source: Socio economic Survey Data



The above incomes show an average of what a household gets per crop in a season. There are two seasons in a year. The yields from maize and beans are quite high and can increase with better farming practices. The yields were reported per season and the graph above shows the surplus yield that is sold.

4.3.25 Community Participation and Integration in the Project

There has been a lot of sensitization on the proposed project and in general local communities foresee social benefits of the project as shown below;

Table 4.40: Social Benefits of the Sugar Project

Social Benefits Anticipated from Project	Community		
	Orma	Wardei	Pokomo
bad cultural practices eroded	6.76%	10%	14.67%
improved educational standards	49.3%	26.67%	42.67%
improved health services hence improved wellbeing	34.67%	56.67%	25.33%
use of stoves, electricity household e.g. cooking	6.67%	3.33%	1.33%
increase in boreholes to provide water to increasing population	2.67%	3.33%	16.0%
Total	100%	100%	100%

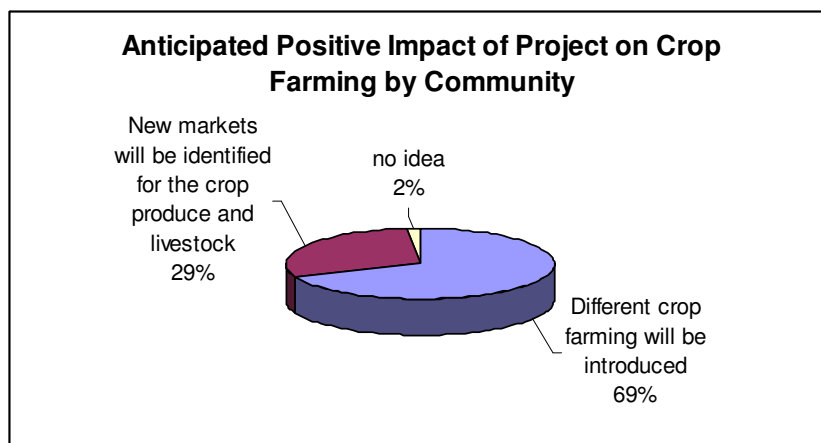
Source: Socio economic survey data

From the table above the community is clear that there is going to be tangible benefits with the introduction of the sugar project. The Orma and Pokomos foresee great strides in Education while the Wardei are foreseeing health and well being benefits.

4.3.26 Impact of the sugar project on crop farming

The farmers are looking at the intended project as a boost to their farming practice as shown in the diagram below;

Figure 4.15: Anticipated Positive Impact of Project on Crop Farming by Community



Source: Socio economic Survey Data

98% feel the project will introduce new ideas, markets and crops and this needs to be incorporated in the project. They all foresee modernization and exposure to new lifestyles that will reduce retrogressive cultural habits like forced marriage, circumcision etc. It is therefore important that the project tries to fulfill some of these expectations.

At the same time Table 42 shows that among the Pokomos 73% and among the Ormas and Wardeis 80% were aware that there will be negative impacts in the project as shown; 5 Table 4.41: Anticipated negative social impacts from the project on education standards on the community

		Community		
		Orma	Wardei	Pokomo
Negative impacts from the project on education standards	low enrolment due to hired child labor in the project	80%	80%	73.3%
	no response	20%	20%	26.7%
Total		100%	100%	100%

Source: Socio economic survey data

On education the community is afraid that more children will drop out of school and get into child labour and other vices due to introduction of money culture. A policy should be put in policy prohibiting the hiring of minors in the project area.

Table 4.42: Anticipated negative social impacts from the project on culture of the community

		Community		
		Orma	Wardei	Pokomo
Negative impacts from the project on culture of the community	mode of dressing will change	81.33%	83.3%	73.3%
	no effect	18.67%	16.7%	26.7%
Total		100%	100%	100%

Source: Socio economic survey data

The pastoralist community is worried of loosing their culture especially the dress mode and reduction of traditional practices.

Table 4.43: Negative social impacts anticipated from the project on religion

		Ethnic group of Respondent		
		Orma	Wardei	Pokomo
Negative impacts from the project on religion	change of faiths due to influx of many other Ethnic groups to the area	85.3%	90%	69.3%
	no reason that I know of	14.7%	10%	30.7%
Total		100%	100%	100%

Source: Socio economic survey data

A lot of new faiths/sects will come to the area as shown above. This will lead to different social codes as dictated and propagated by the new faiths. This will be both positive and negative. On the positive they will bring into the community knowledge and institutions which can be used as forums for propagation of new skills.

The impact of the project on the community is crucial to its progress and for this a lot of issues were raised in focus group discussions. The community members gave their views on the negative impacts they were foreseeing. These were felt to be very critical input from the community and these remarks together with possible solutions to negative issues are key to the acceptability of the proposed project. The table below summarizes the communities' views, proposed solutions and other remarks;

Table 4.44: Negative Socio-Economic Impacts and Proposed Solutions

Negative socio-economic environmental impacts of the Project	Proposed Solutions	Remarks
-emergence of slums due to influx of the unemployed people -increase in house rent - poor sanitation in slum areas	-Building of affordable houses with adequate provision of water and sanitation services	-the project is long overdue it will help in alleviating poverty. -all jobs to be locally advertised and people employed on merit.
-increase in crime rates -highway robbery.	Improvement in vigilance in the towns	-Women should be given equal opportunities with men
-cheap labor and poor salaries.	-provide minimum living wage structures	-the pastoralists leaders should be involved in the project. -government should use peace makers.
Prostitution, high expenditure -mushrooming of bars and pubs and drug abuse	-HIV/AIDS campaigns and safeguard against prostitution and educate the youth on the dangers of drug abuse -educating and awareness creation on the expected social changes.	-interests of the pastoralists should be considered, provide a project e.g. a slaughter house like KMC.
-displacements of pastoralists -farmers might be forced to move away from the river.	-project should consider the plight of the pastoralists by leaving part of the Tana area for the livestock. -Apportion the land and give the pastoralists their share -negotiations on land compensation should include all stakeholders - compensate the displaced persons at land market value.	
-Growth of towns. -noise/sound pollution.	-have regular police patrols. - proper town, physical. environmental and social planning to curb challenges of urbanization and provide ecologically sound towns	
-competition for job opportunities. -businesses might relocate to the project area. -increased road accidents. -increased attacks by buffaloes.	-give locals the priority when it comes to employment and fast track them on skills by attaching them to Mumias Sugar Company before the project starts. -wild animals should be restrained in the parks only.	-decentralize housing and give small towns the opportunity to develop such schemes. -educate the elite who are confusing the pastoralist to oppose the project. -KWS should be up to date on compensation
-corruption and nepotism. -TARDA might influence Mumias too	-TARDA should be completely left out of the programme. -give the youth the job opportunities in the farms. -set up labour organizations	-the project might reduce cases of banditry.
-social cultural changes might occur in language, dressing. -demand for labour might also go high.	-improve security by having more police posted in the area. -set new infrastructure like mutata terminus, market stalls, rental houses.	-educate the community on the expected social cultural changes and the expected skills by the community.

Source: Focus Group Discussions

The above views are held very strongly in the community. Therefore all the negative impacts need to be addressed through interventions at community level. This means that for any mentioned negative impact, responsible institution or the Ministries should address them, i.e. HIV/AIDS-Ministry of Health, Pollution –NEMA, Corruption – Mumias and KACC etc. For others that Mumias/TARDA can address round table discussions with community leaders is recommended. Benchmarks and solutions on how they are being addressed should be maintained to encourage trust and acceptance by the community.

4.3.27 Migration from Other Areas

When the project finally starts off a lot of people will migrate to the area in search of business and opportunities. This will lead to congestion in the existing trading centres and towns. The local people are very worried for it will reduce their employment opportunities and also erode their way of life. Therefore there will be need to address planning of small towns and provision of social amenities like housing, hospitals, playing fields, schools and security measures etc before the take off of the project, since the population will grow and all the spin-offs from this will need to be accommodated and addressed.

It is important also that preferential regulated quota mechanisms of protecting local people from being marginalized in the job market be put in place to control the influx and migration of qualified people from other areas.

Migration however can also be positive in such it will bring ideas and practices that will enrich this area and open it up.

4.3.28 Community's Acceptability of the Project

The community members were asked to state their views on the proposed project and below are their answers;

6 Table 4.45: Question: is the sugar farming in Lower a agreeable to you?

Ethnic group of the Respondent	is the sugar farming of the delta agreeable to you		Total (%)
	yes	no	
Orma	(8.89%)	(32.78%)	(41.67%)
Wardei	(3.88%)	(12.78%)	(16.67%)
Pokomo	(40%)	(1.67%)	(41.67%)
Total	(52.8%)	(47.2%)	(100%)

Source: Socio-economic Survey Data

The community members who are for the project gave reasons of getting employment and having improved standards of living as their reasons for supporting the project. The Pokomos who are agriculturalist are very positive of the project as shown above since they see it as an extension of their existing basic economic activities. The Wardei's and Ormas are apprehensive despite understanding that there might be economic benefits accrued. This is because they feel that the interventions will deprive them of their mode of livelihoods and grazing land. It should be noted that the economic benefits from this project are well known by all in the area and what remains is assurance especially to the pastoralists that their interests will be taken care of. Finally these results were obtained in a period when there was a lot of apprehension and misinformation about the proposed project and the validity of these results although positive might not be fully accurate, and they should be treated as such.

4.3.29 Labour Management

The issue of labor is an important one in the project area due to the high unemployment levels. The youth are idle and have low levels of education. They have no skills except life skills of herding and subsistence farming which they look down upon. This contrasts with other areas of the country where the unemployed youth have technical skills. Their main worry is that upcountry people will most likely take up most of the skilled jobs leaving locals to do manual work. They have suggested that the youth in the project area should be trained in relevant skills before the project starts. They also suggested a quota system whereby a certain number of people from the region be guaranteed jobs at any one time by the proposed project to ensure that they are not marginalized during employment. To enhance acceptability of the project, above views should be considered.

4.3.30 Mechanisms of Engaging the Community

In engaging the community in the project the role of all stakeholders needs to be fully addressed. The role of critical stakeholders like TARDA and Mumias Sugar Company need to be understood by the community as follows;

j) The Role of TARDA

The community has worked with TARDA before in the Rice Project, while they report at the beginning the association was cordial, now they are unhappy because of what they call broken promises that were not fulfilled or sustained. They would like TARDA to assist in;

- Building of bridges
- Hiring them for labor
- Maintaining roads
- Helping them grow rice and searching markets for them
- Repairing the dykes
- Provision of social amenities e.g. schools, dispensaries
- Beefing up security and
- Land compensation issues

The above are some of the activities the proposed sugar project plans to undertake once implementation begins.

2) The Pastoralists Role vis a vis Sugar Cane Growing

The proposal is being perceived by a section of the pastoralists as a project that will alienate them. They fear that it will curtail their free grazing rights in the area. The pastoralist community therefore suggested integration of livestock within the project by providing the following services to them

- Building of an abattoir
- Establishment of vet drug stores
- Removal of 'Mathenge' shrub
- Advanced livestock farming practices to improve on their cattle

There are a few cases of pastoralists who are farming together with grazing which is a good sign of the changing economic times. This should be encouraged especially among the Orma in the Lower Tana area and should be documented as role models of changing lifestyles. They should also be considered for the out-grower component of the project.

In this respect, it is important to note that the proposed project is an integrated one in which livestock is one of the components. Wastes from the sugar cane/sugar processing component will form important inputs into the local livestock as animal feeds besides other planned activities aimed at improving livestock and pastoralists' well being.

3) Community Sensitization/Involvement

The community requested to be involved as stakeholders in the whole project cycle. Further sensitization should be undertaken using participatory approaches to involve the community. This will involve listening and addressing their fears and threats however small they might be. Tangible benefits for the community need to be explicitly stated. Assurances of appropriate mitigation measures for preservation of grazing land, fishing areas, protection of other livelihoods and employment need to be clearly spelt. A structured community engagement mechanism whereby a delegate system of village representation is spelt out will mitigate current fears.

4.3.30 Gender Issues In the Study Area

Gender issues are critical in the proposed project especially on issues that affect the productivity and involvement of women. Results show that women undertake all the major household activities at household level. Among the pastoralists, men are involved in herding while among the agriculturalists, very few men are involved in actual farm work but they control family resources.

The basic gender issues in the area include;

- Heavy workload for women among pastoral and agriculturalist communities
- Exclusion of women in accessing economic assets due to traditional practices
- Exclusion of women in decision making due to cultural practices
- Early marriages for the girl child
- Literacy levels among women are very low due to the preference of educating males.

Women among the Ormas and Wardeis undertake all the workload i.e. building, packing when moving, milking the cows, selling honey and taking care of the household. Among the Pokomos, the women go to the farm and also engage in small enterprises in organized groups involved in poultry keeping, posho-mills and bee-keeping. Among the Wardei, women have of late taken to selling milk, honey and fish along the Garsen-Malindi-Lamu road. This is an important step towards culture change.

4.3.32 Access and Control of Assets

Women's role in decision making is determined mainly by what they own, use, control and benefit from; however the women in the project area have no access to economic assets although they use everything like land, TVs, radios, and animals. As indicated above, all resources and assets traditionally belong to men. This is shown in two selected agricultural villages below;

Table 4.46: Access and Control of Assets: Lazima Village

	Asset	Access Who has access				Control				Perceived Problems	Perceived Solution
		Men	Women	Children		Men	Women	Children			
				M/C	F/C			M/C	F/C		
1	Boats	√	√	√	√	√				-Leaking boats, risk of sinking -Dirty, poorly maintained utensils, source of diseases -Frequent failure of pumps -Purchase of new boats -Clean and dry utensils after use -Regular repair and maintenance of pumps	
2	Pumps	√		√		√					
3	Utensils	√	√	√	√		√				
4	Mobile phones	√	√			√					
5	Carts	√		√		√					
6	Bicycles	√		√		√					
7	Radio	√		√		√					

Source: Focus Group Discussions

Table 47: Access and Control of Assets: Mnazini Village

	Asset	Access Who has access				Control				Perceived Problems	Perceived Solution
		Men	Women	Children		Men	Women	Children			
				M/C	F/C			M/C	F/C		
1	Bicycles	√	√	√		√				-No experts to repair pumps -High maintenance costs of bicycles -Poor network of Celtel mobile company -High cost of running generators -Stealing of solar panels -Artisans to be trained -Companies to lower prices of bicycles spare parts/ improvement of roads. -Celtel to boost their network -Lowering of fish prices -Security to be beefed up	
2	Radio	√	√	√		√					
3	Carts	√	√	√		√					
4	TV	√	√	√	√	√					
5	Mobile phones	√	√			√					
6	Sewing machine	√	√				√				
7	Utensils	√	√	√	√		√	√			
8	Solar panels	√		√		√		√			
9	Generators	√		√		√					
10	Agricultural equipment	√	√	√	√						
11	Pumps	√		√		√					
12	Boats	√		√		√					

Source: Focus Group Discussions

The quantitative survey shows that 81% of women have access to all resources while only 3% have control indicating that men control 97% of all family assets. This lack of control limits the involvement of women in decision-making. At farm level though they might attend agricultural field days and demonstration but they are curtailed on implementing new farming methods for they do not control the resources (money). This implies that gender education is needed to enlighten the community at large on the benefits of giving women more mandates regarding the resources within the family's reach.

The women in this area have heavy workloads, are culturally passive, mainly illiterate and lack skills. Table 49 summarizes results obtained in the study.

Table 4.48: Gender Issues in the area

women	Men	Youth
-High levels of illiteracy	High levels of illiteracy though better than women	Considerably literate especially the male youth
-Low access and control of assets	Men in control of most assets in all the communities	
-Overworked with household domestic chores, taking care of the sick and daily provision of food in the household	Considerably less working hours and little domestic responsibilities	In some communities the youth work as many hours as the women, In others they are as little occupied as the men
-Early marriages		
-Lack of skills	Lack of skills	Lack of skills

Source: Focus Group Discussions

The above information is deduced from in depth discussions with the focus group discussants especially women and it needs to be addressed seriously if gender disparity is to end.

4.3.33 Women Participation

The basic gender concerns in the area are mainly related to heavy workload for women within the pastoral and agricultural communities as the gender daily calendars analysis below indicate.

Table 4.49: Women Participation

POKOMO				
Tasks				
village	men	women	youth	
wema	4	5	7	Among this sub group the men and women work together in farms although the women have the extra load at household level.
vumbwe	4	7	5	
mnazini	8	7	1	
sailoni	5	8	3	
lazina	9	8	3	
	30	35	19	
Average working hours	6	7	3.8	
WARDEI				
village	men	women	youth	
danisa B	8	11	10	The women work long hours at household level. The youth are busy since they help in grazing. The men's workload is less they usually sit leisurely chewing miraa and on safaris.
bura kofira	4	14	10	
	12	25	20	
Average working hours	4	8	7	
ORMA				
village	men	women	youth	
gaili	5	6	4	Among the Orma the women have a heavy workload and the men engage in very few tasks except the occasional grazing. They also chew miraa, play ajua and gambu. The youths are busy because they graze and guard the animals at night.
kibarani	6	10	5	
bandi	7	10	8	
kipao	6	11	7	
onkalde	6	14	9	
	30	51	33	
Average working hours	6	10.2	6.6	

Source: Focus Group Discussions

Like in many other rural areas in Kenya and Africa in general, women work more hours than men and there are more of them who are illiterate and have no or limited access to assets. Lack of control in disposing assets reduces the women's economic power and this renders them passive actors in development for they have no means of monetary contributions in development projects hence low involvement. Women participation in decision making is almost non-existent therefore they have to be encouraged to play an active role in the forthcoming project.

4.3.34 Involvement at farm level

At farm level both men and women are involved but the levels are different. It was reported that men get involved in the planting season and harvesting season especially if there are any sales to be made for they are the decision makers. The women and children are involved in weeding especially for the food crops of cassava, kales, sweet potatoes, maize, peas and tomatoes. The weeding season is very demanding for men and women among the agriculturalists and this implies that there is need to use modern farming methods of agricultural produce, mechanization, and control of pests and disease and hence reduce the women's workload and increase yields that will have a surplus for sale. The participation analysis of the agricultural villages is shown below;

Table 4.50: Participation in Agriculture : Sailoni Village

Type of Agricultural Activity	What is done now?	Participation			Control Decision maker	Perceived Problems	Perceived Solution
		Men	Women	Youth			
Cassava	Planted	√	√	√	Men/ woman	-Lack of enough water for irrigation	-Provide more water for irrigation
Kales	Planted	√	√	√	Men/ woman	-Lack of extension officers	-Recruiting extension officers
Sweet potatoes	Planted	√	√	√	Men/ woman	-Exploitation by middlemen	-Looking for alternative markets
Maize	Planted	√	√	√	Men/ woman	-Farmers have no training on basic agricultural practices	-Establishment of demonstration farms
Peas	Planted	√	√	√	Men/ woman		
Tomatoes	Planted	√	√	√	Men/ woman		
Analysis							
1. Anticipated changes in future Agricultural patterns.							
-Farmers will be compelled to produce more due to increased population, this means need to use modern farming methods for high production of agricultural produce, mechanization, control of pests and diseases.							
Strengthening the existing situation							
-Need to recruit more extension officers who will practically advice farmers on proper agricultural methods which will realize high yields. Introduction of field days and establishment of demonstration farms.							

Source: Focus Group Discussions

It is anticipated that the introduction of cane growing the participation of men will increase and hence reduce considerably the involvement of women. However the gender awareness creation on access and control of benefits accrued from the sale of cane needs to be enhanced to make sure women also gain. If they do not gain there is a possibility of them refusing to work in the project?

4.3.35 Women Participation in Agriculture

Currently women are actively participating in agriculture and this workload impacts heavily on their health and productivity. This active involvement on the farm can be easily capitalized on through improvement of farming skills and methods, hence leading to more productivity and creation of leisure time. Women are already self motivated to participate in agriculture and hence will fit in the proposed project as outgrowers. The table below illustrates the inclusion of women in agricultural activities;

Table 4.51 : Participation in Agriculture in Vumbwe Village

Type of Agricultural Activity	What is done now?	Participation			Control / Decision maker	Perceived Problems	Perceived Solution
		Men	Women	Youth			
-Water melons	-Rainy season crop	√	√	√	Men/ woman	-High land tilling rates -Poor infrastructure of extension officers	-Reduce rates for farmers to afford -Upgrade roads to minimize loss of agricultural produce being taken to the market -Employ extension officers at least one in every sub-location
-Maize	- Rainy season crop	√	√	√	Men/ woman		
-Tomatoes	- Rainy season crop	√	√	√	Men/ woman		
-Kales (sukuma wiki)	- Rainy season crop	√	√	√	Men/ woman		
-Cassava	- Dry season crop	√	√	√	Men/ woman		
-Sweet potatoes	- Dry season crop	√	√	√	Men/ woman		

Analysis

1. Anticipated changes in future Agricultural patterns.

-Increased production due to mechanization, as opposed to the current situation where a farmer employ manual means due to exorbitant tilling rates.

2. Strengthening the existing situation.

-Need to have low affordable rates of tilling land, presently 1,500 per acre primary tillage and 1,400 harrowing, improvement of infrastructure for easy delivery of agricultural produce, agricultural extension officers to practically help farmers, no just theories. TARDA to streamline it operations (it takes long to get a tractor)

Source: Focus Group Discussions

Despite the above analysis where the whole family participates the woman workload is still higher since she works both at household level and at the productive level. Efforts should therefore be made to minimize this workload and give women a chance to be involved in economic and development activities. This can only be accomplished through sensitization of the leaders on gender issues. Among the pastoralists women are not involved in grazing the animals but they milk and feed the calves at household level.

If the workload is reduced and mechanized and also made productive, the women would spare more time to appreciate and take up the proposed sugar project as out-growers for it will easily fit into their busy schedule as reproductive and productive workers. However women's benefits from the sales have to be spelled out so as to encourage them to be more productive in the new cash based farming.

4.3.36 Community Labour Profiles

The amount of work at any given time among the agriculturalists is governed by the rainy seasons of April/May long rains and October/November short rains when everybody is weeding and planting. Among the pastoralists their busy time is during the drought months when they either have to shift or move long distances in search of pasture as demonstrated below;

Women are always busy throughout the year. Among agriculturalists women are very busy during planting season in March/April/May and harvesting in September/October and they also get busy when planting for the short rains in October/November.

The pastoral women workload is the same throughout the year. Their workload only becomes heavy when they are moving during the dry season. They said that now they rarely move. The men's calendar is similar to women among the Agriculturalists but their workload tends to be lower.

The pastoralists' men workload is uniform throughout the year except in the dry months of November – January when they occasionally might move.

In the above labour profiles shows that during harvest and planting months the women from the agriculturalists community cannot participate in any outside work, therefore any planning for interventions have to take this into consideration. As regards the pastoralists, when they move away in search of pasture, it means that it is only the women who can easily participate in the project and not the men. Finally it should be noted that there were no seasonal gender variations as regards women since their workload is the same throughout the year. There is need for de-crusting gender myths through awareness creation sensitization and training.

4.3.37 The Changing Gender Situation (A case for women in the proposed project)

The gender situation is not terribly bad because the women's workload can be converted, lessened and modified to fit changing times. It should be noted that the women among the pastoralists (Orma and Wardei) undertake all the household chores including building and milking. They are also responsible for feeding the household and because of this a few especially the Wardei have resorted to trading on milk, honey and fish along the Lamu-Garsen and Malindi Road. This demonstrates that need for food has overtaken cultural barriers and entrepreneurship has emerged and this can be built on to improve the plight of these women.

Among the agriculturalists (Pokomo) the changing scenario is that the women engage in small enterprises of organized groups involved in poultry keeping, posho mills and bee-keeping. This has made them entrepreneurial at group level and these can be entry

points for bigger projects. Finally the women and the community in general are aware that there is going to be benefits on gender due to the project as shown in the table below;

Table 4.52: Gender benefits of the sugar/livestock project

Gender benefits	Percentage (%)
Creation of gender awareness through working together	59.4%
More women involved in business due to increased population	40.6%
Total	100.0%

Source: Focus Group Discussions

It is therefore important that the gender concerns that are related to economic assets and cultural practices that act against female population be taken care of such that women get into the mainstream of decision making processes in the project area. The men also should be encouraged to take up some of the tasks and assist where possible to reduce the workload.

4.3.38 Literacy Levels in Reference to Agri-Business and Social Facilities Education Levels

According to the Poverty Reduction Strategy Paper (2000-2004), enrolment levels in the area are as follows;

Table 4.53: Enrolment Levels

	<i>Girls</i>	<i>Boys</i>	<i>Total</i>
Primary School	11,627	16,137	27,764
Secondary School	723	1,106	1,829

Source: PRSP Data 2000-2004

There are 124 Primary Schools in the area which means each school has an average of 224 children and this shows low enrolments in the area at Primary School level. There are no colleges or universities in the area.

4.3.39 Literacy Levels among Women

The literacy levels in the project area are generally low and this gets worse where women are concerned. There is tendency of educating males against the females and very few women have gone to school. The table below shows women enrolment in the District.

Table 4.54: Literacy Levels

Level	Boys	Girls
Primary	16137	11627
Secondary	1106	723

Source: Poverty Reduction Strategy Paper 2000-2004

It is clear from the figure above that the enrolment of girls is much lower than boys. Other than low literacy levels the girls drop out very early due to early marriages and also due to cultural forces and lack of motivation and role models. This means that finding women in the society whose level of literacy is good enough to accommodate new ideas is quite a task. Therefore women have to be empowered and encouraged to participate even where it means communication in mother tongue. Role models within the few educated women and girls especially among the pastoralists need to be documented and consciously followed up to be used as part of the Best Practices analysed later in the report.

4.3.40 Community Social Requirements in the Project Area

The people in the proposed project are expecting social benefits out of this intervention and they are aware that the proponent will provide the following;

- Water
- Electricity
- Roads and bridges
- Schools
- Health facilities
- Tree seedlings

When asked to state what individual villages' priorities were, they provided the following list of priority projects:

Table 4.55: Priority Needs for each of the sampled villages

Village	Priority Needs of Each Village
1) Lazima	1. Hospital facilities 2. Road improvement 3. Improvement of their Primary School
2) Bura Kofira	1. Access to safe drinking water (borehole) 2. Have a dispensary 3. Cattle dip
3) Onkolde	1. Cattle dip and livestock improvement education 2. Dispensary 3. Control of flooding – build a dyke
4) Vumbwe	1. Agricultural support in fertilizer and also extension 2. Improve road access 3. Primary school
5) Mnazini	1. Have a bridge over the Tana River 2. Improve road access 3. Dispensary
6) Wema	1. Improve road 2. Clean water supply 3. Rehabilitation of agriculture (rice)
7) Sailoni	1. Improve road 2. Bridge 3. Dispensary
8) Galili	1. Education – provision of qualified teachers 2. Improve roads and bridges

	3. Induct good leadership
9) Kibarani	1. Roads 2. Health care 3. Livestock markets and care
10) Bandi	1. Dyke repair 2. Establish Income Generating Activities 3. Road
11) Kipao	1. Equip and open their dispensary 2. Bride 3. Cattle dip
12) Danisa 'B'	1. Slaughter house 2. Dispensary 3. Employment of their youth

Source: Focus Group Discussions

The above requirements do not necessarily follow the social infrastructure proposed by project proponent; neither do they represent all the villages in the area. Some of the projects mentioned above could be the initial ones to be implemented.

4.3.41 Types and sources of Conflicts

There are various types and levels of conflict in the area. They range from family conflicts, community conflicts, conflicts with TARDA and also inter-ethnic conflicts. At family level, the major conflict is husband and wife conflicts 95%, inheritance conflicts 3.9% and forced marriages 1.1%. Most of the above conflicts are resolved at family level 98.9% and only 1.1% go to normal courts or Kadhi courts when absolutely necessary. Intertribal conflicts account for 95% of the cases reported between Wardei/Orma and Pokomo due to grazing land. TARDA was also accused of causing conflicts in the area for their refusal to pay casual laborers. Human-wildlife conflicts were reported by 86.7% of the respondents and this shows that it is a significant problem.

4.3.42 Conflict Resolution Mechanisms

The community has many ways of resolving the different types of conflict. While some are simplified they might be useful tools in understanding and resolving future conflicts involving the community and the proposed project. The table below shows the mechanisms for resolving conflict in the area as discussed in the Focus Group Discussions of three villages selected.

Table 4.56: Community Conflict Management and Resolution – Onkolde Village

Existing types of conflicts	Actors involved	Mechanisms of resolving the conflict	Possible future conflicts
Sharing of resources			
-Land	-Orma	-Elders	-When livestock graze on TARDA land, and the Pokomos are working there, its likely that conflicts may occur.
-Water	-Pokomo	-Government	
Intra Ethnic			
-Fighting between children of different families	-Children	-Parents -Elders	
Inter Ethnic			
-Wardei being visitors want to have equal share as Orma	-Wardei -Orma	-Inter-tribal -Elders -Committee	-If the Wardei continue to press for their representation, possible future conflicts may occur.
Stakeholders			
-TARDA	-TARDA claims the land and yet they found the people living in the area.	-TARDA	-If TARDA cultivate the farm
-Orma		-Clan Leaders	

Source: Focus Group Discussions-Community

Table 4.57: Community Conflict Management and Resolution – Bandi Village

Existing types of conflicts	Actors involved	Mechanisms of resolving the conflict	Possible future conflicts
Sharing of resources			
-Land	-Orma	-Land adjudication to be done in consultation -	-Land for feeding livestock may be scarce and this will create more conflict
-Cattle	-Pokomo		
-Water	-Wardei		
-Wildlife			
Intra Ethnic			
-Children fighting	-Neighbouring families	-Parents and herdsmen	-Boundaries extent
-Homestead fencing			
-Waste disposal			
Inter Ethnic			
-Wardei claim representation	-Wardei -Orma	-The Wardei to be taken back to Somaliland where they came from	-Expansion of Wardi
Stakeholders			
-KWS -TARDA	-Orma -pokomo	-Animals to be restricted -Payments to be prompt	-Human/animal conflict to cost more lives -TARDA to loose local labour force

Source: Focus Group Discussions

Table 4.58: Community Conflict Management and Resolution – Bura Kofira Village

Existing types of conflicts	Actors involved	Mechanisms of resolving the conflict	Possible future conflicts
Sharing of resources			
-Land	-Wardei -Orma -Pokomo (not much)	-Elders -Local or District Administration	- Marginalization of the locals.
-River			
Intra Ethnic			
-Son selling livestock without consent of the father	-Father -Sons -Wife	-Elders	-Family conflicts
-Inheritance			
-Wife beating			
Inter Ethnic			
-Orma –Wardei over subordination	-The two Ethnic groups of Orma and Wardei	-Village elders	-Marginalization of conflicts
-Wardei			
Stakeholders			
	-KWS -Wardei	-Promote harmonious co-existence	-More human wildlife conflicts

Source: Focus Group Discussions

Conflict is part and parcel of life and the communities through the analysis above have mechanisms for containing them. Now with the introduction of the proposed project efforts should be made to strengthen the same mechanisms where conflicts are managed

where possible at community level to enhance integration and confidence from them. It is important to note conflicts that exist now will also recur in future. Therefore conflict management structures need to be put in place, using the above information as a pointer of how to go about conflict resolution.

4.3.43 Insecurity

The area is characterized by banditry attacks, thuggery, livestock stealing and ethnic clashes. Due to these attacks the communities live together in small villages (homesteads). All the villages in the area have two home-guards each employed by the Government. There is also heavy presence of KWS personnel to deal with human-wildlife conflict. It is also hoped that security will be enhanced in the area due to the spin-off effects of population, exposure, services etc. The government should be requested to increase the staff at the existing Gamba Police Station and also have more police posts in the area. Community policing could also be encouraged as part of community initiative in the project cycle mechanisms discussed earlier.

4.3.44 Existing Tenure and Allocation Agreements

Land tenure refers to the terms and conditions under which rights to land and land based resources are acquired, held, transferred or transmitted. Land tenure determines access to land and land based resources and is therefore a critical variable in the management and conservation of the environment.

TARDA Land in the Area

The three land tenure systems described above exist in the project area. By a Letter of Allotment reference number 106798 dated 17th January 1995, the Government through the Commissioner of Lands offered a grant of a piece of land measuring approximately 28,680 hectares (70,868.28 acres) to TARDA. TARDA therefore claims individual ownership to this land. Upon compliance of the conditions contained in the said letter of offer, TARDA will be granted a title under the Registration of Titles Act or the Registered Land Act both of which embody private tenure system. This land is also home to indigenous and minority communities who derive their livelihood therefrom. To these communities, the lands they occupy together with the land based resources are rightfully theirs even though they do not have legal title thereto. The communities' claim to land is governed by the customary tenure and is based on the principles of equity. The rest of the land in the project area is either government or trust land.

TARDA appears to have remained complacent upon the receipt of the Letter of Offer and contentedly states that the land belongs to the corporation. TARDA is therefore in a precarious condition in as far as legal ownership of the land is concerned. Indeed its claim to the land can be challenged in a court of law. It is therefore imperative that the title to the property be obtained without further delay.

The above notwithstanding, it should be noted that TARDA has taken steps towards complying with the conditions in the Letter of Allotment. In 1993, all the squatters were compensated by TARDA in consultation with the provincial administration. The villages in TARDA land are there to stay and TARDA has no intention of evicting them. TARDA advertised for cadastral survey services and bids are under review and the survey work will commence shortly. The survey work is intended to delineate the boundaries of TARDA land as well as for each of the villages with a view to obtaining separate deed plans for each of them. For this reason, TARDA plans to have a meeting with the villagers and the surveyor prior to commencement of the works in order to agree on the extent of the respective areas for each of them. To this end High Court Civil Cause Number 660 of 1994 filed by the villagers against TARDA is likely to be settled out of court.

Government Agencies in the Area

The Kenya Sugar Research Foundation (KESREF) has a research station within TARDA land. Upon the issuance of Title to TARDA, it will be necessary for TARDA to grant a Lease to KESREF with a view to regularizing the relationship between the two corporate bodies.

Communities

There are a number of villages within the TARDA land such as Wema, Hewani, Kulesa, Kipawa and others which are recognized by TARDA. The surveyor that will be awarded the contract to undertake the cadastral survey will delineate TARDA land excluding the villages. A survey of the villages will also be carried out so that deed plans for each will be prepared. In Block G of the TARDA land however, there is a group of squatters who are said to have moved on to the land in December 2006. TARDA regards this latter group as illegal squatters. The fact is all squatters are illegal. TARDA may have to deal with these new squatters in the same manner as it dealt with the previous squatters. The issue of squatter is always sensitive as they pose a problem to legal land owners. The issue of these squatters must therefore be taken care of to avoid subsequent claims of ownership by adverse possession.

Proposed Factory site

The factory site is outside the concession area. This fact creates a dilemma in that plans are being made and proposed over a piece of land whose ownership is not determined. The size of the land earmarked for the factory is also yet to be determined. Ownership of the said piece of land is key to any proposals made in respect thereof. It is therefore necessary that first and foremost this land be allocated to a given entity. Allocation to a party other than TARDA would involve having a separate agreement between the project proponent and the said party. Ownership by TARDA may therefore be the most rational way to go so that the land encompassing the concession area and the factory site and the activities proposed thereon may be managed under one agreement. The issues associated with the tenure of the factory site are the following:

- The exact acreage of the factory site needs to be determined and a survey be carried out to establish the boundary beacons.
- As the land comprising the factory site is Government land, there is need to apply for allocation of the same.
- There is further need to determine which party ought to apply for the allotment of the land.

The land comprising the factory site is currently inhabited and utilized by the 14 families or so with an average household size 6-10 people. These people will have to be compensated and re-settled elsewhere.

Out growers

It is proposed that over and above the 16,000 hectares of the nucleus estate, 4,000 hectares shall be smallholder sugar cane blocks for out growers. Certain issues arise out of this proposal. Unlike in western Kenya where out growers have title to their land, the land set apart for out growers is Government land. This land is not adjudicated and there are communities that occupy and derive their livelihood from the same. The pastoralists graze all over while the agriculturalists have farming portions given by clans. The communities in the entire project area have been agitating for the issuance of titles for the land they occupy. This will involve the government undertaking an adjudication exercise in the area. Land adjudication is the domain of the Government. The Land Adjudication Act provides that adjudication may be undertaken upon request by the concerned local authority in this case County Council of Tana River. Adjudication may also be undertaken if the Minister for Lands considers it expedient that the rights and interests of persons in

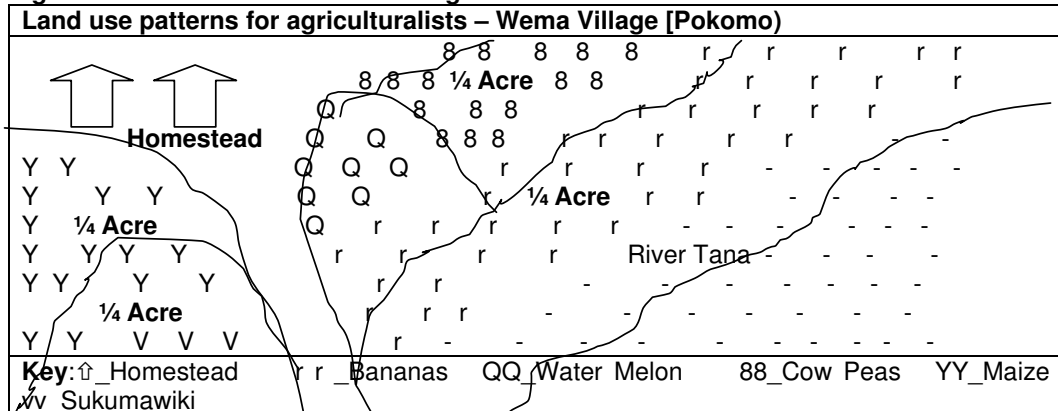
the land should be ascertained and registered. The adjudication exercise and subsequent issuance of titles whether under individual or communal tenure will raise several issues,

- a) Adjudication of land is the sole responsibility of the Government. The Government can only be requested to speed up the exercise which has commenced in some areas
- b) The issuance of title would formalize the ownership of land. However, given the nature of communal tenure regimes, it is unlikely that such communities will wish to formalize relationships with the government. They may not see the rationale in entering into a formal relationship that subjects them to rents and other conditions when they are in fact using such land in these areas unimpeded. The question that would then arise is why would the communities wish to subject themselves to obligations in respect of land which they have been utilizing without obligation or conditions?
- c) The issue of size of land for each individual or group will have to be determined.
- d) The cost of the demarcation exercise is to be born by the Government. This may however not be a budgetary priority for the Government. The adjudication may therefore not be achieved within the required time.
- e) Once titles have been issued to individuals and groups, there is no mitigation against further fragmentation of the land into non-viable pieces of land.
- f) Upon issuance of title, the land new registered owners may sell the same to persons who will completely change the user of the same to suit their own individual economic objectives and aspirations.
- g) It is not clear how the selection of the out growers will be determined. It may therefore not be possible for the project proponent to enter into contractual obligations with the proposed "out growers".
- h) There is no guarantee that the communities will be interested in engaging in the small holding sugar cane growing.

4.3.45 Land Use Patterns

Land use patterns among the pastoralists are characterized by movements around the whole lower Tana area and finally concentrating around the river when they need to water their livestock. The agriculturalists own pieces of land and they use them for subsistence farming of maize, pawpaw, tomatoes, cassavas, green peas etc. The land use pattern below shows the community's presentation of land use;

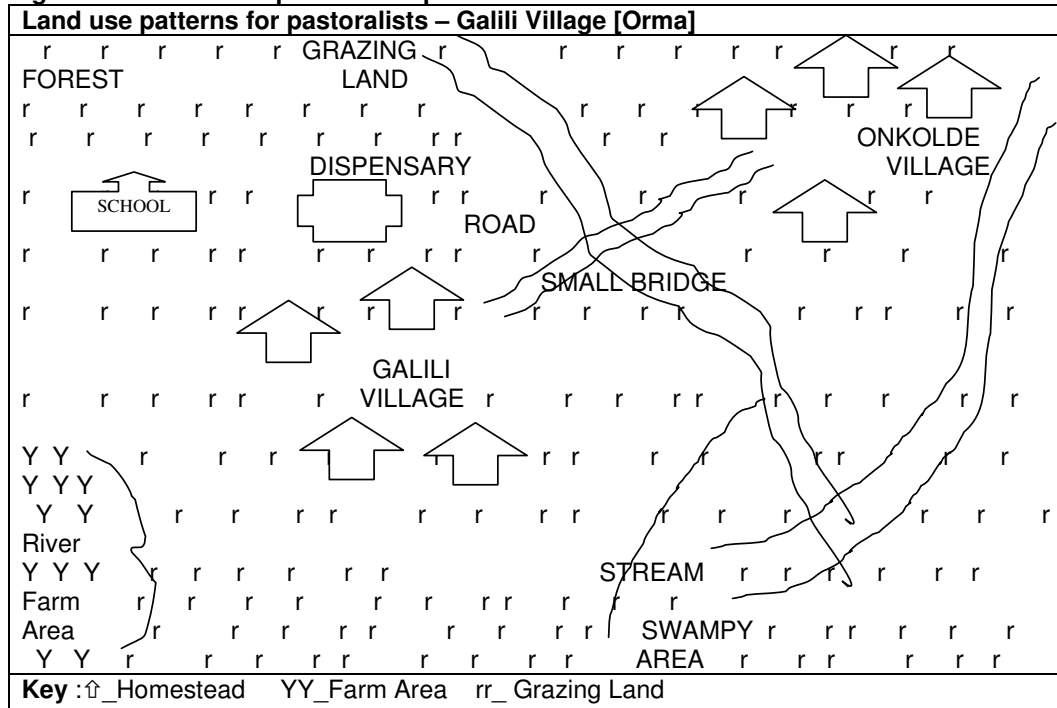
Figure 4.16: Land Use Patterns for Agriculturalists



Source: Focus Group Discussions

It is important to note that some of these small pieces of land are along the river-line and people largely grow fruits and vegetables. The land use is more intensive among the agriculturalist and this could even increase therefore there will be need to educate the farmers on proper use of land which is along the river line.

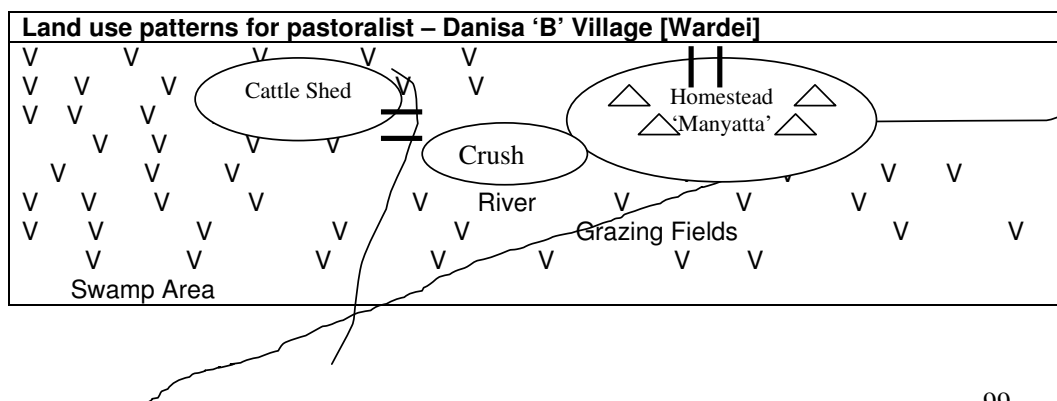
Figure 4.17: Land use patterns for pastoralists



Source: Focus Group Discussions

As shown above the pastoralists use land mainly for grazing and small pieces for minimal agriculture. The land use is dictated by their traditional pastoralist practices. These practices are difficult to change, but they can be improved. The minimal agriculture practiced can also be improved.

Figure 4.18: Land Use Patterns for Pastoralists



Average: The land is freehold, communally shared. Livestock left to graze allover
Key: V V_Grazing Field Δ Δ_Homestead

Source: Focus Group Discussions

The land use patterns shown above are haphazard and scattered. This cannot work on sugar growing that needs mechanized access. The community felt that if allowed to work in groups they can designate special areas for cane growing. However it is important for them to have legal binding agreements for sugar growing that can take care of land tenure issues, contracting and group ownership and since they have already suggested the same it should be followed up.

Poverty Levels

Tana River District is ranked as one of the poorest districts in Kenya. 73% of the total population lives below the poverty line. These high levels of poverty are due to a combination of factors, namely;

- Low literacy levels and high levels of unemployment
- Poor living conditions especially among women and children
- High incidences of diseases e.g. malaria and intestinal diseases due to consumption of raw water
- Lack of groups and credit facilities (Only 12.4% of the respondents belonged to a group or association)
- Women empowerment is lacking hence low participation in decision making
- Poor and outdated agricultural and livestock keeping practices
- Persistent drought seasons/flooding seasons
- Poor infrastructure (roads, telephone, electricity)
- Poor marketing systems
- People/wildlife conflicts
- Inter-tribal conflicts
- Lack of clear land demarcation system

For poverty to be alleviated the above issues have to be addressed. The proposed sugar project will address most of the issues but for the poverty levels to be reduced, the views of the community and their priorities have to be factored in. This situation is also very clear to the community and during the study they were asked to prioritize their problems as shown below;

Table 4.59: Priority needs of each village

Village	Priority Needs of Each Village
Lazima	Hospital facilities
Bura Kofira	Access to safe drinking water (borehole)
Onkolde	Cattle dip and livestock improvement education
Vumbwe	Agricultural support in fertilizer and also extension
Mnazini	Have a bridge over the Tana River
Wema	Improve road
Sailoni	Improve road
Galili	Education – provision of qualified teachers
Kibarani	Roads
Bandi	Dyke repair
Kipao	Equip and open their dispensary
Danisa 'B'	Slaughter house

Source: Focus Group Discussions

The sampled community's needs shown above clearly demonstrate some of the needs that exist in the area and are also in line with sectoral poverty reduction strategies. To address poverty issues in the area the following should be therefore addressed;

i) Food Production alongside Sugar Growing

Agriculture practices in the area are characterized by low yields, traditional farming practices. There is need for extension training to improve the farming methods. This will not only increase the amount of food for sale and consumption but will also address food security which is a problem in the area. Mumias Sugar Company should also include an agricultural component for food production together with sugarcane growing. The other intervention is to start demonstration farms on good farming practices and also organize exchange visits.

ii) Introduction of new crop types

The introduction of new crops is also a possible new strategy for poverty alleviation and the following crops are suggested;

- *Cold tolerant oil palm*

The study of cold tolerant palm oil was done in the 1960's as an alternative crop in the area. It is a tropical crop which can be grown in wet swampy areas to the South of the project area. They can also be grown in hot humid conditions and warm climates. Palm oil can do well in swampy areas of Kibarani, Kipao and Onkolde and it is used as oil and fibre and has high market value.

- *Soya beans*

Soya beans can be grown in tropical areas like the proposed project area as one way of enriching the soils. The crop may be grown along the river terraces. Kenya Agricultural Research Institute (KARI) has developed the variety to suit the Tana Delta area. Soya beans is ideal for inter-cropping with other traditional crops and it has market value for children feed, protein for family and fodder. Soya beans are an ideal crop for inter-cropping with traditional crops and further studies and trials need to be undertaken to see its yield and profitability in the region.

Jetropha

Jetropha grows on marginal soil and marginal rainfall. It is a favorite crop in marginal areas since it does not compete with food crops. It has maximum yields in hot sunny areas. Its seed has high contents of bio-diesel. The seed is also not palatable to animals and hence can grow in the area. Though th area is classified as being suitable for Jetrpha, the technology of growing it is in the formative stages vis a vis the well documented crops. So although a good crop it is recommended that its introduction is on trial basis as an alternative source of fuel in the area.

In conclusion although introduction of new crops is good, it is also recommended that production of traditional crops be enhanced through improved farming practices e.g. beans, cassava, millet, sweet potatoes, maize also as a means of alleviating poverty.

iii) Marketing of Produce

Marketing as a component of Agriculture is also an impediment in this area and for the community to improve on agriculture they have to have access to available markets. It is envisaged that with the introduction of the proposed project the markets of produce will grow automatically. However there is need to open new markets and opening up of the area through making it accessible.

iv) Livestock keeping

Livestock keeping is the mainstay of the pastoralists of Tana River area. It is seen as a way of life and big herds are synonymous to wealth. There is need to incorporate animal husbandry education that encompasses feeding, treatment and the value of animals. Once the herders are assured that the immortality of their animals will end they might in the long run agree on herd reductions. It is important to note that despite livestock keeping being a poverty reduction strategy no meaningful development can take off in the proposed project area unless the pastoralists interests are taken care of. The pastoralists have no problem with the proposed project as long as their interests are taken care of. They are articulate on what they lack and part of the a foregoing should be considered if not all as shown below;

The table below summarizes the improvements the pastoralists have in mind;

Table 4.60: Requested Livestock Improvements as reported in FGDs

• Reliable water for livestock	• Open the nearby ranches for grazing
• Help in reducing cattle rustling	• Control of livestock diseases
• Provide more land for grazing and improve pasture	• Introduce modern breeds
• Construct a slaughter house	• Provide veterinary services
• Introduce zero grazing	• Construct cattle dips
• Restore the dykes	• Control of migrants coming into the area

Source: Focus Group Discussions

The above preferences are critical and some if not all need to be considered in the project. These will help in improving the pastoralist's way of life hence reducing poverty.

iv) Infrastructure

Access to the project area is impossible other than parts of Ngao and those bordering the Lamu-Malindi tarmac road. The access roads that TARDA had built are broken down due to flooding and are not passable especially during the rainy season. The communities get marooned in villages during the rainy season and have no access even to health care centres. People walk long distances and this affects their livelihoods for they cannot easily access markets and services. As a matter of urgency the access roads in the proposed project area and to the villages within and around need to be improved urgently as a poverty alleviation measure. River Tana also is not crossable by human beings due to the width and fear of crocodile attacks. Bridges that have broken down and also new ones as requested by the community need to be constructed to help ease communication of the area. Improved access roads will trigger development in the area. Infrastructure improvement is therefore critical as a poverty alleviation measure in the area.

v) Health

The number of dispensaries and hospitals are inadequate vis a vis the vastness of the area. There is need to equip the existing dispensaries e.g. in Ngao by employing more staff and building new health facilities as requested by the communities. Improved health makes the community more productive and hence lessens poverty. The requirements in health improvement are documented elsewhere in this report.

vi) Water Services Improvement

Provision of clean drinking water in the area is a priority. A lot of people take water straight from the river and there is need for Public Health Education on the dangers of this and also provision of potable tap water where possible. With improved health, the community members will become more productive, and adaptive to new ideas and projects.

vii) Disaster Management Strategy

The area is characterized by an interchange of floods and drought. A permanent disaster management strategy needs to be put in place and repair the dykes to control flooding and build dams to conserve water during dry months. This way the communities will settle and become more productive.

viii) Improving Education Facilities

The area is characterized by incomplete primary schools, poor staffing, low enrolment and drop-out rates and all this contributes to the low literacy levels found especially among women. There is need to improve the existing schools and request for adequate staffing. However this has to be with the participation/contribution of the community to enable them sustain these projects. The hand-out and relief tendencies only increase dependency and poverty. School enrolment can be enhanced through incentives of school feeding programmes and promissory notes of employment after a particular level.

ix) Vocational Training

The youth in the area lack skills for any useful employment. A concerted effort of inducting them through short-term courses is necessary in the short-run. In the long-run vocational school with remedial adult literacy classes need to be established to uplift them to a level employable in the proposed sugar project. The skills offered should be those that will lead to self employment in the final end.

vii) Capacity Building

The project area is lagging behind and there are many areas that need to be addressed to uplift the standards of the community through capacity building, some of them are;

- Leadership

Within any changing environment there is need for local leaders to know and understand and finally steer the changes. The project area is very weak on community leadership. There is need to educate the leaders on how to facilitate and manage community projects, managing change, communicate with them, have them work as team, form groups and eventually embrace development.

This is an empowerment exercise which is time consuming but empowers the leaders to take up changing situations and own up the new projects.

- Conflict resolution measures

There is need to put systems to address and end the conflicts in the area such as; human wildlife conflict, tribal conflicts, grazing conflicts etc. The community needs to be trained on how to resolve and forestall conflicts

- Gender Issues

There is need for organized gender empowerment and awareness creation in the area. This is because the women are marginalized, have heavy workloads and are entangled by traditional practices. They are not involved in any decision making and gender education is needed at all levels.

- Skills Development

Skills development as a means of capacity has also got to be addressed if this community has to gain meaningfully from the proposed project.

Finally a capacity building programme should be inbuilt in the project activities to cater for all social and economic areas that will come up as the projects takes off.

3) Enterprise development (Value addition)

Other than the Sugar Project the community suggested a boost and introduction of new community projects that will be taken up through enterprises;

- Juice extracting (paw paws and mangoes)
- Poultry keeping
- Milk processing
- Tree nurseries
- Palm oil extracting
- Abattoirs and livestock markets
- Rice, maize and vegetables selling

The mentioned local enterprises if supported and promoted will boost employment and generate wealth. The communities can be directed to relevant GoK and NGOs that promote these projects and once they start accruing income from cane, these enterprises will propel themselves and generate more income.

4.3.46 Development of Credit Facilities

Credit Facilities/Issues

Development of credit facilities in the area is an important way of promoting the culture of savings and also enterprise development. There were no credit facilities reported by the respondents. Out of 180 respondents only 2 reported to have bank accounts. CBOs were also few and poorly managed due to lack of leadership capacity. A few NGO's like World Vision have introduced soft loans for agricultural purposes but have not been successful. However the farmers complained of dropping out due to high interest rates. There is very low adoption of a credit culture among the pastoralists. They do not believe in banking. Among the Pokomo's the employed use the banking facility (Post Bank) in Garsen. The other banks are KCB in Hola and several others in Malindi both of which are very far from the project area. The table below shows the banks serving the area;

Table 4.61: Banking services in the area

Place	Bank	location
Hola	-KCB -Post Bank	-150 km away
Malindi	-KCB -Post Bank	-100 km away
Garsen	Post Bank	-Project area

Source: Focus Group Discussions

4.3.47 Groups Receiving Credit Facilities

Adaptation to credit in the area is very low although World Vision had tried to provide credit facilities to the locals especially the peasant farmers as shown below;

Table 4.62: Credit Groups

Village	Activity
Wema	-Women groups to building rental houses -purchase of posho mill by women groups
Sailoni	-bee keeping
Lazima	Purchase of fishing gear
Mnazini	-Bee keeping -purchase of fishing equipment
Vumbwe	-bee keeping -promotion of agriculture-tomatoes

Source: Focus Group Discussions

The above-mentioned groups were given to organized groups but the beneficiaries complained of high interest rates being levied. The Vumbwe village respondents quoted World Vision charging them 30% interest rate, which to them was very high. This made them stop borrowing money although the activities are going on minimally.

Improvement of credit facilities

The groups reported that for credit facilities to succeed the following issues have to be addressed;

- The interest rates should be lowered for the beneficiaries to afford to repayment
- The grace period should be long to allow for the beneficiaries to realize returns and thus be able to repay the loan.

The whole idea of credit is poorly adapted in the area and World Vision reported high default rates. For the people in the area to adapt a savings and credit culture a lot of sensitization is needed in the following areas;

- Basic management
- Credit use
- Leadership
- Savings and Loan
- Record keeping and repayment
- Investing in viable projects

The community will also have to be enlightened on the use and value of banking and it is hoped that with the proposed project when cane payments accrue the savings will pick up.

Formation of Cooperatives

The cooperatives societies are now managed under a new Cooperative Society Act that has enhanced governance issues that used to inhibit the development of the cooperative movement. Cooperatives are excellent tools for savings mobilization and also marketing. They maximize on economies of scale and ensure that benefits are shared equitably. Therefore since there are no cooperatives in the area two types of cooperatives should be promoted i.e.

- i) Savings Credit Cooperatives (SACCO)
- ii) Marketing Cooperatives for Cane out-growers

Out-growers marketing cooperatives should be based on existing village settlements or clan land settlements. The marketing cooperative can organize the marketing of cane and also other agricultural products being produced today and also in future. The cooperatives can also sell farm implements and inputs to farmers on credit. After the cane/products are sold and money is received from the company/buyers, the outgrowers cooperative will be processing all the payments to the farmers. The Ministry of Cooperative Development can help in promoting the marketing cooperatives.

Savings and Credit Cooperative

The SACCOs will be formed on the basis of the outgrowers cooperative activity. The payments from the company can be channeled through the SACCO. The SACCO in return can retain members savings and also process the payments. Therefore there has to be very close collaboration between marketing cooperative and the SACCO. It is important to note that all the two forms of cooperative allow for open membership as long as there is a common bond.

Self Help Groups Promotion to SMEs/MFI

Most of the Self Help Groups in the area are semi-dormant. However, the Community Development Office in Garsen had a list of CBO and Self Help Groups in the area, the list is attached as *Annex 6* of this report. Other groups were reported to be existing informally especially the merry go rounds run by women. Below is a list of groups as reported in the sampled villages.

Table 4.63: Groups reported within the community

Group or organization	Activity
Shining Star Youth Group	-HIV/AIDS advocacy
Sailoni Methodist Youth Group	-Tomato growing
Mikindu Group	
Young Farmers Club	-Farming
Boda Boda Self Help Group (Wema)	-Bicycle transport
Juhudi (Vumbwe)	-Posho mill for women
Cooperative Society	-Milk
Hidu Women Group (Vumbwe)	-HIV/AIDS advocacy
Wema Development Group	-Rental houses in Wema for women
Lazima Lutheran Group	-Evangelization
Umoja Group (Mnazini)	-Farming for all
Saint Joseph Bee Keeping Group	-Bee keeping

Source: Focus Group Discussions

The above mentioned groups have potential and will need to be promoted as Small and Micro Enterprises and Micro Finance Institutions. However the SMEs and MFIs should be community driven and not NGO driven. In order to avoid a situation where NGOs dictate terms of borrowing a revolving fund for MFIs should be created or given. Trustees who will then to lend groups for onward lending to SMEs/MFIs should manage it. SMEs should be given priority since they are the only windows through which a balance in gender disparity can be realized through equal lending to both men and women, which is not anchored on traditional form of assets.

Use of the Pastoralists Forum to Promote Pastoralists SACCO

Tana River Pastoralists Forum based in Garsen that advocates for the rights of pastoralists in marketing and grazing, was reported to be active. This forum can easily be used to sensitise on the pastoralists on need to run a co-operative through which they can borrow credit for enhancing their business enterprise. The forum can be a focal rallying point

4.3.49 Major Recommendations

i) Social Forestry

The project area is characterized by depleting tree resources. The indigenous trees are disappearing very fast to due charcoal burning. There are no significant tree planting efforts to replace the forests and bushes. It is therefore recommended that social forestry be introduced in the area and villages be encouraged to start tree nurseries through organized groups and institutions.

ii) Labour Provision Concerns

The proposed project will generate jobs, which will have an impact on the social, cultural and economic structures of all adjacent communities. The levels of employment are also set to improve. However as shown in the report the residents of Tana River District especially the pastoralists have very low levels of education coupled with lack of technical skills. The community members are very apprehensive of not being competitive in the job market and hence not getting employment when the project starts.

Their concern is genuine and it is therefore recommended that to curb the fear of people from other areas taking up the jobs a preferential quota system be applied as follows;

- (a) The people of the area should get first priority on all non-technical jobs
- (b) The youth of the area should be fast tracked on technical training to acquire skills before the proposed projects starts. Prior intensives training should be given parallel to the start of the project.

- (c) Potential technical staff from the area should also be attached to Mumias Sugar Company for 'on job training' so as to take jobs quickly when the proposed project starts.
- (d) Adult literacy classes should also be inbuilt in these training to help alleviate the low levels of education in the long-run.

III) Dealing with Land Tenure Issues

- a) TARDA should include the factory site in the instructions to the surveyor that wins the contract to survey TARDA land so that the exact size is known and the boundaries marked.
- b) In determining which party should apply to the government for the allotment of land earmarked for the factory site, it is recommended that TARDA applies in its own name so that the Government allots the land to TARDA. The objective here is to have all the land registered in the name of TARDA so as to avoid separate agreements for the 16,000 ha and for the factory land.
- c) A resettlement plan will have to be developed and negotiated among affected parties.
- d) The Government through the Ministry of Lands should be approached to speed up the land adjudication process in the entire project area which will culminate in the issuance of titles to groups or individuals.
- e) Pastoralists should be encouraged to organize themselves into groups and be assisted in obtaining registration of the groups under the Land (Group Representatives) Act after which titles to the land in which they graze will be registered in the group names.
- f) The agriculturalists may also seek registration under the Land (Group Representatives) Act and obtain titles to the land on which they live and grow their crops.
- g) Titles may also be issued to individuals.
- h) Upon the issuance of the titles the project proponent should negotiate and conclude formal agreements with clearly defined land owners over clearly delineated land.

Gender Sensitization

The women in the area are marginalized due to social, cultural and economic issues. There are many gender concerns in the area that are characterized by;

- Heavy workload for women both pastoral and agriculturalists
- Lack of access to economic assets for women due to traditional practices
- Lack of women participation in decision making due to cultural practice
- NB:** Resources and assets belong to the men
- Early marriages
- Literacy levels among women are very low due to the preference of educating males against females.

As part of integrating the women and men to the development of the area it is recommended that gender sensitization and awareness creation training be mounted in the area to enlighten the community on the role of gender and development. Role models should be developed consciously within the area.

Inclusion of Pastoralists Interests

As much as the proposed project is meant to benefit the whole community the pastoralists feel it is an “agricultural project” and this is making them feel somehow left out. It is therefore recommended that before the full value of the project is realized – a project that is livestock oriented be incorporated in the proposed project. An abattoir, drug stores, zero grazing techniques were suggested as possible projects by the pastoralists.

Involvement of the Lower Tana Community

The community is part and parcel of the project and any improvement in the Lower Tana area and they in fact believe that they are principal stakeholders. It is therefore recommended that in order to diffuse negativity on the proposed project that they also be taken on board in the full project cycle. It is therefore recommended that they be integrated into the Agreements or Memorandum of Understanding between TARDA and MUMIAS on equal status in discussing and agreeing on whole sugar project. This should be through elected/selected leaders representing different interests, villages or recognized leadership using the mechanisms shown in the report.

Provision of Social Facilities

The proposed sugar project through its corporate social responsibility is proposing the provision of social facilities e.g. schools, hospitals, roads and houses. While this is noble the proposed project might not be in line with the priorities of the community members as shown in the report. Therefore their expressed social needs are characterized by cases of having schools with no toilets, dispensaries with no personnel and poor access roads etc.

The community in the area has also been recipient of relief food from the government and this type of top down projects will only continue creating a dependency hand-out syndrome where they will continue to expect free things. It is therefore recommended that their views be incorporated during needs assessment, prioritization, planning costing and implementation of the social projects facilities. This will ensure community sustainability and ownership of these projects for they will identify with them and hence take care of them. It is also recommended that a cost sharing element in form of labour, materials, leadership from the community be built in. All these systems can be integrated in the community engagement mechanisms suggested in the report.

Managing Misconceptions

Most of the community members are clear of the gains of the proposed project. However there are some interest groups that are confusing the community members. TARDA has done a lot to try and sensitize the community but as some leaders reported “it is not convincing when you advertise yourself”. The low levels of education and the marginalization of the area is also making the people prey to diverse views and distractions as to ‘why the project’. This has led to a few people being hostile to the project. The apparent frosty relationship with TARDA is also being quoted as a deterrent. It is therefore recommended that a fully fledged community sensitization programme on (What the sugar project entails, the size, the benefits, the role of the community, the role of TARDA, role of MUMIAS etc) be undertaken by an independent party devoid of Mumias Sugar Company and TARDA to sensitize the community on aspects and impacts of the project in a transparent and participatory manner.

It is also recommended that the communities also get sensitization on other various issues which include:

- ✓ The importance of wildlife and incomes that can accrue from sustainable use of their habitats.
- ✓ The rights of the girl child to education and campaign against early marriages
- ✓ Women’s empowerment and gender equity is needed
- ✓ Afforestation measures
- ✓ Other issues as agreed by all stakeholders

Urban Areas Improvement

The Urban centres of Ngao, Tarasaa, Idsoe, Witu Kipini and Garsen are not planned. The water and sanitation facilities are lacking. The centres have poor housing structures and it is only Garsen that has electricity. It is therefore recommended that basic social amenities of water, sanitation be addressed through the local authorities development planning programmes in conjunction with MUMIAS/TARDA to eventually accommodate the envisaged growth in population and as part of social responsibility.

Master Plan for the Area

The stakeholders of the Tana River District need a Master Plan of the area. It is recommended that this be produced to help in understanding the lay-out of the area which is as diverse as the many interest groups. The Ministry of Water through the Integrated Water Resource Management should also draw a River Basin Management Plan for the area jointly with interest groups.

Promotion of SME's and SACCO's

The entrepreneurship culture is lacking in the Lower Tana area especially among the pastoralists. The people have no tangible enterprises; they have no banking knowledge, no savings culture and poor sources of incomes. The NGOs have tried in small-scale enterprises to alleviate this situation but it has not worked. It is therefore recommended that training in entrepreneurship and how to run small businesses be introduced in the area. This can be done in conjunction with the NGOs on the ground to prepare the farmers who will eventually be outgrowers on how to save and invest through cooperatives. The community members can also be encouraged to form and join cooperatives since the land is communally owned and the cooperatives will form a good basis of Savings and Credit system among the outgrowers.

XII) Health and Sanitation Education

Hygiene and Sanitation services levels are very low in the area. People largely use the bush and also drink untreated water. There will be need for implementing a health and sanitation training programme in the area. Collaborating with Ministry of Health, which is implementing a community health strategy, can easily do this.

Historical, Archaeological Monuments and Cultural Heritage

The fieldwork and EIA public meetings indicated that there are no sites of cultural or historical, public or archaeological significance within the project area. There will be no alteration of old construction or cultural heritage building with historical, architectural, or archaeological value within the proposed site.

Otherwise, the consultant does not foresee any deterioration of public meeting places where cultural expressions of the affected people, community, or group take place. However, the consultant observed a temporary Christian church (also used as a community nursery school) at factory proposed site at Milimani area that might be affected. The presence of graves is also a potentially emotive issue in the project area among the various local communities. The relocation of graves will be traumatic for many households in the area and will carry with it the added burden of potentially upsetting the ancestors. Angry ancestors are often regarded as responsible for misfortunes such as illness, drought, cattle dying, crop failure, loss of employment, etc. The disturbance of graves is therefore regarded as a serious matter and belief dictates that when graves are disturbed a sacrifice should be made to the ancestors to appease the spirit. Due to the insecure land tenure in the host area, many households might have opted for burying their deceased outside the area. However, some households will have graves on their land. A detailed assessment of the number of graves per family to be affected, their cultural value, their GPS location and community preferences will be undertaken during the formulation of a Human Resettlement Plan for both the factory site and farm area for the affected people.

4.5 Hydrology and Water Resources

Surface and ground water in relation to the current proposal

The major water resources in the district are the Tana River, seasonal rivers (lagas), ground water, water pans and water holes in the interlaga areas. Tana River is the only river flowing through the district with a permanent source of water for domestic and livestock use, especially during the dry season when other water sources dry up. The river carries a large volume of water all year round and has the potential to support a large industrial sector in the district. For domestic purposes, water from the river requires treatment.

During rainy season, seasonal lagas cover extensive areas. They flow from Kitui district to Tana River district and supply sufficient run-off for livestock and domestic use. As the lagas usually maintain a subsurface flow in their loose sand beds, during the dry season, pastoralists obtain water by making hand-dug water holes in the sand beds. The major lagas include Hilimani in the north, Galore in the central and Kokani to the southern part of the district, besides numerous other small ones flowing onto the main lagas during the rains. The quality of water in lagas is good in dry seasons but becomes turbid during rainy seasons. If water from the lagas could be harnessed, the district would have adequate source of water for domestic, livestock and industrial use. There are numerous natural depressions and water holes spread throughout the district especially the area between the major lagas. Some of the depressions store water which lasts 3-4 months during which time they are important watering points for livestock.

Little is known of the sub-surface water resources of Tana River district. Bore holes in the interior of the district are either saline or of poor quality. The only areas with promising ground water resource are those close to the bank of river Tana where the depth of water varies between 3-15 meters. Water quality is generally good in wells close to the river. Since the district is generally a flat plain with loose sands, harnessing of water from river Tana for hydro-electric power generation is almost impossible. However, dams for hydro-electric power have been constructed upstream in Mbeere district (Masinga, Kiambere and Gitaru dams).

The planned water abstraction from the diversion at Sailoni is 28 m³/s with agriculture (incl. rice) being allocated 22 m³/sec, wildlife 5 m³/sec and other users 1 m³/sec. The important question here is whether the proposed abstraction of 28m³/s can be maintained during dry months and drought periods? A preliminary inspection of the discharge data shows that planned abstraction of water from the Tana river can account for up to 1/3 or more of the discharge during dry months e.g. September or even during the drought periods. This will reduce the Tana flow substantially which could lead to water scarcity particularly for livestock and wildlife. There will also be negative impacts on downstream ecosystems and ecosystem processes. Reduced river flow leading to loss of stream competence, will increase sedimentation rates in the river channel as has happened a few kilometers south of the bridge at Idsowe. In turn, this will probably mean that fish breeding areas and fisheries in the ox-bow lakes, Tana River and possibly marine fisheries will be negatively affected. Reduced river flow also has the potential to enhance the human-wildlife conflicts and/or exacerbate inter-tribal conflicts in the project area.

Potential negative impacts due to reduced Tana discharge will be alleviated if water is released from the dams upstream during the dry months and years.

4.5.1 Cumulative impacts of other developments along the Tana River

Besides the already established projects in upper Tana notably the hydroelectric dams, there are plans by the National Irrigation Board to revive collapsed irrigation schemes particularly in the Lower Tana. According to the DC Hola, the Government has allocated

80,971.6 ha from Galana ADC ranch near Garissa for grazing by the pastoralists. To serve as an effective measure to reduce pressure in the delta region, water will have to be supplied to the candidate ranch. This water will have to come from the Tana River as well. There are reports that MAT International is interested in growing irrigated sugar cane in close proximity to the current proposal. They too will have to depend on water from the Tana River to a large extent.

While opening up the Lower Tana for development, the negative cumulative effects of all these developments will be reduced water quality and quantity in Tana River, more erosion and sedimentation, and water competition amongst different users including wildlife.

4.6 Terrestrial Habitat and Flora

4.6.1 Vegetation Distribution and Trends

Lower Tana vegetation represent and composition of interesting and unique vegetation from phytogeographical point of view. For example, it contains noticeable floral element from West Africa. The area is a semi-arid ecosystem with rainfall ranging between 600 in drier areas inland such as Garsen to 1000 at the coastal region. The area is characterized by bushland and scattered forest patches, which have over the years undergone significant changes due to human activities and changing in flooding regime and pattern. For example, flooding regimes has been affected by building of hydroelectric dams along upper Tana river, thus affecting the amount of water and sediments deposition. This has been affected further by change of the main river course in 1989, which resulted in increased flow along Matomba channel.

Towards the coastline from Sailon a combination of flooding, soils and relatively higher rainfall give a marked difference in vegetation. Increased burning of vegetation by pastoralist to improve grass cover has overtime contributed to expansion of grass habitat. This can be attributed to demand for grazing area as both livestock and human population increase over time. The area near Sailon is covered extensively by closed and open tress canopies with shrubs on temporarily flooded area. It is franked on both sides by closed to open woody vegetation, which breaks into thickest away from the flood plain (Fig 3.1). This gives way to a mixture of herbaceous vegetation towards Idsowe creating a gap with the forest areas at Sailon and lower areas of Idsowe. The area south of Idsowe along the Tana river is again covered by closed and open trees on flooded area and riverbanks. Doum palm –*Hyphaene compressa* is quite extensive in this area an indicator of high water table with dry areas being occupied by *A. zanzibarica*. Other prominent species include Wild date palm –*Phoenix reclinata*, which is grows near wet areas and serves as an important ecological indicator of wet areas. It is mixed with fan palm –*Borassus aethiopum* plus a combination of mango trees and *Ficus sycomorus* L. along the riverine area.

On the westerns side of this forested area is covered by shrubs while the eastern side breaks into herbaceous plants, which cover extensive area with fan palm being extensive here. South of the forested area gives way to large formation of low shrubs and scattered trees. There are few pockets of isolated trees. However, towards the coastline closed trees canopies appears again. These vegetation formations are strongly influenced by flooding pattern and soils, although vegetation changes are fast taking placed influenced by human activities. Lack of proper project implementation in the Bura and Hola irrigation schemes has also contributed to a significant loss in forest cover (Hughes 1984; Medley *et al* 1989), due to the absence of alternative sources of livelihood. Overall, forest area in the Lower Tana has significantly reduced by 34.5% over a 21-year period between 1980 and 2001.

The proposed Tana Integrated Super Project (TISP) project site represents a highly disturbed – semi-natural ecosystem in a dryland environment. The ecosystem shows signs of fast ecological succession due to annual/biannual flooding. Disturbances overtime have emanated from;

- (i) initially large scale TARDA activities, which have almost halted resulting in secondary succession
- (ii) local communities initiative in farming both along the riverine and floodplain areas. This is further compounded by intensive grazing in a rather fragile ecosystem where population increase and grazing have been on the higher side