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MINISTRY OF AGRICULTURE FOOD SECURITY AND  
COOPERATIVES

**Environmental and Social Management Framework  
for  
THE BAGAMOYO SUGAR INFRASTRUCTURE AND  
SUSTAINABLE COMMUNITY (BASIC) PROGRAMME**



**MARCH 2015**



# BAGAMOYO SUGAR INFRASTRUCTURE AND SUSTAINABLE COMMUNITY (BASIC) PROGRAMME

## ENVIRONMENTAL & SOCIAL MANAGEMENT FRAMEWORK

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## Executive Summary

### *Introduction*

The agriculture sector is a key driver of social and economic development in Tanzania and possesses a huge potential for fostering broad based growth and poverty reduction in the country. Tanzania Development Vision 2025 (TDV 2025) emphasizes three goals as being national priorities, namely: (i) ensuring basic food security; (ii) improving income levels; and (iii) increasing export earnings. The National Strategy for Growth and Reduction of Poverty (MKUKUTA II), Agricultural Sector Development Strategy (ASDS), the Agricultural Sector Development Plan (ASDP), the Kilimo Kwanza initiative and the Southern Agricultural Growth Corridor of Tanzania Initiative (SAGCOT) all call for public-private partnerships and increased commercialisation of agriculture. SAGCOT in particular highlights the need to support smallholders to increase farm productivity and engage in commercial value chain through “participation in outgrower and block farming schemes oriented around nucleus large-scale farms, and through greater access to inputs, extension and more favourable post-harvest marketing opportunities”. The Big Results Now (BRN) initiative identifies maize, rice and sugar as being the three priority crops as they contribute to food security and import substitution.

Currently Tanzania produces 300,000 tons of sugar annually, while demand for sugar is in the region of 500,000 tons. The annual deficit of approximately 200,000 tons is supplemented by importing sugar. With rising consumption by the growing population and the increasing number of food processing industries being established in the country, the demand for sugar – and therefore the sugar deficit – is increasing.

The African Development Bank, through its Private Sector Department (OPSM), is considering providing up to USD 50 million as a non-concessional loan to fund the Bagamoyo Eco-Energy Sugar Estate (hereafter referred to as EcoEnergy). The EcoEnergy Project will have a sugar mill initially producing about 132,000 tons of sugar; a bio-ethanol plant producing 10 million litres of biofuel; and a bagasse co-generation plant generating 32 MW of power of which 20 MW will be used on the estate and 12MW will be sold to the national grid. Recognising the opportunities presented by the EcoEnergy Project in the context of the SAGCOT vision, the Ministry of Agriculture, Food Security and Cooperatives (MAFSC) and the Prime Minister’s Office (PMO) recommended that local communities proximate to the EcoEnergy plantation become outgrowers who would supply sugarcane to the EcoEnergy mill. The MAFSC is therefore seeking funds from the AfDB and the International Fund for Agricultural Development (IFAD) to provide financial support for the development of the outgrowers’ schemes in terms of both infrastructure and capacity building.

The Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme intends to commercialise some 2000 smallholder farmers on about 3,000-3,500 ha of newly developed agricultural land in the villages of Kiwangwa, Matipwili and Gama/Kitame in Bagamoyo District, where the “core” activities of bulk infrastructure and on-farm development will be implemented. All three villages lie in close proximity to the EcoEnergy mill. When full capacity is reached, the schemes are expected to supply 300,000 tons of sugarcane per year to EcoEnergy for sugar and energy production. This will greatly enhance EcoEnergy’s output, and thus contribute to addressing the sugar deficit in the country. Earnings from the sale of sugarcane to EcoEnergy are



expected to improve the outgrowers' livelihoods, increase food security and stimulate wealth creation.

It is expected that the BASIC Programme will address the objectives of the national development strategies and the AfDB's and IFAD's objectives in Tanzania by commercializing the agriculture sector through assisting target communities to increase sugarcane production and other food crops through infrastructure development and improved and modern agricultural practices thereby boosting local household incomes and ensuring food security.

### ***Objectives of the Study***

The objective and scope of this assignment are to update the environmental and social impact assessment (ESIA) carried out in January-April 2014 for the three proposed outgrowers' schemes.

This study is therefore required to, among others, identify existing and potential environmental and social concerns; highlight potentially significant issues arising from the outgrowers' schemes; and propose mitigation and enhancement measures, as well as costs for mitigation.

### ***Study Approach and Methodology***

The current study was carried out between December 2014 and March 2015. It has been guided by NEMC's Environmental Impact Assessment Guidelines and Procedures (March 2002), the Environmental Management Act, 2004, and the Environmental Impact Assessment and Audit Regulations, 2005, national sector policies, legislation and regulations, as well as the African Development Bank's safeguard policies and procedures and IFAD's Social, Environmental and Climate Assessment Procedures.

The study methodology involved documentation reviews, site visits to the three outgrowers' schemes, extensive stakeholder consultations, a household survey, field observations, and analysis and synthesis of findings.

However due to a boundary dispute between Saadani National Park and Gama/Kitame village land, this report therefore focuses mainly on the Kiwangwa and Matipwili schemes, although baseline data, findings of consultations and assessment of impacts presented here also cover Gama/Kitame to the extent possible under the given circumstances. It is expected that that once the land dispute is resolved, the environmental and social impacts of the Gama outgrower scheme will be updated.

### ***Project Components***

The outgrower schemes, collectively coming under the Bagamoyo Sugar Infrastructure and Sustainable Community Development (BASIC) Programme, is located in Bagamoyo District, 100 km north of Dar es Salaam, approximately 30 km northwest of the historical town of Bagamoyo. All three schemes are located along the Wami River: the Matipwili scheme (1,150 ha in area) is on the north bank, while Kiwangwa (1,850 ha) and Gama/Kitame schemes (850 ha) are on the south bank of the river.

The main components of the project are:

- Bulk infrastructure, including main water supply, water conveyance systems, 1.4 Mm<sup>3</sup> dam (or an alternative storage structure), flood protection, main and secondary irrigation canals, bridge across the Wami River, and access roads;
- On farm infrastructure, such as offices, sheds, workshops, sanitation facilities, fencing;
- Agricultural equipment, including drag line systems, centre pivot systems, equipment to maintain drainage and roads, equipment for land preparation and harvesting;
- Cultivation of sugarcane (land preparation, planting of cane, irrigation, caring for cane, harvesting, application of agrochemicals);
- Power transmission line – to be constructed by TANESCO; and
- Outgrower capacity building.

The outgrowers will form and register 25 to 30 companies, based on an amalgamation of farms and village land totalling between 100 ha and 150 ha per company. The owners of the farms will have shares in the company and will operate and manage the company. They may opt to work on the schemes themselves or may choose to hire labour from their communities. EcoEnergy will be closely involved in the development of the outgrowers' schemes and provide technical assistance during the setting up stages and during operation.

AfDB will fund the bulk infrastructure, agricultural equipment and associated costs, contributing about 23% of the total cost of the programme. IFAD will fund on-farm civil works, climate resilient community development, and capacity building for both sugar cane outgrower companies and companies in the surrounding community, amounting to approximately 49% of the total cost of the programme. The Government of Tanzania will contribute 11%, while the banks and farmers/companies will make up the rest.

### ***Policy, Legal and Administrative Framework***

Environmental management in Tanzania is guided by the National Environment Policy (1997). The supreme law on environment is the Environmental Management Act of 2004. Various regulations are also in place to ensure the protection and conservation of the environment and natural resources, including the Environmental Impact Assessment Regulations, Solid Waste Regulations, Water Quality Regulations, Soil Quality Regulations and Air Quality Regulations.

Sector policies relevant to this project include the Land, Agriculture and Livestock, Irrigation, Water, Human Settlements Development Policy, Women and Gender Development, HIV/AIDS, Wildlife, Forest and Energy Policies.

The following legislation is also pertinent:

- The Constitution of Tanzania;
- The Water Resources Management Act, 2009;
- The Land Act, 1999, and the Land Regulations, 2001;
- The Fertilizers Act, 2009;
- Road Act, 2007;
- The Occupational Health and Safety Act, 2003;
- Graves (Removal) Act, 1969;
- The Forest Act, (No 14), 2002;
- The National Parks Act, Cap 282
- The Wildlife Conservation Act, (No.12), 1974;

- The Land Acquisition Act, (No.47), 1967;
- Energy and Water Utilities Regulatory Authority, 2001;
- The National Irrigation Act.

The National Environment Management Council is responsible for the overall coordination of sector-related environmental issues.

In addition, the following AfDB and IFAD procedures and guidelines have been followed:

- AfDB's Integrated Environmental and Social Impact Assessment Guidelines, 2003;
- AfDB's Environmental and Social Assessment Procedures, 2001;
- AfDB's Integrated Safeguards System, December 2013;
- IFAD's Social, Environmental and Climate Assessment Procedures, December 2014.

## ***Project Setting***

### **Environmental Profile**

The climate in Bagamoyo district is influenced by its proximity to the Indian Ocean. Seasonal average temperatures range from 13°C to 30°C, and humidity levels can reach as high as 98%. Rainfall ranges between 800mm and 1200 mm per annum. The short rains (*vuli*) fall from October to December while the long rains (*masika*) fall from March to May. June to September is the driest period when monthly rainfall is generally less than 50 mm per month. Climate studies indicate that rainfall has been decreasing since 1913, that since 1999 the rains appear to fall earlier and end earlier, and that the short rains are becoming increasingly unreliable (ref. The Pwani Project/USAID, 2013).

Approximately 85% of the total area of Bagamoyo District is suitable for agriculture. However, of this only about 17% of cultivable land is used to grow various crops such as maize, cassava and pineapples, while only 6% of land with irrigation potential is used. About 15% ha of the total area of the district is used for livestock grazing.

The topography of all three scheme areas is generally flat, having slopes of less than 2%. The soils in Kiwangwa and Matipwili are mainly alluvial gravel, sands and clays while at Gama/Kitame the soils can be described as lagoonal clays and silts and salt pans.

The main source of water for the schemes will be the Wami River, which forms a sub-basin of the Wami-Ruvu Basin. The river has its origins in the Ukaguru, Rubeho and Nguru Mountain Ranges, which are part of the Eastern Arc Mountains.

Saadani National Park lies directly to the north and east of Matipwili village, while Gama/Kitame village lies within the southern section of the gazetted boundary of the Park. The park is unique in that it contains both terrestrial and marine habitats. The park has several endemic and endangered species. There is an elephant migration corridor from Saadani National Park to Wami-Mbiki Forest Reserve from where they travel to Mkomazi National Park in the north, and Mikumi National Park and the Selous Game Reserve to the south. The Zaraninge Forest Reserve, which is now part of Saadani National Park is one of the few extensive remnants of the Zanzibar-Inhambane forest types, and is a biodiversity hotspot. There are several other village forest

reserves within 20 km of the project area. Poaching and deforestation for charcoal production are serious environmental concerns in the project area.

## **Social Profile**

The Tanzania Population and Housing Census (2012) put the Bagamoyo district population at 311,740 people. As regards the outgrowers' schemes, village records show that Kiwangwa village has 9 sub-villages with a total of 9,145 people, and 2,351 households. Gama which is part of Kitame sub-village has a total population of 452 in 180 households. Matipwili village is composed of 6 sub-villages, with a total population of 3,059 and 574 households.

The household survey conducted in the outgrower villages revealed that household land holdings vary from 3-5 acres to 6-15 acres. The amount of land actually cultivated was very small due to the use of rudimentary farm equipment (hand hoes), lack of access to agricultural inputs and extension services.

According to the household survey, the main economic activity in the project area is agriculture, and agriculture combined with small scale businesses (such as vending). Fishing is important on a subsistence level, but in Gama/Kitame prawn fishing provides a good source of income. There are also a number of pastoralists (Berbeig and Maasai) who keep cattle, sheep and goats.

More than 90% of the households spend TShs 1000/- to 5000/- per day, which indicates that their earnings are correspondingly low.

The project area is served by dispensaries and primary schools. Matipwili and Kiwangwa have secondary schools.

## **Public Consultations**

Consultations were held with key stakeholders in Dar es Salaam, following which meetings were held with the regional and District authorities, ward and village authorities, and focus groups representing women, elders, youth, farmers, livestock keepers, paddy irrigator group and fishermen. Tools were developed to guide discussions held with village governments and with focus groups. Informal and formal interviews were held with outgrower communities. In order to develop a social profile of the outgrower communities, a household survey was conducted on a sample of members from the outgrower communities. Data from the household survey was inputted into the SPSS programme to assist with the analysis of socio-economic data.

In addition to the Kiwangwa, Matipwili and Gama/Kitame Village Councils and village communities, and groups mentioned above, key stakeholders identified for the proposed BASIC Programme include various departments within the Ministry of Agriculture Food Security and Cooperatives; Coast Region Regional Administrative Secretariat; Coast Region Regional Agricultural Office; Bagamoyo District Council; the Prime Minister's Office Department of Coordination of Government Business; the Vice President's Office, Directorate of Environment; the Presidential Delivery Bureau; EcoEnergy; Southern Agricultural Growth Corridor of Tanzania (SAGCOT); Tanzania Electrical Supply Company (TANESCO); National Environmental Management Council (NEMC); Ministry of Natural Resources and Tourism Department of Wildlife; Ministry of Lands; Ministry of Water; Ministry of Energy & Minerals; Ardhi University; Space and Development Consultants; Sugar Board of Tanzania; Tanzania

Coastal Management Partnership; IUCN; Wami Ruvu Basin Water Office; National Irrigation Commission Zonal Irrigation Unit, Morogoro; iWASH; and Saadani National Park Authority.

Impacts and issues due to the proposed outgrowers' schemes as perceived by the outgrower communities and stakeholders were:

- An increase of new infection rates for HIV/AIDS due to interactions between outsiders and local people and intermarriages, poverty (income), unfriendly traditions and customs, practicing unsafe sex, and inadequate comprehensive knowledge.
- Insufficient water from the Wami River for downstream users as a result of the water being taken for irrigating the sugarcane fields.
- Environmental degradation due to pollution of water sources, haphazard disposal of wastes, cutting down trees for charcoal making, over-grazing, land clearance for crop cultivation (fallow system) and destruction of fishing breeding sites.
- Access to irrigation farms / outgrowers' schemes will be a problem due to the distances from the villages to the scheme sites.
- Poor governance of outgrower companies based on managerial and administrative hurdles experienced with the pilot rice irrigation groups.
- Food insecurity as farmers are likely to prefer cultivating sugarcane for cash at the expense of growing food crops.
- Access to the river or passage of animals to drink water at the river will be a problem either due to access routes being cut off or because of a shortage of water, and this may cause conflict between farmers and livestock keepers.

Several issues were highlighted by stakeholders that need attention. These include:

- Improved communication and coordination between MAFSC, EcoEnergy, Bagamoyo District Officer, the outgrower villagers and other relevant stakeholders;
- Review and improvement of land use management in villages including the processing of Certificate of Customary Rights of Ownership (CCRO);
- Improvement of transportation (roads) and means of transport means to and from the outgrower farms and villages;
- The need to acquire water-user rights for the rice irrigation groups which will become sugarcane outgrowers in the future;
- Review and improvement of contracts between the rice irrigation groups and the EcoEnergy so as to improve relationships, accountability and production of rice;
- Resolving of the outstanding boundary disputes between Matipwili and Gama/Kitame villages and Saadani National Park;
- The need for a guaranteed market for the sugarcane produced by the outgrowers and reasonable farm gate price to be offered by EcoEnergy for the cane to ensure sustainability of companies,
- Mechanisms to be in place to balance food security vis a vis commercial crops (sugarcane) and how best to manage sugarcane companies;
- Making sure that the quality of outgrower sugarcane meets required standards for EcoEnergy to purchase, and that the purchase price for all cane grown in the schemes is fair and equitable to avoid rejection of outgrower-produced sugarcane and potential disgruntlement with EcoEnergy;
- Regulating sugar importation in order to protect the local sugar industries - this is the responsibility of the Central Government.

## ***Project Alternatives***

A number of alternatives were considered with respect to different aspects of cane cultivation:

- i. The choice of crops to be cultivated, and the reasoning behind growing sugarcane as opposed to food crops;
- ii. Selection of outgrower sites – this was done on the basis of availability of water, suitability of soils for sugarcane production; and proximity to the EcoEnergy mill.
- iii. Location of bulk infrastructure – this is still to be decided through the development of land use plans for each site as a participatory exercise, as the approach adopted emphasizes that the community should decide where bulk infrastructure – such as the roads, conveyance canals, secondary canals, transmission lines – will be located.
- iv. The various options for the bulk storage of water to supplement dry season water supply for irrigation are currently being considered, including a 1.4 million m<sup>3</sup> off-river storage dam, oxbow lake(s), a water pan and a dam on the Wami River. A detailed ESIA will be conducted for whichever option is considered most viable.
- v. Sugarcane varieties – various varieties are being tested on the EcoEnergy seed cane farm, and the most suitable variety for the outgrowers' scheme will be selected on the basis of compatibility with soils, water availability and input requirements.
- vi. Irrigation technology - furrow irrigation, drip irrigation, centre pivot irrigation and modified drag line overhead sprinkler system were considered. The latter two were deemed to be most suited for the outgrowers' schemes.
- vii. Weed control – the pros and cons of chemical weeding, hand weeding, mechanised weeding and trash blankets were considered.
- viii. Finally the “no project option” was discussed.

## ***Environmental and Social Impacts***

There are several benefits to be derived from the BASIC Programme. On the national scale, the project will spearhead public-private-partnership (PPP) initiatives in the agricultural sector, and in line with the SAGCOT vision it will trigger the commercialisation of smallholder farms to in order to improve productivity and efficiency. This will also enhance Bagamoyo District's “new city” image as an emerging economic hub in the Coast Region. The project is expected to produce about 300,000 tons of sugarcane per year, contributing to addressing the huge sugar deficit in the country.

At the local level, the outgrower companies are expected to employ in the region of 1,500 to work on the three schemes namely Kiwangwa, Matipwili and Gama/Kitame. The idea is that each farmer who owns land in the scheme will be employed to work on the farm by the outgrower company, or the company may decide to employ members of the outgrower community to work on the company farms. These employment opportunities will improve household income.

Petty traders particularly women will sell cooked food and fruits to farm workers. People from other surrounding villages Makurunge, Fukayosi and Kidomole may also be employed on the outgrowers' schemes and the EcoEnergy factory, resulting in a multiplier effect on the local economy.

The bulk infrastructure that will be constructed for the project will include access roads from the villages to the outgrowers' schemes, which will also be used by villages and settlements along the

roads. The proposed dam that will store excess water when the Wami River is in flood may be used to supplement water supply to outgrower villages, as well as other neighbouring communities in times of drought. Power lines will be brought into the project area, so that those who wish to connect to the National Grid may easily do so.

The main environmental impacts are related to the availability of water resources from the Wami River, and the adequacy of environmental flow downstream of the EcoEnergy and outgrower schemes' abstraction points. Water quality in the river will be affected by the application of agrochemicals which would impact on aquatic ecology, and therefore on downstream prawn fisheries. The handling, storage and disposal of agrochemicals are also of concern. Soil erosion and degradation may result from poor cultivation practices (such as tilling, excessive watering) and poor drainage. A lot of vegetation will be cleared for the schemes which will leave large areas exposed to rain and wind erosion, but will also result in loss of biodiversity and release of stored carbon into the atmosphere. The elephant migration corridor may be disturbed and movement disrupted. Poaching of wildlife and chopping of trees for firewood may increase due to the influx of labour.

Other environmental impacts include dust emissions especially during construction activities, oil pollution, impacts due to the setting up of the workmen's camp and contractor's camp (including pressure on potable water resources, food and energy), and disposal of solid waste during construction and during scheme operation.

The most serious social impacts relate to the land dispute between the Saadani National Park and EcoEnergy, as this would impact on the sustainability of the outgrowers' scheme. Boundary disputes relating to the Saadani National Park and Matipwili and Saadani National Park and Gama/Kitame would be resolved if the areas of the park annexed in 2005 are degazetted, but that may take some time. Conflicts between livestock keepers and the farmers can be resolved by providing grazing land for the pastoralists and access to the Wami River for watering livestock.

Loss of land, property, trees and crops is also a major impact of the project. At this point the exact number of project affected persons or parties (PAPs) is not known as the scheme designs are still in their conceptual phases, and the location and design of bulk infrastructure has not been fully decided. However, there will be a need for compensation if not relocation, as some infrastructure is to be located outside the scheme boundaries (eg. the dam, access roads and power transmission lines). Food insecurity is another major concern, as farmers may concentrate on growing sugarcane at the expense of food crops.

Other concerns are occupational health and safety; increased HIV/AIDS infection rates due to an immigrant labour force during construction but also as the project is likely to attract more people to the project area; use of child labour on the schemes lured by the prospect of earning money and causing them to drop out of school; disturbances to the public; road safety issues, and the removal of a graveyard at Kiwangwa.

### ***Environmental and Social Management***

The main recommendations proposed for the prevention and mitigation of adverse environmental and social impacts are summarised below:

**Table E1: Environmental and Social Impacts and Proposed Mitigation**

Sources/Causes of Impact	Environmental / Social Impact	Proposed Mitigation
<b>ENVIRONMENTAL MITIGATION</b>		
Climate change resulting in reduced rainfall. Over-abstraction of water upstream	Unavailability of water for irrigation and downstream use, particularly in the dry season	<ul style="list-style-type: none"> <li>- Design and install off river storage facilities, eg dam</li> <li>- Install rainwater harvesting infrastructure at farm offices and workshops</li> <li>- Install water abstraction monitoring infrastructure (gauges)</li> <li>- Install infrastructure to measure flow levels in the river</li> <li>- Form irrigator's organisations</li> <li>- Update environmental flow assessment to take into account developments/ abstractions since 2007 and water demand by the outgrower schemes and the EcoEnergy estate.</li> <li>- Use minimum irrigation water requirements during dry season.</li> <li>- Initiate the Wami River catchment protection programme</li> </ul>
Soil erosion due to excavation and clearing activities, including removal of riparian vegetation. Pollution of water due to foulwater leaching into the Wami River. Pollution due to leaching, seepage or transmission of agrochemicals through the soil into the Wami River	Deterioration of water quality	<ul style="list-style-type: none"> <li>- Minimise/prevent soil erosion – see below</li> <li>- Establish buffer zone along river bank</li> <li>- Drains from the cane fields should lead to a collection pond where the water can be tested and treated before discharge to the river</li> <li>- Install proper sanitation facilities which include a form of treatment</li> <li>- Minimise use of agrochemicals through adopting conservation agriculture techniques, explore organic/natural fertilizers, pesticides</li> <li>- Manual removal of weeds</li> </ul>
Excavation and clearing activities during construction Speeding construction vehicles	Air pollution – dust	<ul style="list-style-type: none"> <li>- Watering exposed/ worked surfaces</li> <li>- Controlling the speed of construction vehicles</li> </ul>
Slash and burn methods to clear land for cultivation of cane. Burning cane to clear land for new planting	Air pollution – particulates	<ul style="list-style-type: none"> <li>- Prohibit clearing through slash and burn methods</li> <li>- No field burning allowed</li> <li>- Create fire breaks</li> <li>- Sensitise farmers on improved farming methods</li> </ul>
Clear vegetation for land preparation for can cultivation Tilling land releases carbon stored in soil. Excessive use of fertilizers where unabsorbed ammonia and nitrates may subsequently be released into the air.	Air pollution – GHG emissions	<ul style="list-style-type: none"> <li>- Introduce an agroforestry project to compensate for CO2 released from clearing vegetation</li> <li>- Adopt zero tillage so carbon stored in soils</li> <li>- Adopt best practices for soil management to minimise emissions of ammonia and nitrates.</li> </ul>
Oil spills from storing, handling and disposal of fuel, oils and lubricants	Oil pollution	<ul style="list-style-type: none"> <li>- For bulk fuel – install fuel tank with bund of 110% capacity</li> <li>- Establish procedures for fuel delivery; decanting/draining; use, storage; spill response; disposal of waste oil; handling of oil products.</li> <li>- Minimise need for having fuel oil on site – explore options for solar powered pumps or connect to national grid.</li> </ul>
Construction traffic, construction works. Pump houses where water from the river is being pumped to the schemes.	Noise quality	<ul style="list-style-type: none"> <li>- Provide PPE to personnel working in areas exposed to excessive noise levels</li> </ul>
Solid waste generated during construction, including debris and packaging.	Solid waste	<ul style="list-style-type: none"> <li>- Dispose of construction waste and solid waste as per NEMC regulations</li> <li>- Recycle, reuse, recover and reduce waste</li> </ul>



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Sources/Causes of Impact	Environmental / Social Impact	Proposed Mitigation
Waste generated during operation, eg food waste, packaging, scrap metal, etc.		
Excessive rain, floods. Over-watering of cane fields.	Water logging, poor drainage	<ul style="list-style-type: none"> <li>- Provide drainage for access roads</li> <li>- Levelling of sugarcane fields so allow drainage of excess water</li> <li>- Maintain drainage canals and other drainage structures</li> <li>- Construct dykes</li> </ul>
Excavation and clearing activities, including removal of riparian vegetation during construction. Clearing for planting new cane. Erosion caused by rain, runoff and wind.	Soil erosion	<ul style="list-style-type: none"> <li>- Control earthworks</li> <li>- Install and maintain drainage structures</li> <li>- Install and maintain erosion control measures</li> <li>- Use zero-till/reduce till methods of land preparation</li> </ul>
Poor cultivation practices, eg tilling, excessive use of chemical inputs, mono-cropping for long periods of time	Soil degradation	<ul style="list-style-type: none"> <li>- Use best practices for growing cane recommended by Bonsucro and conservation agriculture techniques, such as zero tillage or reduced tillage,</li> <li>- Intercropping to strengthen soil structure;</li> <li>- Green fertilization and green harvesting to cover soil with cane straw.</li> <li>- Implement Integrated Soil Conservation and Nutrient Management systems</li> </ul>
Poor application of, and/or excessive use of chemical inputs	Chemical pollution of soils, groundwater and surface water	<ul style="list-style-type: none"> <li>- Minimise use of agrochemicals through adopting conservation agriculture techniques, select natural organic alternatives</li> <li>- Careful supervision of application of agrochemicals</li> <li>- Follow Bonsucro requirements</li> <li>- Use agrochemicals approved by TPRI, WHO and FAO</li> <li>- Set up an Integrated Pest Management system and draw up a pest management plan</li> <li>- Train persons exposed to chemicals in proper use, handling, storage, and disposal.</li> <li>- Ensure chemical containers are disposed of as hazardous waste</li> <li>- Keep records of chemicals used, application amounts.</li> </ul>
Clearing of vegetation during construction and for cultivation of cane	Loss of biodiversity, soil erosion	<ul style="list-style-type: none"> <li>- Careful supervision of clearing activities so that only areas required for bulk infrastructure and agricultural infrastructure are cleared.</li> <li>- Assess impacts of inundation of dam (or alternative water storage facility) on vegetation</li> <li>- Assess impacts of building the bridge at Matipwili on riparian vegetation</li> <li>- Preserve/maintain remnant forest stands to preserve biodiversity</li> <li>- Assess impact on sacred forests within Kiwangwa scheme area.</li> </ul>
	Carbon releases	<ul style="list-style-type: none"> <li>- Green sugar production including adopting conservation agriculture techniques</li> <li>- Use of molasses from cane to produce ethanol</li> <li>- Use of bagasse from cane for electrical generation</li> <li>- Woodlot afforestation of 700 ha within Programme villages</li> <li>- Reafforestation of riverine belt</li> </ul>

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Sources/Causes of Impact	Environmental / Social Impact	Proposed Mitigation
Proximity of schemes to Saadani National Park and wildlife dispersal area	Human-wildlife conflicts – crop raiding	<ul style="list-style-type: none"><li>- Install electrical fences with outriggers, or a double barrier fence</li><li>- Explore the use of beehive fences</li></ul>
	Poaching	<ul style="list-style-type: none"><li>- Awareness raising among outgrower scheme communities.</li><li>- Community skills enhancement to include wildlife/bird guide training</li></ul>
	Disruption of elephant migration	<ul style="list-style-type: none"><li>- Establish exact route elephants use</li><li>- Maintain a biodiversity corridor from Saadani through EcoEnergy estate and outgrowers schemes</li></ul>
Proximity to Zaraninge Forest – leading to illegal felling of trees for charcoal production	Loss of biodiversity	<ul style="list-style-type: none"><li>- Establish community fuelwood plantations</li></ul>
		<ul style="list-style-type: none"><li>- Preserve/maintain remnant forest stands to preserve biodiversity</li></ul>
		<ul style="list-style-type: none"><li>- Community skills enhancement programme to include wildlife/bird guide training</li></ul>
Sourcing of construction materials, excavation of borrow pits, quarries, sand	Destruction of environment, changes in landscape and land use.	<ul style="list-style-type: none"><li>- Assess environmental impacts due to materials for construction</li></ul>
Setting up Workman’s / Contractor’s camp	Pressure on water sources, fuelwood /energy sources and other public services. Generation of solid and liquid waste. Competition for local food. Risks of increased rates of STIs, including HIV/AIDS.	<ul style="list-style-type: none"><li>- Set up camp at same location as EcoEnergy construction camp if possible.</li><li>- Alternatively consult village authorities to identify camp location.</li><li>- Develop clear specifications for camps with regard to sanitation facilities, accommodation, provision of water, health and safety, etc.</li></ul>
		<ul style="list-style-type: none"><li>- Solid and liquid waste management plans to be developed for construction and operation phases.</li><li>- Provide proper sanitation facilities to workforce</li></ul>
		<ul style="list-style-type: none"><li>- Contractor to supply workforce with food ensuring that local food supplies are not compromised in times of food shortages.</li></ul>
		<ul style="list-style-type: none"><li>- Contractor to conduct HIV/AIDS prevention and awareness campaign targeting his workforce as well as local communities.</li></ul>
SOCIAL/SOCIO-ECONOMIC MITIGATION		
EcoEnergy communication strategy is inadequate	Misunderstandings between outgrower communities and EcoEnergy	<ul style="list-style-type: none"><li>- EcoEnergy to revise stakeholder communication/outgrower engagement strategy</li></ul>
Grazing land being taken for agriculture, consequently there is less land available and large numbers of livestock. Access to water for livestock blocked.	Land use conflicts – Livestock keepers and farmers	<ul style="list-style-type: none"><li>- Develop village land use plans that provide land for livestock grazing</li><li>- Allow livestock access routes to Wami River</li><li>- Initiate programme to improve stock but reduce numbers</li><li>- Establish local monitoring system for non-compliance to reduce conflicts and manage them at early stage</li></ul>
In-migration due to potential job opportunities, and spin off employment activities.	Growth of outgrower villages due to induced settlement	<ul style="list-style-type: none"><li>- Plan for population increase and consequent demand on public utilities</li><li>- Interaction between local leadership, outgrowers and immigrants</li><li>- Initiate educational campaigns for HIV/AIDS awareness, drug abuse prevention, security, etc</li><li>- Give employment preference to members of local communities</li></ul>
Permanent and temporary acquisition of land for scheme infrastructure	Loss of land, (including agricultural land), structures, trees and crops	<ul style="list-style-type: none"><li>- Develop land use plans to identify location of infrastructure and affected persons.</li></ul>
		<ul style="list-style-type: none"><li>- Verify identify of project affected persons/parties</li><li>- Prepare RAP</li></ul>
		<ul style="list-style-type: none"><li>- Implement RAP.</li></ul>

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Sources/Causes of Impact	Environmental / Social Impact	Proposed Mitigation
		<ul style="list-style-type: none"> <li>- Compensation to be paid for land and all property on land to temporarily acquired for road construction works</li> <li>- Restoration/ rehabilitation of land acquired temporarily for construction purpose</li> </ul>
Insufficient flow left in Wami River downstream of schemes. Pollution of Wami River water due leaching of agrochemicals into river	Threat to fisheries	<ul style="list-style-type: none"> <li>- Establish updated environmental flows</li> <li>- Careful application of agrochemicals – develop agrochemical management plan</li> <li>- Follow Bonsucro requirements</li> <li>- Establish aquatic ecological baseline</li> <li>- Monitor water quality in Wami River downstream of abstraction points</li> </ul>
Sugarcane grown in preference to food crops – no provision made for growing food crops on schemes.	Food insecurity	<ul style="list-style-type: none"> <li>- Promote production of food crops in parallel to sugarcane</li> <li>- Provide support to farmers to improve food crop production</li> <li>- Introduce cash savings from sugarcane sales for purchasing food especially during times of food shortages</li> </ul>
Construction and operation activities may pose danger to site personnel.	Occupational health and safety	<ul style="list-style-type: none"> <li>- Schemes must set up OHS committees</li> <li>- Comply with national OHS requirements and best practice</li> </ul>
Transient and immigrant labour for construction and spin off employment opportunities, as well as increased incomes in local communities leading to promiscuity.	HIV/AIDS	<ul style="list-style-type: none"> <li>- Situational analysis of HIV/AIDS in project area</li> <li>- Workplace HIV/AIDS prevention and awareness programme</li> </ul>
Children may opt to work on the schemes (or associated spin off activities) for money, thereby dropping out of school, and in violation of national labour laws.	Child labour	<ul style="list-style-type: none"> <li>- Sensitise parents and wherever possible introduce / strengthen provision of food in schools.</li> <li>- Outgrowers schemes should develop a labour policy prohibiting child labour</li> </ul>
Construction traffic, excavation activities, immigrant labour with surplus cash.	Disturbance to the public, disruption of livelihoods and routines, dust emissions, nuisance	<ul style="list-style-type: none"> <li>- Sensitisation / awareness raising on project details, timing etc.</li> <li>- Diligence on the part of contractor/construction workers to minimise disturbance to communities</li> </ul>
Construction traffic, and during operation tractors for collecting cane, and more vehicular traffic due to improved roads/better access in the project area.	Road safety	<ul style="list-style-type: none"> <li>- Implement road safety programme</li> <li>- Construct diversions road to reduce inconvenience to road users</li> <li>- Improve footpaths along construction traffic routes so that pedestrians need not use the roads</li> </ul>
Presence of graves in Kiwangwa scheme area.	Personal / emotional stress to relatives of the deceased.	<ul style="list-style-type: none"> <li>- Identification and relocation of graves as per provisions in Graves (Removal) Act</li> </ul>
Clearing of vegetation/woodlands and forest stands, resulting in destruction/loss of traditional plants, trees and sacred sites.	Loss of indigenous knowledge and cultural heritage	<ul style="list-style-type: none"> <li>- Identify and preserve traditional plants and trees having indigenous value and sacred forests</li> <li>- Develop a procedure to manage “chance finds” of cultural and traditional significance.</li> <li>- Special plantations to grow and preserve indigenous tree/plant species of cultural value</li> </ul>

Wherever possible, mitigation measures must be included in the Engineering Drawings, Specifications and Bills of Quantities. Diligence on the part of the Contractor and proper supervision during construction and the maintenance period immediately after construction will be crucial for mitigating impacts. During operation, maintenance will be a key factor in protecting the environment.

## ***Environmental and Social Monitoring***

Monitoring allows measures to be implemented in order to prevent or avert negative impacts. The overall objective of environmental and social monitoring will be to ensure that activities carried out during planning, construction and operation are environmentally and socially acceptable, and therefore sustainable. In this regard, monitoring of the following parameters is recommended to safeguard against specific impacts:

**Table E2: Monitoring Parameters**

<b>Monitoring Parameter</b>	<b>Monitoring Activity</b>
Water availability	Monitor water levels in Wami River
	Monitor abstraction rates
Water quality in Wami River	Monitor water quality at given sites downstream of abstraction points
Agrochemical releases into irrigation drains/Wami River	Monitor water quality at given sample sites along drainage network, at collection pond and point of discharge to river
Agrochemical concentrations in fish populations	Monitor levels of pollutants from agrochemicals in fish
Soil erosion	Monitor erosion
	Monitor efficiency of erosion control measures
Soil quality	Monitor quality of soil for nutrient depletion and loss in structure, and agrochemical contamination
Elephant migration	Monitor elephant movements, frequency of migration and times of year
Economic activity in project area	Monitor changes in agricultural production and marketing
	Monitor changes in trade and commercial activities
Socio-economic status	Monitor changes in poverty levels
	Monitor changes in health status
	Monitor changes in education levels
	Monitor changes in crime rates/prostitution
	Monitor changes in employment levels for both women and men
Food security	Monitor impacts of sugarcane production on food security in the project villages

## ***Institutional Aspects of Environmental and Social Management***

The Presidential Delivery Bureau (PDB) has been mandated to ensure that the goals and objectives of the Big Results Now Initiative (BRN) are achieved through facilitating the implementation of key projects under the BRN. As it has the ability to call upon all ministries and government departments to streamline the implementation process, the PDB will be responsible for programme oversight. A Programme Coordination and Management Unit (PCMU) will be set up, under the auspices of the Ministry of Agriculture, Food Security and Cooperatives (MAFSC) and bear the responsibility of supervising the setting up and operations and management aspects of the outgrowers' schemes and overseeing the day to day operations, coordination and management of the project activities. The PCMU will be in charge of disbursing payments as required for the setting up and operation of the schemes. The Unit will be overseen by the PDB which will provide strategic guidance and coordination, and approve workplans and budgets. It will also be required to liaise continuously with EcoEnergy, SAGCOT, Ministry of Water, and the Ministry of Lands, Housing and Human Settlements and Development.

During the construction of the bulk infrastructure and putting up the agricultural infrastructure, and the defects liability period, the Contractor will be responsible for implementing the proposed mitigation measures, but the responsibility for supervision and to ensure that mitigation is actually implemented will lie with the Site Supervisor (or Engineer). However, the overall

responsibility in all phases of the project lies with the Programme Coordination and Management Unit. The outgrowers' management will assist the PCMU in ensuring that emerging environmental and social issues are appropriately addressed.

When the scheme is operational, the respective outgrowers' scheme managements will be responsible for the implementation of mitigation measures and the ESMP, and will be guided by PCMU and EcoEnergy.

### ***Complementary Initiatives***

Complementary initiatives to enhance the overall objectives of this project would include:

- A Wami River Sub Basin catchment conservation programme;
- A programme to enhance the value of traditional plants and trees;
- Training of members of the community in guiding/ecotourism ventures.

In addition, the Wami Ruvu Basin Water Office has plans to construct upstream water storage facilities to capture excess water in the Wami River during high flows. This would enhance flows in the river downstream during the dry season, enable environmental flows to be maintained, and will therefore contribute to mitigating the impacts of the schemes on downstream aquatic ecology. However, funding has yet to be sourced for this intervention.

### ***Environmental Management and Monitoring Costs***

Most of the costs associated with environmental management are included in the design costs, the cost of carrying out further studies and preparing / implementing the RAP, as well as costs included in the Engineer's Estimate, and normal operating and maintenance costs. Compensation costs will be determined during the RAP. As it is not possible to predict costs on a long term basis, additional environmental and social management and monitoring costs are provided for the first year, and then for the second to fifth years. Costs are summarised in Table E3 below.

**Table E3: Environmental and Social Management and Monitoring Costs**

<b>Cost Item</b>	<b>Costs in Year 1 USD</b>	<b>Cost in Years 2- 5 USD</b>
<b>Management Intervention</b>		
Further studies, ESIA update and RAP	160,000	
Environmental flow assessments	100,000	150,000
Complementary initiatives <ul style="list-style-type: none"> <li>• Catchment conservation, enhancing value of traditional plants, ecotourism training</li> </ul>	30,000	60,000
<b>Total Additional Management Costs USD</b>	<b>290,000</b>	<b>210,000</b>
<b>Monitoring Parameter</b>		
Water quality testing	10,000	40,000
Agrochemical concentrations in fish populations	5,000	20,000
Soil quality	5,000	20,000
Elephant migration study	50,000	50,000
Economic activity in project area (including food security)	50,000	50,000
Socio-economic status	50,000	50,000
<b>TOTAL MONITORING COSTS USD</b>	<b>170,000</b>	<b>230,000</b>

## Cost Benefit Analysis

Four illustrative company models were developed to show the expected financial returns per ha of crop cultivated, the investments required per hectare, as well as the scope of the estimated financial outlay per company, the type and source of financing obtained, and the financial returns to the company, without and with financing, as well as the internal financial rate of returns. The first three models show the variance of returns for three different areas covered by sugarcane and rice (Model 1, 80 ha of sugarcane with 10 ha of irrigated rice; Model 2: 125 ha of sugarcane with 10 ha of irrigated rice; Model 3: 150 ha of sugarcane with 10 ha of irrigated rice , and the fourth model (125 ha of sugarcane with 40 ha of irrigated rice) shows the returns for a greater area of rice cropping. Table E3 below summarises the financial analysis for the various models. The table shows that on a per hectare basis, annual operating costs and depreciation are more expensive the smaller the company, while the average cash flow per hectare is higher the bigger the company.

**Table E4: Summary of Sugarcane Company Models Financial Analysis**

<b>Sugarcane+Rice</b>	<b>Mod 80+10</b>	<b>Mod 125+10</b>	<b>Mod 150+10</b>	<b>Mod 125+40</b>
<b>Crop budget</b>				
average cane gross revenue (\$/ha) - 15 yrs	\$5,354	\$5,354	\$5,354	\$5,354
average cane gross margin (\$/ha) - 15 yrs	\$3,374	\$3,374	\$3,374	\$3,374
average rice gross revenue (\$/ha) - 15 yrs	\$1,750	\$1,750	\$1,750	\$1,750
average rice gross margin (\$/ha) - 15 yrs	\$587	\$587	\$587	\$587
<b>Company investment costs</b>				
Cost irrigation equip/ha	\$3,000	\$3,000	\$3,000	\$3,000
Cost farm equip/ha	\$2,330	\$1,592	\$1,373	\$1,592
Seed cane/ha	\$1,889	\$1,889	\$1,889	\$1,889
Total cost/ha - sugar	\$7,219	\$6,481	\$6,262	\$6,481
Total cost/ha - rice	\$4,000	\$4,000	\$4,000	\$4,000
<b>Company annual operating costs</b>				
Annual overhead operating costs	\$106,301	\$130,016	\$143,191	\$140,906
Per ha average	\$1,181	\$963	\$895	\$854
Annual depreciation	\$55,209	\$74,732	\$85,579	\$82,832
Per ha average	\$613	\$554	\$535	\$502
<b>Company returns</b>				
average cash flow cane (\$/ha)-15 yrs	\$1,320	\$1,700	\$1,742	\$1,554
average cash flow rice (\$/ha) -15 yrs, 2.5 crop intens	\$1,446	\$1,446	\$1,467	\$1,577
cost of sales %	74%	68%	66%	69%
average yr 2-9 incl loan repayment (\$/ha)	\$361	\$790	\$895	\$718
average yr 10-15 after loan repayment (\$/ha)	\$1,161	\$1,515	\$1,626	\$1,403
IRR without financing	16%	25%	28%	26%
IRR with financing	3%	11%	0%	14%

## Decommissioning

The expected operational life of a programme is estimated at 25 years, but may be longer given that the EcoEnergy lease for the core plantation is 99 years. As it is not possible to ascertain prevailing environmental and social conditions at the time of decommissioning, it is recommended that an ESIA be undertaken at the time of decommissioning in line with NEMC's requirements to be submitted to NEMC 3-6 months before decommissioning activities begin. The ESIA should include a decommissioning plan. Issues that need specific attention would include soil erosion due to removal of infrastructure and removal of sugarcane and exposure of open areas to the elements; testing for contamination; removal of waste; disposal of hazardous materials; remediating contaminated areas; recontouring and revegetating the site; removal of all introduced plant species to the programme area; sociological impact of decommissioning, in terms of livelihoods; and demolition of all unwanted infrastructure.

## **Conclusions and Recommendations**

The Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme is likely to achieve its intended objectives, as well as realise a number of benefits for the local communities, provided that:

- The boundary dispute between Saadani National Park and the EcoEnergy Estate is resolved amicably;
- The environmental flow downstream of Matipwili is maintained;
- The use of agrochemicals is controlled and supervised, and a move is made to change to organic cultivation of sugarcane;
- All land acquired for the purposes of the project is promptly and fairly compensated for, and that any relocation of affected persons or property is carried out in accordance with national legislation and international guidelines;
- Provision is made to grow food crops as well, either through intercropping or reserving land for this purpose;
- There will be a deliberate effort made by the government to regulate the importation of sugar.

Recommendations for mitigation and monitoring made in this report will have to be further elaborated during the design phase when the actual land areas of the schemes have been established, the locations of the various bulk infrastructure components determined, and design specifications availed, particularly for infrastructure for water storage for which options are still being investigated. At that time the environmental and social impacts caused by the establishment and construction of specific bulk infrastructure will have to be re-assessed, specifically:

- i. The water storage facilities (dam or oxbow lakes);
- ii. The bridge over the Wami River at Matipwili;
- iii. The dykes proposed on the north and south banks of the Wami River;
- iv. The power lines to supply the outgrower schemes (and outgrower villages);
- v. The main canals from the water abstraction points and dam feeding into the scheme, and secondary canals;
- vi. Access roads to and within the schemes.

Further studies have been recommended in order to:

- Prepare a Resettlement Action Plan to address the issue of land acquisition if found necessary, and loss of property, trees and crops for the schemes, including land to be taken for the dam or other water storage facilities, and the cane fields. The RAP will have to identify the exact number of project affected people/parties and affected property, and will have to comply with national and AfDB and IFAD requirements for compensation and resettlement, including valuation of affected properties, livelihood restoration plans, and grievance mechanisms.
- Update environmental flows in the Wami River from Mandera to Matipwili to the mouth of the river where it meets the Indian Ocean;
- Confirm the availability of water for irrigation and other uses, and assess whether the storage facilities proposed for diverted flood water are adequate;
- Develop an agrochemical management plan describing the use, application of agrochemicals and disposal of expired chemicals and chemical containers, so that impacts

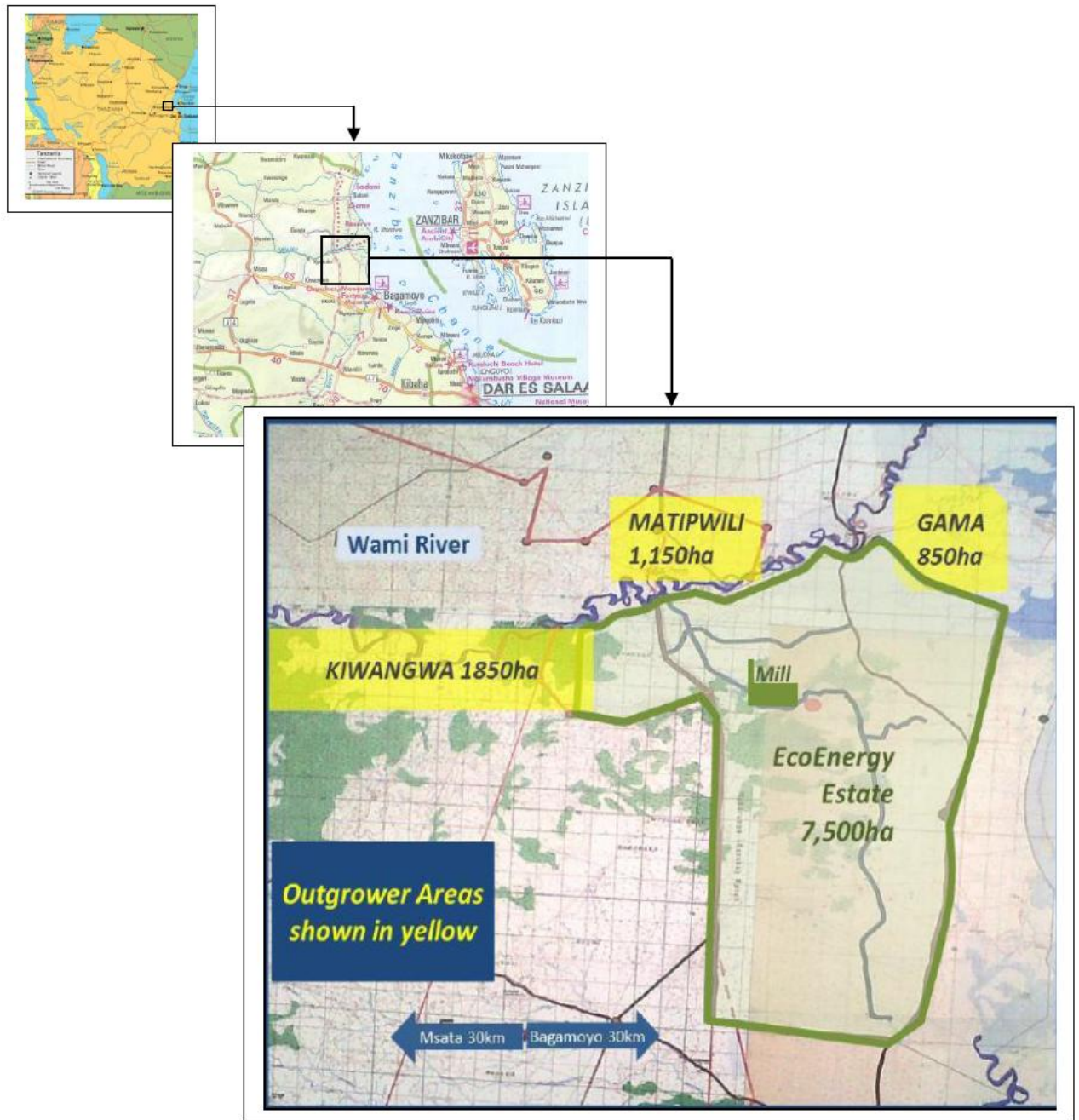
on soils and water quality and human health are eliminated, or at least minimized. Options for organic /non-polluting inputs should also be explored.

In addition, further studies will have to be carried out to establish detailed baselines for water quality in the river and chemical concentrations in fish and shellfish, daily flow levels in the Wami River, soil quality (nutrient content and soil structure), the elephant migration, and a socio-ecological assessment of the scheme areas in order to determine the impacts on sites of cultural importance, such as the sacred forests which were being used as burial sites. These studies will also include one to enhance the socio-economic baseline prepared during this study, focussing on agricultural production and marketing, farming methods, trade and commercial activities, poverty levels, health status (particularly an HIV/AIDS situational analysis), and education levels in the project area.

Once the land dispute between Saadani National Park and EcoEnergy and Gama/Kitame village has been resolved, the environmental and social impacts resulting from the Gama/Kitame scheme should be updated. It is also recommended that the BASIC Programme is phased so that EcoEnergy starts to work with the outgrowers at Kiwangwa and Matipwili villages and then proceeds to Gama/Kitame at a later stage.



**Map 1: Location of the Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme**



## Acknowledgements

During the course of this assignment, the Consultants met with a wide range of stakeholders and interested parties in Dar es Salaam, Morogoro, Bagamoyo and the project villages. It is not possible to refer to them all here; nonetheless, the Consultants would like to extend their appreciation to all those who spared precious time to meet with us to discuss the project.

Valuable guidance, comments and opinions with regarding the study approach and content of this report were received from staff of the National Irrigation Commission in the Ministry of Agriculture, Food Security and Cooperatives (MAFSC), particularly Mr Ronald Komanga, Mr Remigius Rushomesa and Mr Lait Simikanga, as well as Mrs Mary Natai, the Head of the Environmental Management Unit at MAFSC. We would also like to thank Mr Revelian Ngaiza of the Department of Policy and Planning in the MAFSC for arranging and facilitating logistics during the assignment. In addition Eng Rodgers Ishengoma and Eng Imani Nzobonaliba of the Zonal Irrigation Unit and Mrs Praxeda Kalugenda of the Wami Ruvu Basin Water Office provided us with important information.

The Bagamoyo District Administration and Officers were very supportive of the study, and the Kiwangwa, Matipwili and Gama villagers welcomed us to their villages. We are grateful to them all for their time and openly discussing the project and its potential impacts, both positive and negative, with us.

We would also like to acknowledge the support accorded to us during the earlier phase of this study in January/February 2014 by the Department of Coordination of Government Business in the Prime Minister's Office, particularly Mr Assery Obey, Mr Asanterabi Sangenoi, and Mr Pascal Vyagusa .

The report has also gleaned information from various reports and publications, as well as from a number of websites. These are listed in Appendix 1. The Consultants would like to acknowledge the authors of these documents for sharing this information with us.

Finally we would like to thank the African Development Bank and the International Fund for Agricultural Development for funding this study and for their assistance in guiding this study. In this respect our thanks go to Mr Edson Mpyisi, Mr Salum Ramadhani, Mr Noel Kulemeka and Mr Justin Ecaat of AfDB; and Mr Francisco Pichon, Mrs Mwatima Juma, Ms Marian Bradley, Mr Stephen Twomlow, Mr Mawira Chitima and Mrs Sheila Mwanundu of IFAD.

## Abbreviations and Acronyms

A-B-C	Abstain – Be faithful – Condom use
ADEM	Tanzania and Complimentary Basic education in Tanzania
AfDB	African Development Bank
ASDP	Agricultural Sector Development Programme
ASDS	Agricultural Sector Development Strategy
Asl	above sea level
BASOGS	Bagamoyo Sugarcane Outgrowers' Scheme Project
BASIC	Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme
BRN	Big Results Now
CA	Conservation Agriculture
CBO	Community Based Organization
CCRO	Certificate of Customary Rights of Occupancy
CVM / APA	Comunita Volontari per il Mondo (Irish Aid)/AIDS Partnership with Africa
CSO	Civil Society Organization
DC	District Commissioner
DDCA	Drilling and Dam Construction Agency
DED	District Executive Director
DOP	Division of proceeds
ECF	East Coast Fever
EcoDev	EcoEnergy Community & Outgrower Development Programme
EFA	Environmental Flow Assessment
EHS	Environment Health and Safety
EMA	Environmental Management Act, 2004
EPFI	Equator Principles Financing Institution
EPZ	Export Processing Zone
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management Systems
FFS	Farmers Field Schools
FGD	Focus Group Discussion
HC	Health Centre
HIV/AIDS	Human Infected Virus/Anti Immune <i>Deficiency</i> Syndrome
IFC	International Finance Corporation
IPM	Integrated Pest Management
JICA	Japanese International Cooperation Agency
LMO	Living Modified Organisms
MAFSC	Ministry of Agriculture, Food Security and Cooperatives
MDL	Modified Drag Line
MEA	Multilateral Environmental Agreement
MKURABITA	Mpango wa Kurasimisha Raslimali na Biashara za WanyongeTanzania / Property and Business Formalization Programme
MLHSD	Ministry of Lands, Housing and Human Settlements Development

MNRT	Ministry of Natural Resources and Tourism
MOW	Ministry of Water
MOU	Memorandum of Understanding
MSDS	Materials Safety Data Sheets
MVIWATA	Mtandao wa Vikundi vya Wakulima Tanzania Tanzania Network of Farmers Groups
NGO	Non-Governmental Organization
NEMC	National Environmental Management Council
NEP	National Environmental Policy
NSGRP	National Strategy for Growth and Reduction of Poverty
PAPs	Project Affected Persons/Parties
PCMU	Programme Coordination and Management Unit
PDB	Presidential Delivery Bureau
PLHAS	People Living with HIV and AIDS
PMO	Prime Minister's Office
PMTCT	Prevention from Mother to Child Transmission
POPs	Persistent Organic Pollutants
PPPP	Public Private Producer Partnership
RAP	Resettlement Action Plan
SADC	Southern African Development Community
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SANAPA	Saadani National Park
SBT	Sugar Board of Tanzania
Sekab	Svenske Etanol kemi AB
SMP	Social Management Plan
SPSS	Statistical Package for Social Scientists
SLAD	School of Library Archives and Documentary Studies
STIs	Sexually Transmitted Infections
STRIT	Sugar Training and Research Institute of Tanzania
TACAIDS	Tanzania Commission for AIDS
TB	Tuberculosis
TANAPA	Tanzania National Park
THMIS	Tanzania HIV/AIDS & Malaria Indicator Survey
TANESCO	Tanzania Electrical Supply Company
TOR	Terms of Reference
TRC	Teachers' Resource Centre
TShs	Tanzanian Shilling
VCT	Voluntary Counseling and Testing
VEO	Village Executive Officer
WDC	Ward Development Committee
WEO	Ward Executive Officer
WEF	World Economic Forum
WRBWO	Wami-Ruvu Basin Water Office
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar

# 1 Introduction

## 1.1 Background

Social and economic development in Tanzania is largely driven by the agricultural sector. The sector currently employs 77.5% of the population, generates 23.7% of GDP and 24% of export earnings, and contributes about 95% of the national food requirements. In recognising the importance of the agricultural sector, the Tanzania Development Vision 2025 (TDV 2025) emphasizes three goals as being national priorities, viz: (i) ensuring basic food security; (ii) improving income levels; and (iii) increasing export earnings. The National Strategy for Growth and Reduction of Poverty (MKUKUTA II) also identifies agriculture as being fundamental for broad based growth and poverty reduction in the country. Various sector policies and strategies including the Agricultural Sector Development Strategy (ASDS), the Agricultural Sector Development Plan (ASDP), the Kilimo Kwanza initiative and the Southern Agricultural Growth Corridor of Tanzania Initiative (SAGCOT) call for public-private partnerships and increased commercialisation of agriculture. SAGCOT in particular highlights the need to support smallholders to increase farm productivity and engage in commercial value chain through “participation in outgrower and block farming schemes oriented around nucleus large-scale farms, and through greater access to inputs, extension and more favourable post-harvest marketing opportunities”.<sup>1</sup> Specifically, the SAGCOT Blueprint seeks to, inter alia, bring 350,000 ha into commercial agriculture, increase regional sugarcane production by 4.4 million tons, engage tens of thousands of smallholders into irrigated commercial agriculture, provide over 400,000 jobs in the agricultural value chain and promote food security through gains in agricultural productivity, processing and distribution.

The latest national development initiative called the Big Results Now (BRN) identifies maize, rice and sugarcane as the three priority crops for the agriculture sector in order to address food security and import substitution. The BRN also encourages direct foreign investment to promote national processing capacity.

Currently Tanzania produces 300,000 tons of sugar annually, while demand for sugar is in the region of 500,000 tons. The annual deficit of approximately 200,000 tons is supplemented by importing sugar. However, sugar consumption in Tanzania is set to increase in the near future due increased consumption by the growing population and the increasing number of food processing industries being established in the country for which sugar is a vital ingredient. It is therefore expected that the deficit will grow in the coming years, and consequently the Government of Tanzania is now actively seeking investment in domestic sugar production.

It is against this background that the Bagamoyo EcoEnergy Project (also referred to in this document as EcoEnergy) and Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme are being developed as flagship projects within SAGCOT. The BASIC Programme intends to commercialise smallholder farmers on about 3,000 ha in the villages of Kiwangwa, Matipwili and Gama/Kitame in Bagamoyo District, all of which lie in close proximity to the EcoEnergy mill, in order to sell, when full capacity is reached, 300,000 tons of sugarcane per year to EcoEnergy for sugar and energy production.

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<sup>1</sup> SAGCOT Blueprint, 2011

## **1.2 Project Rationale**

The Bagamoyo EcoEnergy Project is located on a former cattle ranch, Ranchi Ya Zanzibar Bagamoyo (commonly called Razaba Ranch), 25 km north-west of the historic town of Bagamoyo. The EcoEnergy Project comprises a core irrigated sugarcane plantation of 7,800 ha which is estimated to yield 800,000 tons of sugarcane annually. The EcoEnergy Project will also have a sugar mill initially producing about 132,000 tons of sugar; a bio-ethanol plant producing 10 million litres of biofuel; and a bagasse co-generation plant generating 32 MW of power of which 20 MW will be used on the estate and 12MW will be sold to the national grid. The African Development Bank (AfDB), through its Private Sector Department (OPSM), is considering providing up to USD 50 million as a non-concessional loan to fund the Bagamoyo Eco-Energy Project.

Since its conception in the mid-2000s, Bagamoyo EcoEnergy (Sekab as it was known then) has been keen to develop an outgrower component that will complement their project. Indeed the mill has been designed to process 60% more sugarcane than will be grown initially on the EcoEnergy plantation. This would greatly enhance EcoEnergy's output, and thus contribute to addressing the sugar deficit in the country. Earnings from the sale of sugarcane to EcoEnergy would improve the outgrowers' livelihoods, increase food security and stimulate wealth creation. In addition, the EcoEnergy Project and the BASIC Programme would substantially develop the agricultural and economic landscape of the Bagamoyo District and will present a number of off-farm opportunities for local communities and entrepreneurs.

Recognising the opportunities presented by the EcoEnergy Project in the context of the SAGCOT vision, the Ministry of Agriculture, Food Security and Cooperatives (MAFSC) and the Prime Minister's Office (PMO) recommended that local communities proximate to the EcoEnergy plantation become outgrowers who would supply sugarcane to the Bagamoyo EcoEnergy mill. MAFSC and PMO therefore approached EcoEnergy to assist them in providing the necessary technical inputs and capacity building to kick-start the BASIC Programme. The public sector financing for the outgrower scheme will complement the EcoEnergy Project to develop a Public Private Producer Partnership (PPPP) programme. The innovative PPPP approach will empower beneficiary farmers to make their own decisions, involving the private sector and the GoT to plan, design, implement, operate and maintain the newly established sugarcane irrigation schemes, and will extend the private sector driven approach to the surrounding communities to extend and manage the benefits of growth and create wealth. The additional production of sugar will address the unmet demand in the country and result in import substitution (both of which will promote food security).

The MAFSC is therefore seeking funds from the AfDB and the International Fund for Agricultural Development (IFAD) to provide financial support for the development of the outgrowers' schemes in terms of both infrastructure and capacity building. AfDB funding will cover the bulk infrastructure required for successful sugarcane production on 3,000-4,000 Ha and will include haulage roads, bridge over the Wami river, flood control dykes, bulk water supply for irrigation purposes (including canals and pumping stations), dam (water storage facility), surface drainage canals and power transmission lines. The AfDB will provide USD 30 million for this infrastructure investment and associated costs.

IFAD aims to reach the largest number of people possible under its investment programmes. IFAD decided that it was important to ensure that the growth benefits of the core sugarcane

investment are shared with the wider community. Therefore, IFAD has expanded the programme area for its assistance, which covers three sugarcane outgrower villages, 6 villages within a 20 km inner circle of the nucleus estate, and 18 villages within the “outer circle” of 20-40 km from the estate. With IFAD financing, the programme is developing programme support activities to raise agricultural and livestock productivity to fulfill the future demand from the nucleus and outgrowers, while promoting climate resilience for all activities. The programme will thus benefit a total of 27 villages consisting of 15,000 households, representing around 72,000 people.

IFAD funding will cover: (a) on-farm civil works for future sugarcane outgrower companies, support for irrigation development and sugarcane crop establishment; (b) climate resilient community development, including the development of climate smart village development plans, the mobilization of commercial companies for crop and livestock production and marketing, and the tailoring of production activities to reduce climate risk; and (c) capacity building for both sugar cane outgrower companies and companies in the surrounding community. IFAD will provide USD 50 million of financing, composed of a loan of USD 40 million and a grant of USD 10 million in support of climate resilience activities.

### **1.3 Objectives of the BASIC Programme**

The overall objective of the Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme is to develop irrigated sugar cane in line with modern agricultural standards and techniques for smallholder farmers in three villages on 3,000-3,500 ha of land surrounding the EcoEnergy industrial estate. At full capacity, the outgrowers’ schemes are expected to produce in the region of 300,000 tonnes of sugarcane annually for sale to the EcoEnergy mill.

### **1.4 Objectives of this ESIA**

The Third Schedule of the Environmental Management Act (2004) requires an environmental impact assessment (EIA) to be carried out for any projects causing a major change in land use, and for agricultural activities.

The Terms of Reference for this study required to the preparation of a RAP in line with AfDB and IFAD requirements, and the updating and finalisation of the ESIA for the outgrower development component in line with AfDB and IFAD requirements and the format/presentation requirements of the Government of Tanzania, so that it can be presented by MAFSC to NEMC for approval.

However, it became evident that only conceptual designs had been prepared for the proposed infrastructure as the approach adopted by EcoEnergy is to allow the outgrower communities to discuss and decide exactly where the various types of infrastructure should be located, based on the layout of the individual farms and the village land use plans. The land use plan for Matipwili has been developed but has not yet been put to the Village Assembly for approval, while the land plan for Kiwangwa is currently in the process of being developed. It was therefore not possible to carry out a full ESIA nor a RAP.

Furthermore, the National Environmental Management Council has procedures that must be followed before undertaking an ESIA and RAP – see Section 3.3 below.

The objective and scope of this assignment were therefore amended to update and finalise the earlier Environmental and Social Impact Assessment for the BASIC Programme in order to:

- Identify existing and potential environmental and social concerns;
- Highlight potentially significant issues arising from the project;
- Propose mitigation measures or enhancement measures; and
- Propose further studies and investigations that would be required in order to ensure that environmental and social management and monitoring would comply with national, AfDB and IFAD requirements.

The deliverables of the study would therefore be as follows:

1. An Environmental and Social Impact Statement (ESIS) for MAFSC to submit to NEMC;
2. An Environmental and Social Management Framework (ESMF) to be submitted to AfDB and IFAD for disclosure purposes
3. A resettlement action framework (RAF) to be submitted to MAFSC, AfDB and IFAD for disclosure purposes, and which can be used as a baseline document for conducting a Resettlement Action Plan when the location of infrastructure and affected properties are known.

## **1.5 Study Approach and Methodology**

This study has been guided by the NEMC's Environmental Impact Assessment Guidelines and Procedures (March 2002), the Environmental Management Act, 2004, and the Environmental Impact Assessment and Audit Regulations, 2005. The report takes cognisance of various other legal requirements under the Laws of Tanzania, and also of international treaties and conventions relevant to this project and to which Tanzania is a signatory. The study has abided by African Development Bank's safeguard policies, particularly its Environmental Policy (2001) and its Involuntary Resettlement Policy (2004), the Integrated Environmental and Social Impact Assessment Guidelines (2003), and the Environmental and Social Assessment Procedures (2001). In addition, reference has been made to the Equator Principles III (June 2013).

It must be noted at the outset, that although the BASIC Programme has a symbiotic relationship with the Bagamoyo EcoEnergy Project, this study focuses on the outgrowers' schemes, as an environmental and social impact assessment study was carried out for the EcoEnergy Project in October 2011, and subsequently updated in May 2012 and submitted to NEMC.

The initial ESIA study was carried out during January and February 2014. Various documents were obtained and reviewed in order to better understand the project, its associated activities, and the project area as a whole. The environmental setting described in this report has largely relied on specialist studies that were carried out for the ESIA for Sekab's Biofuel project in 2007/2008, as well as the ESIA for Bagamoyo EcoEnergy's sugar mill, ethanol plant and bagasse co-generation plant updated in May 2012. The list of documents reviewed is presented in Appendix 1.

The three project villages, the pilot rice plantations (where communities are being trained to irrigate and work as groups), and the identified outgrower farm sites were visited in January/February 2014, December 2014 and February 2015. The tentative locations for the project infrastructure, and EcoEnergy's seed cane farm were also visited. During the field visit,



extensive consultations were held with various levels of stakeholders as described in Section 1.6 below, the findings of which are summarised in Chapter 5.

Thereafter, activities included an analysis of the findings, follow up discussions where necessary for the purposes of clarification or to fill in information gaps, and report preparation.

Thus the study takes into consideration environmental, social, cultural, economic, and legal aspects in order to identify the anticipated environmental impacts of the proposed outgrower schemes and the scale of the impacts, and proposes appropriate mitigation measures to be incorporated during the construction and operation phases of the schemes. The study also analyses scheme alternatives. An environmental management plan has been developed which includes means and mechanisms for monitoring and evaluating the compliance and environmental performance. Costs for mitigation and the time frame of implementing the measures are also provided.

Due to a boundary dispute between Saadani National Park and Gama/Kitame village land, this report has focused mainly on the Kiwangwa and Matipwili schemes, although baseline data, findings of consultations and assessment of impacts presented here also cover the Gama/Kitame scheme to the extent possible under the given circumstances. It is expected that that once the land dispute is resolved, the environmental and social impacts of the Gama outgrower scheme will be updated.

This updated study has been supported by the African Development Bank's (AfDB) Agriculture and Agro-Industry Department and the International Fund for Agricultural Development (IFAD) on behalf of the MAFSC, who is spearheading the BASIC Programme.

The study was carried out by Arundhati Inamdar Willetts, who has registered with NEMC as a EIA expert specifically for this project, and Stella Kaijage who is a NEMC registered expert. The studies have been financed by the AfDB and IFAD.

## **1.6      *Public Consultations***

Meetings were held with key stakeholders in Dar es Salaam, following which meetings were held with the Regional and District authorities, Ward and Village authorities, and focus groups representing women, elders, youth, farmers, livestock keepers, paddy irrigators and fishermen. Details of the outcome of the consultations and the major points raised are presented in Chapter 5. Tools were developed to guide discussions with village governments and with focus groups. In order to develop a social profile of the outgrower communities, a household survey was conducted on a sample of members from the outgrower communities. Data from the household survey were inputted into the SPSS programme to assist with the analysis of socio-economic data. A list of officials and other stakeholders consulted is presented in Appendix 2, while members of the outgrower communities with whom meetings were held are listed in Appendix 3. Minutes of discussions with the Matipwili Ward Government and Kiwangwa Village Government are presented in Appendix 4. Samples of tools are contained in Appendix 5.

## **1.7 Limitations and Assumptions**

The major limitations in the conduct of this assessment were as follows:

- i. A detailed feasibility report for the outgrowers' schemes was not available – the only document available to the Consultant was EcoEnergy's Community and Outgrower Development Programme document dated September 2012;
- ii. Infrastructure design details had not been developed. While the conceptual design and a general idea of infrastructure requirements are known, the EcoEnergy approach is to assist the villagers to develop land use plans of the scheme areas as a first step, after which the villagers will be able to identify the exact area to be irrigated, and their preferences for the locations of the main canal, secondary canals, pumps, electricity transmission lines, dam(s) and other infrastructure. The land use plans have not been developed or as yet approved by the villagers.
- iii. Given the difficulties described above with regard to lack of information on the exact area of land for the outgrower schemes and the infrastructure layout and designs, there are some information gaps for which further studies have been recommended that would have to be carried out as a condition of financing. Some modifications to the project design or operation may be required depending on the outcome of these proposed studies.
- iv. At Matipwili and Gama/Kitame, minutes of consultations with the village committees and a PAP inventory form were not written up/completed to pass on to the Consultant despite follow up visits.
- v. Recently there have been changes in the demarcation of administrative boundaries and upgrading of some villages to street status (Mtaa). This has affected the accuracy of existing statistics, for example those for population per ward.
- vi. Due to the need to meet the AfDB's and IFAD's financing deadlines as well as the limited financial and manpower resources available to conduct this study, it was not possible to undertake detailed environmental or social baseline studies. The environmental profile presented in this document is based on a review of documents and on information gathered from interviews with key informants and stakeholders, and previous studies conducted for the Sekab and EcoEnergy. The social/socio-economic profile has been developed on the basis of document reviews, discussions with key stakeholders and focus group discussions, as well as information obtained from an abbreviated household survey.

## **1.8 Report Presentation**

This report is set out as follows:

The Executive Summary is presented at the beginning of the document.

Chapter 1 provides the background to the study, explaining its objectives and scope, and describing the methodology adopted and public consultations held. It also highlights some limitations and assumptions to the study.

Chapter 2 describes the project components, including cane cultivation activities, bulk infrastructure and agricultural infrastructure that will be installed, and proposed outgrower training programmes. It describes the technology, procedures and processes to be used, in the implementation of the project as well as the materials to be used in the construction and

implementation of the project. In addition, anticipated activities during planning, construction and operation are described.

Chapter 3 describes the policies, legislation and administrative/institutional framework applicable to the BASIC Programme. It also describes requirements of development partner safeguard policies, and Tanzania's obligations as a signatory to relevant multilateral environmental agreements.

Chapter 4 provides the environmental (bio-physical) and socio-economic baselines of the project area.

Chapter 5 summarises the outcome of consultations held with the national, regional and local authorities, focus groups as well as with the outgrower communities.

Chapter 6 presents the analysis of environmental and social impacts and provides recommendations for mitigation. The chapter includes an assessment of the various scheme alternatives, including siting and technical options, and the "no project" option.

Chapter 7 contains the environmental and social management plan, which covers mitigation, institutional responsibilities, as well as associated costs, while Chapter 8 deals with environmental and social monitoring aspects, again identifying institutional responsibilities and costs.

Chapter 9 presents the cost benefit analysis for the BASIC Programme.

Chapter 10 discusses decommissioning requirements.

Chapter 11 gives the conclusions and recommendations of the study.

The Appendices contain maps and schematic land use plans of the outgrower schemes, a list of all persons consulted, minute of meetings with outgrower communities, samples of survey tools, Terms of Reference for further studies to be carried out before project implementation.

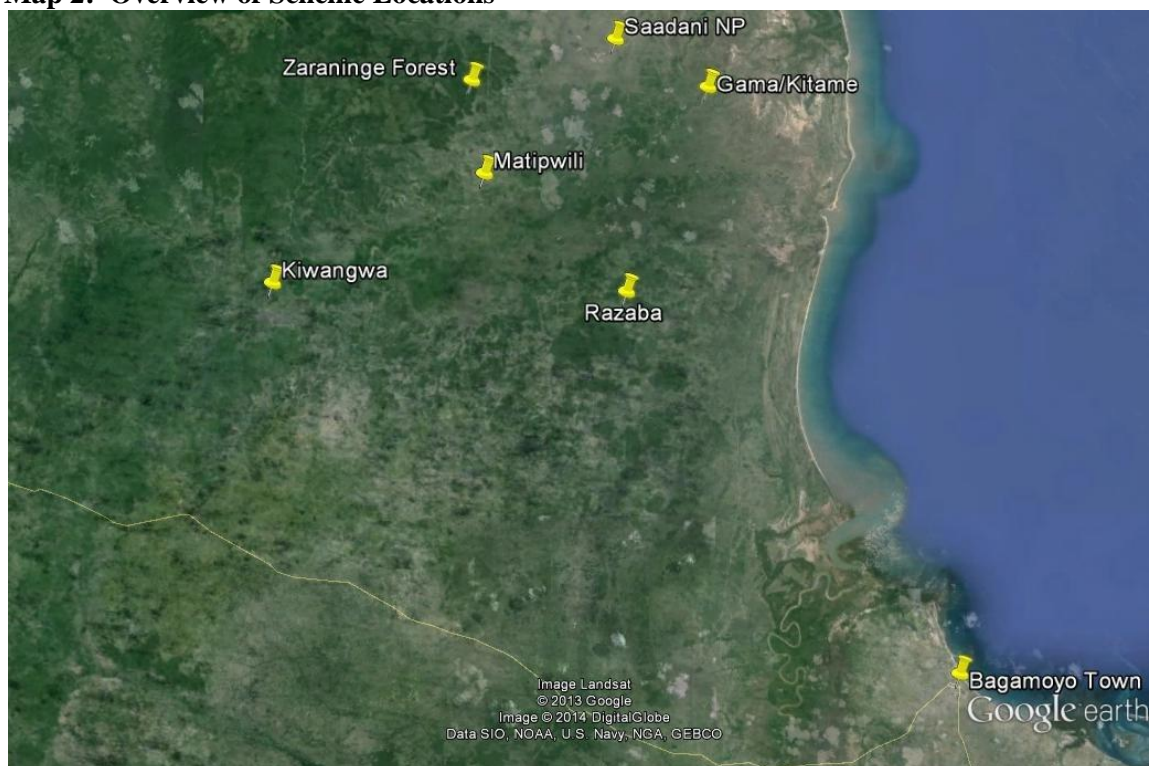
## 2 Project Background and Description

### 2.1 Location of the Project

The BASIC Programme is located in Bagamoyo District, 100 km north of Dar es Salaam, and 30 km north-west of the historical town of Bagamoyo. All three schemes are located along the Wami River: the Matipwili scheme is on the north bank, while Kiwangwa and Gama/Kitame schemes are on the south bank.

Map 1 above shows the location of the outgrower' schemes in relation to the EcoEnergy plantation. Map 2 below shows the spatial locations of the schemes in relation to Bagamoyo Town, Saadani National Park and Zaraninge Forest.

**Map 2: Overview of Scheme Locations**



### 2.2 Project Overview

Three areas along the Wami River have been identified for the outgrower schemes which would be suitable for growing sugarcane. The sites have been identified on the basis of favourable terrain (sugarcane requires a fairly flat land), soil suitability, proximity to a water source and proximity to the sugar mill on the EcoEnergy estate. The total area of land that will be used for cultivation of sugarcane is approximately 3,000 to 3,500 ha. The area of land suitable for cultivation in each scheme is as follows:

Kiwangwa	1,850 ha
Matipwili	1,150 ha
Gama/Kitame	850 ha

Each village government has agreed to allocate approximately 500 ha of village land for the scheme. The balance will be made up from land belonging to individuals. At this point the exact area of each scheme and individual landowners who will be part of the scheme have not been established. This will be done as part of the process of developing the land use plans.

When fully functional, the schemes are expected to produce a total of 300,000 tons of cane per year, assuming that under irrigation each hectare of land yields 90 to 100 tons per year.

EcoEnergy will be closely involved in the development of the outgrowers' schemes and provide technical assistance during the setting up stages and during operation. In this respect EcoEnergy will:

- Design and source the necessary bulk and agricultural infrastructure;
- Impart comprehensive training to the outgrowers which will cover, among other things, technical aspects of sugar cultivation, conservation agriculture, group organisation, business planning and management, and decision making. Training is expected to take 6 years;
- Offer long term purchasing contracts to the outgrowers' schemes.

The outgrower communities on their part will:

- Form 25 to 30 companies, based on an amalgamation of farms and village land totalling between 100 ha and 150 ha per company;
- Register the companies;
- With support from EcoEnergy, prepare business plans, environmental plans and operating plans;
- Have shares in the company, will operate the company and will work on the farms;
- Have the option of hiring labour from their communities to work on the farms on their behalf;
- Borrow money from development banks or commercial banks;
- Use modern farming techniques;
- Earn income from the sale of sugarcane, repay loans and give dividends to the shareholders.

### **2.3 Bulk Infrastructure**

The outgrower company farms will be located approximately 100 m to 2 km from the Wami River, so pumps and pipes will be required to convey the water to the edge of the outgrower farms. Five pumping stations in the Wami River will be installed and 41 km of conveyance pipes will be laid to provide water up to the edge of each outgrower farm. Drainage is needed to ensure the evacuation of water in heavy rainfall periods, so an open drainage network of 41 km following the natural contour and existing natural drains will be built.

The EcoEnergy approach is to allow the villagers to decide where all infrastructure should be located. This will be done after the village land use plans have been developed and approved. However, conceptually the main infrastructure required for modified drag line (MDL) and centre pivot irrigation of 3,000 ha that would be developed at the three sites would be as follows.

### **2.3.1 South Block - Kiwangwa**

The total irrigable area is over 1,850 ha. It is estimated that the scheme will comprise 18 farms of approximately 100 ha each. The infrastructure components will be:

- Flood protection;
- Pump station(s) in the Wami River;
- Drainage canals;
- Dam of 1.4 million m<sup>3</sup> capacity or other type of storage facility (eg oxbow lakes);
- Irrigation systems overhead through a combination of pivots and drag lines;
- Internal haulage roads and power lines;
- Main road connected to the EcoEnergy Sugar Mill;
- Power lines within the scheme and connecting to TANESCO and/or to EcoEnergy Sugar Mill.

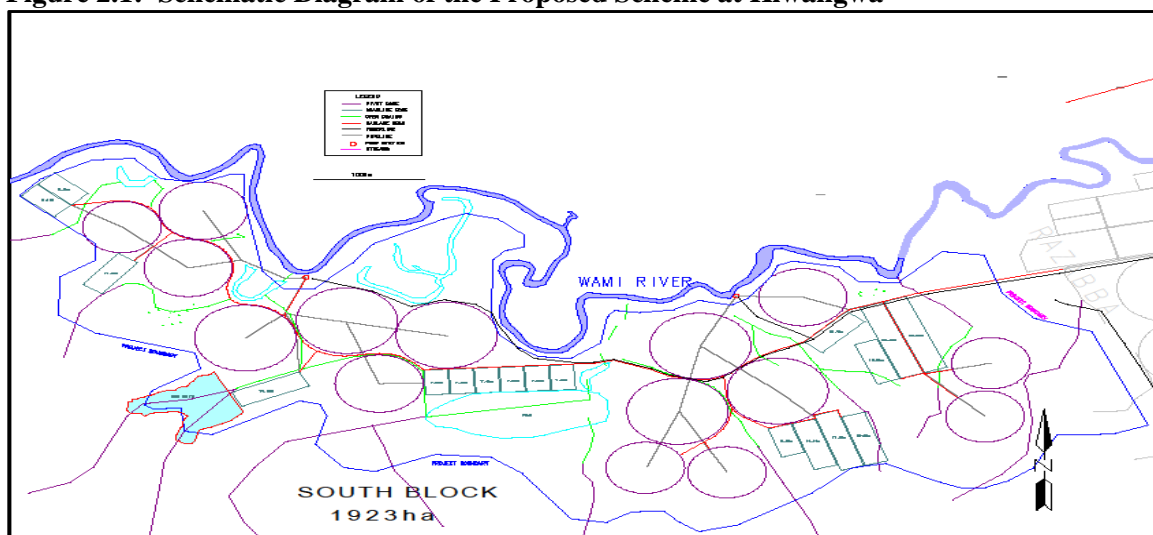
The South Block boundary totals a gross area of 2550 ha and includes large areas up the steep escarpment to the south of the proposed scheme. The flat alluvial plain immediately south of the Wami River provides suitable areas for irrigated crops. The plain gives way to a sharp escarpment rising steeply within the project boundary and this steep land is unsuitable for any agricultural development. Immediately adjacent to the Wami River are several old water courses, ox-bow lakes and wetlands which cannot be developed. There is one large pan in the centre of the block which gets inundated during the wet season.

The irrigation layout proposed consists of 15 centre pivots totalling 1708ha ranging in size from 40ha to 65ha. In between the pivots are 18 overhead fields fitted in where terrain is suitable totalling 214.6 ha, and making a total irrigated area of 1922.6 ha.

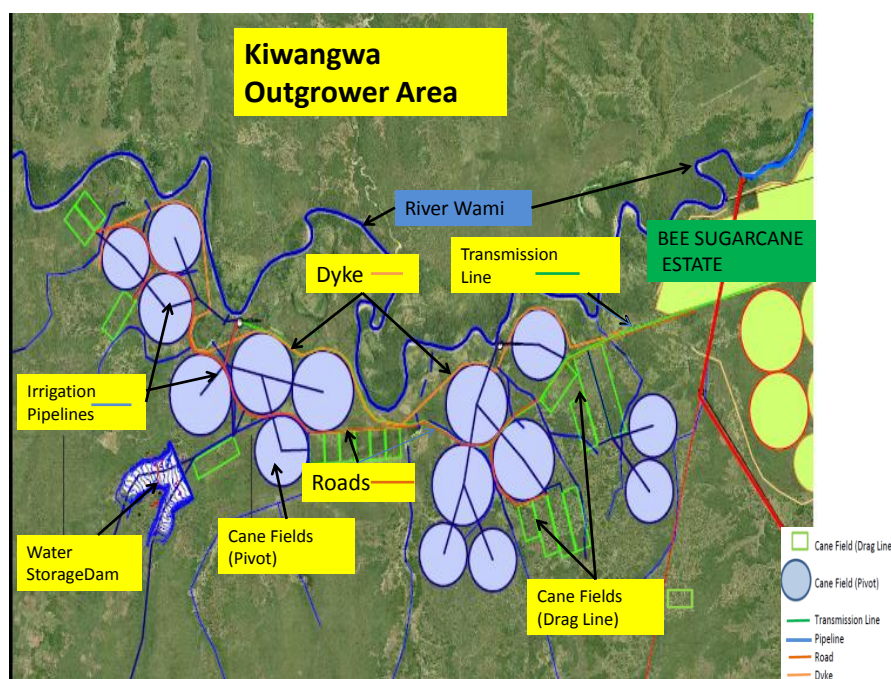
Water for the irrigation system is proposed to be abstracted at two points direct from the river into the various blocks and pivots. Pump stations will be situated within 100m of the main river using a channel to divert faster moving water into a sump area. In the sump area will be purpose made floating structures to support the pump units and suction and discharge works. Pump units will be electrically driven centrifugal pumps to pressurise the system in one lift without the need for boosters.

Schematic and conceptual designs for the Kiwangwa scheme are presented in Figures 2.1 and 2.2 below.

**Figure 2.1: Schematic Diagram of the Proposed Scheme at Kiwangwa**



**Figure 2.2: Conceptual Design of the Proposed Scheme at Kiwangwa**



### 2.3.2 North Block – Matipwili

The total irrigable area is 1,150 ha. It is estimated that 11 farms of approximately 100 ha each will make up the scheme. Infrastructure components include:

- Flood protection;
- Pump station(s) in the Wami River;
- Drainage canals;
- Irrigation systems overhead through a combination of pivots and drag lines;

- Main road and haulage roads;
- Power lines within the scheme and to the Sugar Mill;
- Road bridge over Wami River.

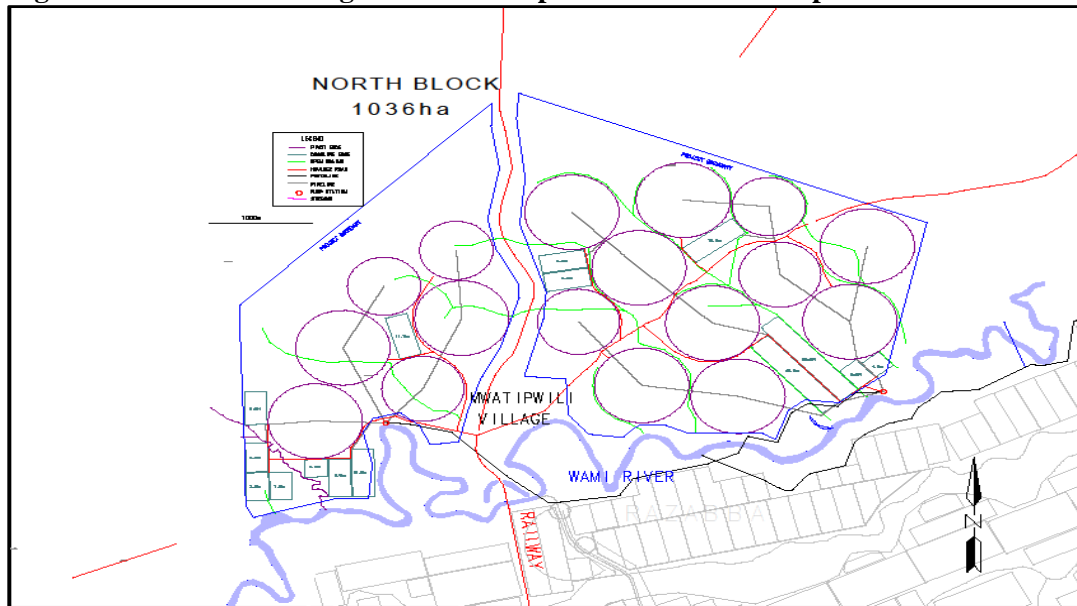
The North Block boundary totals 1,945 ha. It has a general slope throughout the area of around 1:100 but is flatter in the areas near the river. There is distinct soil type change running through the northern part of the block where the soils become very sandy and are considered unsuitable for irrigation development. Within the satisfactory soil zones there are natural drainage lines but overall the area is well drained. The rail line and two local roads dissect the block into four with Matipwili village situated at the junction of all of these. There is no electrical power in the area.

The irrigation layout proposed consists of 17 centre pivots totalling 965ha ranging in size from 40ha to 65ha. In between the pivots are 15 overhead fields fitted in where terrain is suitable totalling 70.5ha, making a total irrigated area in the north at 1035.5ha.

Water for the irrigation system is proposed to be abstracted direct from the river into the various blocks and pivots at two abstraction points. Pump stations will be situated within 100m of the main river using a channel to divert faster moving water into a sump area. In the sump area will be purpose made floating structures to support the pump units and suction and discharge works.

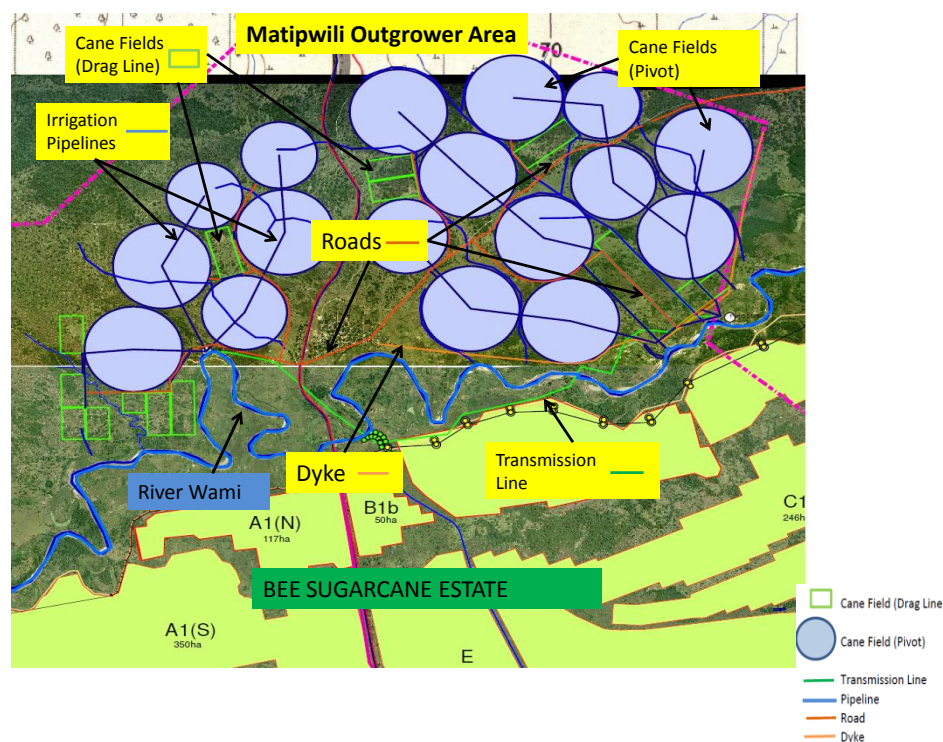
Schematic and conceptual designs for the Matipwili Scheme are presented in Figures 2.3 and 2.4 below.

**Figure 2.3: Schematic Diagram of the Proposed Scheme at Matipwili**





**Figure 2.4: Conceptual Design of the Proposed Scheme at Matipwili**



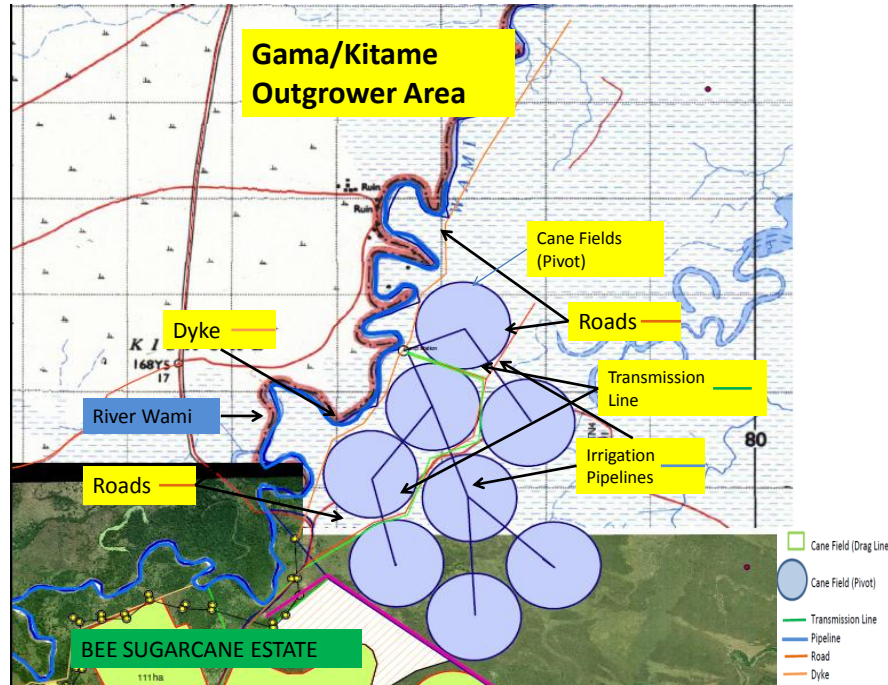
### 2.3.3 South Bank – Gama/Kitame

The total irrigable area for the Gama/Kitame Scheme is 850 ha, comprising 8 farms of approximately 100 ha each. Infrastructure components include:

- Flood protection;
- Pump station(s) in the Wami River;
- Drainage canals;
- Main road and haulage roads;
- Power lines within the scheme and to Sugar Mill.

The conceptual design for the scheme is presented in Figure 2.5 below.

**Figure 2.5: Conceptual Design of the Proposed Scheme at Gama/Kitame**



### 2.3.4 Other Infrastructure

#### Access and Haulage Roads

Approximately 61 km of cane haulage roads will directly link the outgrowers schemes to the EcoEnergy core estate. It is assumed that the present rail bridge over the Wami River at Matipwili Village (which is not currently in use) can be modified to allow access for cane haulage vehicles. The location for haulage roads is still to be confirmed as the land use and ownership maps have not yet been finalised. The project will construct almost all the haulage road network with complete or partial drainage accommodating both the on-farm and road drainage.

The borrow pits for the roads will be strategically located to harvest rain water runoff from the roads and provide a source of water for supplemental irrigation or livestock watering.

#### Bridge over the Wami River

As part of the project, the existing rail bridge over the Wami River at Matipwili Village will be modified to allow access for cane haulage vehicles. Only the main bridge section would be modified to take both road and rail traffic with road embankments built up to merge with the rail bridge. However, the issue of widening the existing railway bridge needs serious consultation/discussion with the concerned ministries. Studies to verify the status of the bridge structure and proposed designs for strengthening/modification of the bridge are yet to be undertaken.

## **Flood Control along the Wami River**

The areas located in or near the flood plain of the Wami River are flooded almost every year during the wet season, and are heavily flooded during peak rainfall events. To protect the outgrower areas from flooding, a total of 23 km of dykes will be built on the south and the north banks of the Wami River ensuring that the water that would normally flood over the floodplain is maintained within the river channel before discharge into the sea. The flood protection dykes on the south bank will link up with the dyke which protects the nucleus estate on both sides; the north bank dyke will stand alone.

## **Bulk Water – Abstraction, Conveyance and Storage**

Recent studies have concluded that sufficient water is available in the Wami River during normal years and wet years, but not during the driest months of the driest years. In order to provide water during drought periods, water storage facilities will be developed to ensure continued optimum production during the three driest months (October, November and March). Outgrowers will ensure their farm water consumption during these periods is optimised with no wastage. The options for the storage are:

- An off -river dam be constructed in the South Block area which could store the 1.4 Mm<sup>3</sup> of water. In this case, the catchment area will be planted with trees and silt protection measures incorporated for the dam. Water will be pumped from a floating pump station into this dam via a pipeline approximately 500 m in length and 600 mm diameter during the wet season and released during the dry season back into the Wami River. The water will return to the Wami River via a drainage line which discharges upstream of the first irrigation pump station.
- One or two existing oxbow lakes which could be rehabilitated to serve as storage tanks. However due to their environmental sensitivity, the ox-bow lakes proposal must be approved by the National Environment Management Council (NEMC).

These options need further detailed investigation.

## **Farm Operation Centres**

On-farm infrastructure includes internal roads and drains, fencing, sheds, offices, stores, workshops and sanitation facilities for each of the 3 sites.

## **2.4 Agricultural Infrastructure**

Agricultural infrastructure will comprise modified drag line systems and centre pivot irrigation equipment, drainage and road works, and land preparation/crop husbandry equipment required for 3,000 ha. Farm equipment will include tractors, loaders, trailers, harrows, ploughs, machetes and knapsack sprayers.

Standard high clearance centre pivots are proposed ranging in sizes from 40 ha, to 50 ha to 65 ha. All pivot controls would be configured in the same manner as those on Razaba Ranch for ease of maintenance and back up spares. Allowance has also been made for Modified Drag Line irrigation. This system is most commonly in use in the sugar industry in the region.

Open drains are specified at 1.5m deep. In some areas the existing natural drains will require cleaning out to ensure uninterrupted drainage flows.

## **2.5      *Cultivation of Sugarcane Cane***

The outgrowers schemes will adopt “climate smart” technologies – in this case two or more conservation agriculture (CA) crop practices will be combined (such as no-till and improved seed with the judicious application of agricultural chemicals), so that the resilience of the schemes is increased to enable the outgrowers to cope with climatic extremes (both drought and flood conditions) while enhancing the productivity and profitability of the schemes.

The cultivation methods used by the outgrowers will be the same as those employed by EcoEnergy on their core plantation. Sugarcane cultivation from planting to harvesting involves a number of steps:

1. Land preparation:
  - Land clearing;
  - Designing the field layout to establish irrigation system layouts, drainage lines, access roads, power lines;
  - No-till land preparation;
  - Application of fertilizer and pesticides in line with CA practices;
  - Levelling;
  - Preparation of planting beds at 40 cm spacing and 180 cm permanent tracking.
2. Planting of cane:
  - Obtaining prepared/improved seed cane from the EcoEnergy Seed Cane farm;
  - Planting sets end to end.
3. Irrigating:
  - Watering the crop on a regular basis using either the centre pivot, sprinkler, modified drag line (MDL) or furrow methods, depending on the soils and areas to be irrigated.
4. Caring for cane:
  - Weeding by applying herbicides once a month for about 6 months;
  - Trash mulching to prevent weed growth;
  - Applying top dressing (urea, phosphates, potash) when the cane is 4-6 months;
  - Rebuilding the ridges during the ratoon stage (every year).
5. Harvesting:
  - Mechanical harvesting of ratoons on maturity (after about one year). The ratoons will be cut just above the ground so that another ratoon develops;
  - Leaving a trash blanket to assist in the build up of organic matter in the soil.

The normal sugarcane cycle lasts for approximately 6 to 8 years, giving 6 to 8 ratoons. After that the land has to be completely cleared and fresh seed cane planted. Allowance will be made for a fallow crop.

## 2.6 Application of Agrochemicals

Throughout the cultivation process, agricultural inputs – fertilizers, weed killers and pesticides – need to be added to the soil and to the crop itself at various stages of its development. Typically some of these inputs are added directly to the irrigation water so that the amount of chemicals used can be controlled and monitored. Only chemicals approved and certified by the Tanzania Pesticide Research Institute (TPRI), Bonsucro, FAO and WHO will be used at the various stages of sugarcane cultivation.

The outgrowers schemes will be adopting the conservation agriculture approach, which promotes modern cropping technologies including green fertilization and green harvesting to achieve Bonsucro social and cropping standards, which includes limiting the use of chemical fertilizers, pesticides and herbicides. EcoEnergy have indicated that they will limit the use of agrochemicals in the outgrower farms as much as possible by instituting organic methods wherever practicable. In addition, outgrower companies will be trained in water monitoring to ensure the rational and economic application of irrigation water, fertilizer and other agricultural chemicals.

## 2.7 Water for Irrigation

Water for irrigation will be sourced from the Wami River. Water will be pumped into settling ponds (also called balance tanks) so that the silt settles. It will then be passed through sand filters to remove more grit and sediment, after which it is mechanically dosed with the required agrochemicals and then pumped to the sugarcane fields.

EcoEnergy's Integrated Water Resources Management Plan (January 2012) estimates irrigation water requirements for the 3,000 ha under the outgrowers' schemes as shown below:

**Table 2.1: Estimated Total Irrigation Demand for Outgrowers' Schemes (Mm<sup>3</sup>)**

	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Irrigation water requirement (Mm <sup>3</sup> )	3.3	3.3	3.1	3.4	2.8	2.4	2.1	3.6	4.7	3.6	1.3	1.4

Source: AgroEcoEnergy, Integrated Water Resources Management Plan (2012)

## 2.8 Power Transmission Line

There is no electrical power supply to the area.

Electricity for the outgrower pumping stations in the Wami River will be supplied by the national power company, Tanzania Electric Supply Company (TANESCO). It is estimated that about 95 km power supply lines will be required to supply both the EcoEnergy plantation and the outgrowers' schemes: 39 km of 33kV line from the grid to the EcoEnergy mill, 47 km from the mill to the outgrower pumping stations, and 19 km from the pumping stations to the farms. Power for the irrigation schemes will be supplied from the EcoEnergy factory via low voltage lines either from pump stations or from independent transformers off the main medium voltage supply line. Fibre optic cabling will be laid along with the power lines. The route of the transmission lines is still to be decided. However, it is expected that one of the two 33kV lines from Tegeta to Kitopeni will be extended to Makurunge and then from Makurunge to a new substation at the EcoEnergy mill with an extension line to the outgrowers' schemes.

## **2.9 Outgrower Capacity Building**

Effective implementation of the recommendations of the ESIA for the BASIC Programme will require technical capacity building in the human resource base of implementing institutions as well as logistical facilitation. Implementers need to understand inherent social and environmental issues and values and be able to clearly identify indicators of these.

Even with existence of policies and laws on environmental and social safeguards, evidence on the ground still indicates that there are significant shortcomings in the abilities of local and district level stakeholders to correctly monitor, mitigate and manage environmental performance of development projects. This is critical as the bulk of the BASIC Programme is to be implemented at the community level.

Therefore a detailed capacity needs assessment will have to be in built to identify needs to enable strengthening of social and environmental evaluation, screening, mitigation and monitoring. Capacity enhancement can be consolidated into two key areas: human resources capacity and institutional resources capacity.

The stakeholders involved in the BASIC Programme either have low technical capacity or inadequate staffing. While adequacy in staffing requirements was varied between the various stakeholders, there is limited presence of directly trained and dedicated staff for environmental management purposes. Staff that belong to other project-relevant departments are also assigned duties related to environmental management. As a result, knowledge on environmental management principles, project screening, impact mitigation, monitoring and follow-up action is limited.

In some cases, environmental personnel are present but level of training and technical capacity on environmental principles and tools of management is not sufficient. Training and awareness creation can therefore be undertaken at different levels of implementation. Training can therefore target BASIC Programme stakeholders from the central Government, local authorities, private sector, NGOs, and grassroots stakeholders/beneficiaries. The exercise will be customised according to the needs at each level to ensure adequacy in implementation of the ESMP.

Awareness creation, training and sensitization will be required for personnel of the following institutions:

- National Environment Management Council (NEMC);
- BASIC Programme Environmental and Social specialist who will be hired;
- Local engineering contractors who will be contracted or sub contracted to undertake the construction works;
- Local governments authorities at different levels;
- Project Relevant Ministries/Department Environment Officers;
- BASIC Programme Staff;
- Farmers Associations;
- NGOs and CBOs.

The training shall focus on:

- Stakeholder engagement, consultation and partnerships and group dynamics;
- EIA law, relevant environmental policies;

- Development of mitigation measures and Environmental Management Plans;
- National EIA procedures, Environmental Management policies & guidelines and AfDB safeguards as well as their implementation and enforcement;
- The use and application of Environmental and social Assessment (ESA) tools (Screening checklists, EIA, EA, ESMP), their review, implementation and enforcement;
- Environmental reporting, monitoring and follow-up of ESMP;
- Data management and use (including book-keeping and accounting);
- Understanding EIA procedures, environmental management policies and guidelines, AfDB and IFAD safeguards, implementation and enforcement

In order to reduce costs, minimize duplication of efforts and integrate existing technical expertise, officers with relevant knowledge and experience in particular fields such as NEMC Environmental Specialists or District Environmental Officers can be used to train the others.

The training programme will be designed to build capacity and required skills for both targeted officers of different institutions and local communities in order to enable them to facilitate not only the project implementation but also the implementation of the ESMP. Once trained, these officers, especially the District Agricultural Extension Officers will facilitate in the full mobilization and later support service providers/contractors in the training of the local communities on the use and implementation of ESIA and ESMP. NEMC will then be able to oversee and monitor the implementation of ESMP under the project.

As mentioned above, EcoEnergy will also provide a range of technical assistance to the outgrowers. Capacity modules will be developed to train members of the 25 – 30 outgrower companies, train trainers (about 150 farmers) and about 15 Bagamoyo District extension and technical staff from the District Agriculture Offices. EcoEnergy will be supported in this by the Sugar Board of Tanzania. The training programme will comprise a number of themes, including:

- Soils, water, crops and irrigation in line with conservation agriculture approaches;
- Leadership, management and organisation;
- Business practices and processes;
- Shareholder agreements and company constitutions;
- Contracts, legislation and corporate responsibility;
- Environment, food security and livestock;
- Wealth management.

Specific topics may include, for example, crop husbandry and farming techniques, scheme design and development, best practices, group organisation, business planning and management (including sound decision-making), environmental management (including application, storage, handling and disposal of agrochemicals), health and safety aspects, and conservation agriculture.

Support to capacity building for the district will include supply of office equipment, a vehicle and motorcycles to the district for supervision purposes.

## **2.10 General Activities during the Planning, Construction and Operation Phases**

### **2.10.1 Planning Phase**

Certain activities have to be carried out during the various project phases. During the planning phase, the scheme layouts, including location of bulk infrastructure and irrigation systems will be planned and designed. EcoEnergy will provide technical assistance for the detailed design and construction supervision of the main irrigation and drainage system with support from district engineers. Capacity building and training will start in this phase and continue through all the project phases. Any baseline studies required by the financing institutions can be carried out during this period.

### **2.10.2 Construction Phase**

At the start of this phase, land will have to be cleared, trees uprooted and stumps removed. The approach will be to leave as much vegetation as possible between the company farms, and preserve/restore riverine vegetation to protect the riverbank. The bulk infrastructure, including canals, dam (or water storage facility), conveyance pipes, access roads, dykes and power lines – as described in Section 2.6 above – will then have to be constructed and irrigation systems set up.

In addition, agricultural equipment, office equipment and vehicles will have to be purchased. The land will be ploughed and deep ripped, made ready for planting.

Project progress will be monitored and evaluated, and progress and supervision reports produced.

### **Waste and By-Products generated during Construction Phase**

The following waste and by-products are expected to be generated during the project construction:

- **Runoff:** Storm water runoff from the site (but not excessive due to the topography of the area)
- **Dust:** Dust will be generated on the site from delivery of material and various construction activities.
- **Solid waste:** Solid waste from construction activities will include material such as scrap timber and various off cuts and refuse such as discarded packaging (e.g. cement bags), workers garbage etc.
- **Building rubble:** This will include sub-soil removed and any rock rubble generated by blasting (or other rock breaking activities) during excavation of trenches for foundation strips and the laying of water reticulation pipes, excavations for water features, storage tanks for water and fuel, etc. and other spoil such as rejected concrete, broken blocks etc.
- **Used oil:** Used oil and lubricants will be generated from routine on-site maintenance of plant and equipment
- **Exhaust emissions:** from operation of vehicles and machinery on site.
- **Sewage:** Sanitary waste generated by the construction workforce.



### **2.10.3 Operation and Maintenance Phase**

Cultivation of the sugarcane will mark the beginning of this phase. Activities include irrigation of the farms; weed control, application of agrochemicals, harvesting and transportation of sugarcane to the EcoEnergy mill.

It is expected that various systems and programmes to enhance productivity and sustainability will be implemented, for example, occupational health and safety and environmental management systems, an integrated pest management programme, an integrated crop management programme, an integrated soil conservation and nutrient management programme, and an integrated water resources management programme.

It is expected that the schemes will be fully operational within one year after construction activities have been completed.

### **Waste and By-Products generated during Operational Phase**

The following waste and by-products are expected to be generated during the project operation:

- **Solid waste:** Solid waste will include material such as scrap timber and various off cuts and refuse such as discarded packaging, workers garbage as a result of renovating and management of the dam/reservoirs and irrigation infrastructure etc
- **Sewage:** Sanitary waste generated by the workforce during operational phase.
- **Storm Water:** An increase in storm water runoff will result from the site due to the development of reservoirs, roofed and paved areas (eg workshop area) which do not allow infiltration of rain water. Storm water run-off from the fuel storage and dispensing area as well as parking areas may contain some hydrocarbons from minor oil or fuel leaks/spills. Storm water run-off typically also contains silt and suspended solids.
- **Hazardous Waste:** Hazardous waste would include, for example, discarded fertilizer bags or pesticide containers; waste oils, used solvents or discarded paint cans from the workshop; and medical waste from the first aid centre.
- **Green waste:** will include leaves and grass cuttings from maintenance of the areas around the reservoir, water canals and other landscaped areas of the project.

EcoEnergy will take responsibility for the proper disposal of all solid and hazardous waste generated during construction and during operation.

### **2.11 Project Beneficiaries**

The main project beneficiaries will be the scheme members and other farmers from the villages of Kiwangwa, Matipwili and Gama/Kitame. Other members of the outgrower scheme communities who will be employed in the various farm-related activities in the different project phases (from, construction to implementation, and including from cultivation, harvesting and post-harvest activities). Other beneficiaries are all those that will benefit from the infrastructure that will be provided by the scheme – such as power and water, and finally those who will buy the sugar that is produced.

## **2.12 Other Proposed Developments in the District**

Existing development plans for the district include the Bagamoyo Port Project (south of Bagamoyo town, at Mbegani). Adjoining the port area, will be the EPZ zone, and areas for industrial, commercial, residential and tourism uses. The new airport will be located further west near Chambezi. As a result of these planned developments, there is a rush to obtain land in Bagamoyo District, mainly by people from Dar es Salaam. In addition, people will be lured to migrate into the district from other parts of Tanzania because of the potential job opportunities that these developments will give rise to.

In the project area itself, apart from the Bagamoyo EcoEnergy Project there are no other proposed development projects of this magnitude. There are existing salt works at Kitame. About four years ago Wami Sugar Ltd wanted 25,000 acres of land to grow sugarcane, but apparently there was not enough suitable land available, so it appears they have set up elsewhere in Tanzania. Shanta Estates Ltd has also identified 5,000 acres of land bordering the Wami River near Matipwili for growing sugarcane; their request is with the MLHHSD (pers. Comm. Mr Mkusa, Head of Department – Lands, Natural Resources and Environment, Bagamoyo District, February 2014).

## **3 Policy, Administrative and Legal Framework**

### **3.1 Introduction**

Three strategic documents provide overall guidance for the BASIC Programme:

1. The Tanzania Development Vision 2023 of February 2000 recognizes the importance of environmental protection. According to this document, development should involve striking a balance between development pursuits, cultural considerations and basic needs on the one hand and the preservation of the natural environment for the current and future generations on the other hand. Section 2.2 of the document considers environment as a cross-cutting issue.
2. The National Strategy for Growth and Reduction of Poverty (NSGRP) is another important national strategy that is relevant for the agriculture sector. The strategy ensures that development activities do not adversely affect the development needs of the future generations. It emphasises the sustainable use of the country's natural resources, avoiding harmful effects on the environment and on people's livelihoods.
3. The Southern Agricultural Growth Corridor of Tanzania (SAGCOT) is an inclusive, multi-stakeholder partnership to rapidly develop the region's agricultural potential. It was initiated at the World Economic Forum (WEF) Africa summit 2010 with the support of founding partners including farmers, agri-business, the Government of Tanzania and companies from across the private sector. SAGCOT's objective is to foster inclusive, commercially successful agribusinesses that will benefit the region's small-scale farmers, and in so doing, improve food security, reduce rural poverty and ensure environmental sustainability. The risk-sharing model of a public-private partnership (PPP) approach has been demonstrated to be successful in achieving these goals and SAGCOT marks the first PPP of such a scale in Tanzania's agricultural history.

In order to achieve sustainable development the Government of Tanzania has developed various national and sector policies, legislations and institutional framework for environmental management in the country. These are summarised below.

### **3.2 Policies**

#### **National Environment Policy (1997)**

The National Environment Policy (NEP, 1997) is the main policy document governing environmental management in the country. The policy addresses environmental issues both as natural and social concerns, and adopts the key principle of sustainable development. The policy has also proposed a framework for environmental legislation to take account of the numerous agencies of the Government involved in regulating the various sectors. The policy provides strategic plans on environmental management at all levels. It provides the approach for mainstreaming environmental issues for decision-making and defining sectoral policy action

plans. In terms of environmental management and protection the policy identifies six key problem areas as: land degradation, lack of access to good quality water, environmental pollution, loss of wildlife habitat and biodiversity, deterioration of aquatic ecosystems and deforestation.

The use of pesticides, herbicides and fertilizers may cause land and water pollution in the areas used for farming. Moreover, clearance of vegetation for cultivation of cane may result in loss of wildlife habitats and biodiversity as well as land degradation. The works may lead to encroachment of land, damage vegetation or affect the quality and quantity of water resources in the area.

### **National Land Policy (1995)**

The National Land Policy of 1995 (revised 1997) recognizes the need for protecting environmentally sensitive areas. The policy emphasizes the protection of environment and natural ecosystems from pollution, degradation and physical destruction. In addition, the policy recognizes the importance of social services such as water, roads, energy and solid waste management in environmental protection. The policy promotes and ensures a secure land tenure system, encourages optimal use of land resources, facilitates broad-based social and economic development without upsetting or endangering the ecological balance of environment.

The existing social services may be affected by the development of the new project in the area. They include both physical and social infrastructure. Moreover, improper management of waste (liquid and solid) may result in ecological imbalances leading to environmental degradation. A secure land tenure system will help to reduce land conflicts between parties.

### **Agriculture and Livestock Policy, 1997**

The Policy emphasizes that for the long term future of the country, the natural resources (land, soil, water and forests) must be managed so that agriculture is sustained. The policy promotes intensification and diversification of agricultural production; seeks to improve crop husbandry through soil erosion control and soil fertility improvement; seeks to implement measures that will minimize encroachment in public lands including forests, woodlands, wetlands and pasture; and strengthens agrochemical monitoring and registration.

The use of agrochemicals may lead to pollution of water sources and land if proper monitoring will not be done. Moreover, clearing land for large plantations and prolonged land use for the same purpose may lead to environmental degradation.

### **National Irrigation Policy, 2010**

The policy promotes the efficient use of water in irrigation systems, and ensures that irrigation development is technically feasible, economically viable, socially desirable and environmentally sustainable. It aims to have irrigation systems which are environmentally sound by ensuring compliance to relevant legislation; protecting and conserving water and land sources; taking into account pollution control in irrigated agriculture; and promoting proper land use practices.

The policy is relevant to the project as impacts from the project may affect water quality and quantity for downstream users. Improper land use practices may also lead to environmental degradation.

### **The National Water Policy (2002)**

The policy objective is to develop a comprehensive framework for sustainable management of the national water resources. In this case the policy recognizes the need to protect water sources from pollution and environmental degradation as well as equitable uses among sectors. The policy recognizes the role of agriculture as one of the key sectors in country's socio-economic development.

The project may result in increasing conflict among downstream water users due to excessive abstraction of water for irrigation during the dry seasons. This may also disturb ecosystems and wildlife that depend on the particular water resource. Furthermore, development of the sugarcane plantation may degrade the quality and quantity of water in surrounding water sources.

### **National Human Settlements Development Policy (2000)**

The overall goal of the National Human Settlement Development Policy (2000) is to promote development of sustainable human settlement and to facilitate provision of adequate and affordable shelter to all people, including the poor. The policy outlines a number of objectives including the environmental protection within human settlement and protect natural ecosystem against pollution, degradation and destruction with the aim of attaining sustainable development. The policy recognizes the impacts of human activities within residential areas. Since the project is located in area habited by people, management will be required to ensure environmental protection within human settlement, for example by minimizing dust generation. The project is surrounded by Wami Rivers; hence in this case the project management will be required to ensure that natural ecosystems like natural rivers are protected from pollution as directed in the policy objective.

### **National Women and Gender Development Policy (2000)**

The objective of this policy is to provide guidelines to ensure gender sensitive in all project plans, programmes and strategies in all sectors and institutions. The policy gives emphasis on gender equality. The policy aims at establishing strategies on poverty eradication by ensuring that both women and men get equal access to existing resources for their development. It values the role played by women in bringing about development in the society. The agriculture sector is also highly committed to gender mainstreaming at all levels, through provision of equal opportunities to both men and women in agriculture works and related activities.

The policy requires project management to ensure that gender issues are given emphasis. It also requires that women and men are given equal employment opportunities in the project, whenever possible.

### **National Policy on HIV/AIDS (2001)**

The Policy identifies HIV/AIDS as a global disaster, hence requiring concerted and unprecedented initiative at national and global levels to combat the disease. It recognizes HIV/AIDS as an impediment to development in all sectors, in terms of social and economic development with serious and direct implication on social services and welfare. The policy recognizes the linkage between poverty and HIV/AIDS, as the poor section of the society are the most vulnerable. The main policy objective is reflected well in the establishment of TACAIDS. However, the policy has also set a number of strategic objectives to deal with specific HIV/AIDS related problems: Prevention of transmission of HIV/AIDS; HIV Testing; care for People Living

with HIV/AIDS (PLHAS); enhance Sectoral roles through participation and financial support; promote and participate in research on HIV/AIDS-including dissemination of scientific information and development of HIV vaccine; creating a legal framework through enactment of laws on HIV/AIDS-governing ethical issues and legal status of HIV/AIDS affected families

The project may attract people from outside the immediate project area, particularly during construction. This may lead to the possible interaction between the workers and the local community members, which may lead to the increased transmission of HIV / AIDS to both the workforce and the local communities. In this case the management would be required to follow the policy directives to minimize the problem.

### **Tanzania Wildlife Policy, 2009**

The Wildlife Policy aims to: conserve areas with great biological diversity which are representative of the major habitats of Tanzania; support and where necessary, enlarge the protected area network as the core of conservation activities; promote involvement of local communities participation in wildlife conservation in and outside the protected area network; integrate wildlife conservation with rural development; foster sustainable and legal use of wildlife resources; ensure that wildlife conservation competes with other forms of land use; enhance the recognition of the intrinsic value of wildlife to rural people; and minimize human-wildlife conflicts whenever it occurs.

The project has implications on wildlife protection, management and development of protected areas and promotion of international cooperation, particularly in light of emerging issues regarding human/wildlife conflict and encroachment into Saadani National Park.

### **National Forest Policy, 1998**

The National Forestry (March 1998) is based on a macro-economic, environmental and social framework. The overall goal of the national forestry policy is to enhance the contribution of the forestry sector to the sustainable development of Tanzania and the conservation and management of forest resources for the benefit of present and future generations. There are four policy areas: forest land management, forest-based industries and products, ecosystem conservation and management, institutions and human resources. The main forest regulatory instrument is the Forests Ordinance of 1957 which was based on a strong controlling function of the sectoral authorities and centralized administrative structures for its implementation.

One of the outgrower villages neighbours the Zaraninge Forest. In addition there are several village forest reserves in the project area. Deforestation has been cited as one of the major environmental challenges in the project area, hence the relevance of this policy.

### **National Climate Change Strategy, 2012**

The goal of this Strategy is to enable Tanzania to effectively adapt to climate change and participate in global efforts to mitigate climate change with a view to achieving sustainable development in line with the Five Year National Development Plan, Vision 2025, as well as national sectoral policies. The Strategy aims to reduce vulnerability and enhance resilience to the impacts of climate change. The implementation of the Strategy will enable the country to put in place measures to adapt to climate change and mitigate GHG emissions in order to achieve sustainable national development through climate resilient pathways.

The specific objectives of the Strategy are to:

- a) Build the capacity of Tanzania to adapt to climate change impacts;
- b) Enhance resilience of ecosystems to the challenges posed by climate change;
- c) Enable accessibility and utilization of the available climate change opportunities through implementation;
- d) Enhance participation in climate change mitigation activities that lead to sustainable development;
- e) Enhance public awareness on climate change;
- f) Enhance information management on climate change;
- g) Put in place a better institutional arrangement to adequately address climate change;
- h) Mobilize resources including finance to adequately address climate change.

In line with the National Climate Change Strategy, the recently prepared TACRP has been developed by the Ministry of Agriculture, Food Security and Cooperatives (MAFC) with “the strategic direction of modernizing the agriculture sector through promoting large-scale commercial farms, irrigation expansion, and strengthening value chains, and improving linkages with smallholders”. The priority areas for adapting to the effects of climate change are:

- i. agricultural water and land management, focusing on catchment management and adoption of sustainable agriculture and water management practices;
- ii. accelerating uptake of climate-smart agriculture, including building supporting evidence for climate-smart agricultural practices and incentives at the district level, and generating awareness and capacity for these practices;
- iii. reducing impacts of climate-related shocks and instituting measures to diversify livelihoods and to respond to weather related-shocks;
- iv. strengthening knowledge and systems to target climate action; and
- v. mainstreaming gender into climate change initiatives for agriculture. In promoting climate resiliency, the approach will be to reduce the environmental impacts of agricultural activities that can drive climate vulnerability.

### **The Energy Policy of Tanzania, 1992**

The objective of the policy is to provide input into development process through the establishment of an efficient energy production, procurement, transportation, distribution and end use in an environmentally sound manner and with due regard to gender issues. The policy recognizes the critical role of energy in all sub-sectors of the economy, including the agricultural sector. It underscores the importance of having sufficient supply and efficient use of energy in order to realize sustainable development and satisfy basic needs of the society.

The policy is relevant because as a result of the project the outgrower villages will have access to electricity, as electrical infrastructure will have to be installed to supply the pumps, other agricultural equipment and offices.

### **Construction Industry Policy, 2002**

The policy regards construction industry as a fundamental economic sector in the country. The important issues of major concern in the policy document range from planning, design, construction / production, procurement, repair, maintenance and demolition of physical infrastructure. It recognizes the need for delivery of good quality and valuable service in the

development and maintenance of physical infrastructure. The policy recognizes the importance of involving various organizations and persons including companies, firms and individuals working as consultants, main contractors and sub-contractors, materials and equipment producers, plant and equipment suppliers, builders and merchants. According to the government as a purchaser, financier, regulator and operator maintain close relationship with clients and other financiers.

The relevance of this policy is that it requires the project management to give priority to local consultants and contractors, and to the use of locally available materials, as well as the need to ensure delivery of good quality structures.

### **3.3      *Legislation***

#### **The Constitution of Tanzania**

The Constitution of the United Republic of Tanzania (1977 – 1995, Revised 1997) is the overarching legal framework in the country. It recognizes the basic rights for its people as outlined in Part III section 14 and 24 (Act No. 15 of 19874). Section 14 states that every person has the right to life – that every person has the right to live and to the protection of his / her life by the society in accordance with the law. Section 24 stipulates that every person is entitled to own property and has a right to the protection of his property held in accordance with the law. However, there are certain limitations upon enforcement and preservation of basic rights, freedom and duties as stipulated in the Act No. 15 of 1984 Section 6 and Act No. 34 of 1994.

The Constitution must be observed by the project proponent, especially in matters concerning human rights, land acquisition and loss of private properties. Under such circumstances the project proponent would be required to execute compensation or resettlement according to the country laws.

#### **Environmental Management Act (EMA) 2004**

The Environmental Management Act No. 20 of 2004 is the principle legislation governing environmental management in the country. The Act recognizes the right of every citizen to a clean, safe and healthy environment, and the right of access to environmental resources for recreational, educational, health, spiritual, cultural and economic purposes.” The Act provides a legal framework for coordinating harmonious and conflicting activities by integrating those activities into overall sustainable environmental management system by providing key technical support to sectoral Ministries.

The Act identifies and outlines specific roles, responsibilities and functions of various key players and provides a comprehensive administrative and institutional arrangement, comprising: National Advisory Committee, Minister Responsible for Environment, Director of Environment, National Environmental Management Council (NEMC), Sector Ministries, Regional Secretariat, and Local Government Authorities (City, Municipal, District and Town Councils). Part VI Sub-section 81(1) the Act requires a project proponent or developer of a project to undertake Environmental Impact Assessment (EIA) at his / her own cost prior to commencement or financing of the project or undertaking. The types of projects requiring EIA are listed in the Third Schedule of the Act. The Act prohibits any development to be initiated without an Environmental Impact Assessment (EIA) Certificate. Sub-section 86(1) stipulates ...” the Council shall upon examination of a



project brief, require the proponent of a project or undertaking to carry out an Environmental Impact Assessment study and prepare an Environmental Impact Statement”.

Under Section 47, the Minister may, on recommendation of the National Environmental Advisory Committee, declare any area of land which is ecologically fragile or sensitive to be an Environmental Protected Area, and in doing so must take into consideration various factors such as whether any representations have been made in relation to that land, ecological issues, unique areas or sites of special interest.

This project falls under projects listed in the Third Schedule of the Act that requires Environmental Impact Assessment (EIA) studies, and Environmental Impact Assessment Certificates to be issued before its commencement. The box below describes the EIA process in Tanzania.

**Box 3.1: The EIA Process in Tanzania**

An EIA study in Tanzania includes the following main steps: (1) Preparation of Project Brief, project application and registration, (2) screening, scoping and terms of reference, (3) EIA study and report, (4) submission of an EIA report and finally (5) decision making.

**Registration:** The developer submits to National Environmental Management Council (NEMC) a duly filled Registration Form and a Project Brief together with the registration fee.

**Screening.** The Council reviews the Registration Form and the Project Brief in accordance with the EIA and Audit Regulations of 2005. The Council undertakes the screening of the proposed project in accordance with the aforementioned Regulations to determine the level of EIA the proposed project should be subjected to. This consists of evaluation and analysis of the Project Brief with the outcome of informing the developer whether the project requires some further environmental analysis or not or if the project requires a full EIA.

*[Time frame: Within 45 days from the date of submission of the Project Brief]*

**Scoping and Terms of Reference:** The developer commissions an Environmental Expert/EIA Consultant to prepare the Scoping Report and Terms of Reference (ToR) for the EIA. The Scoping Report and ToR are submitted to NEMC for review and approval before commencement of the EIA study.

*[Time frame: Approval of ToR by NEMC to be done within 14 days of submission of Scoping Report and ToR]*

**Environment Impact Assessment:** An EIA study is conducted in accordance with the approved TOR, the Environmental Management Act No. 20 of 2004 and the Environmental Impact Assessment and Audit Regulations of 2005. An expert or firm of experts undertakes detailed survey of the existing social, economic, physical, socio-cultural and institutional environment within the project boundary.

*[Time frame: depends on significance, magnitude and complexity of the project]*

**Preparation of Environmental Impact Statement (EIS).** An environmental expert or firm of experts prepares an EIS observing the contents of the EIS as outlined in the EIA and Audit Regulations of 2005, including an Environmental Management Plan (EMP).

*[Time frame: depends on significance, magnitude and complexity of the project]*

**Submission of EIS.** The developer submits 15 copies of the EIS to NEMC for review by the cross-sectoral Technical Advisory Committee (TAC). The developer facilitates the review process by paying the review costs to NEMC as required by the Environmental Management Act of 2004.

**Review of the EIS.** The Council reviews the EIS adhering to review criteria and approved ToR developed during the scoping exercise. NEMC may organise a public review. NEMC then prepares a review report and recommendations on the EIS and the project.

*[Time frame: within 60 days from the date of submission of the EIS to NEMC]*

**Permitting/Decision.** The Council submits the review report and all documents used in the review process to the Minister responsible for Environment with its recommendations for issuance of an EIA Certificate or disapproval.

*[Time frame: within 30 days from the date of submission of EIS to the Minister]*

**Environmental Monitoring and Auditing.** The proponent/developer conducts internal monitoring on the implementation of mitigation measures. NEMC conducts control monitoring in order to evaluate the performance of the mitigation measures, adherence to approved plans, environmental standards and general compliance with terms and conditions set out in the Environmental Impact Assessment Certificate.

**Decommissioning.** Upon project completion or relocation, the developer prepares a decommissioning report to submit to NEMC. This plan must include a description of the existing environmental conditions and proposed restoration measures. The developer also has to submit an annual monitoring report and an environmental auditing report as demanded by NEMC.

Source: NEMC, 2014

Various regulations have been drawn up under EMA including regulations for environmental impact assessment and auditing, water quality, waste management, and air emissions which will have to be adhered to during the construction and operation phases of the programme.

### **The Environmental Impact Assessment and Audit Regulations, 2005**

The Regulations provide the basis for undertaking Environmental Impact Assessment (EIA) and Environmental Audit for various development projects with significant environmental impacts in the country. Part III of the Regulations deals with project registration and screening procedures. Section 5 requires the registration applicant for Environmental Impact Assessment Certificate to submit a Project Brief to the National Environment Management Council (NEMC) in the format shown in the Third Schedule of the EMA (2005) and First Schedule of the Regulation. According to Section 11(1) the proponent is required to undertake a preliminary assessment if more information is required to determine a screening decision, or to undertake an environmental impact assessment if the project brief does not provide sufficient mitigation measures.

The project management will be required to carry out environmental monitoring and auditing of the project, and will have to ensure that project activities comply with guidelines provided in the following regulations developed under EMA:

- The Environmental Management (Air Quality Standards) Regulations, 2007
- The Environmental Management (Water Quality Standards) Regulations, 2007
- The Environmental (Solid Waste Management) Regulations, 2009
- The Environmental Management (Hazardous Waste Control And Management) Regulations, 2009
- The Environmental Management (Soil Quality Standards) Regulations, 2007

### **The National Irrigation Act (No.5) of 2013**

This act provides for the establishment of the National Irrigation Commission as well as for the zonal irrigation offices, district irrigation departments as well as the appointment of irrigation inspectors. The Act also provides for the development, operation and maintenance of irrigation and drainage systems as well as effective implementation of the National Irrigation Policy and the National Irrigation Development Strategy. Section 16 of the Act states that the Minister responsible for Agriculture, upon consultations with the Ministers responsible for Lands, Water

and local government authorities, is empowered to declare any specified area to be an irrigation area. Section 17 authorizes the acquisition by the President of land for purposes of irrigation, and Section 18 that deals with the classification of land for irrigation purposes in terms of suitability for specific crops and irrigation methods. These sections have implications on the acquisition of land (currently under dispute) within Saadani National Park for the Gama irrigation scheme, but also for the Bagamoyo EcoEnergy core plantation.

Section 19 of the Act that specifies persons and entities who may undertake construction of irrigation works, and Section 22 provides for compensation for damages suffered by any person as a consequence of such construction of irrigation works. Section 28 describes how and by whom irrigation schemes are required to be managed, namely the Commission, local government authorities, public or private entities and individual farmers or irrigators' organizations. Sections 29 - 35 set out the provisions for the establishment of irrigators' organizations, functions of irrigators' organizations, sources of funds of irrigators' organizations, allocation of irrigation plots, and dispute settlements on irrigation schemes. Section 49 relates to monitoring and evaluation of performance of irrigation schemes. Section 50 of the Act relates to environmental compliance of the schemes, and requires the Commission to ensure that all irrigation developments are integrated with other natural resources development and management activities such as catchment management in order to protect the environment.

The act is therefore of utmost importance in terms of providing guidance in respect of setting up, acquiring land for the programme schemes, and managing the proposed outgrowers schemes.

### **The Water Resources Management Act, (No. 11), 2009**

This act provides for an institutional and legal framework for sustainable management and development of water resources; outline principles for water resources management; prevention and control of water pollution; puts in place mechanisms for harvesting and using water; and participation of stakeholders and general public in implementation of National Water Policy. The act requires protection of water resources; prevention of pollution to water sources; acquisition of water use permit and sustainable management of water resources that facilitates social economic development. It also establishes a National Water Board and provides for its functions. Among these, is the power to regulate water catchment areas, putting in place water management plans, classification of water resources and restricting the use of water during certain periods.

Large scale agriculture projects contribute to degradation of water resources, through pollution and/or over-exploitation. The schemes will be required to obtain bulk water permits from the Wami-Ruvu Basin Water Office, and monitor water abstraction and submit records.

### **Water Utilization and Regulation Act, (No. 42) 1974**

The Water Utilization (Control and Regulation) Act, (No. 42), 1974, is the principal legislation dealing with the protection of water resources and control of water extraction for different uses. This act has gone through three amendments, amendment through Act No. 10 of 1981, Written Laws (miscellaneous amendment) Act No. 17 of 1989 and the Water Utilization (miscellaneous amendment) Act No 8 of 1997. The extraction of water for different users is controlled through “a water right permit “. Under this law, applications for water rights required to be submitted to the River Basin Water Office for water sources falling under the River Basin. The applicant is required to undertake EIA as classified in the EMA (2004) and submit the environmental clearance certificate from NEMC to the Basin Water Office. The provisions for the water rights under this act contain the following:

The Water projects needs to understand the procedures for acquiring and managing water rights, discharges to open environment and maintenance of water quality, which are provided by this act.

The proposed Water Legislation in Part XII provides for dam safety and flood management.

### **Energy and Water Utilities Regulatory Authority, 2001.**

The general functions of EWURA are covered under the provisions of Section 7 of the Energy and Water Utilities Regulatory Authority Act, 2001. Under the provisions of Section 7 (1) of that Act the functions conferred on EWURA by this Act shall be to perform the following in relation to the regulation of the provision of water supply and sanitation services by a water authority or other person, other than a community organisation established in accordance with Section 37 of this Act: (a) exercise licensing and regulatory functions in respect of water supply and sanitation services including the establishment of standards relating to equipment attached to the water and sanitation system; also among others provide guidelines on tariffs chargeable for the provisions of water supply and sanitation services.

### **The Land Act, (No.4), 1999, and the Land Regulations, 2001**

Both The Land Act (1999) and The Land Regulations (2001) address compensation as a requirement in the acquisition of land owned by people.

Compensation under Section 156 of the Land Act No. 4 of 1999 applies to non-governmental corporate bodies, institutions or groups of persons. This Section requires compensation to be paid to any person for the use of land of which he / she is in lawful or actual occupation, as a communal right of way and with respect to a way leave. These include any damage suffered in respect of trees, crops, and buildings as result of creation of way leave; and damage due to surveying or determining the route of that way leave.

The Land Regulations of 2001 comprise the Land (Compensation Claims) Regulation of 2001 and the Land (Assessment of Value for Compensation) Regulation of 2001.

According to the Land (Compensation Claims) Regulation of 2001, the following are eligible for compensation / resettlement:

- Holder of right of occupancy (Section 22 of the Land Act of 1999);
- Holder of customary right of occupancy whose land has been declared a hazard land (Section 49 of the Land Act, 1999)
- Holder of customary land, whose land becomes granted to other person and is moved or relocated under Section 34 of the Land Act, 1999;
- Land obtained as a consequence of disposition by a holder of right of granted or customary right of occupancy but is refused a right of occupancy under Section 54 of the Land Act, 1999;
- Urban or peri-urban land acquired by the President under Section 60 of the Land Act, 1999.

Sub-section 2 of Section 9 applies to all applications or claims for compensation against government or Local Government authority, public body or institution.

Section 10(1) states that compensation shall take the form of: monetary compensation; a plot of land of comparable quality, extent and productive potential to the land lost; a building or buildings of comparable quality, extent and use comparable to the building or buildings lost; plants and seedlings; and/or regular supplies of grain and other basic foodstuffs for a specified time.

The Land (Assessment of Value for Compensation) Regulation, 2001 applies to any application or claims for compensation by any person occupying land and shall the value of un-exhausted improvements on the occupied land (eg. grazing land). The regulation states that the *“basis for assessment of the value of any land and un-exhausted improvement... shall be the market value of such land”*. The market value is arrived at using the comparative method proved by actual recent sales of similar properties or by use of the income approach or replacement cost method, in case the property is of a special nature and not saleable. An assessment of the value of land and unexhausted improvements is done by Qualified Valuer and verified by the Chief Valuer of the Government or his / her representative. Aspects of compensation include: (a) Value of unexhausted improvement; (b) Disturbance allowance; (c) Transport allowance; (d) Accommodation allowance and (e) Loss of profits.

The BASIC Programme infrastructure may destroy properties or necessitate land acquisition. Hence compensation will have to be paid to the affected persons in line with existing legislation and regulations described here.

### **The Land Acquisition Act, No 47 of 1967**

The Land Acquisition Act of 1967 stipulates the power and the procedures for acquiring land and the required degree of compensation. Section 3 & 4 of the acts provide that, the president may acquire any land for any estate or term provided such land is required for public purposes such as for exclusive government use, general public use, any government scheme, development of social services or commercial development of any kind including declamation. According to Section 5, if the President’s considers the land in a certain locality to be appropriate, it should be examined for possible acquisition by any persons authorized by the Minister, who may do the following:

- Enter upon and survey any land in such locality;
- Dig or drill under the subsoil; and
- Clearly, set and mark the boundaries of the land proposed to be required.

The law forbids entrance into any buildings or closed garden attached to dwelling house without first giving three days notice. Any damage that results from activities of the authorized person must be compensated. In case of a dispute on the amount of compensation, the Regional Commissioner will make a decision.

Section 6 requires the Minister to give a notice to all interested persons or those claiming to be interested in such land. Section 7 & 8 of the same Act provides for publication of a notice in the gazette to interested persons requiring them to yield up possession of such land and section 9 forbids a party from being compelled to sell or convey part of a house if he is willing to yield the whole house or building in the process of acquisition.

Section 11 (1) provides for compensation by the government to the person whose land is acquired. The president’s, with consent of the person entitled to compensation, and may grant public land not exceeding in value of the land acquired, for an estate not exceeding the state acquired and upon the same terms and condition of the land acquired instead of or in addition to any compensation

### **The Fertilizers Act, 2009**

The Act provides for regulation of manufacturing, importation, exportation, sale and use of agricultural fertilizers. It requires adherence to environmental legal requirements prior to issuance of permit for importation and exportation of fertilizers. Furthermore, the Act obliges any owner, occupier or any person entrusted with the charge of the premises where undesired fertilizers, package or article is found, to cover the cost for removal, reshipment or destruction.

Fertilizers will be used in the cane production process, and may result in environmental degradation through water and land pollution if not supervised and applied properly.

### **Road Act, 2007**

Section 16 of the Act addressed the issue of compensation for any acquired land for road development. The Section emphasizes that, where it become necessary for the road authority to acquire a land owned by any person for the purpose of this act, the owners of such land shall be entitled to compensation for any development on such land in accordance with the Land Acquisition Act (1967), Land and Village Land Acts (1999) and any other written law. The law requires compensation to be paid to anyone whose land will be acquired for the access roads.

For this project, the community needs to be informed that the land that is to be acquired for the access roads and that in acquiring that land there are special procedures to be followed including payment of compensation before the land is acquired.

### **The Occupational Health and Safety Act, (No.5), 2003**

The Occupational Health and Safety Act No. 5 of 2003, deals with regulation of health, safety and welfare of workers in factories / workplaces. The Act will require the Contractor to, *inter alia*: appoint a safety and health representative and committee; register their workplace before operation; provide safety precautions; ensure health and welfare of workers; and ensure proper handling of hazardous materials / chemicals and process. This act therefore applies to all phases and activities of the programme.

### **Graves (Removal) Act, 1969**

This is an act to provide for the removal of graves from land required for public purposes. Subject to Section 3 of this Act, where any land on which a grave is situated is required for a public purpose the Minister may cause such a grave and any dead body buried therein to be removed from the land and, in such case, shall take all such steps as may be requisite or convenient for the reinstatement of the grave and the re-interment of the dead body in a place approved by him for the purpose. In the project area there are graves within the Kiwangwa scheme area, and these may have to be relocated.

### **The Wildlife Conservation Act (No. 12), 1974**

The Wildlife Conservation Act, (No. 12), 1974, deals with the sector that is entrusted with the custodianship of wildlife resources in the country. The Act empowers the Minister to establish game control areas, prohibit, restrict/regulate the hunting, killing and capture of animals during such periods as may be specified. In addition, it also gives the Director of Wildlife powers *inter alia*: to restrict the carriage of weapons in game reserve; protect vegetations against burning or

cutting; restrict use of devices for killing or capturing animals within game reserve and game controlled areas and to declare any area to be a partial game reserve for protected animals and restrict the hunting, capturing or killing protected animals or national game.

On public interest, the Director is empowered to refuse to issue license, certificate and permission to any person and may cancel permission/permit and try various offences. Although the Act does not prohibit consumptive use of wildlife, it seeks to control and regulate that use in order to ensure sustainability.

Among the many objectives and strategies that the Act sets, the following are major ones:

- To promote conservation wildlife and its habitat (Protection);
- To regulate development, projects/activities in protected areas (Development);
- To conserve viable populations of species making up Tanzania's fauna and flora with emphasis on endangered, threatened, endemic species and their habitats;
- Enforcing EIA process for proposed developments in protected areas and requesting for environmental planning for developments to be carried out in the wildlife areas outside protected areas in order to minimize negative impacts.

Water development projects will observe laws governing the conservation of wildlife

### **National Parks Act, Cap 282**

This Act provides for the establishment, control and management of national parks. Section 3 of this Act states that the President may, with the consent of the National Assembly, by proclamation published in the Gazette, declare any area of land to be a national park, while Section 4 states that the President, with the consent of the National Assembly, by proclamation published in the Gazette, alter the boundaries of any area declared to be a national park under the provisions of Section 3.

### **The Forest Act, (No. 14), 2002**

The Forest Act, (No. 14), 2002, provides for the management of forests and its main objectives are to promote and enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resources for the benefit of the present and future generations. In addition, the legislation aims to ensure ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility.

According to section 18 of this Act, an EIA is required for certain developments in accordance with the modalities and substance as set out in the guidelines by authorities responsible for the protection of the environment. Among others are (a) road construction or the laying of pipelines; (b) construction of dams, power stations, electrical or telecommunication installations; (c) construction of buildings.

### **3.4 Institutional Framework for Environmental Management in Tanzania**

The Environmental Management Act No. 20 of 2004 stipulates the administrative and institutional arrangements for environmental management in Tanzania. It gives the overall responsibility of undertaking enforcement, compliance, review and monitoring of Environmental Impact Assessment to National Environmental Management Council (NEMC). The Ministry responsible for Environment is responsible to approve the EIA and to issue the environmental impact assessment certificate

Under the EMA, the Regional Secretariat is responsible for co-ordination of all advice on environmental management in their respective region and liaison with the Director of Environment. At local government level, an Environmental Management Officer is designated by each City, Municipality, District, or Town Council. The District Environmental Committee is responsible for promoting and enhancing sustainable management of the environment. The District Council designates an environmental management officer for each administrative area as township, ward, village, mtaa, kitongoji to coordinate all functions and activities related to the protection of the environment in their area. The Village Development Committee is responsible for the proper management of the environment in respect of their jurisdiction.

Sector ministries and agencies are responsible for conserving and protecting environmental resources as applicable to their respective sectors. In this case, the Ministry of Water through the Wami-Ruvu Basin Water Office is responsible for issuing water permits, and for monitoring abstraction as well as water quality in the Wami River. Management of forest and wildlife resources are administered by the Ministry of Natural Resources and Tourism (MNRT), through the Forestry Department and the Directorate of Wildlife. The latter is directly responsible for wildlife outside national parks, while Tanzania National Parks (TANAPA) is a parastatal under the latter responsible for the management of wildlife in the national parks.

### **3.5 Financial Institutions Safeguard Policies**

#### **3.5.1 African Development Bank Safeguard Policies**

The key AfDB safeguard policies triggered by the project are:

- Policy on the Environment (2004);
- Involuntary Resettlement Policy (2003).

These are described briefly below.

#### **Environmental Policy**

The AfDB's Environmental Policy is founded on the concept of sustainable development, where sustainable development is described as "the acquisition, transformation, distribution, and disposal of resources in a manner capable of sustaining human activities without any reduction in the aggregate natural resource stocks". It assumes that "the ecological, regenerative and assimilative capacities of the natural ecosystems will be maintained. The policy takes cognisance of rapid population growth and poverty as being the major contributors to environmental degradation, and highlights its key environmental foci as being:



- Reversing land degradation and desertification;
- Protecting coastal zones;
- Protecting global public goods;
- Improving public health;
- Enhancing disaster management capabilities;
- Promoting sustainable industry, mining and energy resources;
- Improving urban environmental management;
- Supporting good environmental governance;
- Institution and capacity building;
- Increasing awareness;
- Stakeholder participation.

In order to achieve its policy goals, the Bank's approach aims at mainstreaming environmental sustainability considerations into all its operations; strengthening existing environmental assessment procedures and developing new environmental management tools; demarcating internal responsibility in implementation; assisting regional member countries to build adequate human and institutional capacity to deal with environmental management; improving public consultation and information disclosure mechanisms; building partnerships to address environmental issues, harmonise policies and disseminate environmental information; and improving monitoring and evaluation of operations.

### **Involuntary Resettlement Policy**

The AfDB's Involuntary Resettlement Policy is set within the framework of the Bank's overarching vision of poverty reduction, through sustainable development. The primary goal of the policy is the equitable treatment of people who are displaced as a result of a project, and that they have access to the benefits of the project that involves their resettlement. The policy's objectives are to ensure that disruption of people's livelihoods is minimised, and that resettlement assistance improves their living standards. The policy requires the preparation of a Resettlement Plan that addresses the issues of livelihood and living standards of the displaced persons, as well as compensation for loss of assets, using a participatory approach at all stages of project design and implementation.

The policy requires compensation to be paid at the full replacement cost for loss of lands and other assets, and this should be paid prior to project implementation with a view to improve the former living standards, income earning capacity and production levels of the affected population. Consideration to impacts on the host communities is also required.

The policy framework covers economic and social impacts associated with Bank financed projects involving involuntary acquisition of land or other assets which result in:

- Relocation or loss of shelter by the persons residing in the project area;
- Loss of assets or involuntary restriction of access to assets including national parks, protected areas or natural resources; or
- Loss of income sources or means of livelihood as a result of the project, whether or not the affected persons are required to move.

Displaced persons who are entitled to compensation for loss of land or other assets fall into two groups:

- i. Those who have formal rights to land or other assets recognised under the laws of the country;
- ii. Those who may not have formal rights, but who can prove entitlement under the country's customary laws. This group also includes people who may not physically reside at the project site or persons who may not have any assets or direct sources of livelihood derived from the project site, but who have spiritual and/or ancestral ties with the land (eg. graveyards, sacred forests or places of worship). Sharecroppers and tenants, seasonal migrants belong to this group.

A third category of displaced persons who have no recognisable legal right or claim to the land they are occupying in the project area will be entitled to resettlement assistance in lieu of compensation for land. With no contradiction to the borrower's legislation, land, housing and infrastructure will be provided to the adversely affected population, including indigenous groups, ethnic, religious and linguistic minorities, and pastoralists who may have usufruct rights to the land or other resources.

### **Other AfDB Policies of Relevance**

Other Bank policies to be taken into consideration are:

- Gender Policy (2001);
- Policy on Integrated Water Resources Management (2000);
- Energy Sector Policy;
- Framework for Enhanced Engagement with Civil Service Organisations (2012).

### **AfDB Integrated Safeguards System (2013)**

Environmental and social sustainability is key to economic growth and poverty reduction in Africa. The Bank's Strategy for 2013-2022 emphasises the need to assist regional member countries in their efforts to achieve inclusive growth and transition to green growth. In addition, the Bank is committed to ensuring the social and environmental sustainability of the projects it supports. The ISS is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. The safeguards aim to:

- Avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible;
- Minimise, mitigate, and/or compensate for adverse impacts on the environment and affected people when avoidance is not possible; and
- Help borrowers/clients to strengthen their safeguard systems and to develop the capacity to manage environmental and social risks

The Bank requires that borrowers/clients comply with these safeguards requirements during project preparation and implementation. The Integrated Safeguards Policy Statement sets out the basic tenets that guide and underpin the Bank's approach to environmental safeguards. In addition, the Bank has adopted five Operational Safeguards (OSs), limiting their number to just what is required to achieve the goals and optimal functioning of the ISS:

**Operational Safeguard 1: Environmental and Social Assessment.** This overarching safeguard governs the process of determining a project's

- environmental and social category and the resulting environmental and social requirements
- Operational Safeguard 2:** **Involuntary Resettlement: Land acquisition, population displacement and compensation.** This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement (see above), and incorporates a number of refinements designed to improve the operational effectiveness of those requirements.
- Operational Safeguard 3:** **Biodiversity and ecosystem services.** This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management in operational requirements.
- Operational Safeguard 4:** **Pollution prevention and control, hazardous and control, hazardous materials and resource efficiency.** This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.
- Operational Safeguard 5:** **Labour conditions, health and safety.** This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It also ensures greater harmonization with most other multilateral development banks.

The BASIC Programme triggers all five OSs, and has therefore been rated as Environmental Assessment Category 1, as indicated in Table 3.1 below.

**Table 3.1: AfDB Safeguard Policies Triggered by the BASIC Programme**

Safeguard Policies Triggered	Yes	No	TBD
<b>Environmental and Social Assessment (OS 1)</b>	<b>X</b>		
BASIC Programme will intensify sugarcane cultivation agriculture at sites that are situated near sensitive areas. Given this setting, the BASIC Programme is likely to have significant environmental impacts that are sensitive, diverse or unprecedented, although potential risk of further environmental degradation exists from the construction and use of irrigation infrastructure (eg. soil erosion, pesticide use, hydrological changes, wetland degradation, increase in waterborne diseases).			
<b>Biodiversity and Ecosystems Services (OS 3)</b>	<b>X</b>		
BASIC Programme activities may potentially contribute to degradation of natural habitats such as wetlands downstreams, Saadani National Park, remnants of natural vegetation and remnant forests, thus have impact on the health and quality of forests.			
<b>Pollution Prevention and Control, Hazardous Materials and Resources Efficiency (OS 4)</b>	<b>X</b>		
BASIC Programme aims to bring about agricultural intensification, shift to commercial farming, may lead to increase use of pesticides despite its explicit efforts to promote organic agriculture.			
<b>Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation (OS 2)</b>	<b>X</b>		
BASIC Programme activities include development of infrastructure that will support increased agricultural production and productivity with implications of land taking for the purpose.			
<b>Labour Conditions, Health and Safety (OS 5)</b>	<b>X</b>		
The storage dam or conversion of oxbow lakes into storage reservoirs shall be designed by qualified engineers, and reservoir safety measures shall be incorporated in dam/reservoir operations guidelines.			

## Bank Procedures and Guidelines

In addition, the Bank has various procedures and guidelines that need to be followed if funding is secured. These include:

- **The Integrated Environmental and Social Impact Assessment Guidelines, 2003.** The guidelines evolved as a result of new procedures for environmental and gender assessment that aim to integrate the Bank's new vision and emerging priorities, particularly cross cutting themes of poverty, environment, population, health, gender and stakeholder participation. The underlying approach for implementing AfDB funded projects is the mitigation approach, which targets preventative actions related to project design, location, and implementation, rather than curative interventions. The guidelines indicate that compensation measures should be the last action to resort to.
- **The Environmental and Social Assessment Procedures, 2001.** These provide guidance on the specific procedures to be followed by the Bank and its borrowers to meet the requirements of the operational safeguards at each stage of the Bank's project cycle.

### 3.5.2 International Fund for Agricultural Development (IFAD)

#### Environment and Natural Resources Policy (2012)

IFAD's Environment and Natural Resources Policy aims to enable poor rural people to escape from and remain out of poverty through more-productive and resilient livelihoods and ecosystems, by integrating the sustainable management of natural assets across its activities and its partners' activities.

The Policy sets out 10 core principles to guide its support, namely:

1. Scaled-up investment in multiple benefit approaches for sustainable agricultural intensification;
2. Recognition and greater awareness of the economic, social and cultural value of natural assets;
3. 'Climate-smart' approaches to rural development;
4. Greater attention to risk and resilience in order to manage environment- and natural-resource related shocks;
5. Engagement in value chains to drive green growth;
6. Improved governance of natural assets for poor rural people by strengthening land tenure and community-led empowerment;
7. Livelihood diversification to reduce vulnerability and build resilience for sustainable natural resource management;
8. Equality and empowerment for women and indigenous peoples in managing natural resources;
9. Increased access by poor rural communities to environment and climate finance; and
10. Environmental commitment through changing its own behaviour.

## **Social, Environment and Climate Assessment Procedures (SECAP) (2014)**

SECAP endeavours to ensure that IFAD's goal of enabling poor rural people to improve their food and nutrition security, increase their incomes and strengthen their resilience, particularly to climate change, is done in an environmentally and socially responsible manner. The procedures set the minimum standards for the assessment of social, environmental and climate change risks of IFAD projects which apply throughout the project cycle. The procedures aim to:

“.. (i) provide information and analysis that strengthen the social, environmental and climate dimensions of projects and programmes; (ii) maximise social, environmental and climate change adaptation benefits and avoid or minimise negative impacts; and (iii) increase the consistency, transparency and accountability in decision making concerning these dimensions...”.

SECAP provides a step-wise description of the processes to assess risk at each phase of the project or programme cycle, namely: Environmental and Social Categorisation and Criteria, Environmental and Social Impact Assessment (ESIA); Climate Risk Analysis; ESIA Review and Recommendations; Loan Negotiations; Executive Board Approval, Project Supervision and Implementation, and Project Completion and ex-post ESIA.

With regard to categorisation the BASIC Programme falls under Category A for the following reasons:

- The programme involves large scale irrigation schemes
- The outgrower schemes will convert some areas of natural forest (especially in Kiwangwa), but significant areas of wild lands, particularly in the Gama scheme;
- The programme may result in loss of natural habitat and loss of biodiversity as a result of diminished flow in the Wami River due to offtake of water for irrigation
- or environmental services provided by a natural ecosystem;
- Oxbow lakes – which are regarded as wetlands – may be used as water storage reservoirs,
- There will be a significant increase in the use of agrochemicals;
- There is a risk of destruction as a result of flooding
- Some forests in the Kiwangwa scheme were traditionally used for burials, and these will be lost to irrigated land;
- The programme may necessitate the compensation of farmers for crops on land that will become part of the schemes, and in some cases may necessitate relocation of persons affected by the schemes.
- The proposed storage dam will have a height of 8-10 m and a capacity of 1.4 million m<sup>3</sup>, but if the oxbow lake option is pursued the estimated storage capacity could exceed 3 million m<sup>3</sup>;
- There will be a need to construct dykes to “train” the Wami River.

The programme also classifies as high risk for climate risk as the schemes will be located on marginal land, and some areas within the schemes are low-lying coastal areas.

In addition, SECAP provides guidance statements on biodiversity and protected area management; agrochemicals; energy; fisheries and aquaculture; forest resources; livestock and range resources; water; small dams; physical cultural resources; rural roads; development of value chain, microenterprises and small enterprises; rural finance; and physical and economic resettlement – all of which are applicable in the context of the BASIC Programme.

Where resettlement or economic displacement is envisaged, SECAP requires that the principles of “do no harm” and “free, prior and informed consent” are adhered to at all times and for all beneficiaries for any intervention that might affect the land access and user rights of communities.

### 3.5.3 The Equator Principles

The Equator Principles (EPs) provide a framework for determining, assessing and managing environmental and social risk in projects, thereby informing the decision-making processes adopted by Equator Principles Financial Institutions (EPFIs) (ref. The Equator Principles, June 2013).

The principles are aligned with the IFC Environmental and Social Sustainability Performance Criteria and the World Bank’s Environmental, Health and Safety (EHS) Guidelines.

There are ten Equator Principles:

- Principle 1: Review and Categorisation.** Projects are required to be screened and categorised based on the magnitude of their potential environmental and social risks and impacts.  
Category A projects are those with potentially significant diverse, irreversible or unprecedented adverse environmental or social risks and/or impacts.  
Category B projects have potentially adverse environmental or social risks and/or impacts that are generally site specific, largely reversible and can be mitigated.  
Category C projects are those with minimal or no adverse environmental and social risks and/or impacts.
- Principle 2: Environmental and Social Assessment.** For Category A projects (such as the BASIC Programme) and some Category B projects, an ESIA is required, which may include specialist studies. For the latter category, if risks are limited then a limited environmental and social impact assessment (or audit) may be carried out, or the risks can be addressed through applying environmental siting criteria, pollution standards, design criteria and/or construction standards.
- Principle 3: Applicable Environmental and Social Standards.** Environmental and social assessment should address compliance relevant host country laws, regulations and permits, and where these are lacking with IFC Performance Criteria and WB EHS Guidelines.
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan.** All Category A and B projects require the client to develop or maintain an Environmental and Social Management System (ESMS). Environmental and Social Management Plans (ESMPs) must be prepared. Gaps and commitments to EPFI requirements are met through the development of action plans (APs).
- Principle 5: Stakeholder Engagement.** For all Category A and B projects, effective, structured and culturally acceptable stakeholder engagement as an ongoing process must be demonstrated.
- Principle 6: Grievance Mechanism.** For all Category A and some Category B projects, the ESMS must establish a grievance mechanism to receive and facilitate resolution of concerns and grievances about the project’s environmental and social performance.

- Principle 7: Independent Review.** Independent reviews must be carried out by an independent environmental and social consultant to ensure that all documentation is in order and that the EPs are complied with.
- Principle 8: Covenants.** These are included in the financing documentation to ensure that all relevant country environmental and social laws, regulations and permits as well as ESMPs and EP APs are complied with.
- Principle 9: Independent Monitoring and Reporting.** After financial close and over the life of the loan, Category A and if appropriate, Category B projects must be monitored by an independent Environmental and Social Consultant in order to verify monitoring information.
- Principle 10: Reporting and Transparency.** The client is required to ensure that a summary of the ESIA is accessible and available on line, and to publicly report GHG emission levels during the operation phase.

### **3.6      *Multilateral Environmental Agreements applicable to the Project***

Tanzania is party to a number of Multilateral Environmental Agreements (MEAs), and consequently has obligations under those agreements.

The most relevant MEAs to this study are:

- Convention on Biological Diversity (CBD, 1992; ratified by Tanzania 1996). The Convention's aims to ensure the conservation, sustainable use and equitable distribution of the benefits arising from the use of biological resources. Saadani National Park which neighbours two of the project sites harbours several endangered and near-threatened species of wildlife (including avifauna).
- UNESCO Convention for the Protection of World Cultural and Natural Heritage (World Heritage Convention 1972). This convention aims to protect natural areas and cultural sites of "outstanding universal value". Saadani village just north of the project area is one of the oldest Swahili villages on the coast. Saadani National Park is unique in that it is the only national park in Africa which includes terrestrial and marine habitats.
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS, 1980; ratified by Tanzania in 1999). The Bonn Convention aims to protect all species of animal exhibiting intra- or inter-continental migratory movements. This MEA has particular applicability to the project area due to the elephant migration route which passes through the project area.
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention; ratified by Tanzania in 1999). Three Ramsar sites have been designated in Tanzania but none are located in the study area.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES aims to control commercial exploitation of wild species in trade. This has implications on the project area because two of the outgrowers' schemes are located adjacent to Saadani National Park, and wildlife-human conflict and poaching occur frequently.

- The African-Eurasia Migratory Waterbird Agreement (AEWA, 1999, ratified in 1999). This aims to protect all species of waterbirds and their habitats within the Eurasian-African flyway system. The Saadani National Park which lies adjacent to the schemes has an extensive coastland where numerous migrant waterbird species are found.
- African Convention on the Conservation of Nature and Natural Resources (Algiers Convention, 1968), administered by the AU. This obliges member states to conserve African biodiversity. In this case it could apply to the preservation of Saadani National Park.
- The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (1997). The treaty aims at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol establishes emission limits for greenhouse gases. Anecdotal information indicates that the effects of climate change are being felt in the project area as there has been a marked change in rainfall patterns as well as in water levels in the Wami River. This could affect water availability for the schemes.
- The Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora, 1994 (ratified by Tanzania in 1994). This is again relevant due to the proximity of the schemes to the Saadani National Park and the problems related to human-wildlife conflict and poaching.
- The SADC Protocol on Wildlife Conservation and Law Enforcement, 1999. Ratified by Tanzania in 2003. This is an interstate regulation affirming that member states have the sovereign right to manage their wildlife resources and corresponding responsibility to sustainably use and conserve these resources. This protocol therefore has implications on the preservation of Saadani National Park.
- The United Nations Convention to Combat Desertification (1994), ratified in 1997. Certain parts of the project area is overgrazed and badly degraded, hence the applicability of this convention.
- The Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (1985). Ratified by Tanzania in 1996. This convention potentially applies to the impact of fertilizer use on the marine ecosystem in the Wami Estuary and at the mouth of the Wami River.
- The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998, was ratified in 2002. This applies because of the need for using fertilizers and pesticides for the sugarcane plantation.
- The Stockholm Convention on Persistent Organic Pollutants (POPs), 2001, ratified in 2004, and is relevant to the cane growing operations in the schemes.
- The Cartagena Protocol on Biosafety (2000), ratified in 2003. This agreement aims to ensure the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological



diversity, taking also into account risks to human health. The sugarcane varieties used on the outgrower farms may be genetically modified, in which case this protocol will apply.

- The United Nations Law of the Sea (1958), ratified in 1985. The treaty calls for all parties to adopt regulations and laws to control pollution of the marine environment. This applies to the outgrowers' schemes because of the potential pollution risks to the aquatic and marine environments in the Wami estuary and at the mouth of the river as it discharges into the Indian Ocean.

## **4 Environmental and Social Baseline**

### **4.1 *Biophysical Environment***

The description of the biophysical environment presented here has largely depended on documentation and findings from various studies carried out within the environs of the project area and Bagamoyo District, and particularly on specific environmental studies commissioned by Sekab for the ESIA carried out on their bioethanol plant in 2008.

#### **4.1.1 Topography**

All three project sites are located in flat areas (having slopes of 2% or less) suited to the cultivation of sugarcane.

The Kiwangwa scheme starts at the foot of a plateau at an altitude of about 30 m above sea level (asl) and slopes very gently northwards towards the Wami River to an altitude of about 26 m asl.

**Photo 4.1: One of the Proposed Areas for Centre Pivot Irrigation at Kiwangwa**



The Matipwili scheme lies on a flat alluvial plain on the north bank of the Wami River, about 1 km west of Matipwili village. The altitude here ranges from about 24 m asl in the northern section of the scheme area to 15 m by the river.

The Gama scheme also lies on a flat alluvial plain on the south bank of the Wami River, about 10 km west of the Kitame Salt Works. The altitude of the site is between 6m and 10m asl.

**Photo 4.2: The Proposed Area for the Scheme at Gama**



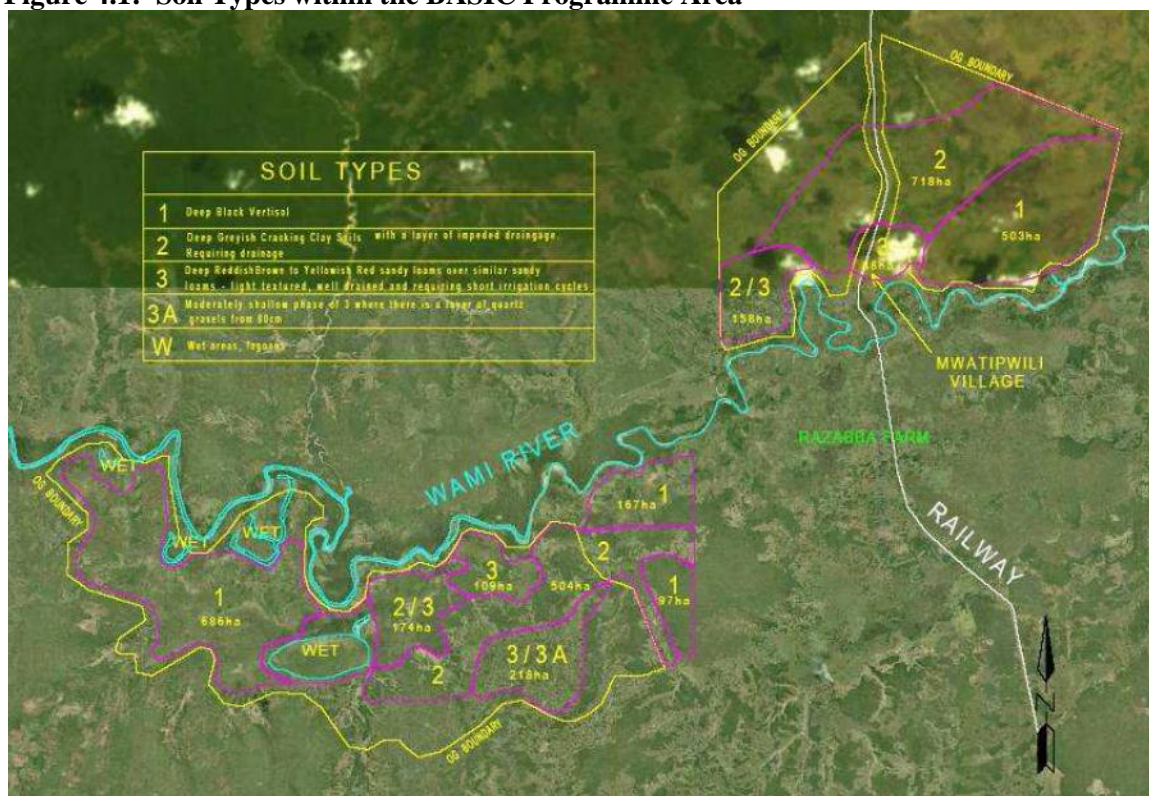
#### **4.1.2 Geology and Soils**

The three outgrowers' schemes are located within an old uplifted dissected coastal plain. The soils are based on post-Karoo recent cretaceous marine and continental sediments from the Cenozoic period. At Kiwangwa and Matipwili they are mainly alluvial gravel, sands and clays while at Gama/Kitame the soils can be described as lagoonal clays and silts and salt pans.

A reconnaissance soil survey was conducted for EcoEnergy in 2012 which covered the Kiwangwa and Matipwili sites (see Hungwe, 2012). The survey found that the most common soils were deep black alluvial vertisols of the lower alluvial plain (Soil Type 1). These soils become lighter at depths of 150 cm, which facilitate drainage and therefore are more suitable for agriculture. There are however some areas with deep grayish black cracking clay soils which have a layer of impeded drainage not suited to irrigated sugarcane (Soil Type 2). Soil types 1 and 2 exhibited sodic characteristics, which can be prone to waterlogging and erosion, and can inhibit plant growth. There are also areas with deep reddish brown to yellow red sandy loams which are suited to overhead irrigation (eg using centre pivots) and short irrigation cycles (Soil Type 3). In Kiwangwa a moderately shallow phase of the latter soil type is found in the higher areas at the bottom of the plateau (Soil Type 3a). Here too overhead irrigation and short irrigation cycles would be suitable.

Figure 4.1 below shows the soil types at Kiwangwa and Matipwili.

**Figure 4.1: Soil Types within the BASIC Programme Area**



Source: Hungwe, A (2012), Reconnaissance Soil Survey of the Bagamoyo Smallholder Irrigated Sugarcane Sites.

#### 4.1.3 Climate and Rainfall

The humid tropical climate of Bagamoyo district in general is influenced by its proximity to the Indian Ocean. Seasonal average temperatures range from 13°C to 30°C, and humidity levels can reach as high as 98%.

Rainfall ranges between 800mm and 1200 mm per annum. The short rains (*vuli*) fall from October to December while the long rains (*masika*) fall from March to May (Bagamoyo District Profile, 2006). June to September is the driest period when monthly rainfall is generally less than 50 mm per month.

Over the last 40 years, there has been an increase in weather variability, with extreme weather events, notably floods and droughts occurring more frequently both within and between seasons. Major floods have occurred in the Bagamoyo area in three out of the last 22 years, including twice in 2014, and drought has occurred in nine out of the last 22 years. Temperatures seem to be increasing and are accompanied by a trend of decreasing annual rainfall, with changes in both the start and end of the cropping seasons. Farmers in the district confirmed that there is more seasonal and annual variability in rainfall patterns within a declining trend, higher temperatures, less overall climate predictability and a corresponding increase in risk. Credible models suggest that by 2050, temperatures in the Bagamoyo area will rise by 1-3°C, maize yields could decline 20-40%.

The Pwani Project studied changes in rainfall patterns in coastal villages in Bagamoyo District (The Pwani Project/USAID, 2013). Analysing rainfall data over a period from 1920 to 2007, that rainfall trends showed high inter-annual variability. Annual rainfall appears to have fluctuated about 1000 mm on average. The study noted that from 1999 to 2008 rainfall has been decreasing. In comparing the mean monthly variation of rainfall between two distant years, 1938 and 2006, it found that rainfall in 1938 was higher in the *vuli*, but had now decreased considerably. The *masika* rains are now marginally lower than in the past, and they appear to come earlier than before and cease earlier than before. Stakeholders consulted during this assignment corroborated these findings. Indeed, they said that the *vuli* has become unreliable and sometimes fails altogether.

#### **4.1.4 Water Resources**

The information in this section has been sourced from the Water Resources Specialist Study carried out for the ESIA for the Sekab Biofuel Project in December 2007 (Mato et al, 2007), as well as the Wami River Initial Environmental Flow Assessment (EFA) Report (WRBWO, 2008) and the Wami River Basin Tanzania Environmental Flow Assessment Phase II Report (GLOWS-FIU, 2014).

#### **Surface Water and Hydrology**

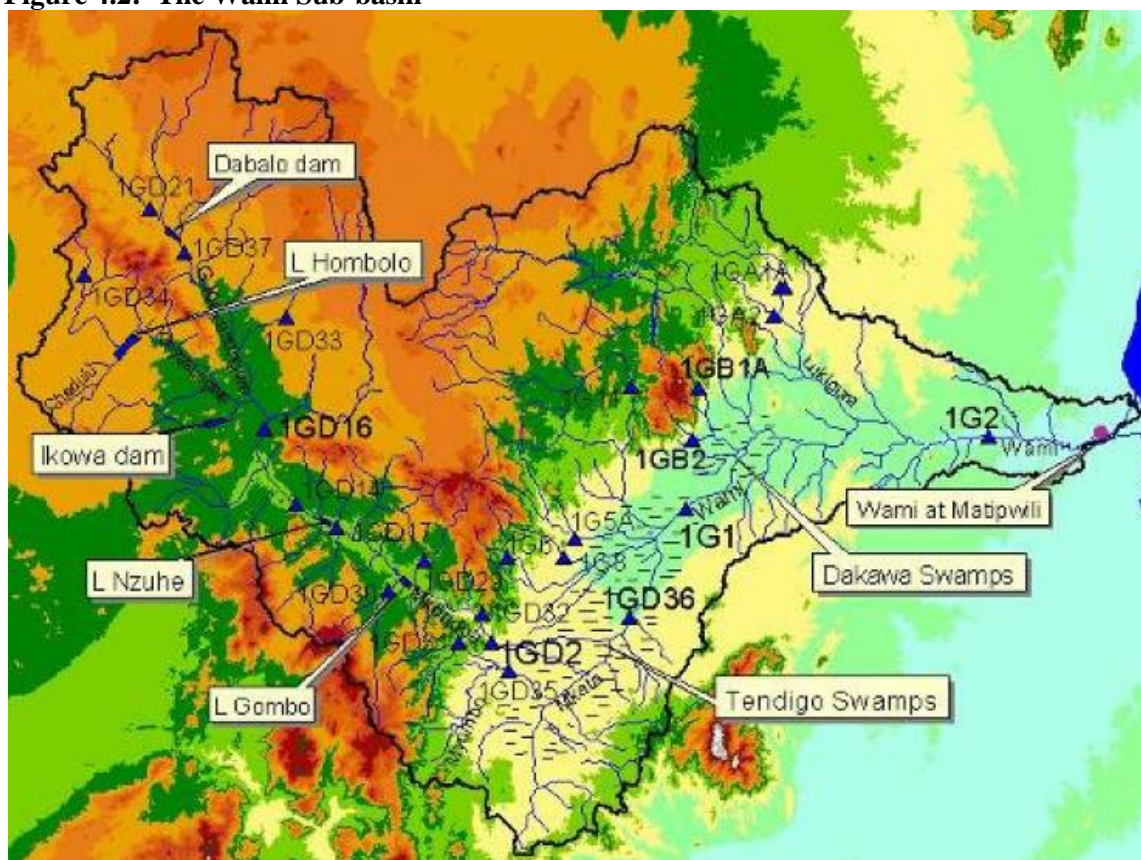
The outgrowers' schemes are located along the Wami River, and irrigation water will be drawn from this source.

The Wami River forms a sub-basin of the Wami-Ruvu Basin. The river has its origins in the Ukaguru, Rubeho and Nguru Mountain ranges, which are part of the Eastern Arc Mountains. The river drains eastwards, from the semi-arid regions of Dodoma, through the inland wetlands in Morogoro, and on to meet the Indian Ocean just south of Saadani. Its catchment covers 43,046 sq km. The Mkondoa River catchment contributes the largest flow into the Wami River, contributing some 80% of flows recorded at in the Mkata River. Figure 4.2 below shows the Wami Sub-basin.

The 2002 Population Census estimated that some 1.8 million people inhabit the Wami Sub-basin – this projects to be in the region of 2.35 million today (based on the national intercensal growth rate of 2.7%). Upstream of the project area the river provides water for small-scale irrigation activities (both legal and illegal), livestock and industrial use. Some important upstream users of the Wami River are the Mtibwa Sugar Estate, the Dakawa Rice Fields, the Chalinze-Wami Water Supply, the Wami-Mbiki Wildlife Management Area and Saadani National Park.



**Figure 4.2: The Wami Sub-basin**



Source: Wami-Ruvu Basin Water Office (2007). Environmental Flow Assessment (EFA), Wami River Sub-Basin, Tanzania: The Wami River Hydrology – Volume I General Description.

The EFA Report highlights three critical environmental conservation and water management issues affecting the Wami River:

- i. Forest clearing for agricultural expansion, timber and charcoal production, which could lead to increased sediment loads in rivers, altering water quality and affecting the aquatic habitat. Riparian forests are at particular risk because of their proximity to water sources for agriculture and for livestock. This also leads to riverbank erosion, siltation, and degradation of edge habitats.
- ii. Water pollution resulting from industrial discharges, agricultural activity and domestic wastewater is becoming an increasingly important threat to the quality of water in the Wami River system, and consequently to its aquatic habitats.
- iii. Demand for water for irrigation, industrial and domestic use will increase substantially in the near future, driven by the need for increased food security, higher employment levels, and better health standards.

The ESIA conducted for the EcoEnergy Project also noted the importance of the Dakawa and Tendigo swamps in the upper catchments of the Wami River in terms of river-swamp water exchanges and their role in regulating downstream flows in the Wami. Cultivation in these swamps, as is occurring in the Dakawa swamp, would therefore affect flows reaching the lower parts of the Wami.

The EFA established environmental flows at five sites in the Wami catchment: Kinyasungwe at Kongwa, Mkondoa at Kilosa, Wami at Mtibwa, Wami at Mandera and Wami at Matipwili. Environmental flows at Mandera and Matipwili are relevant to the BASIC Programme as water will be drawn from the Wami between Mandera and Matipwili, since water downstream of Matipwili is saline and not suitable for irrigating sugarcane. However, abstractions at Mandera would affect the environmental flow downstream of Matipwili for other uses (eg. to maintain aquatic habitats – specifically mangroves – and the aquatic fauna that depends on those habitats).

**Table 4.1: Recommended Environmental Flow for the Wami River at Mandera (m<sup>3</sup>/s)**

	WAMI AT MANDERA								
	Driest year			Maintenance year			Wettest year		
	Recom.	Available	Recom. Inst Peak	Recom.	Available	Recom. Inst Peak	Recom.	Available	Recom. Inst Peak
Oct	3.0	4.3		13.3	13.3		23.0	65.0	
Nov	3.0	5.9		14.0	26.0		23.0	265.9	
Dec	7.7	15.9		27.3	54.6		59.8	503.9	
Jan	7.7	10.1		32.8	65.7		96.5	412.9	
Feb	7.7	12.3		24.6	49.2		133.3	325.1	
Mar	5.6	5.6		52.4	69.9		170.0	466.6	
Apr	21.7	102.1	48 (T = <1 yr)	65.0	192.9	53 (T = <1 yr)	170.0	1240.5	220 (T = 1.5 yrs)
May	21.7	261.7		65.0	145.4		170.0	465.9	
Jun	15.5	42.6		37.5	49.9		91.4	182.8	
Jul	9.2	27.9		20.8	27.7		30.1	60.3	
Aug	3.0	15.4		14.0	21.1		23.0	51.3	
Sep	3.0	10.4		14.0	15.5		23.0	61.5	

Source: Wami-Ruvu Basin Water Office (2008). Environmental Flow Assessment (EFA), Wami River Sub-Basin, Tanzania

**Table 4.2: Recommended Environmental Flow for the Wami River at Matipwili (m<sup>3</sup>/s)**

	WAMI AT MATIPWILI								
	Driest year			Maintenance year			Wettest year		
	Recom.	Available	Recom. Inst Peak	Recom.	Available	Recom. Inst Peak	Recom.	Available	Recom. Inst Peak
Oct	4.6	4.6		6.6	13.9		37.0	68.3	
Nov	5.5	6.2		6.6	27.3		37.0	279.1	
Dec	8.3	16.7		14.7	57.3		86.5	529.1	
Jan	5.3	10.6		22.8	69.0		136.0	433.5	
Feb	6.4	12.9		30.9	51.6		185.5	341.4	
Mar	5.9	5.9		39.0	73.4		235.0	490.0	
Apr	21.2	107.2	37 (T = < 1 yr)	39.0	202.5	39 (T = < 1 yr)	235.0	1302.5	220 (T = 1.5 yrs)
May	21.2	274.8		39.0	152.7		235.0	489.2	
Jun	16.0	44.7		28.2	52.4		169.0	192.0	
Jul	10.7	29.3		17.4	29.1		103.0	63.3	
Aug	5.5	16.2		6.6	22.2		37.0	53.9	
Sep	5.5	11.0		6.6	16.3		37.0	64.6	

Source: Wami-Ruvu Basin Water Office (2008). Environmental Flow Assessment (EFA), Wami River Sub-Basin, Tanzania

In average and wet years, there is enough water in the river to sustain the river ecosystems and downstream water use. The most critical time to ensure environmental flow is during the dry years. The environmental flows at Mandera and Matipwili are illustrated graphically in Figures 4.3 and 4.4 below. The relative amounts of water required for environmental flow are shown in yellow, and water available for extractive use is shown in blue. It can be seen from the figures overleaf that in dry years from October to March there is little, if any, water available for use at both Mandera and Matipwili. At Mandera in an average (maintenance) year, in the months of September and October, no water is available for use. In wet years at Matipwili, there is little water available for use between June and September. In fact the Mandera site was considered the most sensitive by the EFA study team.

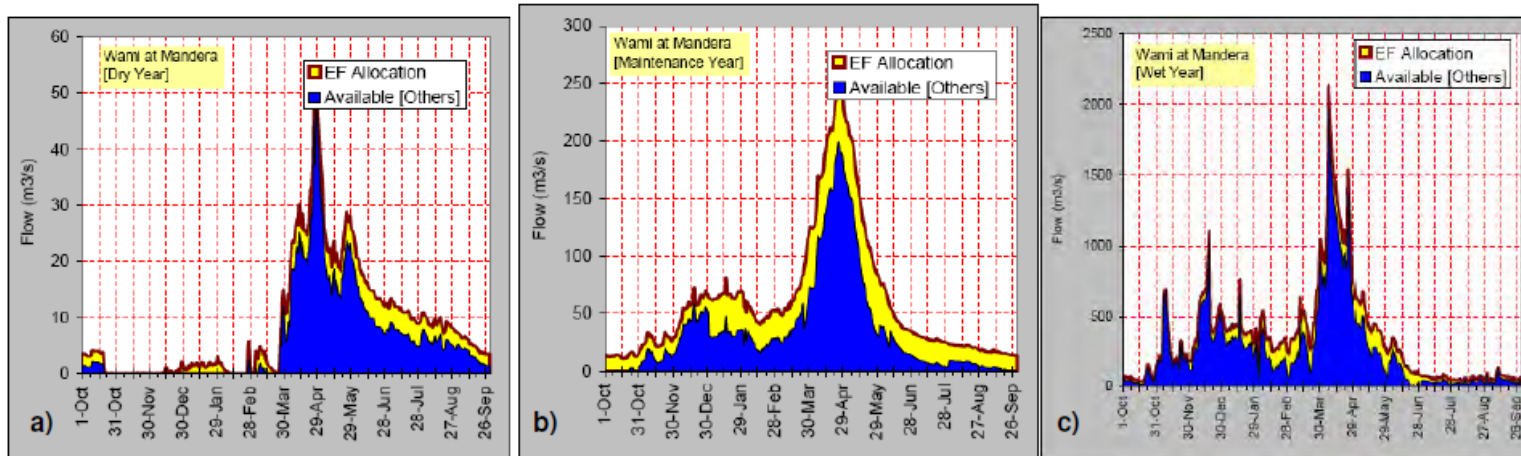
The assessment notes that the “17,000 ha sugarcane plantation just downstream of Matipwili Village will require an additional 11,810 l/s withdrawal, more than doubling the current licensed withdrawals for the river. Such a substantial increase may have significant impacts on

*estuarine and marine morphology and ecosystems*”. While the hectareage indicated here may be inaccurate, the statement raises concern about water availability for the schemes, and the impacts abstraction of water for irrigation may have on the downstream estuarine and marine ecosystems.

The second phase of EFA study was subsequently carried out to update analyses of the hydrologic record and revisited the original environmental flow recommendations (see GLOWS-FIU, 2014). Data was collected in April 2011. This study upheld the original recommendations on environmental flow, as indicated in Tables 4.3 and 4.4 above for Mandera and Matipwili respectively.

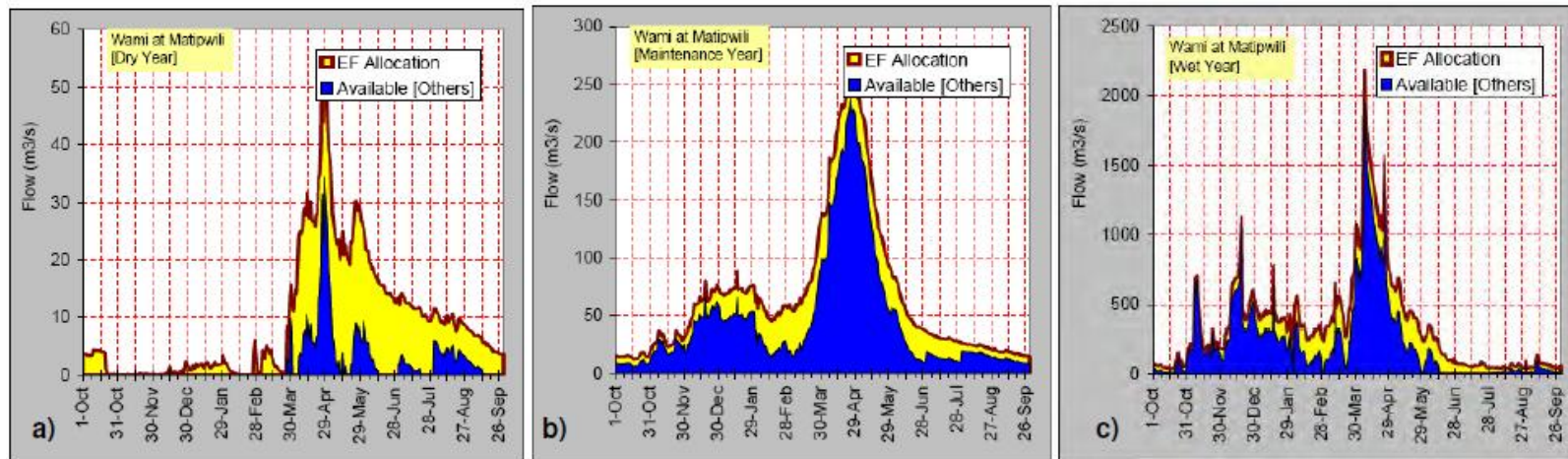


**Figure 4.3: Wami River at Mandera: Environmental Flow Allocation in a) dry year b) maintenance year c) wet year**



Source: Wami-Ruvu Basin Water Office (2008). Environmental Flow Assessment (EFA), Wami River Sub-Basin, Tanzania

**Figure 4.4: Wami River at Matipwili – Environmental Flow Allocation in a) dry year b) maintenance year c) wet year**



Source: Wami-Ruvu Basin Water Office (2008). Environmental Flow Assessment (EFA), Wami River Sub-Basin, Tanzania

JICA undertook a study on water resources management and development in Wami-Ruvu basin (JICA, 2013). The document indicates that there is huge potential for water resources development in the Wami Basin. However, at present there is a lot of wastage, many illegal connections and over-use or abuse of water abstraction limits; the WRBWO estimates this amounts to nearly 50% of abstracted water (pers. Comm. Ms Praxeda Kalugendo, WRBWO, February 2014). The JICA study notes that water use in 2011 in the Wami Sub-catchment was 119.6 million m<sup>3</sup>, of which 91% was used for irrigation, about 5.7% for domestic purposes, and about 2.6% for livestock. Demand for irrigation water in the sub-catchment will increase from the 2011 level of 109.0 million m<sup>3</sup> to 217.1 million m<sup>3</sup> in 2035, which is an increase of almost 100%. While the study proposes a development plan for priority water supply projects in the Wami-Ruvu Basin, it did not update environmental flows for the Wami and Ruvu Rivers.

It is conceivable then that in the short- to medium-term future water availability for the outgrowers' schemes is will be an concern in the dry season. There is therefore a need for storage of water by having reservoirs to divert excess water from the Wami River during high flows. WRBWO has proposed the building of a series of dams upstream of Mandera along the Wami River for which funding is being sought.

Whether diverting river water to the off-river storage facilities for the outgrowers' schemes as well as the EcoEnergy plantation will result in diminished water quantities downstream water will have to be investigated.

In order to manage water resources better, the WRBWO is promoting the setting up of Water Users Associations (WUA) which will help regulate and monitor water use/abstraction along the Wami and Ruvu Rivers, and encourage dialogue between upstream and downstream users, in order to resolve any conflicts in water use. In the case of the BASIC Programme, each outgrower's scheme would require a water use permit, for which they would have to register as a company. The company would then form an irrigator's organisation, in accordance with the National Irrigation Act of 2013, and would be required to prepare and implement a water schedule for each irrigation season based on water use permit as well as an operation and maintenance system for the scheme. The irrigator's organisation is also required to, among other functions, regulate use of water, promote water use efficiency, monitor and keep records of water flows for irrigation. They will therefore be required to coordinate with the WRBWO in all these aspects.

The impacts of water abstraction for the schemes from the Wami River are discussed in Chapter 6.

### **Surface Water Quality**

Existing sources of water pollution in the Wami River are reportedly due various activities upstream, mainly agricultural activities as a result of the use of agrochemicals (notably at the Mtibwa Sugar Plantation) but also by smallholders, and by industrial activity and domestic wastewater (WRBWO, 2008).

The ESIA for the Bagamoyo EcoEnergy Project in 2012 provides water quality monitoring data which was done during baseline studies carried out in 2008. Samples were taken along the Wami River at upper Mandera and upper Gama, as well as three dams on the Razaba Ranch. The results showed that water in the Wami River was of "very good quality suitable for both industrial/domestic water supply (for treatment) and irrigation." However the samples at the

dams indicated higher salinity levels, implying that upon inundation the water may be prone to salinity. This is therefore relevant for the dam(s) or reservoirs to be constructed for the outgrowers' schemes, but also implies that if irrigation is not well managed, salinization may occur. It should also be noted that the samples were taken 7 years ago, during which time agricultural activity in the Wami Basin has increased. Prior to implementation of the BASIC Programme, samples will have to be taken again for baseline purposes as well as to compare water quality trends in the Wami River.

## **Groundwater**

According to information gathered from the Drilling and Dam Construction Agency (DDCA) for the Sekab ESIA study, there are two existing boreholes at Matipwili village, both drilled in the mid-2000s. There are also a number of shallow wells but these are saline. There are boreholes in Saadani (which has saline water) and Msata (which has fresh water). Apparently sea water intrudes up the Wami River up to Matipwili. Above Matipwili, groundwater is fresh.

## **Wetlands**

Mato et al (2007) describe the Wami Sub-basin as comprising four wetland categories: palustrine, lacustrine, riverine and estuarine. The Dakawa and Tendigo Swamps are the major palustrine (vegetated) wetlands, and extend across much of the inland plain zone. These swamps are perennial, but shrink and expand seasonally according to the dry and rainy seasons. Lakes Hombolo, Nzuhe and Gombo and the Ikowa and Dabalo reservoirs are classified as lacustrine wetlands. The largest wetland system along the Wami River is the riverine wetlands system, comprising the rivers and floodplains within the basin. The mouth of the Wami River where it discharges into the Indian Ocean is an estuarine wetland system. The riverine and estuarine wetland systems are found within the immediate project area. These wetland systems are depicted in Figure 4.2 above.

### **4.1.5 Vegetation / Flora**

The description in this section has been based mainly on a vegetation survey that was carried out as a specialist study for the ESIA for the Sekab Biofuel Project in December 2007 (Mwasumbi et al, 2007). While the study focussed on the Razaba Ranch, it also describes vegetation to the west of the railway line (assumed to be similar the vegetation at the Kiwangwa scheme) and to the east along the Wami River to the coast (assumed to be similar to the vegetation at the Gama/Kitame scheme). The description has also relied on Mligo, 2011. The vegetation at Matipwili is assumed to be similar to that found in Saadani, although cultivation activities have greatly affected the natural vegetation pattern.

Information from the 1950s indicates that the project area was once covered with thick East African coastal forest, but now only remnants of this forest exist, most notably the Zaraninge Forest located approximately 4 km north and northwest of Matipwili (see Section 4.1.7 below). Over the centuries the wider project area has seen a range of anthropogenic activities such as farming, grazing, burning, all of which have contributed to changes in vegetation patterns and associated plant communities.

Vegetation maps from the mid-1990s show that the Kiwangwa site was predominantly closed woodland with some areas of open grassland. The Matipwili and Gama/Kitame sites were mainly bushland with emergent trees and open woodland (Hunting Technical Services, 1996).

The vegetation in the Kiwangwa area at present can be described as *Diospyros-Spirostachys* scrub forest, where the woodland community is characterised by *Manilkara sulcata*, *Diospyros cornii*, *Albizia petersiana*, *Azelia quanzneis*, *Spirostachys africana* and *Lannea stuhlmanii*. The indicator species of the scrub habitats were *Diospyros bussei* and *Haplocoelum inopluem*. Matipwili was probably *Acacia-Terminalia-Spyrostachys-Diospyros* woodland. Along the riverine areas, *Ficus sur*, *Ficus sycomorus*, *Combretum apiculata* and *Syzigium guineense* were key species. There are isolated stands of *Acacia zanzibarica* and scattered individuals of *Encephalartos hildebrandii* (cycad), *Sansevieria bagamoyoensis* and *Tricalysia microphylla* (the latter two are coastal endemics). The mangrove communities along the Wami Estuary and the Indian Ocean coastline consisted of *Avicennia marina*, *Bruguiera gymnorhiza*, *Sonneratia alba*, *Ceriops tagal* and *Rhizophora mcuronata*. The Gama/Kitame area was dominated by *Hyphaene compressa*, while *Pennisetum purpureum* grasslands cover the open areas (Mwasumbi et al, 2007; Mligo, 2011).

Today the vegetal landscape is substantially different. Field observations noted that the Kiwangwa site is mainly bushland, in some places fairly dense. There are areas of open bare land that have been overgrazed, but also some remaining stands of original woodland. Nearer the river some cultivation is taking place. The vegetation at the Matipwili site is now a mixture of bushland and cultivated fields. The Gama/Kitame site now has open bushland, largely overgrazed, with some patches of vegetation along stream beds. In general, the riverine vegetation along the Wami River in the project area has largely been cleared. When told that the law requires cultivation should only take place 60 m from the high water mark of any water body, the focus groups interviewed said that that is too far to walk if one is watering one's crops using buckets and watering cans.

**Photo 4.3: Typical Vegetation on the Kiwangwa Site**



#### **4.1.6 Fauna**

##### **Terrestrial and Avian Fauna**

The description of terrestrial fauna in the project area has been based mainly on an inventory that was compiled as a specialist study for the ESIA for the Sekab Biofuel Project in January 2008 (Nahonyo et al, 2008).

Due to the proximity of the outgrowers' schemes to the Saadani National Park (particularly Matipwili and Gama/Kitame) and Zaraninge Forest (Matipwili), there is abundant wildlife in the project area. The villagers in all three scheme areas mentioned human/wildlife conflict as being a frequent occurrence. Large mammals seen during the wildlife inventory for the 2008 ESIA Study for EcoEnergy (and reportedly seen by the communities and mentioned by the District Wildlife



Officer) include endangered species such as Elephant, Lion, and Hippopotamus. According to the Chief Warden at Saadani, as well as villagers at Gama/Kitame, about forty elephants were seen in Gama/Kitame as recently as December 2013. Elephants from Saadani National Park are known to migrate through (or very near) the Matipwili and Kiwangwa scheme sites, to and from the Wami-Mbiki Wildlife Management Area, from where they either go up towards Mkomazi National Park, or southwards to Mikumi National Park or through the Mkulazi Forest Reserve to Selous Game Reserve (Kikoti, 2010). The migration corridor is shown in Figure 4.5 below. It is also believed that buffalo migrate from Saadani to Wami-Mbiki through the project schemes.

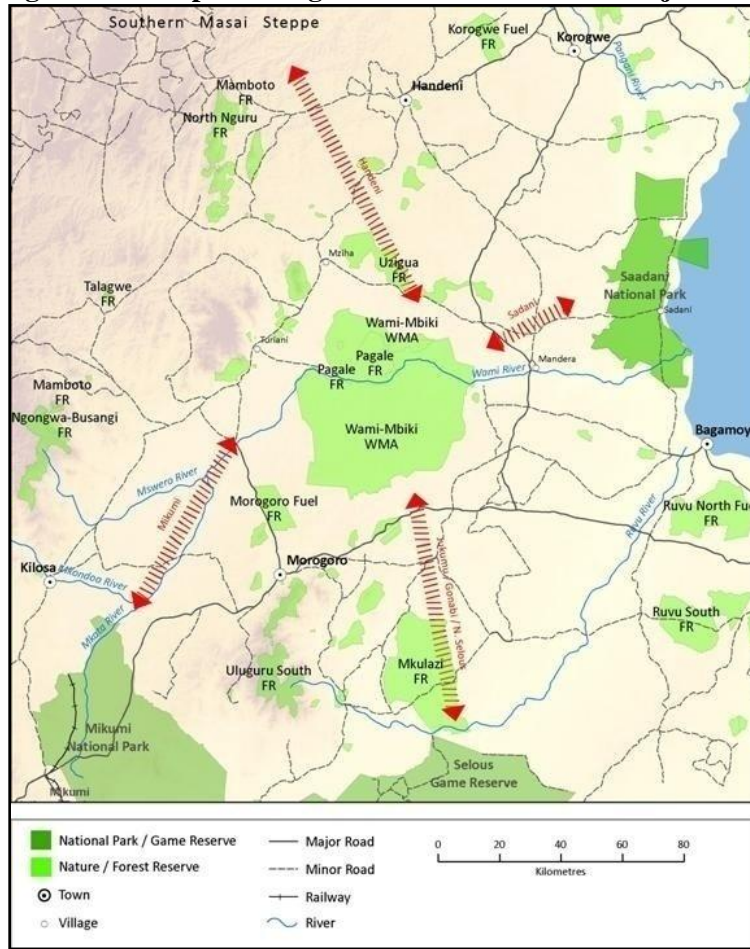
Other species recorded in the project area are Crocodile, Leopard, Black and White Colobus Monkey, Vervet Monkey, Yellow Baboon, Duiker, Buffalo, Reed Buck, and Bush Pig.

The wildlife inventory for the Razaba area recorded 112 species of birds belonging to 49 families. Species such as the Red-Capped Robin Chat, Tambourine Dove and Narina's Trogon are found in the riparian forests.

**Photo 4.4: Elephant Spoor seen during the Study Site Visit  
near the Proposed Outgrower Scheme at Gama/Kitame**



**Figure 4.5: Elephant Migration Corridors in the Project Area**



Source: <http://www.tzwildlifecorridors.org/corridors/wami-mbiki-sadaani/>

## Aquatic Fauna

The fish survey conducted during the EFA study identified 28 species of fish in the Wami Sub-basin, belonging to 13 genera – see Table 4.3 below. (Previous studies have reported up to 37 species). Species of conservation significance are *Labeo victorianus* (endemic) found in the upper reaches of the Wami River, and *Opsaridium microlepis* (endangered) which was recorded in the Wami River at Mandra. The EFA study noted species found in the Wami River at Mandra as being: *Barbus usambarae*, *Tilapia zillii* and *Astatotilapia bloyeti*, *Synodontis wamiensis*, and *Amphilius uranoscopus*. At Matipwili, the following fish were found: *Glossogobius giuris*, *Eleotris fusca*, *Liza macrolepis* and *Microphis fluviatilis*, while species found at both Mandra and Matipwili were *Labeo cylindricus* and *Brycinus sp.* According to the District Fisheries Office, *Oreochromis* spp and *Clarius* spp are also found in the river by the Kiwangwa and Matipwili outgrowers sites. In the estuary – Gama/Kitame – prawn fisheries are an important source of income.

**Table 4.3: Fish Species in the Wami River**

FAMILY	SCIENTIFIC NAME	COMMON NAME	Conserv. Status	Makondoa at Kilosa	Mkata at Mkata	Wami at Matibwa	Wami at Mandera	Wami at Matipwili
Cyprinidae	<i>Barbus kerstenii</i>	Redspot barb	Lc	✓	✓			
	<i>Barbus paludinosus</i>	Straightfin barb	Lc	✓	✓			
	<i>Barbus amphigramma</i>	Straightfin barb	Lc		✓			
	<i>Barbus leticeps</i>	Soft-rayed minnows	Lc			✓		
	<i>Barbus usambarae</i>	Soft-rayed minnows	Lc				✓	
	<i>Labeo victorianus</i>	Labeo / Ningu	Endemic		✓			
	<i>Labeo cylindricus</i>	Redeye labeo	Lc		✓		✓	✓
	<i>Labeo coubie</i>	African carp	Lc		✓	✓		
	<i>Raia mas sp</i>	African bariliins	Lc		✓			
	<i>Opsaridium microlepis</i>	Lake salmon	Endangered				✓	
Characidae	<i>Brycinus affinis</i>	Redfin robber	Lc		✓		✓	✓
	<i>Brycinus imberi</i>	Spot-tail	Lc		✓	✓	✓	✓
	<i>Micralestes acutidens</i>	African tetra	Lc			✓		
Cichlidae	<i>Astatotilapia bloyeti</i>	Haplochromis	Lc				✓	
	<i>Tilapia zillii</i>	Redbelly tilapia	Lc				✓	
	<i>Oreochromis niloticus</i>	Nile tilapia	Lc		✓			
Clariidae	<i>Clarias gariepinus</i>	Airbreating catfish	Lc		✓			
Mochokidae	<i>Chiloglanis deckenii</i>	Pangani suckermouth	Lc		✓			
	<i>Synodontis wamiensis</i>	Squeaker catfish	Lc		✓	✓	✓	
	<i>Synodontis sp</i>	Squeaker catfish	Lc		✓		✓	
Bagridae	<i>Bagrus orientalis</i>	Bagrid catfish	Lc		✓	✓		
Mormyridae	<i>Petrocephalus catostoma</i>	Elephantfish	Lc		✓			
Amphiliidae	<i>Amphilius uranoscopus</i>	Loach catfishes	Lc				✓	
Gobiidae	<i>Glossogobius giuris</i>	Tank goby	Lc					✓
Eleotridae	<i>Eleotris fusca</i>	Dusky sleeper	Lc					✓
Mugilidae	<i>Liza macrolepis</i>	Largescale mullet	Lc					✓
Caridea	<i>Macrobrachium sp</i>	Freshwater prawn	Lc					
Syngnathidae	<i>Microphis fluvialilis</i>	Pipefishes	Lc					✓
<b>TOTAL =13</b>	<b>28</b>			<b>2</b>	<b>16</b>	<b>6</b>	<b>10</b>	<b>7</b>

Source: WRBWO, 2007.

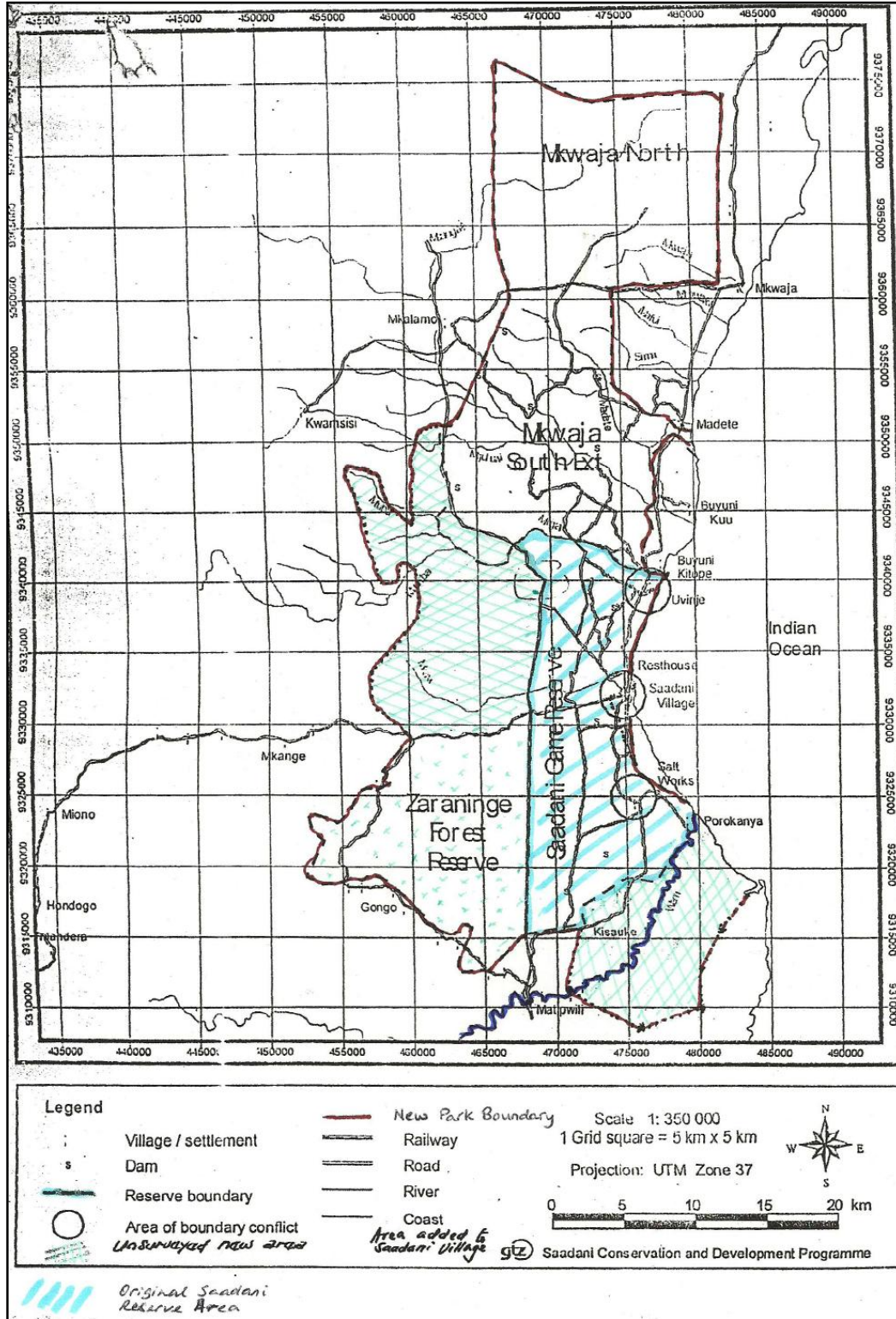
#### 4.1.7 Protected Areas

##### National Parks

As noted above, Matipwili village is bordered to the east by Saadani National Park, while the park lies immediately to the north of Gama/Kitame. The Kiwangwa site is located some 10 km west-south-west of the park.



**Map 3: Saadani National Park and Zaraninge Forest**





The Saadani Game Reserve was created in 1969. In 2005, it was gazetted as a national park. At that time, the boundary of the reserve was extended to include Zaraninge Forest, Mkwaja Ranch (South), Mkwaja Ranch (North) and Kisauke. In addition, the villages of Saadani/Mkange, villages south of the Wami River up to Kitame salt works, Kwamsisi, Madete and a marine area of Madete were included. The extension of the Saadani National Park has caused much grief amongst the villagers of both Matipwili and Gama, as land belonging to both these villages was acquired by TANAPA for the creation of the park. A strip of land bordering the Wami River belonging to the Razaba Ranch, and which was subsequently given to EcoEnergy, was also taken into the park. Villagers at Kisauke were all resettled outside the park. The villagers of Matipwili claim they were not compensated, while the villagers of Gama said they were compensated, but their livelihoods depended on the salt works at Kitame, so they would not leave. Map 3 above shows the original reserve boundary and the areas annexed during the 2005 gazettment of the park.

The Park is approximately 1,100 km<sup>2</sup> in area. It is unique in that it is the only national park in East Africa to combine both marine and mainland flora and fauna in a culturally historic area. (Saadani village is said to be one of the oldest villages in East Africa). In addition to the wildlife species seen in the project area mentioned above, Suni, Liechtenstein's Hartebeest, Greater Kudu and Sable Antelope are uncommon antelopes that are found in the park.

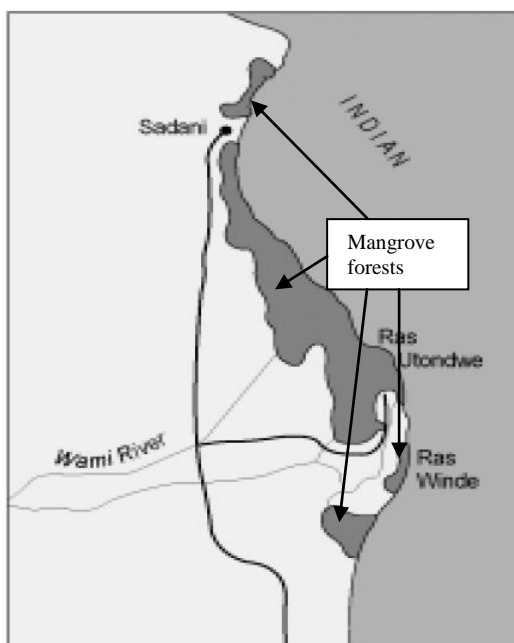
Saadani NP harbours some rare and endemic species including the Black and Rufous Elephant Shrew (endangered), Zanzibar Galago (vulnerable), Lesser Pouched Rat, Musk Shrew as well as some rare bats (such as the Persian Leaf-Nosed Bat). In addition there are 17 forest-dependent reptile species, and about 30 species of amphibians. Avifauna of note includes the near-threatened Southern Banded Snake Eagle and the endangered Sokoke Pipit. In the marine areas of the park there are over 40 species of fish, Green Turtle, Humpback Whale and Dolphin ([www.saadani.org](http://www.saadani.org)).

### **Forest Reserves**

The most important forest reserve in the project area is Zaraninge Forest Reserve which is located about 4 km from Matipwili village. Since 2005 it has been part of Saadani National Park (see Map 3 above), and prior to that the forest was managed by the WWF. Zaraninge Forest covers an area of 17,870 ha. It is a remnant of the Zanzibar-Inhambane Undifferentiated Type which at one time extended all along the East African coast. The forest is also an Important Bird Area (IBA) (Birdlife International, 2014). Other wildlife found in the Forest has been described above. Current threats to the forest are illegal cutting of trees for charcoal and poaching.

The project area also contains some mangrove forests along the Wami Estuary and around the coastal inlets at the mouth of the river. Vegetation found in the mangrove areas is described in Section 4.1.5. Figure 4.6 shows the locations of major mangrove forests along the estuary and coastal areas proximate to the project area.

**Figure 4.6: Location of Mangrove Forests in the Project Area**



Source: Semesi et al (undated)

Other forest reserves in the near the project schemes but which would not be affected by project activities include the Tangwe/Matipwili Village Forest Reserve, Gongo Village Forest Reserve, Fukayosi Village Forest Reserve, Ngubura-Kidomole Village Forest Reserve, Simbo Forest Reserve and Kikoka Forest Reserve.

## **4.2 Socio Economic Environment**

### **4.2.1 Administrative Set Up**

Bagamoyo District has a total area of 9,847 square kilometres. Politically it has two parliamentary constituencies: Bagamoyo and Chalinze. The district has seven divisions, 22 wards and 97 villages divided into 692 hamlets. The district is bordered by Morogoro District to the west; Mvomero, Kilindi, and Handeni districts to the north; Pangani District to the north east; Kinondoni District to the south east and Kibaha District to the south. Its eastern boundary is the Indian Ocean.



The EcoEnergy Project will create multiple and varied business opportunities for local entrepreneurs and employment to improve their livelihoods in the district. Therefore, the whole of Bagamoyo District will be influenced by that project in different ways, socio-economically, environmentally, culturally and even politically. The magnitude of influence will vary from one place to another depending on the proximity to the EcoEnergy mill, sugarcane fields, level of involvement, interests, different roles and responsibilities by different entities or authorities, etc.

Economic benefits of the EcoEnergy project will spill over to the population within and adjacent to the project area. Apart from villages which directly surround the EcoEnergy sugar mill and plantations, other villages for example Gongo, Manda, Mkange in Mkange Ward, and Fukayosi, Kidomole and Makurunge in Makurunge Ward, will be influenced economically through access to employment (ie. direct employment at the EcoEnergy estate of approximately 2,300 persons), supply of various goods to factory and plantation workers, capacity building including entrepreneurship, and purchase of factory goods (sugar), etc. All these will assist people to earn cash or gain benefits from and help to improve their economic situation and improve their living standards.

The wider BASIC Programme to be funded under IFAD is geographically targeted to respond to the social and commercial incentives that are expected to emerge because of the investments for sugar, and focuses on the development of sustainable livelihood diversification and employment opportunities for the wider community of farmers, pastoralists and other rural groups in Bagamoyo district residing within 40 km radius of the nucleus estate which otherwise would have been by-passed. The BASIC Programme will cover about 30% of the land area and 30% of the population of the district (some 27 villages, containing 20,173 households or 91,448 people).

### **4.3      *Essential services***

#### **4.3.1    *Water Supply***

In Bagamoyo District, there are 316 public water points of different types. There are 140 water taps distributed in almost all wards except in Kiwangwa, Magomeni, Talawanda, Ubenazomози and Kibindu. Most of these water taps are concentrated in Miono (35), Msata (30) and Lugoba (22) wards.

Kiwangwa has only five protected wells and 31 water points which are unsafe water sources. Matipwili and Gama/Kitame (including Gama Mtaa) depend entirely on the Wami River for domestic water and watering their livestock. Potable water is sold for between TShs 700/= to 1500/= for a bucket of 20 litres. Consequently households use very little water - a household of 6 people reportedly use between three and five buckets a day. During the focus group discussions and village government meetings it was reported that food and water are the main household expenses. Water in the project area is obtained from unsafe sources, and people share the same source with wild animals. As the water is turbid, water treatment is done by adding a flocculant which is dropped into the water container, and the solids then settle. However, Gama/Kitame will soon be supplied with a water supply as part of the Chalinze-Wami Water Supply Project.

#### **Water for irrigation**

Matipwili has a water abstraction permit for 20 m<sup>3</sup>/d for irrigation purposes. Kiwangwa and Gama/Kitame do not have abstraction permits as yet (it seems they had not thought about how they would get them). For the latter two schemes it is probably still too early to apply for an

abstraction permit as they have not registered their irrigators' company as yet. Matipwili is in the process of registering as an irrigators' organization with the Ministry of Home Affairs.

### **Sanitation and Solid Waste**

Overall, the sanitation situation in the project area is poor. Discussions held with villagers during the study and the household survey revealed that more than 68 % of the households do not have pit latrines. They use bushes, the beach or neighbours' facilities for defecation. People urinate anywhere within the house compound, on bushes and where there are trees or vegetation to hide. Some of the pit latrines collapse during the rainy season due to poor design and workmanship, posing sanitation-related health risks.

The solid waste is disposed haphazardly: 5% burn the waste, while 95% bury it.

### **Power Supply**

Fuel wood, charcoal and kerosene are the main sources of domestic energy. No houses in the project area are connected to the National Grid. However, few households at Kiwangwa and Matipwili use generators and solar energy to light their houses and to charge their handset phones. However, Kiwangwa is in the process of getting electric power through a rural electrification project. The lack of alternative sources of energy has resulted in deforestation, as charcoal makers are cutting trees to make charcoal for home use as well as a source of income. Truck loads of charcoal are transported to Dar es Salaam for sale and it is claimed some charcoal is even taken to the Middle East. The income from charcoal is more attractive than agricultural activities because charcoal makers get quick money compared to tedious agricultural activities. One sack of charcoal is sold for TShs 10,000/- at Kiwangwa and when transported to Bagamoyo town the price rises to TShs 25,000/-, while in Dar es Salaam it can fetch up to TShs 50,000/=.

### **Telecommunications**

The project area enjoys the services of 3 mobile telephone companies (namely Airtel, Tigo and Vodacom). Although this service is available in some places, the signals are weak and hence poor communication for some locations.

### **Road Network and Transportation**

Roads are the major means of transport within and outside the project area. Bagamoyo district is connected by the tarmac road to Dar es Salaam and to Msata. At Msata the road branches off to the south to Chalinze connecting to Morogoro and southern and central Tanzania, and to the north connecting Pwani Region with Tanga, Kilimanjaro and Arusha Regions.

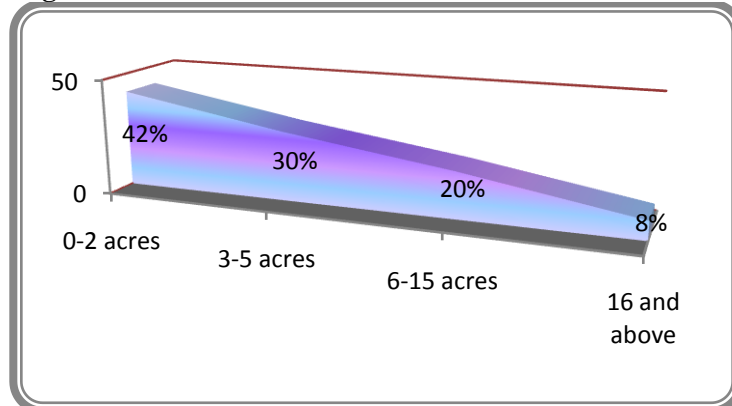
Kiwangwa, Matipwili and Gama/Kitame are accessible by vehicles during the dry season, though Gama/Kitame can only be reached by a four wheel drive vehicle. However, the roads are not in good condition - some roads are not passable during the rainy season, and Gama/Kitame is completely cut off during the rains. The villagers walk about 1-2 km from their homes to reach transportation means. The cost of transport is high - a person travelling from Matipwili to Bagamoyo is charged TShs 20,000/- and TShs 15,000/- from Kitame to Bagamoyo. The poor state of the roads contributes to these high charges.

#### 4.3.2 Land Tenure

The household survey and stakeholders consultations indicated that there are three main land tenure systems in the project area. Most of the land is allocated by the village governments, while the remainder is inherited or is privately purchased. On average, each household owns 2 – 4 acres of land. Gama/Kitame village has allocated 4 acres of land to individuals. The Kiwangwa village government has allocated 4,700 acres (approximately 1,900 ha) of land for the sugarcane outgrowers' scheme. Kitame and Matipwili governments' village have allocated 500 ha each for outgrowers' schemes. A large percentage of land available for outgrowers' schemes is privately owned. Few women own land in all project villages.

The household survey carried out in three outgrower villages revealed that 42% of the interviewed households own two acres, 30% owned 3-5 acres of land, while 20% own between 6-15 acres of land. Very few (8%) own over 16 acres. The villagers admitted that majority of them cultivate between 2-4 acres. The amount of cultivated land is small because of rudimentary farm implements, inadequate access to/availability of fertilisers and pesticides. Wildlife and birds also attack and destroy crops.

**Figure 4.7: Number of Acres of Land Owned Per Household**



Source: Household Survey of Outgrower Villages, January 2014

The household survey established that 73% of the respondents are willing to provide land without compensation for infrastructure as they felt the project is benefiting the whole community, while 27% of the respondents were unwilling to provide land without any form of compensation because the loss of land for constructing infrastructure for the outgrowers' scheme would reduce the size of their farms resulting in reduced income and food shortages.

However, there is influx of people coming from Dar es Salaam to Bagamoyo District to buy large tracts of land from the local people. Because of this, it is anticipated that in the future there will be a shortage of land which might lead to land conflicts.

At the moment the village governments have land which they are allowed to allocate. For example a group of farmers at Kiwangwa have been allocated land to grow paddy as part of EcoEnergy's training programme. However, the discussion with focus group discussions revealed that it is very difficult to get land from the village government, as the village leaders say that land is not available while land is sold to individuals from Dar es Salaam. For example at Kiwangwa the rice grower group was allocated 500 ha, out of these 40 ha have been sold by 3 individuals who claimed they owned it and were continuing to sell land till the group members firmly

opposed the business. Now only 460 ha remain for the rice irrigation / sugarcane outgrowers. The selling of the land is endorsed by village government leaders.

#### **4.3.3 Land Use**

Bagamoyo District is 984,700 ha in area out of this, 833,579ha (85%) of the district is suitable for agriculture. However, only small amount of land is cultivated per year. For example in 2011 only 139,908 ha (16.7%) of the cultivatable land was used for various crops such as maize, cassava and pineapples. Area with irrigation potential is 17,475 ha; of which currently only 6% is used. About 15% (147,700) ha of the total area is used for livestock grazing (pers. Comm. District Agricultural Officer, February 2014). The EcoEnergy and the outgrowers' schemes will cover 11,650 ha, about 67% of the total irrigable area. This leaves 27% or about 4,720 ha for other irrigation activities. However, it should be noted here that most of the villages do not have land use plans which shows demarcated area where livestock should be grazed. Lack of land use plans has caused livestock keepers to graze anywhere causing conflict between farmers and livestock keepers as livestock feed on their crops.

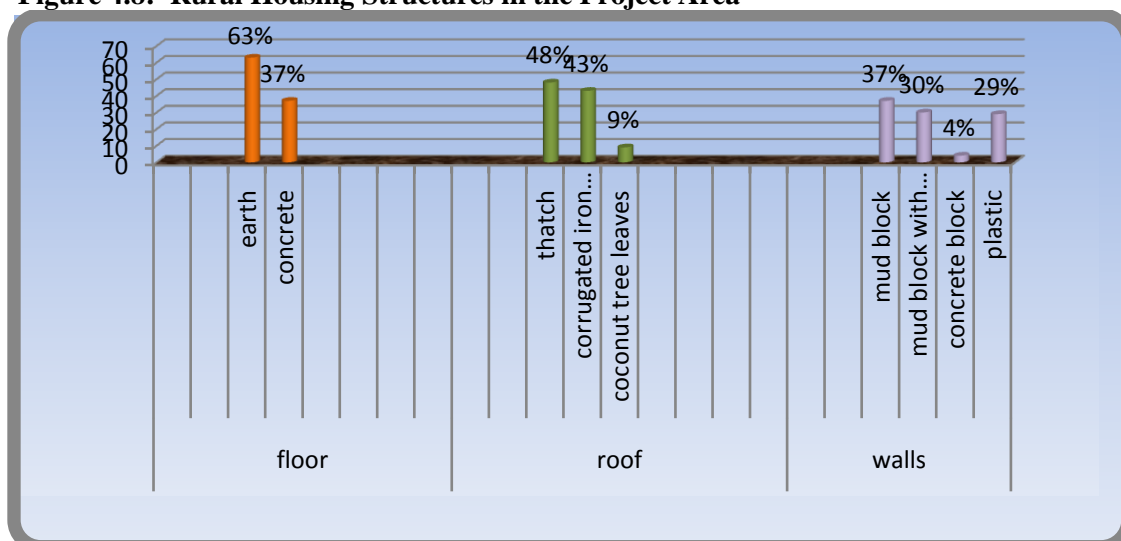
Most of the land in the project area is used for farming, followed by grazing. A small percentage of land is used for residential settlements as well as infrastructure such as roads including social services like schools, medical facilities, etc.

At the time of writing this report, the land use plan for Matipwili Village had been prepared but was awaiting approval from the Matipwili Village Government. This is provided in Appendix 1. The land use plan for Kiwangwa was being finalised, and a draft is also presented in Appendix 1. It was decided to postpone the preparation of the land use plan for Gama/Kitame until the boundary dispute with Saadani National Park has been resolved.

#### **Rural Settlement**

Household survey conducted for this assignment shows that all respondents possess at least one structure that belongs to the family. These structures are of different sizes depending on what the head of the household could afford. Data shows that about half of the houses (48%) are thatched, 43% are using iron sheets for roofing and the remaining 9% use coconut palm leaves for roofing. The survey also showed 37% of the houses had walls made of wattle and mud, followed by those houses made of sunbaked blocks, 29% are plastered while few houses (4%) have concrete block walls. 63% of the houses had earth floors, and 37% had concrete floors.

**Figure 4.8: Rural Housing Structures in the Project Area**



Source: Household Survey of Outgrower Villages, January 2014

## Urban Settlement

Out of the three project villages only Kiwangwa has semi urban characteristics. Kiwangwa has attracted traders due to its location on the Bagamoyo-Msata road. Here there are many trading and artisanal activities such as minor garages; bicycle repair shops; guest houses; food stalls and tea-shops. Kiwangwa is famous for growing pineapples. Many people from Dar es Salaam bought land at Kiwangwa to grow pineapples. Kiwangwa has a high HIV and AIDS prevalence rate. This is attributed to the large number of prostitutes in the village attracted by long-haul truck drivers plying along the Msata-Bagamoyo Road, and intense interaction between local people and newcomers from other areas of Dar es Salaam who work on the pineapple farms as well as pineapple buyers who come to the area during the harvest period.

### 4.3.4 Population and Demographic Characteristics

In 2002 Bagamoyo District had a population of 228,967 people of whom 113,991 were males and 114,976 females. According to the 2012 Population and Housing Census, Bagamoyo District has a total population of 311,740 people, whereby 157,198 are male and 154,542 are female as indicated in Table 4.4 below.

The village records show that Kiwangwa village has 9 sub-villages with a total of 9,145 people, of which 4379 are male and 4766 are female (Village records: February 2014). It has a total of 2,351 households. Gama which is part of Kitame sub-village has a total population of 452 from 180 households. Matipwili village is composed of 6 sub-villages, with a total population of 3,059 and 574 households. The village records indicate that out of the total population, 1,513 are male and 1,546 are female (February 2014).



**Table 4.4: Area, Population and Population Density by Ward - 2002 & 2012**

Ward Name	Area in Ha	Area in Sq. Km	Population (2002)	Population Density (Persons per Sq.Km)	Population (2012)
Kiwangwa	89,212	892	16,094	18	14,586
Mkange	88,294	883	10,023	11	12,026
Magomeni	64,802	648	17,986	28	29,234
<b>Total</b>	242,308	2,423	44,103	57	55,846

Source: Bagamoyo District Profile and National Census 2012

### Demographic Structure

A high percentage (40%) of the population in Bagamoyo District is below 15 years of age – 42% in rural areas, and 36% in urban areas of the district. The economically active population (aged 20 to 60 years) is comparatively low. It is interesting to note that there are more male-children than female-children between 0-4, 5-9 and 10-14 years respectively but the trend changes with ages between 15-19, 20-24 years old and upwards where there are more girls than boys. This means the survival rate of females is higher than males at early ages.

### Population Projections

Population projections show that the population in the district has been increasing and is highly mixed due to several factors such as natural growth, migration and settlement of different ethnic groups. Data from the National Bureau of Statistics Tanzania indicates that the population in 1988 was 173,871 and increased to 230,164 in 2002 and 311,740 in 2012. The last census puts the population growth rate for the district at 2.2%. The trend indicates that the population will continue to increase.

### Population Density

The population density of the outgrower villages is sparse. In 2002 the density for Kiwangwa ward which comprises of Kiwangwa village was 18 people/sq km, while Mkange which comprises Matipwili had a population density of 11 people/sq km. Magomeni ward which is partly an urban of Bagamoyo had a population density of 28 people/sq km. Most of the land is unsettled and is used for farming, grazing or remained idle land and while many people are concentrated in settlements

### Migration and Settlement Patterns

Kiwangwa and Matipwili villages and Gama/Kitame sub-village show cluster type settlement, which is a result of the villagisation program.

All three outgrower villages confirmed that people from different places migrated into the villages for different socio-economic reasons. For example, Gama has been receiving immigrants seasonally, mostly attracted by salt harvesting and fishing activities in the Indian Ocean. According to village leaders, most of the people migrating to Matipwili village were engaged in the illegal business of charcoal making which is contributing to environmental degradation.

**Photo 4.5: Cluster Settlement at Gama/Kitame Sub-Village**



Other immigrants include livestock keepers who came here because of the availability of grazing land, and potential farmers due to availability of arable land.

### **Ethnicity**

The project area is inhabited by tribes from all regions of Tanzania. All migrated to Bagamoyo because of different pull factors: some are descendents of slaves, and others come to work as labourers in the sisal plantations while others come for fishing. Recent availability of idle cultivatable land has attracted people from Dar es Salaam to set up pineapple farms. Pastoralists are moving to Bagamoyo district looking for green pasture for their livestock. However, the indigenous tribes are the Wakwere and Wadoe. Matipwili village is more dominated by the indigenous tribes compared to other two villages of Kiwangwa and Gama/Kitame.

Majority of residents in the project area are Muslims, followed by Christians. As a result the communities are predominantly polygamous.

### **4.3.5 Economic Activities**

#### **Agriculture**

Bagamoyo district has plenty of arable land. However, only a small proportion of land is cultivated. The total arable land is 836,578 ha (85%) square km of which only 139,908 ha square km (16.7%) of land is utilized. Irrigation is covering just 6% (17,475 ha) of the suitable land for agriculture. According to the district agriculture directives / policy each household is obliged to own at least 4 acres of cultivated crops, comprising of an acre for cassava, another acre for food crops and 2 acres of cash crops. In practice, this policy has not been successfully implemented and enforcement has been weak.

Food crops grown in the outgrower villages include maize, cassava, paddy, beans, sorghum and cowpeas. Cash crops include cashew nuts and pineapples grown at Kiwangwa. Fruit such as

mangos, pineapples and oranges are grown for both home consumption and for sale in the markets.

**Table 4.5: Food Crops Production in Bagamoyo District Council**

Crop	2008/2009		2009/2010		2010/2011		2011/2012		2012/2013	
	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)
Maize	34,061	1475	43017.5	86,035	27,658.6	55,317.2	23,510.2	47,020.3	23,559	47,118
Rice	912.4	256	5,978	23,912	7,067	28,268	7,773.	31,094.8	4,299	8,598
Sorghum			4,378	4,378	7,661.4	7,661.4	8,320	16,640	8,157	8,157
Cassava	11,650	34950	27424.8	274,248	23,196.8	246,161	26,676.5	246,161	21,405	128,430
Soya beans			9,239	9,239	11,844	11,844	11,844	11,844	16,344	16,344
Sweet potatoes			2,768	27,680	1,923	19,230	19,923	19,230	1,639	6,556

Source: District Council Records, 2013

**Table 4.6: Cash Crop Production in Bagamoyo District Council**

Type of crop	2008/2009		2009/2010		2010/2011		2011/2012		2012/2013	
	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)	Area (Ha)	Harvest (Tons)
Pineapples			8871	266130	8871	266,130	8871	266130	6671	200130
Coconuts			1815	1640	1815	1,640	1815	1640	1815	1815
Simsim	10389.5	5197.8	34362.4	30926.2	25771.8	23,194.6	25771.8	23194.6	200,617.3	18555.6
Cotton			656	787.2	656	787.2	656	787.2	230	253
Cashew nuts							5846	7015.2	5846	7015.2

Source: District Council Records, 2013

Both tables show that there are seasonal fluctuations in the area of land cultivated, and in harvest yields. For example 34,061 ha were cultivated for maize and the harvest was 1,475 tonnes in 2008/9 but in 2012/13, 23,559 ha was cultivated and 47,118 tonnes harvested. Harvest of maize was 86,035 tonnes in 2009/10 but dropped to 47,020.3 tonnes in 2011/12 from 23,510.2 ha. The areas cultivated for food crops were less in 2012/13 compared to the previous year except maize and soya-beans. Similar trends have been observed for the cash crops except for coconuts which remained with constant area cultivated year after year.

Apart from crop cultivation, the villages keep varieties of livestock like cattle, goats, sheep and chicken. Livestock are mainly kept for meat and milk production and for cash by selling them. The District Livestock Officer revealed that currently there were 3 established units for milk collection and the district is planning to increase the number of units.

The district has roles and responsibilities of providing agricultural education through practices, Farmers Field Schools (FFS), field visits, study tours and participation during exhibitions (Nane-Nane). The agriculture sector is faced with several challenges which contribute to decline in agricultural development leading to low production, namely:

- Inadequate working facilities / equipment.
- Transport difficulties to support provision of extension services to farmers.
- Unreliable distribution of rainfall (October – December and March – June rain seasons).
- Inadequate knowledge, poor technology and low commitment to agriculture among households.
- Market related problems especially low prices for produce, and interference from middlemen

- Agricultural inputs are unaffordable for the majority of farmers.
- Land conflicts: intra-conflict between farmers and livestock keepers and inter-conflict between one village and the other on boundaries.
- Crops and livestock diseases, eg. East Coast Fever and trypanosomiasis.
- Gender imbalance on access, control and use of resources.

## Livestock

The main livestock areas are Kidomole, Fukayosi and Makurunge. The main issues affecting livestock in the project area are that the schemes may cut off livestock access to water, so provision must be made for them to be able to circumvent the schemes. Also, most of the areas previously used for grazing have been sold or taken over for agriculture, so the grazing areas are becoming much smaller, while the number of livestock is increasing.

**Table 4.7: Number of Livestock in Selected Villages**

Village	Type of livestock			Total
	Cattle	Goats	Sheep	
Fukayosi	6,125	1,943	773	8,841
Makurunge	1,423	638	124	2,185
Kidomole				11,174
<b>Total</b>	<b>7,548</b>	<b>2,581</b>	<b>897</b>	<b>22,200</b>

Source: District Council (Livestock), 2013

Discussions with the villagers revealed that most of the livestock keepers were originally from the outgrower villages. For instance, only 5 village households kept livestock in Matipwili. The livestock keepers are the Berbeig, the Maasai and the Kwavi who immigrated to the areas.

The main types of kept livestock include cattle, sheep and goats, with few donkeys. The number of livestock owned by an individual varied. Table 4.8 below illustrates livestock numbers by outgrower village. As noted in the table, the grazing areas are decreasing as the number of livestock is increasing leading to overstocking and frequent conflicts between livestock keepers and farmers in the outgrower villages.

**Table 4.8: Number of Livestock in the Three Project Villages**

Type	Kiwangwa village / ward	Matipwili	Makurunge /Gama
Cattle	2114	2503	4753
Goats	1003	274	1297
Sheep	507	-	240
Donkeys	21	15	53
<b>Total</b>	<b>3645</b>	<b>2792</b>	<b>6343</b>

Source: District Council (Livestock) 2013

In Kiwangwa village, the livestock keepers complained that the village government did not respect them and discriminated them just because they were livestock keepers. This is an important matter that needs to be resolved in order to avoid land conflicts when the outgrower schemes become operational, and also to prevent livestock illegally feeding on sugarcane.

Focus group discussions with villagers on the problems related to livestock keeping revealed that during the dry season when all the pasturelands have deteriorated cattle herders travel to neighbouring regions and distant districts in search of pasture. The district extension staff are available only at the ward and district levels, and are hindered by lack of reliable transport and

unavailability of fuel, and therefore cannot reach livestock keepers to give advice on modern livestock husbandry. Besides, veterinary care is too expensive for most livestock keepers. Due to these reasons, compounded by drought and diseases, the livestock mortality rate is quite high.

**Photo 4.6: Livestock Grazing near the Gama Scheme**



### **Fisheries**

According to the District Fisheries Officer there were no significant fisheries along the Wami River from Matipwili down along the estuary. However, according to the villagers at Gama/Kitame, prawn fishing was an important source of income although most fishermen come from Saadani village. Limited prawn fishing practiced by the villagers of Matipwili. Some documents claim that the prawns hatch in the estuary then migrate up to Saadani, and during the breeding season, migrate back to the estuary. If this is so, then fertilizers and pesticides used on the schemes may, over time impact on the prawn fisheries since shellfish are bio-magnifiers of organic and inorganic pollutants (they concentrate pollutants).

Discussions with villagers also indicated that people of Gama (Kitame) fish out at sea for consumption and for cash. The fishing activities peak between September and May and the rest of the months fishing is halted due to unfavorable weather. According to fishermen consulted, the availability of fish has decreased compared to the past years and they attributed this to changes in weather patterns. When asked to compare fishing and sugarcane farming, the villagers said that sugarcane outgrowing would be more beneficial for them because it provides work (and therefore income) all year round, provided there is an assured market for their cane.

Matipwili fishers stated that they conduct fishing during the period from August through January in the Wami River. The main challenge facing these fishermen is attacks by crocodiles in the river. Some villagers owned fish ponds in which they bred fish for both food and sale in the villages or in Bagamoyo. However, most of the ponds were constructed in the area claimed by Saadani National Park (TANAPA) and an area of conflict.

## **Tourism**

Bagamoyo town is renowned of being rich in historical, cultural and tourist sites such as the famous Kaole ruins, the resting place for of Dr. David Livingstone's body before it was shipped off to London, the Old Boma, the Catholic Museum which is one of the oldest Cathedrals in Africa and a slaves and ivory centre. Other attractions include the beautiful and long stretch of beaches along the western coast of the Indian Ocean running from Saadani on the north east to the mouth of Zinga River in the south. Another attraction of growing importance for people from Dar es Salaam is the Saadani National Park.

## **Other Forms of Employment**

As mentioned above, the salt works at Kitame are an important source of income to the villagers of Gama/Kitame.

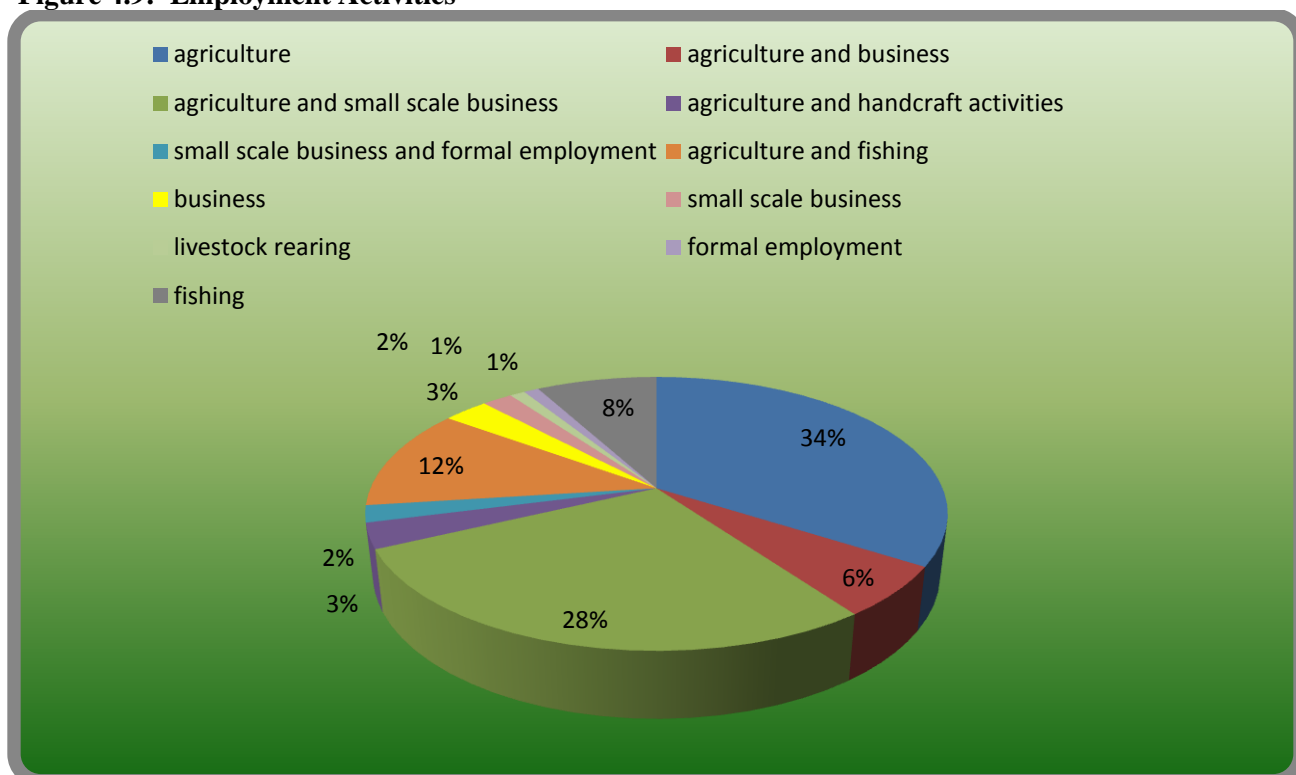
**Photo 4.7: Salt Works at Kitame**



Other income generating activities in the project area include handcraft making (mainly carvings), and charcoal making.

Data obtained during the household survey shows that 34% of the interviewed households depended on income from agriculture, followed by 28% who reported to be engaged in both activities i.e. agriculture combined with businesses. On the other hand, 12% of the interviewed households earn income fishing and agriculture. The other economic activities include livestock keeping and formal employment. Although livestock keeping employ a good number of people, it not quite reflected in this study as pastoralists keep moving so it was difficult to interview them. Income earning activities according the household survey are depicted in Figure 4.9 below.

**Figure 4.9: Employment Activities**



Source: Household Survey of Outgrower Villages, January 2014

#### 4.3.6 Food Security

Some of the challenges mentioned above have contributed to food insecurity in the outgrower villages. Food shortages are experienced during January through to May. This is caused by the low level of harvest per household, small scale production, inadequate rainfall, climate change, poor agricultural technology or crop raiding by wild animals (elephants, wild pigs). In addition, food shortages are also attributed to households selling produce for cash instead of storing enough for future consumption and excessive use of food during traditional ngomas (dances). The data collected from socio economic survey of households revealed that 46% of the interviewed household reported to experience food shortages while 54 % said there have no experience of food shortage throughout a year.

There are a number of individual household coping mechanisms, and the government also provides support through the District Council by providing food aid at an affordable prices. For example, the needy households in Bagamoyo district were supplied with 433 tons of food in 2013 at a cost of TShs 50/= per kg while vulnerable families were given it free. Some of the farmers resort to carrying out off-farm activities such as charcoal making and petty trading.

#### 4.3.7 Household Income

Distribution of income among the inhabitants differs tremendously, based on their occupations. For example peasant farmers earn very little income from their farms, and livestock production systems are not market oriented, so livestock prices are low. On the other hand, those who are engaged in trading have relatively better earnings.



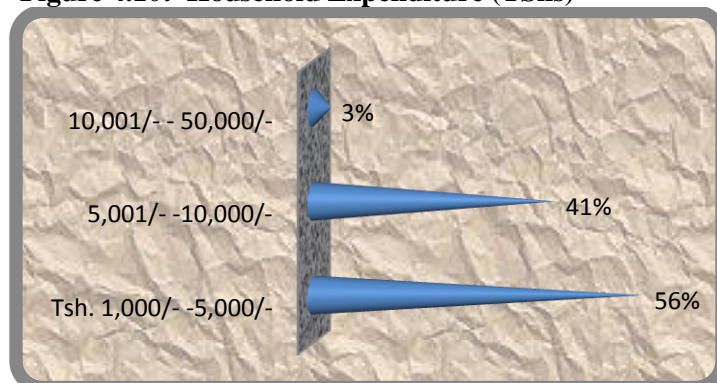
## Income and Expenditure

The distribution of income among the inhabitants differs tremendously, based on their occupations and gender. Gender wise, the distribution of income among men and women in the area is uneven. Men own all major means of production like land, livestock and financial capital while women provide labour. Women headed household have lower incomes compared to those household headed by men

Most Tanzanians do not keep records of household expenditure, particularly in the rural areas where production is mainly intended for household consumption. Peasants usually do not include value of their farm products consumed as expenditures. For the household survey, respondents were asked to itemise their expenditure, in order to estimate household incomes.

All respondents revealed that they depend on food produced through their own agricultural activities for household consumptions. This assists the families in minimizing household cash expenditure. It was reported that expenditure levels rise during the dry season when food crops like vegetables are difficult to produce in the valleys or within the compounds. The most difficult months are January to May. Expenditures reported by the respondents are summarized in Figure 4.10 below. It shows that 56% of the households surveyed spend between TShs 1,000-5,000/= per day. Also 41% spend between TShs 5,000 – 10,000/= a day, while the few rich people reported to spend 10,000 –50,000/= a day. All the settlements in the project area acknowledged that water is the major consumer of household budget.

**Figure 4.10: Household Expenditure (TShs)**



Source: Household Survey of Outgrower Villages, January 2014

### 4.3.8 Health Profile and Infrastructure

#### Health Status

The overall health status for Bagamoyo District is unsatisfactory in terms of available facilities, required personnel and medical supplies.

#### HIV/AIDS Status

Responses from interviewed communities of Kiwangwa, Matipwili and Gama/Kitame, indicate that the majority of the respondents (80%) stated that HIV infections rate was high in the areas. Fifteen respondents (15%) out of 100 interviewed people stated that the rate of infection or HIV



/AIDS status was low while 5 (5%) replied that they did not know about the situation of HIV and AIDS in their areas.

The Acting District Medical Officer and District HIV/AIDS Coordinator reported that the prevalence rate for the Coast region is 5.9% which above the national preference rate of 5.1% (THMIS 2012). The situation is even worse in Bagamoyo district which has 6.9% infection rate of HIV (facility based). Some of the accelerating factors that contribute to the spread of new HIV infection include presence of key populations (ie. homosexuals, sex workers, drug users) among fishing communities, the mixture and interaction of different people from different places engaged in socio-economic activities such as petty businesses; unsafe sexual interaction between local people with truck drivers or employees at packing centres, salt mines, and pineapple farms (especially at Kiwangwa); and unfriendly traditions and customs.

The Bagamoyo District HIV/AIDS Coordinator reported that the HIV occurrence rate in the district is 7.5% (February, 2015) as compared to the national preference rate of 5.1% while the regional rate was 5.9% (also higher than the national preference rate). Factors contributing to the spread of new HIV infections include low income poverty, unemployment among youth girls and women, polygamy and unfaithfulness, resistance or slow pace in changing behaviour among the community members, traditional dances (*unyago*) conducted during nights and the presence of the Dar es Salaam – Morogoro highway along which popular truck stops are Chalinze, Ubena, Vigwaza and Lugoba. The District HIV/AIDS Coordinator strongly recommended that the proposed BASIC Programme strengthening preventative measures to control new HIV infections.

There are several interventions conducted by the District Council in collaboration with other stakeholders like CVM and Action Aid. HIV /AIDS committees have been established at different levels (district, ward and villages) though most of them were said to be inactive.

## Health Infrastructure

According to the district profile, Bagamoyo is served by a number of health facilities including a hospital, 5 health centres each serving approximately 20,905 people. Furthermore, there are 63 dispensaries in the district, which are spread in all the wards. Kiwangwa dispensary will soon be upgraded to Health Centre, while people in Gama/Kitame receive services from Makurunge.

**Table 4.9: Health Infrastructure in the Bagamoyo District**

Type of Health services	Ownership		
	Government	Private	Total
Hospital	1	0	1
Health Centres	4	1	5
Dispensaries	48	15	63

Source: Regional Hospital, 2013

## Health Personnel

Regarding staffing, there are five medical officers and one dental surgeon all based at the Bagamoyo District Hospital. One Medical Officer is based in Lugoba Ward. Out of eight assistant

medical officers available in the district, seven are based at the District Hospital and one in Miono HC. The district has 83 clinical officers, of whom 21 are at the District Hospital, while the remaining 62 are distributed in other health facilities. The district has 85 nurses, 46 are stationed at the District Hospital and the remaining 39 are at other facilities. Staffing in the health facilities located in outgrower villages showed the presence of staff as per table below:

**Table 4.10: Staffing at Health Facilities in Outgrower Villages**

Village	Number required	Kiwangwa	Matipwili	Makurunge
<b>Personnel</b>				
Clinical Officer	3	3	1	1
Medical Attendant		2	-	-
Assistant Lab	2	1	-	-
Nurse	3	3	1	-
Assistant Nurse		-	-	1
Environmental Assistant Health			1	

Source: Socio economic Profile of the Outgrower Villages, January 2014

Discussions held with the Ag. District Medical Officer focused on villages earmarked for outgrowers schemes and highlighted some of the challenges / problems facing the health sector in those villages. These included shortage of staff including high staff turnover (Matipwili and Kiwangwa), inadequate supply of medicines from MSD, unreliable transport, resistance of people to join Health Community Fund and departmental coordination.

It was explained that sometimes 3 months can pass without receiving medicines and therefore without supply to the facilities.

The increasing population growth has been adding pressure on the health services in the district which are faced by several challenges. The health infrastructure (hospital, health centres and dispensaries) is challenged by shortage of facilities, health personnel and supplies.

### **Access to Health Services**

According to the available statistics, access to health services varies from village to village, depending on location and type of health services one is looking for within the district. Bagamoyo District has only 5 Health centres and only 1 District Hospital and 63 dispensaries to service a population of 311,740 people. This means that 34 villages have to travel to adjacent villages to get services at a dispensary while the majority have to travel a long distance to obtain services offered at the health centres. Transport to health services is costly and roads are not always passable. Access to health facilities is therefore a challenge for the majority of people in the District.

#### **4.3.9 Education Profile and Infrastructure**

The main categories of education in the district are Pre-Primary, Primary, Secondary, Vocational Training and Complimentary Basic Education in Tanzania (COBET) classes. Statistics from the district profile indicate that a council has a total number of 116 pre-primary schools of which 100 are attached to primary schools and 16 are owned by private institutions. There are 121 registered

primary schools of which 119 are owned by the Government and 2 are Private English Medium Primary Schools. The district has 26 secondary schools of which, 17 are owned by the Government and 9 are owned by individuals or religious organizations. Within the district, there are institutions which play a great role in education sector development in the district. These include the Agency for the Development of Education Management (ADEM), Bagamoyo College of Art, Mbegani Fisheries and School of Library Archives and Documentation Studies (SLADS.). At the moment, there are five Vocational Training Centres, three Special Education Centres and 99 Adult Education Centres. Also, there are four Teachers' Resource Centres (TRCs) in Magomeni, Chalinze, Miono and Msata Wards.

Provision of education and level of literacy is relatively unsatisfactory in the district. All villages have primary schools but with inadequate facilities. The education infrastructure is discouraging due to problems such as shortage of desks and books, shortage of teachers and lack of houses for teachers, lack of laboratories and inadequate classes causing overcrowding of pupils in classes. Transport or access to some of the schools is a big problem, for example, Gama/Kitame which is located 64 km from Bagamoyo and sometimes teachers refuse to stay there. The ratio for books is 1:5. Mostly, schools have no toilets or else available toilets were below acceptable standards.

Performance for Standard VII has been poor, so limiting admission into secondary schools. The District Academic Officer mentioned truancy and drop out as being a big problem, a claim which was supported by the villagers. Other problems are that parents give low priority to education; there is little motivation, lack of cooperation from parents, poverty, lack of food for pupils in schools and nomadic parents. Because of poverty, the officer claimed that some parents were convincing their children to perform poorly in their examination in order to discontinue with secondary education, so that parents are relieved from incurring school costs. In Gama, the District Academic Officer mentioned that the district is contemplating to close down the primary school because there are not enough pupils to continue running the school. The number of pupils indicated below comprises Standard I to VII per school.

**Table 4.11: Availability of Teachers, Number of Pupils & Classrooms**

Name of the Primary school	Number of Teachers	Number of Pupils		Number of classrooms
		Male	Female	
Razaba	3	30	25	7
Kitame	5	52	31	5
Kiwangwa	22	490	447	7
Matipwili	8	243	242	7
Bigiro	14	218	218	7
Bago	11	329	347	7
Kwawema	9	287	289	5
<b>Total</b>	<b>72</b>	<b>1649</b>	<b>1599</b>	<b>45</b>

Source: District Council/ Education Department, 2014

It is anticipated that the introduction of the BASIC Programme will help residents in the area not only to get income which will be invested in education for their children but also contribute to improve their living standards in general. The District Academic Officer pointed out that there laws and bye-laws prohibit school-age children engaging in the cultivation of sugarcane and in the EcoEnergy mill.

## School Coverage and Enrolment

The situation of enrolment is really poor in some schools like Gama/Kitame where it was evident that there was no enrolment in 2011 and 2014. Razaba is even worse and according to the District Academic Officer, the school is about to be closed because there are no children.

**Table 4.12: School Enrolment**

Name of school	2010		2011		2012		2013		2014	
	Male	Female	Male	Female	Male	Fe	Male	Fe	Male	Female
Bigilo (Makurunge)	17	13	23	18	14	18	21	19	26	23
Razaba (Makurunge)	-	-	4	3	-	-	-	-	-	-
Kitame (Makurunge)	9	3	-	-	6	5	7	1	-	-
Kiwangwa	70	51	57	76	55	38	34	46	58	63
Kwawema (Kiwangwa)	-	-	-	-	38	42	26	27	38	42
Bago (Kiwangwa)	24	30	46	36	45	43	30	35	34	35

Source: District Council/ Education Department, 2014

## Literacy Rates and Education Levels

In villages where discussions were held (Kiwangwa, Matipwili and Kitame/ Gama), it was noted that there are villagers who cannot be read and write because they have never been to school.

The table below illustrates that 80% respondents in the household survey had obtained primary level education, with 7% of respondents having secondary education, and only 1 (1%) out of 100 respondents had tertiary education. Four percent of the respondents had attended adult education. Out of 100 people, 8% were illiterate and it was claimed that the illiterate people included both old and young people. This is important because outgrowers will need to read and write and sign their contracts with EcoEnergy, and will need to be oriented or trained in order to establish, own and run their companies.

## Access to Education Institutions

The table above is self-explanatory in terms of access to educational institutions. Given the trend of education from low enrolment in primary schools, drop outs and truancy, academic performance in schools is likely to be low which might deny opportunities for many students to access higher learning institutions.

### 4.3.10 Gender in Agriculture

During discussions with various groups within the proposed project areas, it was found that most of the land is customarily owned through inheritance according to traditions and customs. As a result of this system, land is mainly owned by men. Women are the main users of the land even though they are not the main owners. For example, it was stated that it was difficult for a divorced woman to get land from her husband unless the land was obtained through purchase. In some cases, widows are harassed by relatives of their deceased husbands regarding land ownership.

However, the situation is changing slowly because people have started to recognize the rights of women to have access, use and own land. This is partly due to efforts by organizations such as Action Aid, which sensitizes communities and women in particular on access to land, good governance, women rights and justice through its project of Land Accountability Project at Fukayosi.

## **5 Public Consultation**

### **5.1 Background and Rationale**

Public Participation is a process through which different stakeholders influence and share their views regarding development initiatives and the decisions and resources that affect them. An important element in the process of impact assessment is consulting with stakeholders to gather the information needed to complete the assessment. In the public consultation process for this assignment, five levels of consultations were undertaken. These were:

- i. Consultation with relevant Ministries;
- ii. Consultation with relevant institutions at all levels;
- iii. Consultations with District and Local authorities;
- iv. Consultations with communities from the three outgrower sites, namely Kiwangwa, Matipwili and Gama/Kitame;
- v. Consultation with potentially affected groups in the project area through focus group discussions.

Fundamentally these consultations were intended to collect views, concerns, and perceptions of the stakeholders related to sugarcane outgrowers' scheme. Information related to population, economic activities, sources of livelihood and living standards were also collected. The minutes of the consultative meetings are attached in Appendix 4 of this report.

Prior to the commencement of this study, a letter of introduction explaining the purpose of the study and introducing the consultants was sent to the Permanent Secretaries of relevant ministries and heads of government institutions. The letter was also sent to the Pwani Regional Administrative Secretary to ask the Bagamoyo District Executive Director to provide access for discussions with various sector offices in the District. Details of the outcomes of these consultations are summarised in this chapter.

### **5.2 Perceived Impacts of the Project**

#### **5.2.1 Positive Impacts**

It was felt that the BASIC Programme would be very beneficial to the potential outgrowers and communities in the targeted villages, as well as to communities in the neighbouring villages of Mkange, Gongo and Manda. Views on the benefits derived from the BASIC Programme and EcoEnergy Projects are summarised below:

1. The sugarcane outgrowers will get a better income from selling sugarcane to EcoEnergy.
2. Job opportunities will be created for local people on the sugarcane plantations. EcoEnergy will employ about 2300 people on its estate, while the outgrower schemes will provide 1500 jobs, which will be filled either by the farm owners who are part of the scheme, or by people the outgrower companies will employ.
3. Women will be able to sell cooked/uncooked food, fruits, other items like soft drinks and manufactured products to sugarcane mill workers

4. Locally produced commodities will fetch higher prices than they do at present due to increased demand as there will be many buyers of the locally produced commodities. This will have a positive impact on the local economy as well as increase people's income.
5. There will be easier access to modern equipment such as tractors and to farm inputs. This will contribute to the modernization of agriculture, as agriculture is the backbone of rural economy.
6. The villagers felt that mixed crops could be practiced during the early stages of sugarcane cultivation.
7. Villages will get sugar and other services as a result of establishment of the outgrowers' schemes and EcoEnergy factory.
8. Villagers will be assured of the market for their sugarcane and will get income to meet their needs.
9. Infrastructure to and within the project areas will be established such as road, water supply and electricity
10. The model of working as a company will make easier to access to loans from banks and also to receive assistance from Eco-energy.
11. The villagers will be empowered to develop and carry out profitable businesses in agriculture.
12. As a group, it will be easy to get assistance to transport sugarcane from the farms to the EcoEnergy mill.
13. The sugarcane outgrowers will benefit from training packages whereby they will acquire new knowledge and skills in the management and production of sugarcane.
14. The project will induce a growth in businesses/trading in the project area between the local people and outsiders, and contribute to increasing incomes and improving economic activities in the project area.
15. Outgrowers will be exposed to ways in which similar projects are implemented in other parts of the country, for example, Kilombero.
16. During production, it is anticipated that the District Council will also get service levy (0.3% of the total sales) from sugarcane factory.
17. The project will attract people from different corners to settle and engage in various businesses which in turn will influence growth of town centres accompanied with development activities in the project areas and nearby ones like makurunge
18. The villagers will be empowered economically due to the project. This will have impacts on the outgrowers ability to afford school fees and other education expenses, improve their diet in their families and thus contribute to improved attendance and academic performance of their children at school.

### **5.2.2 Perceived Negative Impacts**

A number of concerns were raised by various stakeholders which were perceived as adverse impacts of the project. The stakeholders also made recommendations on how these concerns could be addressed/overcome.

#### **Increase of New Infection Rates for HIV/AIDS**

In general, the project will likely contribute to an increase in the rate of new HIV infections. Some of the factors contributing to this were cited as being: interactions between outsiders and local people and intermarriages, poverty (income), unfriendly traditions and customs, practicing unsafe sex, and inadequate comprehensive knowledge.

Suggestions made for addressing these issues included abstaining from unsafe sex and sharing of sharp objects; adherence to A-B-C principles, ie. abstain, be faithful and use of condom and avoidance on sharing of sharp objects; and enhancement of education / sensitization programs.

### **Insufficient Water from Wami River for Downstream Users**

There was concern that there may not be enough water for all users and uses as a result of the water being taken for irrigating the sugarcane fields. This might cause a distress during the dry periods (ie from November to February) and subsequently a scramble for water among users.

### **Destruction of the Environment**

Environmental destruction is a problem in the villages, for example, destruction of water sources, haphazard disposal of wastes, etc. Environmental degradation is caused by cutting down trees for charcoal making, over-grazing, uncontrolled influx of people and land clearance for crop cultivation (fallow system) and destruction of fishing breeding sites. The villagers said that by-laws should be implemented to prohibit human activities within 60m from the Wami River, and that non-compliers should be taken to court as an example. In addition, there needs to be more education /community sensitization on environmental conservation and protection, and on tree planting as part of remedial measures.

### **Access to Irrigation Farms / Outgrowers' Schemes**

The outgrowers' schemes are located quite a distance from the village centres. This has been a headache for people who have previously formed farming groups, as travelling to and from their farms is expensive, tiring and reduces efficiency, and has contributed to some members dropping out of groups. The villagers therefore suggested that the access roads to the farms should be improved and should be passable all the year round. Also, transport should be provided for the farmers to get to the outgrowers' schemes.

### **Poor Governance of Outgrower Companies**

The management and administration of the outgrowers' companies will likely be accompanied with managerial and administrative hurdles as was experienced with rice irrigation groups. The following measures were suggested to address those issues:

- There should be good governance and accountability up to highest levels;
- The contracts or memoranda of understanding (MOUs) should be prepared in Kiswahili for outgrowers to understand. If written in English then must be translated in Kiswahili;
- The outgrowers should be assisted in the process of registering their companies as this is a complex and time consuming exercise;
- The outgrowers should be provided with more information on EcoEnergy's approach to operating the schemes as well as cultivation of sugarcane, so that they are better able to make an informed choice with regard to the outgrower companies' strategies;
- There should be cooperation between the top management and farmers/other members of the outgrowers' schemes;
- A memorandum of understanding should be drawn up indicating the allocation of responsibilities and follow up;
- EcoEnergy should follow up on group performance;



- There should be a guaranteed market for sugarcane as well as quality assurance of produced sugarcane. This will require capacity building of the outgrowers and inputs support.
- There should be a contractual agreement between the outgrowers and EcoEnergy whereby EcoEnergy will be bound to buy sugarcane from outgrowers regardless of whether the EcoEnergy plantation has enough sugarcane for the factory or not.
- There should also be a program to develop capacity among youth (both male and female) on entrepreneurial skills, rights on land ownership, gender and other tailor-made short courses related to sugarcane industry (electrical, driving, technician, plumbing, etc) so that they can be absorbed by the project or knock-on activities resulting from the project.

### **Food Insecurity**

Food security is an issue in all three outgrower villages: from March to June there is always a food shortage. Villagers and other stakeholders expressed concern that farmers are likely to prefer cultivating sugarcane for cash instead growing food crops. They recommended that in order to avoid food shortages the outgrowers should utilize 400 ha for sugarcane and keep 100 ha (25%) for paddy for consumption by the villages.

Therefore, there is a need to establish a mechanism to ensure that outgrower's families do not experience food shortages as a result of growing sugarcane, and that cash obtained from cane production is spent on purchasing food.

### **5.3 Main Issues and Concerns**

The table below summarises the key issues and concerns arising from stakeholder consultations.

**Table 5.1: Key Issues and Concerns Raised by Stakeholders**

Issue	Concern	Location	Remarks
The conflict between Matipwili and Saadani National Park	<p>Matipwili village complained that the Saadani National Park has taken part of its land. Initially the two parties discussed and agreed on the boundary but later when the National Park was demarcating its boundary, it did not involve the village government and therefore extended it beyond the agreed boundaries.</p> <p>The land annexed by the National Park authority included some villagers' fish ponds and the owners of the fish ponds are now denied of access to their ponds.</p>	Matipwili and Saadani National Park	This has been negatively affecting the relationship between the National Park and the villages bordering the park. Matipwili village reported that the matter now lay at the hands of the Ministry of Lands who were in the process of resolving it
The conflict between Gama/Kitame and Saadani National Park	<p>When the Saadani Game Reserve area was extended, and Gama/Kitame was one of the villages that was annexed</p> <p>Villagers were concerned that wild animals from the Saadani National Park were repeatedly attacking and destroyed their crops. They said SANAPA failed to chase animals away from the villagers' fields, and no compensation has been paid for loss of crops, etc. SANAPA responded that they were living in that village at their own risk, as they were supposed to have moved. SANAPA emphasised that wild animals know no boundary</p>	Gama/ Kitame and Saadani National Park	As with Matipwili.
EcoEnergy and National Park	The boundary for the National Park was gazetted in 2005. However, part of the area given to EcoEnergy by the government falls which is within the Razaba Ranch, is now within the National Park's gazetted boundary. And this has created a boundary dispute between the two parties	EcoEnergy and Saadani national Park	EcoEnergy are aware of the 86azette boundary as the Chief Warden and EcoEnergy representatives walked the demarcation line. However, EcoEnergy said they needed the land by the river, but the Chief Warden had told them that that was part of the 86azette National Park land, so they could not have it. There is now a proposal to degazette the disputed area of land and push the national park boundary back to the Wami River, or even further north to the original reserve boundary. The Chief Warden said that if the legal procedures for degazettement were followed, they would have to acquiesce.
Conflict of interest in land between EcoEnergy and Matipwili Village ( Kaloleni, Biga West)	"We are ready to participate in growing sugarcane BUT we cannot do anything at the moment because we are losing interest and trust in EcoEnergy for various reasons. EcoEnergy should not "grab our land"	Matipwili	EcoEnergy acknowledged that this was a serious matter. EcoEnergy explained that the maps they were given by the district when they were looking for additional land showed that the area under contention belonged to Fukayosi Village. The Fukayosi Village Assembly signed the lease in 2007/8. In 2011, the people of Matipwili said they also use that land on a seasonal

Issue	Concern	Location	Remarks
			<p>basis, although there appeared to be no legal document indicating it was land belonging to Matipwili village. When EcoEnergy sat down with the Matipwili village committee they were told that if EcoEnergy let the communities have a 1.5 km strip along the river, EcoEnergy could have the rest of the land for sugarcane. During those discussions EcoEnergy had agreed to do this and still agrees to it.</p> <p>EcoEnergy was also aware that the DC had gone to Matipwili and when he declared that the land under contention belongs to Fukayosi, this fired up the villagers' emotions, and they linked this "grabbing" to EcoEnergy. EcoEnergy denied they had anything to do with the DC's comments.</p>
Conflict between Kiwangwa villages outgrowers group and those who bought land from the Village government	There are land speculators from Dar es Salaam who bought land at Kiwangwa village, the land which has been allocated to rice growing group	Kiwangwa	The elders said that the 500 ha given to the farmers group was owned by individuals but the village government plundered it. Some commented that the village government took the land after noticing that the owners are not developing it. However due to this uncertainty the land entitlement will be determined by the court.
Conflict between farmers and livestock keepers	Livestock keepers have invaded in people's farms destructing farmers' crops; this has created conflicts between the groups.	All villages in the project area	Kitame villagers claim that they do not have livestock keepers in their village while Matipwili claim to have only five families with livestock. They are wondering why the nomadic should invade their farms.
The land set aside for livestock keepers is being sold	The livestock keepers are worried about losing land for grazing their livestock because they are told that the land was not set aside for them. The village leaders are claiming that MKURABITA mistakenly allocated individually owned land for the public use.	Kiwangwa	It should be noted that the same land of livestock keepers have been allocated to rice growers group. And the same land is what is said to be owned by individuals and is being sold to land speculators from Dar es Salaam.
Disputes over boundaries	There are disputes over the boundaries between individuals, experienced at Kiwangwa and Matipwili	All villages in the project area	Boundary disputes are mainly found along river Wami because land along river Wami is more fertile compared to other places
Failure of EcoEnergy to keep promise/ agreement between them and the outgrowers	EcoEnergy promised to provide fuel for the pump to the outgrowers for their rice plantation each week. However for three consecutive weeks they did not supply the fuel. The outgrowers have had to get their own fuel. For the past week	Matipwili	<p>The blame was clarified by EcoEnergy who said that:</p> <p>"The contract said that EcoEnergy would supply fuel for the pump, inputs and capacity building/advice, and in return the</p>

Issue	Concern	Location	Remarks
	they have tried to get hold of the EcoEnergy's community liaison person, but he either cuts off the phone or doesn't answer. Some farmers who are not able to buy fuel, the paddy is drying consequently low production		farmers had to weed their plots, keep records and follow certain other procedures. Every farmer signed the contract, so if one farmer lets them down, the rest should push him to conform to the requirements. However apparently one third of the farmers are not weeding their plots, so EcoEnergy says they are not keeping to their side of the contract and feel it is up to the other farmers to make the non-compliant farmers comply with the requirements
Failure to provide a tractor for cultivation	EcoEnergy asked villagers to clear 5 acres of land (1/4 per person) and promised to provide a tractor for cultivation. After clearing, EcoEnergy did not provide a tractor and people wasted their energy and money (labourers)	Matipwili	The similar story as above
Failure of EcoEnergy to complying with the agreement of providing weekly loan to the irrigation group	EcoEnergy has not also complying with the agreement of providing weekly loan to the irrigation group for running a pumping machine. All these have contributed to discredit EcoEnergy	Matipwili	The similar story as above
Misunderstanding over boundaries	EcoEnergy has created misunderstanding over boundaries between Matipwili and Fukayosi.  EcoEnergy tried to influence the change of the boundary between Matipwili and Fukayosi by transferring one of the Matipwili sub-villages (Biga West) to Fukayosi where it could be easy to EcoEnergy to take from Fukayosi and put it under its control	Matipwili	This has contributed to create villagers' distrust on EcoEnergy and feel that the project has a hidden agenda  The issue seemed to take a political turn when the District Commissioners intervened and sided with EcoEnergy and Fukayosi village  The dispute over this boundary has now been resolved.
Land availability for sugarcane growing	There are 500 ha of land belonging to the village government of Matipwili for small scale producers of sugarcane. The same was reported by village government of Kitame and Kiwangwa 4, 700 acres. No scarcity of land in the project area.	All villages for potential outgrowers	Land is no longer sold in Matipwili; all land is retained for community members' use for producing sugarcane as outgrowers. The situation is different at Kiwangwa, during focus group discussion with women and livestock keepers, they complained that the village government is selling land to people from Dar es Salaam and is reluctant to allocate land to villagers
Lack of Certificate of Customary Rights of Ownership (CCRO)	CCROs for the schemes is not a big issue can be done by the District Land Office (Bagamoyo)	All villages of the project area	The problem is the lack of funds to pay per diem to the field staff, logistics and data inputting.
Willingness to provide free	The village governments of Kiwangwa and Gama/Kitame	All villages of the	However, some villagers said it might be difficult for farmers to

Issue	Concern	Location	Remarks
land for irrigation infrastructure development	said they will call the village assembly and decide on how to treat people who will lose land due to installation of infrastructure (such as transmission lines, pipelines taking water to the farms). The villagers may provide alternative land to PAPs.	project area	provide land free of charge for infrastructure, while others said that there is no problem, land can be provided freely as long as the owner also benefits from the project.  In addition it has recently come to light that the villages (for example, Kiwangwa) have little public land which could be used to compensate PAPs if the need to do so arises.
The project has taken too long to start	The project has taken too long to take off. This was mentioned by officers at the regional, district and village level, as well as by participants in the FGDs. Farmers are despairing as nothing is happening on the ground, no plantation, and no factory – they are tired of words and now they need to see action.	All villages in the project area, as well as Ministries, regional and district administration	EcoEnergy acknowledged that the project has taken too long to take off. It was also mentioned that people do not understand the reasons why it is taking too long, as neither the government nor EcoEnergy is informing the communities about what is actually happening. EcoEnergy feel it should be the responsibility of the MAFSC / PMO to inform communities since it is their project. But the communities are putting the blame on EcoEnergy (rather unfairly).
Water uses from Wami River (might not be enough for all users and uses)	Wami River is being used for many uses including Chalinze –Wami water project  The water may not be enough for irrigation during the dry season	Matipwili and Gama/Kitame villages	The consultation with Wami Water office indicated that, there is adequate water for all uses but at the moment there is a waste of water through illegal abstraction and uncontrolled uses and etc. The problem is monitoring water use.  EcoEnergy explained that they will have a dam for the core plantation, and there will be another dam or reservoir having a 1.4 million m <sup>3</sup> storage capacity for the outgrowers' schemes. They felt that rather than the off take for the outgrowers dam upstream compromising off take for the EcoEnergy dam further downstream, there may be the issue of the dams not storing enough water altogether. This will have to be investigated during the detailed design phase of the BASIC Programme.
Food insecurity	Food security in the outgrower areas is poor. From March to June there is always food shortage, villagers are worried that farmers are likely to prefer cultivating sugarcane for cash at the expenses of food crops	All villages in the project area	The discussion with the outgrowers groups confirmed that there will be land earmarked for food crops like rice and maize. In addition some people added that money earned from sugarcane sales will be used to buy food in order to overcome the problem of food insecurity. Kiwangwa has put aside 100ha for rice cultivation.
Environmental destruction (fishing breeding places)	Gama/Kitame villagers are worried about destruction of breeding areas for fish, particularly prawns, if the water flow in Wami River is reduced.	Gama/Kitame	This issue will have to be further investigated during the detailed design stage, prior to implementation.

Issue	Concern	Location	Remarks
Long distance to travel to reach out grower farms	The outgrower farms are far from the existing villages (Kiwangwa is about 18. Km and Gama/Kitame 11 kms from the village centres, without reliable transport will be difficult to grow sugarcane at those locations	All villages in the project area	<p>During the focus group discussions, women said that they are not able to farm because of the long distances to their farms. As a result, villagers in Gama/Kitame opt to work as labourers at salt factory and other small businesses. In Matipwili the women indicated they would prefer to work as “middle men” by buying crops during the harvest period, hoarding them, and then selling them when there is a shortage.</p> <p>The Kiwangwa rice growing group reported that the group members attend their rice farm 3 times a week. The group has been facing transport difficulties to the field and back. It is expensive – TShs 10,000/= per trip per person by motorcycle. The road is also very poor at the moment.</p> <p>Kiwangwa elders said that they used to own land along the Wami River but during villagisation they were transferred to Kiwangwa. Hence they all have inherited land. They do however go to their original farms during the farming season but the distance makes it difficult, so some farms have reverted to bushland.</p>
Part of community members feel that are left out in the project process	EcoEnergy has not involved every group in the project, few members knows about the project while majority are left out	In all villages	The elders commented that they are not aware of sugarcane irrigation farming. They are also not aware that there is a group that farm paddy and later will change to sugarcane farming in the form of companies
Increased infection rate of HIV and AIDS	During FGD it was reported that the epidemic is prevalence in the area (Matipwili and Kiwangwa ), although no statistics were presented	All villages of the project area	<p>The district HIV /AIDS prevalence rate (6.9%) at the moment is high than the national and regional rate of 5.1% and 5.9% respectively.</p> <p>The main cause of the disease is the high interaction with outsiders due to the new Msata-Bagamoyo road which has made Kiwangwa a popular stopover, the pineapple farms, the salt factory at Kitame and fishing, all of which employ transient workers.</p>
Inadequate information given to outgrowers to be able to make informed choice	The information given to the communities is not enough for the farmers to make a well informed choice. More information is required on resettlement issues, establishment of companies, ownership of infrastructures and etc	All villages of the project area	Official channels of communication need to be established, respected and effective to serve both vertical and horizontal communication. The onus for this lies primarily with the MAFSC as this is the agency that is fronting the BASIC Programme. MAFSC should also be involved in ensuring dissemination of information, as it has personnel on the ground

Issue	Concern	Location	Remarks
			(extension workers) that can be mobilised to do this.
Destruction of environment through charcoal making	Charcoal production leading to serious deforestation is a major issue in entire district	All villages of the project area	The villagers said that they are aware of the bad outcome of making charcoal, but there is no alternative for livelihood. They also mentioned that the business of charcoal is not illegal as the dealers also get license and pay revenue to District authority.
Lack of water rights Gama/Kitame and Kiwangwa	The village or irrigation groups of Kiwangwa and Kitame have no water-user rights– and not aware on the process	Kitame and Kiwangwa	The villagers need assistance from the district irrigation department to process water user right
Presence of ritual sites at Kiwangwa	It was noted that at Kiwangwa there are few graves within the land for outgrowers scheme, the number is unknown	Kiwangwa	The village leaders will decide and arrange how to relocate identified graves in collaboration with owners.
Lack of Land management plans for Kiwangwa and Kitame	Kiwangwa village has developed its land management plan under Property and Business Formalization Program (MKURABITA). However, this plan is already outdated since the village has been split in two three village. Kitame has none. Thd land use plan for Matipwili has been prepared with the help of consultants engaged by EcoEnergy, but the plan is yet to be passed by the Village Assembly. The plan for Kiwangwa is still being finalised.	All villages of the project area	EcoEnergy is currently supporting the outgrower villages through engaging consultants to develop zonal land use management plans and production of maps indicating the owners of land parcels in the project areas

#### **5.4 Priorities for Improvement**

Several issues were pointed out by stakeholders that need attention. These include:

- Revitalization of the relationship between EcoEnergy and other players, especially Matipwili village.
- Improved communication and coordination between MAFSC, EcoEnergy, Bagamoyo District Officers and the villagers.
- Review and improvement of land use management in villages including processing of CCROs.
- Improvement of transportation (roads) and means of transport means to and from the outgrower farms and villages.
- The need to acquire water-user rights for the rice irrigation groups which will become sugarcane outgrowers in the future.
- Review and improvement of contracts between the rice irrigation groups and the EcoEnergy so as to improve relationships, accountability and production of rice.
- Resolving of the outstanding boundary conflicts between Matipwili and Gama/Kitame villages and the National Park.
- Preparation of the preliminary (as opposed to conceptual) project designs (particularly of bulk infrastructure) to allow activities such as Resettlement Action Plan to proceed as soon as possible.

**Photo 5.1: Consultations with the Village Government at Kiwangwa on 1<sup>st</sup> February 2014**



**Photo 5.2: Consultations with Farmers at Kiwangwa Rice Plantation on 1<sup>st</sup> February 2014**





**Photo 5.3: Consultations with the Village Government at Matipwili on 5<sup>th</sup> February 2014**



**Photo 5.4: Consultations with Youth at Matipwili on 5<sup>th</sup> February 2014**



**Photo 5.5: Consultations with Farmers at Matipwili on 5<sup>th</sup> February 2014**



**Photo 5.6: Visit to Gama Scheme Location with the Village Chairman**



## **6 Assessment of Potential Environmental and Social Impacts and their Mitigation/Enhancement**

### **6.1 Benefits of the Project**

There are several benefits to be derived from the BASIC Programme. On the national scale, the project will spearhead public-private-partnership (PPP) initiatives in the agricultural sector, and in line with the SAGCOT vision it will trigger the commercialisation of smallholder farms to in order to improve productivity and efficiency. This will also enhance Bagamoyo District's "new city" image as an emerging economic hub in the Coast Region. The project is expected to produce about 300,000 tons of sugarcane per year, contributing to addressing the huge sugar deficit in the country.

At the local level, the outgrower companies are expected to employ in the region of 1,500 to work on the farms at Kiwangwa, Matipwili and Gama/Kitame. In all, around 25 to 30 companies will be formed, each company on average covering 100 ha. Assuming an average farm area of 2 ha, there will be 50 farmers per company. The idea is that each farmer who owns land in the scheme will be employed to work on the farm by the outgrower company, or the company may decide to employ members of the outgrower community to work on the company farms. These employment opportunities are expected to improve household income – on average every worker will be paid TShs 6,500/= per day compared with say, TShs 4,500/- paid by the salt factory at Gama/Kitame.

Petty traders particularly women will sell cooked food and fruits to farm workers. People from the other surrounding villages Makurunge, Fukayosi and Kidomole may also be employed in the outgrower farms and the EcoEnergy factory, resulting in a multiplier effect on the local economy.

The bulk infrastructure that will be constructed for the project will include access roads from the villages to the outgrowers' schemes, which will also be used by villages and settlement along the roads. The dam or oxbow lake(s), and/or off-river storage facility that will store excess water when the Wami River is in flood may be used to supplement water supply to outgrower villages, as well as other neighbouring communities in times of drought. Power lines will be brought into the project area, so that those who wish to connect to the National Grid may easily do so.

### **6.2 Environmental Impacts**

Environmental impacts due to sugarcane cultivation and their mitigation have been studied by a number of organisations, and many of the mitigation measures proposed below have been drawn from the following resources: IFC EHS Guidelines for Plantation Crop Production, 2007; Bonsucro ([www.bonsucro.com](http://www.bonsucro.com)); and [www.sugarcane.org](http://www.sugarcane.org).

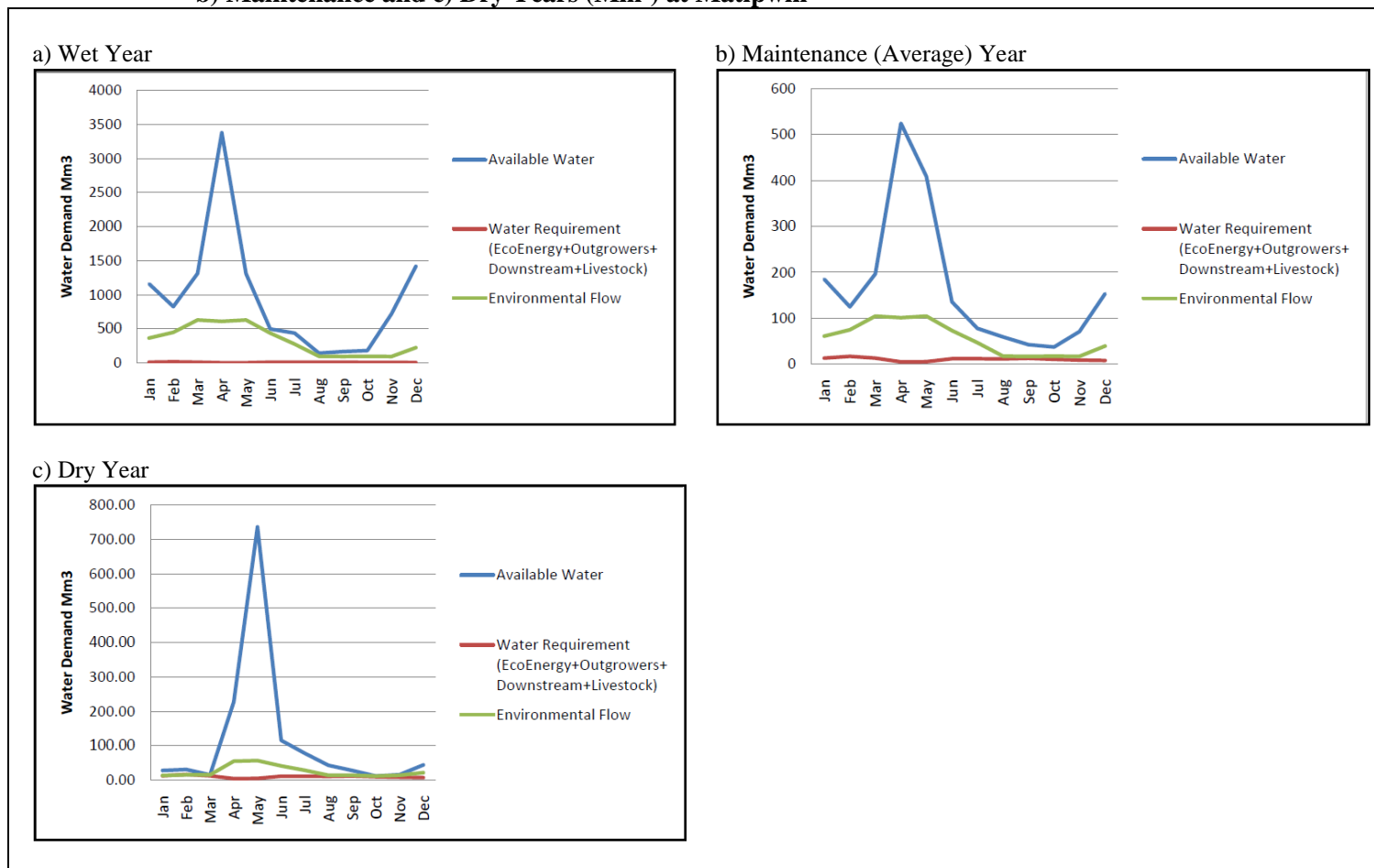
#### **6.2.1 Water Resources**

The most significant environmental impact resulting from the project will be as a result of water abstraction from the Wami River for irrigation purposes. The graphs in Figure 6.1 below show

estimated water requirements for the outgrowers' schemes and the EcoEnergy estate (including the mill), together with downstream domestic and livestock water use, against environmental flow allocations and water availability data taken from the Wami River Environmental Flow Assessment (EFA) Study for wet, maintenance (average) and dry years (WRBWO, 2008).

The graphs show that water availability in wet and maintenance years may be sufficient. But in dry years there is a definite risk that water will not be sufficient to meet all the water requirements during February/March and October/November.

**Figure 6.1: Water Requirements, Environmental Flows and Available Water for a) Wet, b) Maintenance and c) Dry Years (Mm<sup>3</sup>) at Matipwili**



The analysis above is based on environmental flows and water availability established by the EFA Study in 2007, and upheld in the Phase II of the EFA study in 2014. Since the data for these studies were obtained between 2006 and 2011, there has been significant development in the Wami Sub-basin above Manderu and Matipwili, and in the past couple of years, there has been a rush to buy land in the greater project area. There has also been noticeable degradation of the Wami catchment area over these years (IUCN, 2010). These factors would contribute to reduced flow in the Wami River, particularly in the dry season, and the situation is compounded by the fact that about 50% of water abstracted from the river is wasted (see Section 4.1.4). Unpredictable weather patterns also affects water availability in the river, so that on some occasions there may be too much water in the river, while at other times there may be less flow

than would be expected in the driest year. The JICA Water Resources Study (2013) has assessed water availability in the Wami Sub-basin, but does not provide environmental flow allocations.

Recommendations for Mitigation:

- The analysis of water requirements shows that in a dry year during February/March and October/November there will be very little, if any, flow left in the river, if the full requirement of water for irrigating the fields is used. In order to reduce the amount of water abstracted in the dry season, the amount of water used for irrigation can be reduced to 35% of the optimum water requirement. In February it would only be possible to reduce it to 85% of the optimum requirement. (EcoEnergy will be adopting this approach on their sugarcane plantation).
- The schemes' design also allows for a dam of 1.4 Mm<sup>3</sup> capacity, into which excess water will be directed when the Wami River is in flood. The dam water can be used for irrigation the reduced abstraction rates during the dry season. It can also be used to maintain the environmental flow in the river. During the detailed design phase of the BASIC Programme, an ESIA will have to be undertaken to assess the impacts of the dam, including its impacts on water flow in the Wami River.
- It is also possible that an off-river storage facility will be constructed to store surface runoff.
- Consideration is also being given to using existing oxbow lakes for water storage purposes, either as an alternative to the above-mentioned dam or in addition to it. However, should it be decided that oxbow lake(s) will be used, then a separate ESIA will have to be undertaken to address the impacts resulting from this.
- In addition, during the detailed design phase, the EFA study conducted by WRBWO will have to be reviewed so that the quantity of water currently available during any given month and the amount of water that should remain in the river as environmental flow can be more accurately established. This would then enable the WRBWO to plan water resources development and issue water permits in a more sustainable manner.
- In order to minimise water loss, there is an urgent need to set up a water use monitoring system in the Wami Sub-catchment. This would require every abstractor to install a water meter or a flow chamber, to be trained in record keeping and to join in Water User Associations. In the case of the schemes, irrigator's organisations have to be set up in accordance with the National Irrigation Act, 2013.
- On a broader scale, there must be a concerted effort by the Government as well as the private sector to protect the Wami/Ruvu catchment. Programmes should be implemented to educate farmers not to cultivate up to the river's edge and to adhere to the 60 m buffer zone requirement. Concurrently projects to restore the catchment forests and protect upstream swamps should be initiated.

### **6.2.2 Water Quality**

Water quality in the Wami River and its wetland areas downstream of the schemes will be affected by soil erosion which could occur during construction works, but also as a result of ploughing and tilling, and poor soil management practices.

More serious will be the impact on water quality in the river due to the application of various chemical inputs in the cultivation of sugarcane – namely fertilizers, herbicides and pesticides. These chemicals leach into the soils and are then transported by water to the river, or they may enter the river through the drains from the fields. Pollution of the river from these chemicals will

affect the aquatic ecology downstream. Fishing, especially for prawns, in the Wami estuary is an important activity in Gama/Kitame, and some people in Matipwili also fish. Shellfish in particular are known to accumulate inorganic (particularly heavy metals) and organic pollutants in their tissues, and when they are eaten the pollutants are biomagnified higher up the food chain. This can have serious effects on the health of the people who eat the shellfish or the fish that eat the shellfish.

The use of chemicals also causes eutrophication of water bodies, including wetlands – that is the build up of algae in water bodies caused by high concentrations of nitrates and phosphates. The algae forms blankets on the surface that hinder the transmission of light into the water and depletes oxygen levels in the bottom water. Benthic fauna and fish can be affected. Eutrophication in the river would be more of an issue when flow levels are low and slow.

The schemes will also have sanitation facilities for its workers, and therefore foulwater will have to be treated.

#### Recommendations for Mitigation

- Recommendations for minimising and preventing soil erosion are made in Section 6.2.8 below.
- As much as possible the use of chemical inputs must be minimised, and wherever possible natural fertilizers and pesticides should be used. Much of the land within the schemes is virgin land, and therefore very fertile. Therefore large quantities of fertilizer may not be necessary. However, it is possible that certain nutrients need to be added to the soil. The schemes should then consider the use of organic fertilizers, such as filter cakes from the mill (which is rich in phosphorus) and vinasse (which contains high levels of potassium and other nutrients).
- Careful application of chemicals is therefore essential, and the conservation agriculture approach that is proposed for the outgrowers schemes will ensure that the use of chemicals is minimised. This is discussed further in Section 6.2.9 below.
- An untreated buffer zone of vegetation along the Wami River will help to reduce the amount of chemicals reaching the water.
- Drains from the fields should lead to a collection pond where the water can be tested and treated before discharge to the river.
- As there is no sewer system in the project area, the sanitation facilities should have either septic tanks, or two chamber treatment systems having French drains or soakaway pits depending on the location of the facilities and the soils in that area. Some treatment systems having soakaway pits are not effective in black cotton soils where the water table is high. Also soakaway pits and pit latrines should be located at least 50 – 100 m away from a water source, again depending on soil types.

#### **6.2.3 Water Movement**

The construction of the dykes on the north and south banks of the Wami River will have an impact on the movement of water during high flows. The water flowing down the river will not be able to overtop the banks of the river along the length of the dyke. Consequently a greater volume of water, potentially at a higher velocity, would be pushed further downstream. This may cause more severe scouring or flooding downstream beyond the dyked area of the river, more sedimentation downstream in or towards the Wami estuary, and therefore could affect riverine ecology.

### Recommendations for Mitigation

- Once the final location and design specifications of the dykes and the bridge over the Wami River are determined, an assessment of the potential impacts of river flow along the dyked sections of the river will have to be carried out. This may require hydraulic modelling.

#### **6.2.4 Air Quality**

There will be some dust emissions when the dam or water storage facilities and access roads are being constructed, and when the fields are being levelled.

Smoke (mainly carbon dioxide and particulates) would result when cane is burned to clear the fields after 5 to 7 ratoons. If the cane treated with chlorinated pesticides is burned, dioxins, furans or persistent organic pollutants (POPs) may be released. Ammonia and nitrates may be given off if too much fertilizer is applied to the soil and the soil is not managed.

### Recommendations for Mitigation

- Dust emissions can be reduced by watering exposed work surfaces.
- Cutting of cane will be done mechanically, and the cane will be cut just above the ground, leaving the first node to develop into a ratoon. Field burning will therefore not be done.
- However, appropriate fire breaks should be created around the plots so that in the event that neighbouring farms are set on fire for clearing or ground preparation, these fires will not spread into the schemes.
- By adopting reduced tillage options, the carbon storage capacity of the soils is increased, so less carbon is released to the air.
- Best practices for soil management (eg aeration, careful application of inputs) will also minimize the release of ammonia and nitrates (from fertilizers) into the atmosphere.

#### **6.2.5 Oil Pollution**

Oil products used on the schemes will consist of fuel for the pumps, fuel for farm vehicles (eg tractors, cane cutters) and for lubrication of farm machinery. The fuel will probably be stored at the workshops.

Oil from oil spills or leaks can be transmitted through soil into water bodies – in this case the Wami River – particularly in sandy well drained soils. This would affect water quality depending on the amount of oil entering the river system, the frequency of oil entering the river, and flow in the river at that time.



### Recommendations for Mitigation

- If a fuel tank is to be installed, it should be located in a contained shed that will accommodate 110% of the total volume of fuel stored. The shed should have good ventilation.
- A procedure should be drawn up for fuel delivery in order to minimise the risk of spills during this activity.
- Drip trays should be used whenever oil or fuel is decanted or drained.
- All oil products and lubricants should be placed on sump pallets, if they are not stored in a contained room/shed.
- Areas storing oil should not be cleaned with water and detergents. Any spills should be mopped up, and the floors swept.
- If there is to be a designated vehicle washing area this should have formalised drainage leading to an oil interceptor, and thereafter the water should be directed to a soakpit, rather than into a natural water course. Detergents should not be used for washing as these break down oils.
- A simple spill kit (a box containing sand, saw dust or rags, and a boom or kapok-stuffed cushions) should be provided near areas where fuel or oils will be stored.
- All oil stained soil should be removed. Contaminated soil is treated as hazardous waste, and can be treated through combined bio-remediation and atmospheric weathering via solar oxidation (similar to composting).
- Waste oil should be stored in drums placed on a sump pallet or in a contained enclosure.
- Waste oil should be returned to the supplier for disposal. Alternatively it can be taken to a cement factory, incineration plant or kilns for fuelling their furnaces. Staff should be discouraged from using it as there is some concern that waste oil gives off vapours that could be carcinogenic.
- Materials Safety Data Sheets for fuels and lubricants should be readily accessible to all persons who handle those materials. These should be obtained from the fuel supplier.
- All staff dealing with oils and fuels should be trained in the storage, handling and management of these compounds. Training manuals can be obtained from the major fuel suppliers, which give instructions for storage, handling and disposal.
- In order to minimise the amount of fuel required for pumping, the viability of solar pumps should be explored.
- Alternatively the pumps may be electrically powered through the power line that will supply the schemes.

#### **6.2.6 Noise Quality**

During construction of the bulk infrastructure there would be noise emissions from plant and equipment (eg. trucks, dozers, etc). This would be a temporary impact. When the scheme is operational, the only source of noise pollution that would be a nuisance would be from the pumps used to pump water into the cane fields. If a system similar to that used on EcoEnergy's seed cane farm is used – where all pumps, filters and chemical dosing machines are contained in a concrete building – noise levels would be minimal outside the shed. However, if a floating pump is to be used as is the case at Kiwangwa at the moment, then there will be noise emissions that may not be controllable.

### Recommendations for Mitigation

- Personnel working in or near the pumps should be provided with ear muffs

#### **6.2.7 Solid Waste**

A considerable amount of waste will be generated during the construction phase, including construction debris, comprising stone, metal, pipes, paper, packaging, spoil from earthworks, and food waste. Solid waste will also be generated during operations. This will include used agrochemical containers and bags, which are regarded as being hazardous, as well as expired agrochemicals. Debris can affect water quality, while food waste can attract disease-spreading vermin.

### Recommendations for Mitigation

- Diligence during construction and operation activities will minimise the amount of debris.
- EcoEnergy will be responsible for managing and disposing of all solid and hazardous waste in a responsible manner, at an approved dumpsite and in accordance with NEMC's Waste Management Regulations.
- Wherever possible, solid waste (eg. scrap metal, crushed concrete, paper, and packaging) should be reused, recycled or sold.
- Hazardous waste will have to be handled with care, and site personnel dealing with this will have to undergo appropriate training.
- A solid and hazardous waste management plan will be drawn up by EcoEnergy to address waste generated by the outgrowers schemes operations. This will establish volumes and types of waste, hazard categorisation, appropriate disposal routes and the necessary permits for disposal.

#### **6.2.8 Drainage**

Drainage is an important feature of any road. If roads are not properly drained, they will start deteriorating due to erosion, rutting, or water logging.

Drainage is also required for the sugarcane fields as irrigation water has to be drained away from the fields to prevent waterlogging. Water in these drains tends to contain any excess chemicals that were not taken up by the sugarcane, and this water is then discharged into the river. Impacts of irrigation water discharge into the Wami River have been discussed in Section 6.2.2 above.

There is also the danger that if drainage is not properly designed, salinization of the soils may occur, which would then render the soils unsuitable for growing sugarcane.

### Recommendations for Mitigation

- All access roads must have side drains that will drain water away from the road. Water should be discharged little and often, and should be led to "safe point of discharge" in order to avoid erosion or sedimentation of the drain.
- The design and layout of the sugarcane fields will take into account slopes and levelling will be done so that excess water drains away. However, it is important that the drainage canals are well maintained.



### 6.2.9 Soil Erosion and Degradation

Soil erosion may occur if cleared areas are left exposed to wind and rain, for example during construction of the bulk infrastructure (especially the dam/water storage facilities, the bridge across the Wami River at Matipwili, and the access roads) and land preparation. Tilling of the land also encourages erosion as well as degradation, while use of heavy machinery may compact the soils. As mentioned above, if drainage is not managed well, or if saline water is used for irrigation, salinization can occur.

The conservation agriculture approach to be adopted in the outgrowers schemes will employ a no-tillage or reduced tillage production system which protects the soil from moisture loss as well as reduces carbon emissions. Harvesting of green cane – as part of the conservation agriculture approach - will be done mechanically, so that the blanket of leaf litter in the cane fields will gradually build-up of organic matter, protect the soil from water and wind erosion and improve the carbon content in the soils, and reducing green house gas emissions.

#### Recommendations for Mitigation

- Erosion in hilly or undulating terrain can be prevented by constructing catchwater drains, especially at the bottom of the escarpment at the Kiwangwa scheme to break the impact of runoff from the hill onto the farms.
- “Fanya-juu” terraces (cross-slope vegetation barriers) would be effective in preventing erosion where there is a slight slope.
- It is important to maintain organic matter in the soils so as to avoid erosion by wind during and after soil preparation activities.
- The possibility of intercropping with peanuts or other appropriate crops should be explored.
- Green fertilization can be done by planting cover crops such as *Crotalaria juncea* (Indian Hemp) or using leftover sugarcane straw after mechanized harvesting in order to keep the ground covered.
- Integrated Nutrient Management systems can be implemented so that the organic and nutrient content in the soils is maintained, and the soils remain stable.

### 6.2.10 Usage, Storage, Handling and Disposal of Chemicals

Pesticides, herbicides and fertilizers can pollute soils and groundwater and affect water quality in the Wami River downstream of the schemes. The impacts of this on water quality in the Wami River have been discussed in Section 6.2.2 above. In addition, these chemicals may pose health risks to farm workers, particularly if they are not handled with care or stored properly.

Leaf litter from green harvesting methods that will be employed on the outgrowers schemes will improve soil quality and minimize weed growth, resulting in a reduction in the quantities of herbicides and inorganic fertilizers. With the development of the trash blanket and no-till techniques, biological weed control will be used, thus reducing the need for the application of chemicals.

### Recommendations for Mitigation

- The use of pesticides, herbicides and fertilizers should be minimised as much as possible, and natural organic alternatives explored (see Section 6.2.2 above).
- The application of pesticides, herbicides and fertilizers should be carefully supervised. Bonsucro principles should be applied.
- All chemicals must be approved by the Tanzania Pesticide Research Institute (TPRI), Bonsucro, WHO and FAO.
- An Integrated Pest Management (IPM) system should be set up and a Pesticide Management Plan implemented.
- All persons handling these chemicals should be properly trained in their application, storage, handling and disposal. They should be provided with appropriate PPE. MSDS should be available and accessible for each chemical stored.
- Only the amount of chemicals required immediately should be stored.
- All containers and bags for pesticides, herbicides and fertilizers should be handled as hazardous waste, and disposed of accordingly. They should not be reused.
- Records of chemical use and application amounts should be kept.

#### **6.2.11 Vegetation**

The existing vegetation on the farms will have to be cleared for access roads, canals, sugarcane fields, office and workshop areas, and dam/off-river water storage facilities and power transmission lines. A number of trees will therefore have to be cut down. Clearing of land results in the loss of biodiversity, releases carbon into the atmosphere and leaves the bare soils open to erosion by wind and rain.

In line with conservation agriculture approaches, cleared biomass from the outgrower fields will not be burned, but chipped and ploughed into the soil during land preparation or used to produce compost. Larger biomass will be brought to the EcoEnergy sugar mill site and stored for producing power during operations.

### Recommendations for Mitigation

- Clearing of vegetation should be done carefully and well supervised so that only the area required for the scheme facilities and infrastructure are cleared.
- The dam will also inundate a large area of land, and will result in loss of vegetation and will affect any fauna that may be living in the area that will be flooded. The effects of inundation will have to be studied, including loss of vegetation and loss of any biodiversity areas.
- The construction of the bridge may also require riparian vegetation to be cleared. The impacts of building the bridge will have to be studied prior to project implementation.
- Any small stands of remnant forest or dense woodland in the scheme areas should be preserved as biodiversity areas.

**Photo 6.1: Possible Site for the Dam**



**Photo 6.2: Possible Site for Off-River Water Reservoir**



#### **6.2.12 Wildlife**

There are two issues with regard to wildlife that need to be addressed. The first is that some species of large mammals, particularly elephants but also hippopotamus and buffalo, are very fond of sugarcane. As it is, human-wildlife conflict in Matipwili and Gama/Kitame is a common phenomenon. While hippos and buffalo (and other wildlife) can be kept out using electrical fences, these have not proved effective against elephants.

Secondly, as mentioned in Section 4.1.6, there is an elephant migration route that passes from Saadani NP, through Matipwili, across the river at Kisamba, through the Kiwangwa scheme area and on to Wami-Mbiki and beyond, and then back along the same route. The migration usually starts when at the beginning of the long rains. It has not been established whether the migration is still occurring, and if so whether the same route is followed.

There may also be a risk of poaching by the contractor's workforce.

#### **Recommendations for Mitigation**

If the land annexed by Saadani National Park is degazetted, and the park boundary reverts to its original reserve boundary, then the following recommendations are proposed.

- The exact migration route of the elephants should be established.
- EcoEnergy in their plans for their estate have demarcated a biodiversity corridor which goes along the top of the Razaba Ranch. This corridor is apparently part of the elephants' migration route. The biodiversity corridor should be extended into the outgrowers' schemes so that the sugarcane schemes do not block the route.
- The biodiversity corridor could include a thin strip of sugarcane to tempt them to use the corridor.
- The use of bee hive fences and electric fences with outriggers should be explored to see whether they would be effective to keep the elephants and other wildlife out of the

sugarcane fields (King et al, 2011; <http://animals.oreilly.com/elephants-and-bees/>; and Graham et al, 2009).

- The contractor should be contractually bound to ensure that his workforce is not involved in poaching activities.

#### **6.2.13 Forest**

The Zaraninge Forest lies close to Matipwili village. As mentioned in Section 4.1.7, the current threats to the forest are illegal harvesting of wood for charcoal production and poaching. It is hoped that the schemes will provide an adequate source of income for the Matipwili community so that their need to pursue these destructive activities is reduced.

#### **Recommendations for Mitigation**

- Community fuelwood plantations should be established as part of the scheme programme. If managed well, this could provide alternative sources of income for the outgrowers. Trees could be grown in a cyclical manner so that they mature one lot after another, so that there is a constant supply of wood. Assistance can be sought from the District Forest Office to assist with the selection of appropriate fast growing trees, and to advise on best tree planting techniques.
- As mentioned above, the stands of remnant forest and dense woodland should be preserved to enhance biodiversity.
- In 5 to 10 years' time, the Zaraninge Forest could become a popular place to visit for recreation purposes, for people from Dar es Salaam who have bought land in the area as well as for people attracted to Bagamoyo and the project area as a result of the proposed Bagamoyo Port development and other developments that are planned to be implemented alongside the Port project. Some of the villagers in the project villages (but particularly Matipwili) could be encouraged to train as guides in anticipation of a demand for walks in the forest.

#### **6.2.14 Climate Change**

The impact of climate change in the district in the coming decades is difficult to predict, but it is likely to cause an increase in the intensity and frequency of extreme events, generating impacts and reducing the time available for recovery. Villagers describe both flood and drought events as having a dramatic impact on their livelihoods. Floods damage local infrastructure, particularly along the main inundation and water flow routes, as well as homes and vegetation, and harm livestock. Drought cripples agriculture, and livestock and wildlife perish due lack of food and water. Without predictable precipitation patterns, planning for rainfed crops using existing technology is uncertain and food security is put at risk.

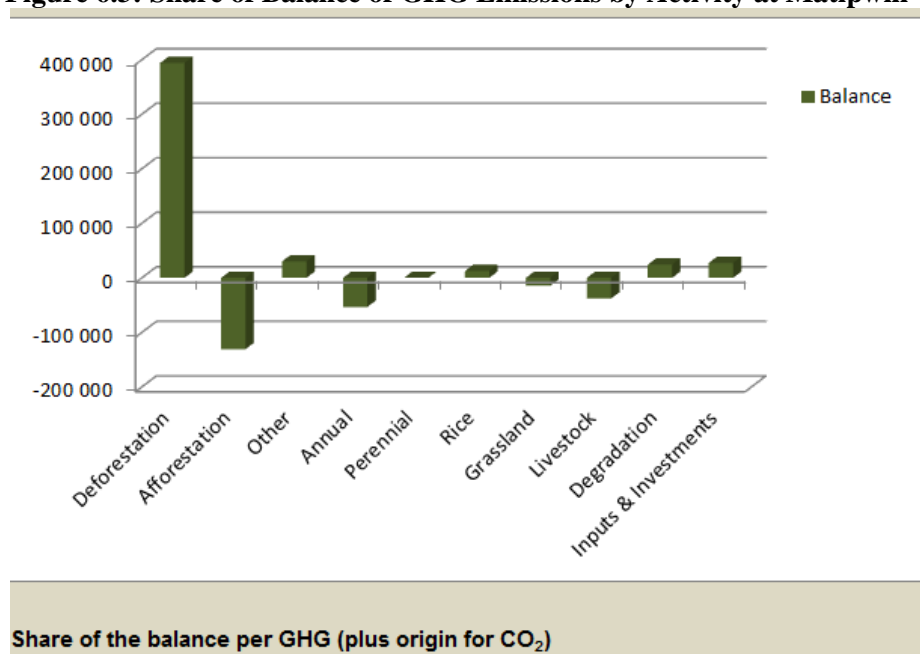
Based on the land use plan developed for Matipwili (see Appendix 1), the initial analysis of greenhouse gas emissions (GHG) from the Programme for Matipwili shows that with mitigation the project will release greenhouse gases in the region of 252,568 tonnes equivalent CO<sub>2</sub>, as shown in Figures 6.2 and 6.3 below, which is about 130,000 tonnes equivalent CO<sub>2</sub> less than if no mitigation measures were incorporated.

**Figure 6.2: Greenhouse Gas Emissions Analysis of the BASIC Programme at Matipwili**

Component of the project	Gross fluxes		Balance
	Without	With	
	All GHG in tCO <sub>2</sub> eq		
	Positive = source / negative = sink		
Land Use Changes			
Deforestation	0	394 032	394 032
Afforestation	0	-130 726	-130 726
Other	0	30 234	30 234
Agriculture			
Annual	0	-53 288	-53 288
Perennial	0	0	0
Rice	4 141	16 656	12 516
Grassland & Livestocks			
Grassland	16 503	2 316	-14 186
Livestock	98 306	60 579	-37 727
Degradation	12 119	36 357	24 238
Inputs & Investments	0	27 476	27 476
Total	131 068	383 636	252 568
Per hectare	25	73	48
Per hectare per year	1.2	3.7	2.4

Source: IFAD, March 2015

**Figure 6.3: Share of Balance of GHG Emissions by Activity at Matipwili**



Source: IFAD, March 2015

The analysis for Kiwangwa has not been done at present as the land use plans are still being finalised.

Mitigation measures:

- The BASIC Programme will help villages achieve climate-resilience through village planning, climate-smart infrastructure investments, and institutional capacity building, thus enabling residents to strengthen their land and resource tenure and ability to prosper from their traditional resource base while building climate resilience.
- The BASIC Programme will address risks resulting from climate change by introducing climate-smart technologies in all production activities in order to increase and stabilize yields. The initial investment adoption may be somewhat more expensive for equipment purchase and land preparation, but with higher stable yields and reduced costs for weeding and agricultural chemicals, farmers will be able to earn a more reliable income, and consequently households will be able to cope with the negative impact of climate change.
- All technologies which will be adopted under the programme focus on environmental sustainability and increased resilience to changing climate patterns. For sugar cane, the conservation agriculture approach will ensure that there will be a no-burn policy when clearing land, and green harvesting will reduce greenhouse gas emissions and eventually reduce the quantities of agrochemicals required. The adoption of climate-smart technologies will reduce soil erosion and run-off, as well as reducing the need for agricultural chemical and facilitating replanting, while achieving less variance in yields.
- Molasses from the sugarcane from the outgrowers' schemes and the EcoEnergy plantation will be used to produce ethanol, while bagasse will be used for the generation of energy.
- The BASIC Programme also includes woodlot afforestation of 700 ha within the villages, and there will be restoration of the riverine forest across the Programme area to compensate for GHG releases.
- There are also savings in GHG emissions (from transportation) on each tonne of sugar that does not have to be imported into Tanzania.

**6.2.15 Material for Construction**

At present the source of materials for construction of the bulk infrastructure is not known. The contractor will have to source gravel and sand for construction which he may or may not obtain from a commercial source. Hardstone material can be obtained from commercial quarries. The volumes of material are not known at the moment, so the impact of mining stone, gravel and sand cannot be determined at this stage.

Recommendations for Mitigation

- If the contractor is to establish his own gravel and sand sites, he will have to carry out an environmental impact assessment for those sites. The main mitigation measures in this case would be prevention of erosion, ensuring proper drainage in the gravel pit areas, restoring and landscaping the borrow sites after excavation, planting of grasses and trees to re-vegetate the sites.
- Possibilities for rehabilitating borrow pits for use as water pans for livestock should be considered, taking into account potential impacts that may result from them.
- The impacts due to the use of construction materials (including gravel, hardstone, sand, water, steel) for the road, dam and bridge, as well as the irrigation canals will have to be investigated during the detailed design phase.

#### **6.2.16 Workmen's / Contractors' Camp**

It is not known at the moment whether a workman's camp will be set up for the construction of bulk infrastructure or whether the construction workers will be transported from Bagamoyo or a major settlement such as Kiwangwa, to the scheme sites. It may be that the Contractor's camp set up on the EcoEnergy estate for construction works there will be used during construction of the outgrowers' schemes. This would be the best option as the workshop and stores, oil/fuel storage facilities, offices, storage areas for plant and equipment, etc and certain works such as casting of concrete pipe culverts will likely be located at the yard. The living quarters for the engineers, administration, foremen and machine operators may also be located there.

#### **Recommendations for Mitigation**

- As mentioned above, the least impacting option for the Contractor's and Workmen's Camp would be to use the camp that was set up for EcoEnergy's infrastructure.
- If this option is not available, the Contractor must consult with the local authorities to assist them in identifying a suitable location for his Yard and the Workmen's Camp.
- Specifications for the establishment of the work sites should be clear, including provision for, amongst others, sanitation, disposal of garbage and wastewater, handling of fuel and oil, etc.
- The Contractor will require water for his camp and for the works. It is likely he will take water from the Wami River, for which he will require an abstraction permit from WRBWO. However, care must be taken not to stress the supply of potable water, at the expense of the local population. In this connection, the Contractors will consult with the respective village councils and authorities to identify acceptable potable water sources so that there is no competition for water resources.
- Assuming that the workmen/construction labour will stay at the camp, a central canteen would contribute towards the general health in the camp as kitchen wastes can be disposed of in an organised manner, while hygiene can be monitored. The workforce should not be permitted to buy charcoal. Solid wastes must be disposed of in an acceptable manner. Waste must be segregated into metals, paper, plastics and organic waste, so that it can be sold, reused, buried or burned as appropriate. Wastes that do not fall into these categories should be taken to an approved council dump.
- Ventilated improved pit (VIP) latrines should be provided for the workforce. These must be carefully located and designed. Ideally, the drop should be between 2.5-3.5 metres (8-12 feet), but where the water table is high, a composting style double shallow pit design is more suitable. The location of VIP latrines in the camp should be 50 m from any surface water body, and protected from runoff. Communal bathrooms/lavatories leading to soakaway pits are another option, but would be slightly more expensive.

#### **6.2.17 Demobilisation**

The Contractor will have to construct various facilities, which will have to be removed and dismantled on completion of works. In addition, as mentioned above, there will be a lot of scrap and waste material on the site, at the camps, and possibly at locations around the schemes where the Contractor establishes laydown areas or work sites.

It is anticipated that the outgrowers' schemes will be functioning for more than 20 years.

### Recommendations for Mitigation

- The Contractor must leave the site in a clean and orderly condition on completion of works. The Contractor must also restore and landscape all areas to the satisfaction of the Project Coordination and Management Unit.
- If for any reason the schemes are to be abandoned after they have become operational, then a separate environmental assessment will have to be carried out at that time to assess the impacts of decommissioning the schemes.

## **6.3 Social/Socio-Economic Impacts**

### **6.3.1 Land Use Conflicts**

Stakeholder consultations revealed that there are a number of areas of conflict or dispute regarding land use, which may impact on the success of the BASIC Programme and its sustainability, specifically conflicts/disputes between:

- i. Saadani National Park and Matipwili and Gama/Kitame Villages
- ii. Saadani National Park and EcoEnergy
- iii. Matipwili and EcoEnergy
- iv. Livestock and Farmers.

Figure 6.4 overpage illustrates the various land use conflicts and boundary disputes in the Programme area.

### **Saadani National Park and Matipwili and Gama/Kitame Villages**

When Saadani National Park was gazetted, the original reserve boundary was extended to include part of Matipwili and all of Gama/Kitame. The Gama/Kitame outgrowers' scheme is located within the gazetted boundary of Saadani National Park. Human-wildlife conflict at both villages is a common phenomenon, and this has caused much tension between SANAPA and the villagers. When the sugarcane fields are planted there will be more of a problem. Mitigation measures for keeping wildlife out of the cane fields have been discussed in Section 6.2.11 above.

### **Saadani National Park and EcoEnergy**

Saadani National Park extends into an area of the Razaba Ranch that was given to EcoEnergy by the government in 2007/2008. EcoEnergy are aware of the gazetted boundary as the Chief Warden and EcoEnergy representatives walked the demarcation line as provided in the Government Notice No. 281 of 2005. The land by the Wami River within the disputed area is the most suitable for cane cultivation and therefore important for the viability of EcoEnergy's investment. The matter has gone to the Parliamentary Committee on Lands, Environment and National Resources, and as it stands now, the Permanent Secretaries of the Ministries of Land, Natural Resources and Tourism, and Agriculture have been asked to meet to resolve the issue. EcoEnergy and the villagers of Matipwili and Gama/Kitame are keen to have the park boundary pushed back to the original reserve boundary as per the Government Notice No. 275 of 1974, or at least to the river. TANAPA has said that if the legal procedures are followed for degazettement, they would accept that they would lose that land (pers. Comm. Chief Warden, Saadani National Park, February 2014 and February 2015). However if the land in question is degazetted, there is likely to be a public outcry not only from local wildlife NGOs and



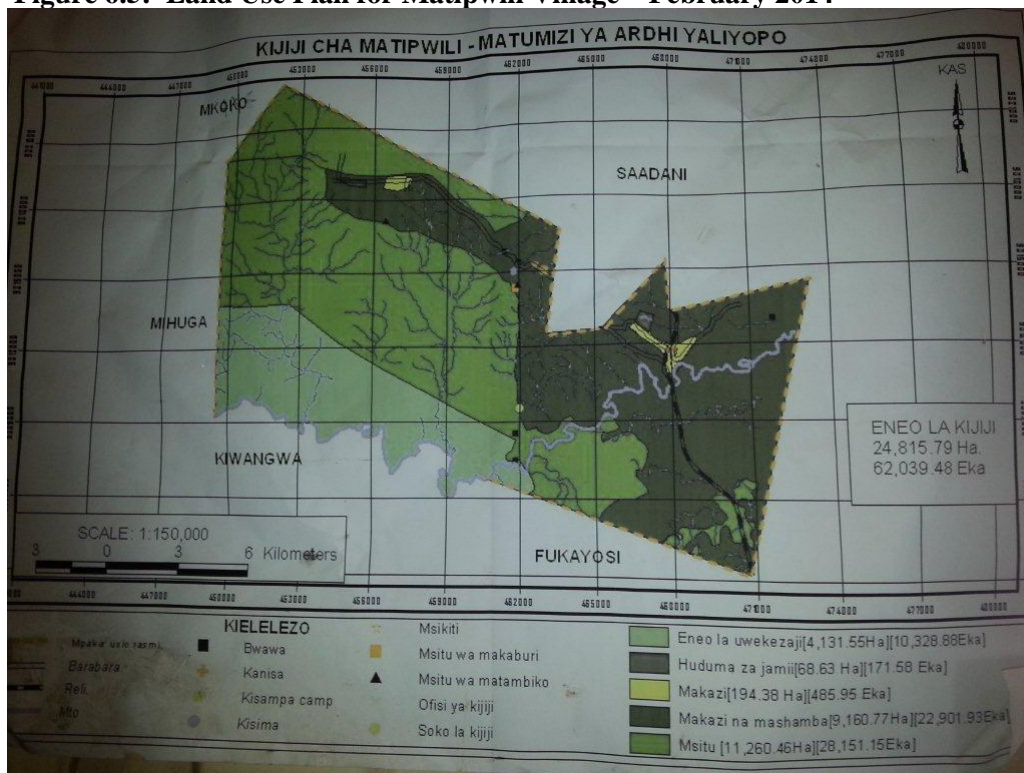


## Matipwili and EcoEnergy

EcoEnergy has been looking for more land for sugarcane in areas near the core plantation. They have identified a piece of land on the southern side of the Wami River across from Matipwili, which is known as Biga. Biga, Biga Kidomole and Gobole North and Gobole South, are all sub-villages of Matipwili. Biga lies to the west of the railway line, while Biga Kidomole lies to its east. They are effectively one sub-village, as is the case of Gobole, where Gobole North is north of the Wami River and Gobole South is south of the Wami River but it is considered as one sub-village. This land has been traditionally used by the villagers for planting food crops because it is very fertile and close to the river (when the Wami River floods, it deposits nutrient rich silt in this area). The area is therefore very valuable to the villagers in terms of food security.

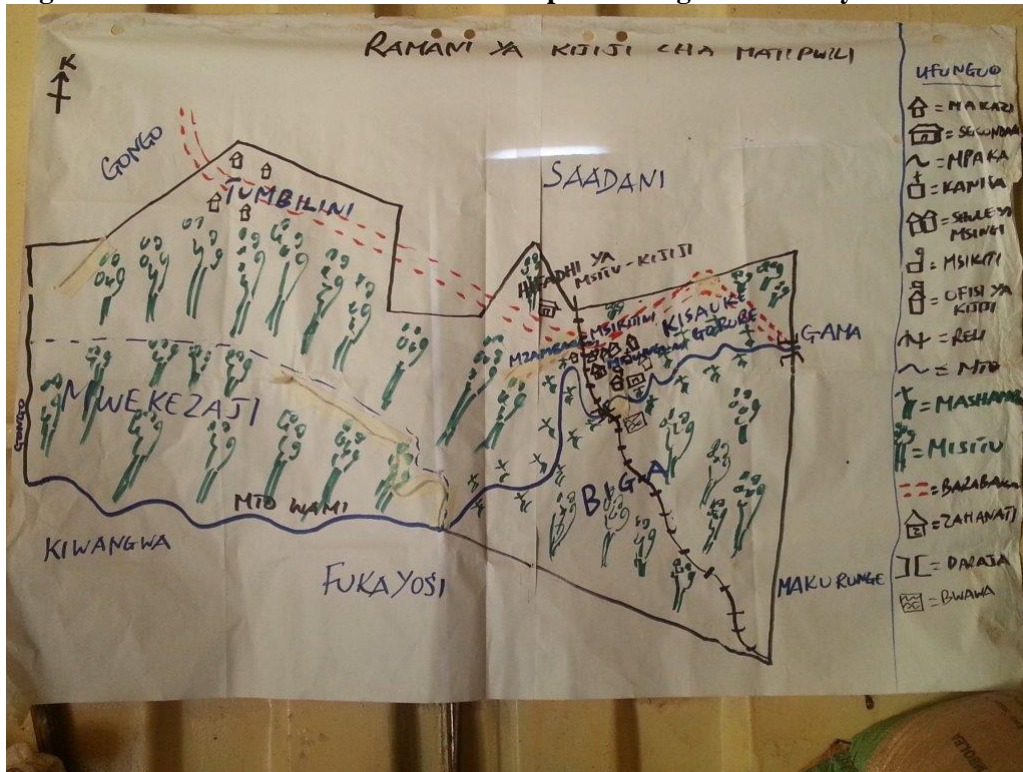
Village land use plans are presented in Figures 6.5 and 6.6 for 2014 and 2015 respectively.

**Figure 6.5: Land Use Plan for Matipwili Village – February 2014**



Source: Matipwili Village Government, February 2014

**Figure 6.6: Latest Land Use Plan for Matipwili Village - February 2015**



Source: Matipwili Village Government, February 2015

EcoEnergy had asked the Matipwili village committee if they could have this area, and the village committee declined, for the foregoing reason. The District Commissioner then visited Matipwili and declared that Biga West belonged to Fukayosi. The Matipwili villagers felt that this land was given to Fukayosi without consultation and without their consent. They claimed that EcoEnergy had approached the Fukayosi village government who willingly sold that land to EcoEnergy. This has caused conflict between the villages of Fukayosi and Matipwili. However, EcoEnergy explained that the maps they were given by the district when they were looking for additional land showed that the area under contention belonged to Fukayosi Village. The Fukayosi Village Assembly signed the lease in 2007/8. In 2011, the people of Matipwili objected saying that they also use that land on a seasonal basis (after the floods), but there appeared to be no legal documents indicating that the land belonged to Matipwili village. When EcoEnergy sat down with the Matipwili Village Government they were told that if EcoEnergy let the communities have a 1.5 km strip along the river, EcoEnergy could have the rest of the land for sugarcane. During those discussions EcoEnergy agreed to do this. In addition the Fukayosi and Matipwili Village Governments have come to an agreement on their respective village boundaries. This dispute has therefore now been resolved.

There were a number of other issues that have contributed to disputes – such as EcoEnergy not delivering diesel to the farmers on a regular basis to run the pumps to irrigate their paddy fields, and not providing a tractor for ploughing as they said they would. According to EcoEnergy, the farmers have reneged on the contract that they all signed and it is up to them to fulfil their contractual obligations before EcoEnergy supplies them with more fuel and other services. This has been discussed in Chapter 5. This is a communication issue, but it also indicates that a lot more work may have to be done to make sure the farmers can work as a company.

These disputes and misunderstandings have arisen from a lack of communication or miscommunication between the parties involved. While EcoEnergy has the right intentions, somehow there appeared to be a gap in the line of communication between them and the villagers. Subsequently EcoEnergy has worked with the village and relationships have now improved. The designs for the Matipwili scheme take into consideration the 1.5 km strip requested for by the Matipwili villagers.

#### Recommendations for Mitigation

- EcoEnergy must keep a constant line of communication to provide information to the Matipwili villagers and also to provide a local platform where the villagers can discuss their issues frankly with EcoEnergy (this also applies to the other outgrower schemes). In order to re-establish the trust of the Matipwili Villagers, it is important that the Matipwili villagers understand that EcoEnergy has actually heeded to their request of leaving the 1.5 km strip for them. EcoEnergy should begin by explaining that the village land use plan that has been developed by the Land Use consultant hired by EcoEnergy does provide for the 1.5 km strip, and now awaits review by the Matipwili Village Assembly.
- In addition, EcoEnergy will have to revisit their communication/outgrower engagement strategy.

#### **Livestock keepers / Farmers Conflicts**

There is a conflict of interest between livestock keepers and farmers, and livestock keepers and the village governments. This has led to disputes over land use in the project area, with each side blaming the other as the cause of the problem. Livestock keepers have been taking their livestock onto cultivated farms in search of pasture. The livestock eat and/or trample the crops, overgraze the land, cause compaction and erosion of the soil. The livestock keepers claim that their grazing lands have been taken by the farmers, so they have nowhere else to graze. They do not appear to take heed of warnings from the village governments, as the village governments do not have the manpower or resources to police the land, while the livestock keepers are usually armed with spears. The number of livestock is increasing and the number of farmers is also increasing, which means there will be even greater pressure on available land resources in the villages. Added to this, in recent years there has been a flood of land speculators buying land in and around the outgrower villages in anticipation of an economic boom spurred on by the EcoEnergy Project and the proposed development of the port, international airport, tourism zone, export processing zone and industrial zone for Bagamoyo District.

#### Recommendations for Mitigation

- In order to avoid conflicts between livestock keepers and farmers, land use management plan that are being developed for the outgrower villages must indicate the areas set aside for livestock (ie. grazing areas), farming and other uses as determined by the respective villagers.
- The layout of the outgrowers' schemes should provide for access for livestock to the Wami River and other watering points.
- Livestock keepers should be educated to enhance the quality of their stock and reduce the number of animals, so that the areas set aside for them are not overgrazed.

- The village councils and elders from the pastoralist groups should be asked to mediate the existing conflicts. Mechanisms to resolve such conflicts at the earliest stages in future should be developed prior to project implementation.
- The Project Coordination and Management Unit, through its representatives from the MAFSC, MLHSD, and the Ministry of Livestock and Fisheries should assist in resolving such conflicts.

### **6.3.2 Induced Settlement Patterns**

The BASIC Programme in tandem with the EcoEnergy Project is expected to stimulate businesses and other economic activities which will impact on the outgrower villages of Kiwangwa, Matipwili and Gama/Kitame. Access to the villages by road, and access to electrical power and water will draw people to the outgrower villages in search of employment or to start up businesses. This, combined with natural growth rates, will in the medium term lead to an increase in the village populations.

The influx of people will no doubt add demand on water, health services, power, etc, exerting more pressure on the already constrained utilities. In addition, there may be some angst as a result of outsiders coming into the area and competing for employment. In-migration is also associated with increased crime rates, drug abuse and prostitution.

#### Recommendations for Mitigation

- Participatory village land use management plans should be developed and/or updated by the villages taking into account the possible implications of expected population increases in the outgrower villages.
- The Project Coordination Unit should collaborate with the village and district authorities to identify services required in the outgrower villages and provide support for the same, through for example providing technical advice or assisting in sourcing funding for service utility improvements.
- The project should come up with an employment policy that guarantees a certain number of jobs reserved for members of the local communities, so as to ensure they benefit and to reduce the risk of conflict.
- There should be constant interaction between the local leadership and the outgrowers. An open door policy should be adopted for local leadership to air their views.
- Issues to do with security should be given priority involving all stakeholders from company personnel, police, local leadership and villagers.
- A series of educational campaigns should be initiated, eg, HIV/AIDS awareness prevention, road safety awareness, drug abuse awareness and prevention, security briefings, etc.

### **6.3.3 Loss of Land, Structures, Trees and Crops**

The bulk infrastructure – namely the dams, canals, roads, power lines, etc – will require land to be acquired by the project. Part of this land might be owned privately or public. Some private owners might not be willing to give free their land for installation of the above infrastructure consequently compensation will be required. At the moment however, details of the type of infrastructure and their exact location are not known, as neither the preliminary nor detailed engineering designs have been developed.



At present there are a few structures located in the areas earmarked for the outgrowers' schemes. At Gama/Kitame four structures were identified during field observations and confirmed by the village government as being on the outgrowers' scheme. Structures were also seen in Matipwili and Kiwangwa, but the number of structures affected was not available to the study team. It is also evident that some land outside the scheme areas will also be affected since water conveyance pipes from the dam, discharge drains from the schemes to the river, access roads to the schemes and power lines will need land – although at this point the affected areas have not been identified. These issues will have to be established during the RAP which will be undertaken during the detailed design phase of the BASIC Programme.

There are a few exotic and indigenous trees which have various uses (eg. medicinal uses, poles for building, etc) that will have to be cleared. Whether these belong to individuals, how many trees will be affected, what species, and the value of the trees (economic or cultural) are not yet known and will be established during the detailed design phase and when the RAP is being prepared. However, compensation will most likely have to be paid.

**Photo 6.3: Potentially Affected Structures at Kiwangwe**



**Photo 6.4: Potentially Affected Structure at Gama**



### Recommendations for Mitigation

- The approach to the scheme design is a fully participatory one, so the farmers will decide how and where bulk infrastructure will be located. People who are not involved in the schemes but who may have land that is required for infrastructure to pass must also be involved, as must all sections of the community. Once the scheme layout has been agreed by the villagers, more detailed engineering designs will be drawn up.
- Community members, whether part of the outgrowers' schemes or not, should be informed properly about the land requirements for bulk infrastructure well in advance and should be made to fully understand the whole compensation/resettlement process before making any decisions. It is therefore important that the village councils involve all sections of their respective communities in regard to any plans being drawn up for the BASIC Programme.
- Prepare and implement a Resettlement Action Plan to identify project affected persons/parties (PAPs) and provide adequate compensation and additional support in accordance with Tanzanian law and AfDB safeguard policies.
- If village/government land is available close by, then any affected individuals should be compensated in-kind, ie. land for land.

#### **6.3.4 Fisheries**

Water quality and quantity in the Wami River will be affected by the outgrowers' schemes activities, mainly due to water abstraction requirements and the use of agrochemicals. Fish breeding sites (particularly prawns) in the Wami estuary mangroves may be affected.

### Recommendations for Mitigation

- The application of chemical inputs – fertilizers, pesticides and herbicides – should be carefully monitored. Where possible, organic/natural fertilizers and pesticides should be used. Weeds can be removed manually.
- Bonsucro standards should be followed.
- The environmental flow downstream of the project and EcoEnergy abstraction points on the Wami River should be carefully monitored.
- The impact of the outgrowers' schemes and the EcoEnergy estate on aquatic flora and fauna needs to be monitored.

#### **6.3.5 Food Insecurity**

Food insecurity is already a problem in the outgrower villages at the moment. District records showed fluctuations in the production of both food and cash crop. Various factors are attributed to low harvests, for example, poor technology, inadequate provision of extension services, drought due to unreliable rainfall, small units of land cultivated by households, low commitment by households to become involved in agricultural production, etc. One of the major concerns then is that when the outgrowers' schemes are operational, people will shift their attention and labour to work on the schemes and their spin-off activities to earn incomes, rather than concentrating on food production. Although there is an argument that by earning money, people can buy food, it is not guaranteed that food will be bought for the family. This may lead to households, and children in particular, being deprived of food as cash may be used for other non-priority expenses (such as clothes, cell phones, televisions, etc). Besides someone has to produce the food that is bought.

### Recommendations for Mitigation

- Production of food crops in parallel with sugarcane should be promoted, for example through improved extension services.
- Farmers should be encouraged to keep part of their land – at least 25% - for food production. For example, in order to avoid shortage of food at Kiwangwa the farmers' group is planning to utilize 400 ha for sugarcane and reserve 100 ha for rice growing for home consumption.
- Farmers should be educated on improved agriculture techniques, and encouraged to expand their land production units, and use improved storage methods of their produce.
- The possibility of intercropping food crops with sugarcane should be explored.
- Farmers (outgrowers) should be encouraged to purchase and store food in the event that they experience low harvests due to any unforeseen factors.

#### **6.3.6 Occupational Health and Safety**

The occupational health and safety Act (2004) stipulates that all work areas should be constructed in a manner that ensures that all people working there are safe. For both the construction / setting up phase as well as operation, all hazards should be identified, and mitigation measures identified and implemented.

Typical occupational hazards include noise from the different machinery and equipment, dust emissions, moving machinery parts, electrocution, fire, effects of manual lifting, and working at height.

The outgrowers' schemes will have to therefore comply with legal requirements as well as best practices.

### Recommendations

- Schemes are required to set up OHS committees.
- Outgrower schemes should prepare OHS procedures and an OHS manual.
- Sanitary facilities should be put up for all workers both men and woman.
- First aid training should be provided to key personnel. First aid boxes and emergency facilities should be provided, and access to a trained nurse and a doctor available.
- Necessary PPE given to workers depending on their work, for example, nose masks to prevent inhalation of dust particles and inhalation of pesticide / herbicide fumes, helmets, boots, ear muffs.
- All machinery and equipment should be well maintained and serviced. All moving or rotating parts of machinery should be guarded (machine guarding). Emergency stop devices should be placed on all machinery. Workers operating machinery have to be trained in the hazards of operating machinery and how to stop the machines in case of emergency.
- Areas that would potentially generate dust should be watered.
- All electrical wires should be insulated, electrical breaker mechanisms should be in place in case there is a short circuit and workers handling electrical equipment should be trained on dangers of electricity.
- Emergency fire prevention and control measures should be in place, fire extinguishers located in strategic and accessible places, and all personnel should be trained in fire fighting.



- Workers who are in heavy lifting (eg offloading fertilizer bags) should be trained in lifting techniques.
- For work at a height (above two metres) fall abatement procedures need to be in place - these can take the form of safety belts, guard rails etc.
- Safety measures should be in place at all active construction sites (including borrow pits, laydown areas, etc).

### **6.3.7 HIV/ AIDS**

Information gathered through focus group discussions combined with consultations with district staff showed that HIV/AIDS is a big problem in the district including the proposed villages for out-growers schemes (regional HIV prevalence rate of 5.9% and district prevalence rate 6.9%). In-migration of people into the project area in search of employment will create socio-economic interactions with local people including sexual relationships. Increased income also leads to promiscuity.

#### Recommendations for Mitigation

- A situational analysis on HIV/AIDS in the project area should be prepared and specific and general strategies designed to address the problem.
- HIV/AIDS interventions should be part of the project planning process, budgeting, and implementation as well as monitoring and evaluation
- All key HIV/AIDS players (District Council, Eco-Energy and CSOs working in the district, e.g. CVM/APA) should be involved in coordinating and enhancing prevention measures such as counselling and testing, behavioural change, effective use of condoms, etc.
- Health facilities should be improved to provide HIV/AIDS related services, like Voluntary Counselling and Testing (VCT), Prevention from Mother to Child Transmission (PMTCT), treatment on STIs.
- There should be a workplace HIV/AIDS awareness and prevention programme for the outgrowers' schemes

### **6.3.8 Child Labour**

Children under 18 years, particularly in poor rural areas are easy target for cheap labour. Sometimes their families encourage them to work rather than go to school, while other times the children themselves may skip school to be employed on the sugarcane farms to earn cash - this was corroborated by the District Education Officer in Bagamoyo. In addition, spin-off businesses like vending, restaurants, bars and other smaller businesses may also employ children, or they may be taken on as housemaids/houseboys by the sugarcane workers.

#### Recommendations for Mitigation

- Parents / guardians and young boys and girls must be sensitized on the importance of education and there should be stern consequences for non-compliance;
- The Ministry of Community Development, Gender and Children, local authorities and NGOs and Village School Committees will have to take a very active role in order to curb this problem. Laws / bylaws prohibiting children of school-going age to be employed on the sugarcane farms should be in place and enforced by relevant authorities.

- The outgrower companies, EcoEnergy and schools in the project area should have policies prohibiting the employment of children on the farms and by the farm workers.

### **6.3.9 Disturbance to the Public**

During preparation phase, construction and operation there will be movement of vehicles, people and noises which are unusual at the moment. All these will cause disturbances to the public in the project area. Dust will also be generated during the construction phase of the project. There will also be noticeable changes to the landscape due to changes in land use as new structures are constructed, for example when the dam is constructed and the power lines erected.

#### Recommendations for Mitigation

- Sensitization/awareness creation should be adequately carried out so that the public is aware of the project schedule and any disturbances before commencement of the project. This can be done through, for example, public meetings, posters, etc
- Construction workers as well as project staff including drivers should be educated and instructed to abide to safety rules and to respect communities within and around the immediate project area.
- All access roads passing near houses should be watered down to suppress dust.
- Any construction works near the villages should not be done during the night (after 6 pm and before 6 am).

### **6.3.10 Road Safety**

During construction of bulk infrastructure, trucks and heavy equipment will ply the roads to the outgrowers' schemes. When the schemes are operational, tractors will take cane to the EcoEnergy mill and there will also be some increase in traffic in the project area as more vehicles deliver and collect goods and passengers to and from the outgrower villages. As villagers' income increases some will buy vehicles, motorbikes and bicycles. With the increase in traffic there will also be an increase in traffic accidents involving people and livestock being struck on the roads.

#### Recommendations for Mitigation

- Road safety programmes should be initiated at schools and for the communities in the outgrower villages, as well as villages and settlements along the access roads. Materials for this are available at the Ministry of Infrastructure Development.
- During construction, a traffic management plan should be put in place.

### **6.3.11 Archaeological, Traditional, Religious or Cultural Sites**

Of the three outgrower villages, only Kiwangwa is reported to have a graveyard in the scheme land. However, the villagers did not see this as an issue and were willing to relocate the graves. The number of graves and the relatives of the deceased have not yet been established. This is conformity with the Graves (Removal) Act of 1969 which allows the graves to be relocated in case the land is required for public purposes. The village government of Kiwangwa said that the discussion will be done by the owners of the graves to relocate them.

In addition, it was observed that some of the coppices within the Kiwangwa scheme area were used as burial grounds and could therefore have cultural significance. Due to deforestation certain tree species and plants having traditional or medicinal value may be lost during clearing and grubbing some. Preservation of indigenous biological knowledge systems is very important and its loss may have long term detrimental effects.

#### Recommendations for Mitigation

- Careful identification and relocation of the graves will have to be done as per Graves (Removal) Act of 1969. As this can be an emotive issue, the relocation of the graves should be done by the grave owners in collaboration with the village government and the District Lands Office.
- A socio-ecological assessment should be carried out of all coppices in the scheme areas to determine their cultural importance and value to the local communities.
- Special plantations maybe initiated to preserve indigenous plant species which have value to the local people.
- A procedure for chance finds should be developed before construction of bulk infrastructure and land clearing for the outgrower farms takes place to ensure that sacred forests or any other sites or assets of cultural value are not destroyed or affected by the establishment and development of the outgrowers' schemes.

### **6.4 Resettlement Action Framework**

One of the major social impacts of the BASIC Programme will be the need to compensate villagers for land to be acquired for the schemes, or for structures and crops that may be lost due to land being taken for growing sugarcane on the schemes. At the time of writing, the location of the infrastructure had not been finalized, so it was not possible to estimate of how many people or households would lose land, structures or crops, and to what extent each project affected persons or parties (PAPs) would be affected. Therefore a Resettlement Action Framework (RAF) has been prepared which describes the procedures and policies that will apply in preparing the Resettlement Action Plan (RAP) that will be required for the outgrowers' schemes once the scheme infrastructure layouts have been finalized.

#### **6.4.1 Scope of Land Acquisition and Resettlement**

The information available indicates that there are few people who will lose structures and crops. The majority of the affected households will lose a small portion of land but at the same time they will benefit from the scheme because all the PAPs will be potential sugarcane outgrowers. For example, at Kiwangwa it is estimated that about 50 people will be affected.

#### **6.4.2 Legislative Framework**

The National Land Policy (1995), the National Environment Policy and the National Human Settlements Development Policy (2000) are the key policies providing guidance for compensation and resettlement issues.

The following principal legislation provide the legal basis for compensation and resettlement in Tanzania:

- Land Act, Cap. 113 R.E. 2002
- Village Land Act, Cap. 114 R.E. 2002
- Land Acquisition Act, Cap. 118 R.E. 2002
- Road Act, 2007
- Town and Country Planning Act, Cap 355 R.E. 2002
- Local Government (District Authorities) Act, Cap. 287
- Graves (Removal) Act, Cap. 73

The Land Act, Cap. 113 R.E. 2002 is supplemented by a number of pieces of subsidiary legislation that are relevant to compensation and resettlement. These are:

- The Land (Forms) Regulations, 2001 (GN No. 71 of 2001)
- The Land (Assessment of the Value of Land for Compensation) Regulations, 2001 (GN No. 78 of 2001)
- The Land (Compensation Claims) Regulations, 2001 (GN. No. 79 of 2001)
- The Land (Management of the Land Compensation Fund) Regulations, 2001 (GN 82 of 2001)

Property laws and customary laws are also applicable.

Other pertinent aspects relating to land administration, ownership and expropriation in Tanzania which are regulated by legislation include public domain, entitlement, land asset classification and valuation, procedures for expropriation and procedures for grievance redress

There are a number of differences between the national Tanzanian legislation and the AfDB's Operational Safeguard 2 on Involuntary Resettlement: Land acquisition, population displacement and compensation, and IFAD's safeguard requirements on resettlement. These differences relate to the general principles for resettlement, eligibility criteria, and the notification period for expropriation and resettlement and are summarized as follows:

- According to the AfDB and IFAD safeguard policies, resettlement should be avoided whenever possible, while national legislation states that 'expropriation of land will be done when deemed necessary for public purposes';
- In regard to eligibility, where the AfDB and IFAD entitles those who have formal rights, claims to land and no recognizable legal right, to compensation, while national legislation entitles only those who are 'landholders' with legal possession of the land and who own property thereon;
- The AfDB and IFAD also stipulate that compensation must be done at full replacement cost based on market values, whereas the GOT valuation processes are guided by rates established by the District Land Office;
- The notification period required differs, where national legislation requires that property must be handed over 180 days after compensation has been paid, while AfDB and IFAD involuntary resettlement safeguard policy requires that displacement must not occur before necessary measures for resettlement are in place;
- IFAD requires that where resettlement or economic displacement is envisaged, the principles of "do no harm" and "free, prior and informed consent" are adhered to at all times and for all beneficiaries for any intervention that might affect the land access and user rights of communities.

#### **6.4.3 Valuation and Compensation**

Valuation of the affected properties will follow the government procedures and will be carried out by the qualified registered government valuer. The process will be fully participatory. Similarly, compensation will follow the government procedures with full observance of the AfDB and IFAD safeguard requirements.

#### **6.4.4 Preparation and Implementation of RAP**

The steps to be undertaken for the RAP include a screening process, a socio-economic census, land asset inventory of the area and identification of project affected persons/parties (PAPs). This will be followed by the development of a Resettlement Action Plan (RAP), RAP review and approval, implementation of the RAP and monitoring of RAP implementation and its successes. These steps will be the responsibility of the District Irrigation Officers through an elected Resettlement and Compensation Committee, in association with each village's Compensation and Implementation Committee. Consequently, the implementation of RAP will be evaluated and documented. Throughout this process, consultation and public disclosure will take place with the PAPs, ensuring that the affected persons are informed about the intentions of outgrowers' schemes, and involvement of land owners in the scheme .

Following approval of the RAP, the process of implementation will take place. This will involve:

- Consultation (a continuation of the process entered into during RAP development process);
- Notification to affected parties;
- Documentation of assets;
- Agreement on compensation; and
- Preparation of contracts, compensation payments and provision of assistance in resettlement.

#### **6.4.5 Institutional Implementation Arrangements**

The two main agencies involved in implementation of the RAP will be the Ministry of Agriculture, Food Security and Cooperatives and the District Council of Bagamoyo. The MAFSC will oversee, coordinate and facilitate the implementation of the scheme. The IFAD will play a role of capacity building for out growers in the training and sensitization programs, this will be done in collaboration with the district Council officials. EcoEnergy will provide the technical support.

The National Irrigation Commission within the MAFSC, which will have representation on the Programme Coordination and Management Unit (PCMU) will be responsible for ensuring that compensation payments are included in the requests for funds and that they are allocated accordingly. The relevant departments at district level will provide a review and monitoring role and provide political and administrative support for the implementation of the RAP.

In keeping with Tanzanian's decentralization policy, the responsibility for the development and implementation of the RAP will be at District level, Ward and Village level. The extension teams will be responsible for undertaking training and follow up to determine whether compensation is done adequately as planned the PAPs and as required. As part of the institutional framework,

committees will be set up at village level to represent out-growers and community members and their views and concerns on the out growers schemes.

#### **6.4.6 Grievance Redress Mechanisms**

At the time that the RAP is approved, disclosure is made and individual compensation contracts are signed, affected individuals and households will have been informed of the process for expressing dissatisfaction and to seek redress. The grievance procedure will be simple and will be administered as far as possible, at the Village and Ward Level by the Compensation Committee to facilitate access by PAPs. All grievances concerning non-fulfillment of contracts, levels of compensation, or seizure of assets without compensation shall be addressed to the Village Executive Officer in writing copied to the Ward Executive Officer and District Level.

#### **6.4.7 Monitoring and Evaluation**

The arrangements for monitoring the resettlement and compensation activities will fit the overall monitoring programme, which will fall under the overall responsibility of the different executing agencies. Periodic evaluations will be made in order to determine whether the PAPs have been paid in full and before implementation of the schemes activities; and whether the PAPs enjoy the same or higher standard of living than before. A number of objectively verifiable indicators shall be used to monitor the impacts of the compensation and resettlement activities. These indicators will be targeted at quantitatively measuring the physical and socio-economic status of the PAPs, to determine and guide improvement in their social wellbeing. Therefore, monitoring indicators to be used for the RAP will have to be developed to respond to specific site conditions. In addition, an independent audit will take place on the completion of the RAP.

#### **6.4.8 Estimated Budget**

Because the exact unit prices, the number of people to be affected, and the scope of land acquisition are estimates, the exact figures will not be known until the RAPs are prepared.

### **6.5 Project Alternatives**

This section describes the various alternatives, including the “no project” alternative, considered for the establishment of the BASIC Programme.

#### **6.5.1 Choice of Crops**

The EcoEnergy Project has changed its emphasis from the production of ethanol to the production of sugar, although some ethanol will also be produced. Project alternatives for the EcoEnergy Project have been discussed in the ESIA that was conducted for that project, including alternative sites for the project within the country, options for other feedstocks, processing alternatives and alternatives for irrigation technology.

With regard to the choice of crops for the outgrowers' schemes, given that EcoEnergy is setting up a mill having a capacity to crush 1.3 million tons of sugarcane and producing 132,000 tons of sugar initially, there would be no point in growing any other type of cash crop for which no market is currently available or as easily accessible.

The outgrowers could grow irrigated food crops, but food crops grown on a large scale in effect become cash crops. Markets for food crops are not easily accessible at the moment – these are based in Dar es Salaam, or in Moshi and Arusha where irrigated horticulture is becoming increasingly important. If the communities were to grow food crops, EcoEnergy would have no reason to provide technical assistance, capacity building and other support to the villagers and their communities, as there would be little benefit for them in doing so. EcoEnergy would then argue, rightly, that it is the responsibility of the Government (through the Ministry of Agriculture, Food Security and Cooperatives and the District Agriculture Office) to provide technical support (such as capacity building, supply of inputs) and infrastructure support (eg access roads to market) to ensure that people are growing enough food for subsistence.

### **6.5.2 Outgrower Sites**

The selection of outgrower sites has been governed by the following factors:

- Availability of water;
- Suitability of soils for sugarcane production; and
- Proximity to the EcoEnergy mill.

With regard to water availability, the two perennial sources of water in Bagamoyo District are the Ruvu and the Wami Rivers. The Ruvu River is currently unable to support any further abstraction for irrigation purposes, especially for crops such as sugarcane that have a high demand. Therefore the Wami River was the only other alternative. Groundwater sources were not of suitable quality, or there if water quality was adequate, several boreholes would have to be drilled which would be an expensive option.

Soil types are crucial for the growing of sugarcane as they affect the productivity of the cane. Soils in some parts of the district are too saline or sodic, or the texture of the soils is not suitable for growing cane. The three scheme sites were also selected on the basis of having suitable soils.

In economic terms, proximity to the EcoEnergy mill was important, otherwise the cost of delivering the sugarcane to the mill would be higher the further the schemes were located away from the mill, and consequently net earnings received by the outgrowers for selling their cane to EcoEnergy would be lower.

### **6.5.3 Location of Infrastructure**

EcoEnergy's approach to developing the outgrowers' schemes emphasizes that the community should decide where bulk infrastructure – such as the roads, conveyance canals, secondary canals, transmission lines – will be located. For this EcoEnergy and the community begin a land use planning exercise so that the community understands what infrastructure is required, and with some technical advice/explanations, they discuss the various options available to them in order to make the most appropriate decisions as to where the infrastructure should be placed.

So far, the land use exercise for Matipwili has been completed, but has not been presented to the Village Assembly for approval. The land use plan for Kiwangwa is being developed at present while for Gama/Kitame the exercise has not yet commenced.

#### **6.5.4 Alternative Scheme Locations**

In the event that the dispute with Saadani NP is not resolved, alternative areas of land can be identified for irrigation instead of the Gama/Kitame scheme. For example, according to the Zonal Irrigation Engineers (pers. Comm. Eng Eng Nzobonaliba and Eng Rogers Ishengoma, December 2014), there is an abandoned rice scheme at Mkoko to the west of Kiwangwa which may offer a viable alternative location for growing cane. It is not clear whether any alternative locations were investigated, but according to EcoEnergy the Mkoko area would be too far to transport the cane to the factory. However, in that case consideration could be given to moving the location of the EcoEnergy Sugar Mill into the Biga West area so that it is closer to Mkoko.

#### **6.5.5 Water Storage Facilities**

A number of possible alternatives for water storage are being considered at the time of writing, namely:

- A 1.4 million m<sup>3</sup> off-river storage dam;
- A dam on the Wami River;
- Conversion of one or two oxbow lakes into off-river storage reservoirs;
- Water pans.

No feasibility or detailed investigations have been conducted to assess and compare the viability of these structures have been carried out as yet. It must be noted that for all options, detailed environmental and social assessments will have to be undertaken, and in the case of either of the dam options, the assessments must be carried out in line with guidelines issued by the World Commission on Dams (International Rivers, 2014).

#### **6.5.6 Cane Varieties**

EcoEnergy have established a 200 ha seed cane farm near Bagamoyo where various types of sugarcane varieties are being tested. The most suitable variety for the outgrowers' scheme will be selected on the basis of compatibility with soils, water availability and input requirements.

It is not anticipated that genetically modified sugarcane varieties will be used (GM cane for commercial plantations is has only recently been developed and is in its trial stages in Indonesia).

#### **6.5.7 Irrigation Technology**

In terms of irrigation technology two aspects were deliberated: application of water (irrigation) and weeding.

##### ***Irrigation***

With regard to watering (irrigating), the following irrigating methods were considered:

- i. Furrow irrigation – this is a fairly straightforward system similar to the one which the farmers on the pilot rice schemes are operating. However, furrow irrigation has high capital cost because of the land levelling required. It is also not suitable where the cultivation area is limited.



- ii. Drip irrigation – this was not considered suitable because of the local soil quality and the relative complexity of the filtration system that would have to be put in.
- iii. Centre pivot irrigation – this system has the advantage of having low capital cost per hectare, relatively low maintenance and running costs and a high application efficiency (85% efficiency rate).
- iv. Modified Drag line (MDL) is an overhead sprinkler system that will be used on the EcoEnergy estate. It is also would also be suitable for the outgrowers' schemes as it is much cheaper than other drag line systems, but it has a lower efficiency than the centre pivot method.

It is likely that a combination of these methods will be employed, although the centre pivot method is the favoured one but MDL overhead sprinkler system would be the most appropriate where centre pivots cannot be accommodated.

### **Weed Control**

The ESIA study for EcoEnergy's core estate and mill discussed options for the use of various methods of weed control. These options also apply to the BASIC Programme, and are reproduced here.

**Table 6.1: Comparison of Weed Control Alternatives**

<b>Alternatives for Weed Control</b>	<b>Chemical Weeding</b>	<b>Hand Weeding</b>	<b>Mechanical Weeding</b>	<b>Trash Blanket</b>
Advantages	<ul style="list-style-type: none"> <li>• Can cover a large area quickly</li> <li>• Residual action</li> <li>• Training can be low level</li> <li>• Can be selective</li> </ul>	<ul style="list-style-type: none"> <li>• Use of labour = money back into community</li> <li>• Little damage to crops</li> <li>• Unskilled labour can be employed</li> <li>• Can be selective</li> <li>• Generates negligible greenhouse gases</li> </ul>	<ul style="list-style-type: none"> <li>• Cover a large area relatively quickly</li> <li>• Disturbs soil crust, thus improving infiltration</li> </ul>	<ul style="list-style-type: none"> <li>• Little or no further treatment required once green cane harvesting is complete</li> <li>• Savings realised in energy and labour</li> <li>• Conserves water due to reduced evaporation from the soil</li> <li>• Organic matter returns to soil (trash decomposition)</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Risk of pollution if misused</li> <li>• Chemicals must be properly stored</li> <li>• Requires specific moist conditions to be effective</li> </ul>	<ul style="list-style-type: none"> <li>• Needs a lot of resources eg. supervisors, transport, salary payment system</li> <li>• Cannot be used during the rains (because weeds get transplanted)</li> </ul>	<ul style="list-style-type: none"> <li>• Non-selective on weeds</li> <li>• Generates greenhouse gases</li> <li>• Can result in compaction of the soil</li> <li>• Can only be used when cane is young</li> <li>• Damage to cane when turning</li> <li>• No residual effect</li> <li>• Application can be weather dependent</li> </ul>	<ul style="list-style-type: none"> <li>• Trash harbours other pests which attack the cane.</li> <li>• Retards germination</li> <li>• Trash blanket can pose a fire risk</li> </ul>

From: Ardhi University (2012)

Initially weeds will have to be controlled chemically because the trash blanket will not have been generated. Also, it is not known prior to cultivation what weeds will grow, and also it is likely that the soils will contain a high quantity of weed seeds. Once the cane is harvested for the first

time, the trash blanket can be generated, and biological control can be implemented, so that the use of chemicals for weeding is decreased.

#### **6.5.8 Alternative Programme Design**

In the event that the land dispute between Saadani National Park and EcoEnergy is not resolved in the near future, AfDB and IFAD could consider altering the focus of the BASIC Programme from sugarcane to other irrigable crops. This would of course mean that the Programme could not continue in its current form, and would necessitate revisiting the feasibility of the Programme, undertaking other studies and re-doing the ESIA; but the overall objectives of having a PPP within the agricultural sector, addressing food security as well as promoting socio-economic development, would likely still be met, if the project design were to be changed involving the cultivation of another type of cash crop.

#### **6.5.9 The “No Project” Option**

The BASIC Programme has several advantages. On the national level it is implementing the SAGCOT vision of commercialising smallholder agriculture. The schemes will also contribute to addressing the huge sugar deficit currently experienced in the country.

Currently much of the land selected for the outgrowers’ schemes is lying idle - present the villagers cultivate only a fraction of the land they have for food crops, and the rest of the land is left fallow. Adopting this novel approach to establishing outgrowers’ schemes provides an opportunity for the local communities to empower themselves so that they make their own choices at each stage of the process of establishing a sugarcane plantation. The project hopes to encourage the communities to work together as bonafide business entities, thereby stimulating wealth creation amongst them. The project will assist the communities to form companies and work for those same companies. The communities will still own the land within the schemes.

If there is no project, then the status quo will remain: land will continue to lie idle or will be sold to “outsiders” as is already happening at an astonishing rate. This will result in diminished livelihood options for the members of the community (this is already happening in the project area – pers. Comm. A. Namangaya, December 2014). They will then resort even more to poaching and/or charcoal production, which in turn will degrade the very environment that they depend on.

## **7 Environmental and Social Management Plan**

### **7.1 Environmental and Social Management**

A number of activities have to be carried out during the various phases of the project to ensure adequate environmental and social impact management. These include, but are not limited, to the following:

#### **Project Preparation**

- Revision of EcoEnergy's stakeholder communication and engagement programme;
- Preparation of Village Land Use Plans for the three outgrower villages;
- Ascertaining the location of bulk infrastructure;
- Verification of design details of the outgrowers' schemes and bulk infrastructure (eg. the dam, the bridge across the Wami River at Matipwili, access roads);
- Resolution of Saadani National Park boundary;
- Collection of baseline data for monitoring purposes (eg. river flows and water quality, meteorological conditions, wildlife movement, prawn fisheries in the Wami Estuary, inventory of PAPs);
- Conducting further studies during the detailed design phase the BASIC Programme;
- Preparing a RAP, and implementing it before construction begins;
- Training of outgrowers in environmental and social management;
- Inclusion of environmental specifications in Tender Documents, and development of Code of Conduct for the Contractor;
- Preparation of an occupational health and safety manual for use during project operation;
- Preparation of an emergency preparedness and response manual for use during operation;
- Preparation of a multi-faceted environmental and social awareness/sensitization programme to cover issues related to HIV/AIDS, road safety, child labour, indigenous plant species preservation; solid waste disposal, and deforestation.

#### **Construction**

- Incorporation of mitigation measures;
- Enforcement of occupational health and safety requirements (conditions at the Contractor's Yard, materials storage, condition of equipment, protective clothing, etc);
- Continuation of data collection on river flow, fisheries, meteorological conditions, etc;
- Disposal of construction, solid and sanitary wastes in an acceptable manner and in conformance with regulations;
- Ensuring that the Contractor is following the Code of Conduct and environmental specifications in the Tender Documents;
- Training the Contractor's workforce in environmental and social awareness and responsibility (including STD/HIV/AIDS awareness).
- Liaison with local administration and community leaders in matters of disturbance to the public, security issues, and siting of the Contractor's Yard.

## Operation

- Maintenance, calibration and checking of all equipment as specified in respective manuals or regulations (eg pumps, agricultural equipment);
- Monitoring leakage and spills;
- Collection of data on river flow and river water quality, fisheries, meteorological conditions, etc, to be used for analysis and remediation where necessary;
- Disposal of solid and sanitary wastes in an acceptable manner and in conformance with regulations;
- Compliance with occupational health and safety manual to be prepared during by scheme management during the project preparation phase;
- Environmental performance reporting (based on evaluation of data collected, investigations, etc).

Table 7.1 below presents an environmental and social management plan. It describes how each of the main mitigation measures proposed in Chapter 6 should be implemented, how frequently, and who should be responsible during and after construction.

Assuming the contract for the bulk infrastructure will be tendered out, prior to mobilisation, the Contractor should also prepare his own environmental management plan for review by the Site Supervisor. In his schedule of works, the Contractor must include all proposed mitigation measures, and the Supervising Engineer should ensure that the schedule and environmental and social management/monitoring plan are complied with. He must therefore be provided with the final environmental management plan. This will also lend a sense of ownership to the Contractor, in addition to instilling in him a thorough understanding of the pertinent issues.

The Contractor and the Site Supervisor should have qualified Environmental Specialists and Sociologists to ensure that environmental and social mitigation is implemented and environmental and social management plans are followed in accordance with national, as well as the financiers', requirements and standards.

**Table 7.1: Environmental and Social Management Plan**

Environmental/ Social Impact	Recommended Mitigation	Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)	Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)	Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation	Timing/ Frequency of verification	Estimated Cost of Mitigation
<b>ENVIRONMENTAL MITIGATION PLAN</b>						
Unavailability of water for irrigation and downstream use	- Design and install off river storage facilities, eg dam - Install rainwater harvesting infrastructure at farm offices and workshops	Design Consultant Contractor Site Supervisor Input from outgrowers	PCMU	(c) inspection (o) routine maintenance	(c) once a week during construction and on completion of each structure (o) once a year	(c) Included in Engineer's Estimate  (o) Included in O&M costs
	- Install water abstraction monitoring infrastructure (gauges) - Install infrastructure to measure flow levels in the river	Design Consultant Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(d) drawings available (c) inspection (o) records	(c) once a week during construction and on completion	tbd
	- Form Irrigator's Organisations	PCMU Outgrower Scheme Mgt WRBWO	PCMU Outgrower Scheme Mgt	(o) IO establishment certificate, minutes of meetings	(o) quarterly	tbd
	- Update environmental flow assessment to take into account developments/ abstractions since 2007	PCMU WRBWO	WRBWO	(d)(o)Independent EFA study	(d) once during design phase (o) update every 5 years	USD100,000 for the first assessment, USD 150,000 for next after 5 years
	- Use minimum irrigation water requirements during dry season.	n/a	PCMU, Outgrower Scheme Mgt	(o) water abstraction records	(o) during dry season and times of low flow	nil
	- Initiate the Wami River catchment protection programme	WRBWO	WRBWO	Programme developed, funding secured, programme progress reports	(o) quarterly	Estimate USD 20,000 in the first year, then years 2-5 USD 5,000 per year

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Deterioration of water quality	- Minimise/prevent soil erosion – see below	Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) inspection (o) routine maintenance	(c) daily; erosion control measures: during construction and on completion of each measure (o) once a month in dry season, once a week during rains	(c) Included in Engineer's Estimate (o) Included in O&M costs
	- Establish and maintain buffer zone along river bank	PCMU Contractor Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) once a month	(c) Included in Engineer's Estimate (o) Included in O&M costs
	- Drains from the cane fields should lead to a collection pond where the water can be tested and treated before discharge to the river	Design Consultant Contractor Site Supervisor	PCMU Outgrower Scheme Mgt	(c) inspection (o) inspection, waer quality testing	(c) daily (o) once a month in dry season, once a week during rains	(c) Included in Engineer's Estimate (o) Included in O&M costs
	- Install proper and maintain sanitation facilities which include a form of treatment	Design Consultant Contractor Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) once a month	(c) Included in Engineer's Estimate (o) Included in O&M costs
	- Minimise use of agrochemicals, explore organic/natural fertilizers, pesticides - Manual removal of weeds	n/a	PCMU Outgrower Scheme Mgt	(o) integrated pest management system in place, records of use of chemicals, records of drain water tests (o) records of manual weeders employed	(o) continuous	(o) Included in O&M costs
Air pollution – dust	- Watering exposed/ worked surfaces during construction - Controlling the speed of construction vehicles	Contractor Site Supervisor	n/a	(c) inspection	(c) daily, continuous	(c) Included in Engineer's Estimate

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Air pollution – particulates	- No field burning allowed - Create fire breaks	n/a	PCMU Outgrower Scheme Mgt	(o) farm inspection	(o) daily, continuous	(o) Included in O&M costs
Air pollution – GHG emissions	- Adopt zero tillage so carbon stored in soils - Adopt best practices for soil management to minimise ammonia/nitrates emissions following CA approaches	n/a	PCMU Outgrower Scheme Mgt	(o) farm inspection	(o) daily, continuous	(o) Included in O&M costs
Oil pollution – from fuel, oils and lubricants	- For bulk fuel – install fuel tank with bund of 110% capacity	Design Consultant Contractor Site Supervisor	n/a	(c) inspection	(c) during construction, and on completion	(c) Included in Engineer's Estimate
	- Train personnel handling oil products. - Establish procedures for fuel delivery; decanting/draining; use, storage; spill response; disposal of waste oil; handling of oil products.	Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) training records, procedures	(c) (o) continuous	(c) contractor's obligation (o) Included in O&M costs
	- Minimise need for having fuel oil on site – explore options for solar powered pumps or connect to national grid.	Design Consultant, Site Supervisor	n/a	(d) (c) alternative/ renewable energy sources identified, installed	(d) (c) during design stage	(c) Included in Engineer's Estimate
Noise quality	- Provide PPE to personnel working in areas exposed to excessive noise levels	Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) continuous	(c) Included in Engineer's Estimate (o) Included in O&M costs
Solid waste	- Dispose of construction waste and solid waste as per NEMC regulations	Contractor, Site Supervisor	n/a	(c) inspection	(c) continuous	(c) Included in Engineer's Estimate
	- Recycle, reuse, recover and reduce waste	Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) continuous	(c) Included in Engineer's Estimate (o) Included in O&M costs

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Drainage	<ul style="list-style-type: none"> <li>- Provide drainage for access roads</li> <li>- Levelling of sugarcane fields so allow drainage of excess water</li> </ul>	Design Consultant, Contractor, Site Supervisor	n/a	(c) inspection	(c) continuous	(c) Included in Engineer's Estimate
	<ul style="list-style-type: none"> <li>- Maintain drainage canals and other drainage structures</li> </ul>	n/a	PCMU Outgrower Scheme Mgt	(o) routine maintenance	(o) continuous	(o) Included in O&M costs
Soil erosion	<ul style="list-style-type: none"> <li>- Control earthworks</li> <li>- Install and maintain drainage structures</li> <li>- Install and maintain erosion control measures</li> </ul>	Contractor Site Supervisor	PCMU Outgrower Scheme Mgt	(c) inspection (o) routine maintenance	(c) earthworks - daily; erosion control measures - during construction and on completion of each measure (o) once a month in dry season, once a week during rains	(c) Included in Engineer's Estimate (o) Included in O&M costs
Soil degradation	<ul style="list-style-type: none"> <li>- Use best practices for growing cane, such as zero tillage or reduced tillage using CA approaches</li> <li>- Intercropping to strengthen soil structure;</li> <li>- Green fertilization, green harvesting, covering soil with cane straw (CA).</li> <li>- Implement Integrated Soil Conservation and Nutrient Management systems</li> </ul>	n/a	PCMU Outgrower Scheme Mgt	(o) inspection, systems and procedures in place	(o) continuous	(o) Included in O&M costs



<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Chemical pollution of soils, groundwater and surface water	<ul style="list-style-type: none"> <li>- Minimise use of agrochemicals, select natural organic alternatives</li> <li>- Careful supervision of application of chemicals, develop agrochemical management plan</li> <li>- Adopt CA techniques that reduce the need for use of agrochemicals</li> <li>- Follow Bonsucro requirements</li> <li>- Use agrochemicals approved by TPRI, Bonsucro, WHO and FAO</li> <li>- Set up an Integrated Pest Management system and draw up a pest management plan</li> <li>- Train persons exposed to chemicals in proper use, handling, storage, and disposal.</li> <li>- Ensure chemical containers are disposed of as hazardous waste</li> <li>- Keep records of chemicals used, application amounts.</li> </ul>	n/a	PCMU Outgrower Scheme Mgt	(o) inspection, systems and procedures in place	(o) continuous	(o) Included in O&M costs
Clearing of vegetation – impacts on biodiversity, soil erosion, carbon releases	<ul style="list-style-type: none"> <li>- Careful supervision of clearing activities so that only areas required for bulk infrastructure and agricultural infrastructure are cleared.</li> </ul>	Design Consultant, Contractor, Site Supervisor				(c) Included in Engineer's Estimate

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
	<ul style="list-style-type: none"> <li>- Assess impacts of inundation of dam on vegetation</li> <li>- Assess impacts of building the bridge at Matipwili on riparian vegetation</li> </ul>	Consultant	n/a	(d) Study report on environmental and social impacts of dam and bridge	(d) during design stage	Cost of further studies /ESIA update and RAP USD 150,000
Wildlife – human-wildlife conflicts	- Install electrical fences with outriggers, or a double barrier fence	Design Consultant, Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt a	(c) inspection (o) observations	(c) on completion of installation (o) continuous	(c) Included in Engineer's Estimate
	- Explore the use of beehive fences	Consultant Ecologist	PCMU Outgrower Scheme Mgt	(d) Study report (o) observations	(d) during design stage (o) continuous	Included in cost of further studies and RAP– see above Cost of fence to be determined
Wildlife – impacts on elephant migration	- Establish exact route elephants use	PCMU, TANAPA/SANAPA, District Wildlife Officer Consultant Ecologist, Design Consultant, Contractor, Site Supervisor	PCMU, TANAPA/SANAPA, District Wildlife Officer	(d) discussions, survey (o) observations, monitoring study	(d) during design stage (o) continuous observations for 5 year period	Included in cost of further studies – see above
	- Establish and maintain a biodiversity corridor from Saadani through EcoEnergy estate and outgrowers schemes	PCMU, SANAPA Design Consultant, Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) continuous	(c) Included in Engineer's Estimate (o) Included in O&M costs
Deforestation	- Establish community fuelwood plantations	PCMU Outgrower Scheme Mgt	PCMU Outgrower Scheme Mgt	(d) (c) plans for forest and woodland areas (o) inspection, land use monitoring	(d) during scheme design stage (c) (o) continuous	Included in BASIC Programme funding
Greenhouse gas emissions	- Adopt conservation agriculture practices including no burn, green harvesting and reduced use of agrochemicals	PCMU Outgrower Scheme Mgt	PCMU Outgrower Scheme Mgt	(o) observation	(o) continuous	Included in BASIC Programme funding

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
	<ul style="list-style-type: none"> <li>- Use molasses from cane ethanol production</li> <li>- Use bagasse for electricity generation</li> </ul>					
	<ul style="list-style-type: none"> <li>- Establish woodland forests and riverine forests</li> </ul>	PCMU Outgrower Scheme Mgt	PCMU Outgrower Scheme Mgt	(d) (c) plans for forest and woodland areas (o) inspection, land use monitoring	(c) (o) continuous	Included in BASIC Programme funding
Loss of biodiversity	<ul style="list-style-type: none"> <li>- Preserve/maintain remnant forest stands to preserve biodiversity</li> </ul>	Design Consultant, Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(c) (o) inspection	(c) (o) continuous	(c) Included in Engineer's Estimate (o) Included in O&M costs
	<ul style="list-style-type: none"> <li>- Community skills enhancement programme to include wildlife/bird guide training</li> </ul>	n/a	PCMU Outgrower Scheme Mgt SANAPA	(o) training records	(o) quarterly	USD 5,000 per year
Impact of sourcing materials for construction	<ul style="list-style-type: none"> <li>- Assess environmental impacts due to materials for construction</li> </ul>	Environmental Consultant	n/a	(d) Study report	(d) during design stage	Included in cost of further studies and RAP– see above see above
Workman's / Contractor's camp	<ul style="list-style-type: none"> <li>- Set up camp at same location as EcoEnergy construction camp</li> <li>- Alternatively consult village authorities to identify camp location</li> </ul>	Contractor, Site Supervisor	n/a	(c) inspection	(c) continuous	(c) Included in Engineer's Estimate
	<ul style="list-style-type: none"> <li>- Develop clear specifications for camps with regard to sanitation facilities, accommodation, provision of water, health and safety, etc.</li> </ul>	Site Supervisor	n/a	(c) inspection	(c) continuous	(c) Included in Engineer's Estimate

Environmental/ Social Impact	Recommended Mitigation	Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)	Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)	Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation	Timing/ Frequency of verification	Estimated Cost of Mitigation
<b>SOCIAL /SOCIO-ECONOMIC MITIGATION PLAN</b>						
Land use conflicts – Matipwili and EcoEnergy	- EcoEnergy to revive communication with Matipwili villagers	EcoEnergy, Matipwili community members	EcoEnergy, Matipwili community members	(d) meeting records	(d) during scheme design	Design costs
	- EcoEnergy to revise stakeholder communication/ outgrower engagement strategy	EcoEnergy, Outgrowers	EcoEnergy, Outgrowers	(d) Revised strateg	(d) during scheme design	nil
Land use conflicts – livestock keepers and farmers	- Develop village land use plans that provide land for livestock grazing	Village government, livestock keepers and farmers	n/a	(d) land use plans	(d) during scheme design	Design costs
	- Allow livestock access routes to Wami River	Village Governments, livestock keepers and farmers	PCMU, Outgrower Scheme Mgt	(d)(c) indicated in land use plans (o) observation	(d)(c) once to ensure implementation (o) continuously	Nil
	- Initiate programme to improve stock but reduce numbers	District Livestock and Fisheries Dept, Bagamoyo	District Livestock and Fisheries Dept, Bagamoyo			tbd
Growth of outgrower villages due to induced settlement	- Plan for population increase and consequent demand on public utilities - Interaction between local leadership, outgrowers and immigrants - Initiate campaigns for HIV/AIDS awareness, drug abuse prevention, security, etc	PCMU Village Governments	PCMU Village Governments	(d) (o) district budgets, workplans	(d) (o) continuous	tbd
	- Give employment preference to members of local communities	n/a	PCMU Outgrower Scheme Mgt	(o) employment records	(o) continuous	(o) Included in O&M costs

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Loss of land, (incl agricultural land), structures, trees and crops	- Develop land use plans to identify location of infrastructure and affected persons.	Village Government Outgrower village communities	n/a	(d) inventory, plans	(d) during design	Design cost
	- Verify identification of project affected people - Prepare RAP	RAP Consultant	n/a	(d) survey, meetings with local authorities, RAP Report	(d) RAP implemented before construction works begin.	(d) compensation amount to be determined when RAP completed
	- Implement RAP. - Compensation to be paid for land and all property on land to temporarily acquired for road construction works	PCMU RAP Consultant	n/a	(c) inspection (c) compensation payment records	(c) compensation paid once, after assessment of loss, before infrastructure is installed	As above
	- Restoration/ rehabilitation of land acquired temporarily for construction purpose	Contractor, Site Supervisor	n/a	(c) inspection	(c) at the end of construction	(c) Included in Engineer's Estimate
Threat to fisheries	- Establish updated environmental flows	PCMU WRBWO	WRBWO	(d)(o)Independent EFA study	(d) once during design phase (o) update every 5 years	See above
	- Careful application of agrochemicals, develop agrochemical management plan - Follow Bonsucro requirements - Monitor water quality in Wami River downstream of abstraction points	n/a	PCMU Outgrower Scheme Mgt	(o) integrated pest management system in place, records of use of chemicals, records of drain water tests (o) records of manual weederers employed	(o) continuous	(o) Included in O&M costs
Food insecurity	- Promote production of food crops in parallel to sugarcane - Provide support to farmers to improve food crop production	PCMU Outgrower Scheme Mgt, District Agricultural Extension Office	PCMU Outgrower Scheme Mgt, District Agricultural Extension Office	(c) (o) visits to farmers, farm inspections	(c) (o) monthly	(c) District agricultural extension budgets (o) Included in O&M costs

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Occupational health and safety	- Schemes must set up OHS committees - Comply with national OHS requirements and best practice	n/a	PCMU Outgrower Scheme management	(o) meeting records	(o) monthly committee meetings	(o) Included in O&M costs
HIV/AIDS	- Situational analysis of HIV/AIDS in project area	Consultant Sociologist	n/a	(d) situational report	(d) before construction phase	Included in cost of further studies and RAP– see above – see above
	- Workplace HIV/AIDS prevention and awareness programme	Contractor, Site Supervisor	PCMU Outgrower Scheme Mgt	(o) attendance records	(c) monthly	(c) Included in Engineer's Estimate (o) Included in O&M costs
Child labour	- Sensitise parents. - Outgrowers schemes should develop a labour policy prohibiting child labour	n/a	PCMU Outgrower Scheme Mgt, Ministry of Community Development, Gender and Children, Village authorities.	(o) minutes of meetings	(o) continuous	(o) Included in O&M costs
Disturbance to the public	- Sensitisation / awareness raising on project details, timing etc.	PCMU	n/a	(c) attendance records	(c) twice at each village before construction begins, then every month	(c) Included in Engineer's Estimate
	- Diligence on the part of construction workers to minimise disturbance to communities	Contractor, Site Supervisor	n/a	(c) inspection	(c) continuous	(c) Included in Engineer's Estimate
Road safety	- Implement road safety programme	PCMU, Contractor, Site Supervisor	n/a	(c) attendance records	(c) every month	(c) Included in Engineer's Estimate
Relocation of graves	- Identification and relocation of graves as per provisions in Graves (Removal) Act	RAP Consultant Contractor, Site Supervisor	n/a	(d) inventory	(d) during RAP study	Included in cost of further studies and RAP– see above

<b>Environmental/ Social Impact</b>	<b>Recommended Mitigation</b>	<b>Responsibility for intervention during design, construction of scheme (installation of bulk infrastructure and agricultural infrastructure)</b>	<b>Responsibility for implementing mitigation, during operation of scheme (cane cultivation and harvesting)</b>	<b>Means of implementation/ verification (d)= detailed design/ planning (c) = construction (o) = operation</b>	<b>Timing/ Frequency of verification</b>	<b>Estimated Cost of Mitigation</b>
Cultural sites	- Socio-ecological assessment to assess importance and value of remnant forest coppices in scheme areas which were used as burial sites or rituals.	Environmental Consultant or Sociologist PCMU	PCMU Outgrower Scheme Mgt	(d) study report (o) inspection	(d) during detailed design	USD 10,000
	- Before clearance of land and construction of bulk infrastructure, develop a procedure for chance finds to preserve and protect sites/assets of cultural importance.	Environmental Consultant or Sociologist PCMU	n/a	(d)(c) survey	(d)(c) Chance find procedure to be developed before construction begins, but applicable during construction	Included in the cost of further studies – see above
Loss of traditional plants and trees	- Identify and preserve traditional plants and trees of indigenous value, and sacred forests having cultural value	Environmental Consultant or Sociologist PCMU	n/a	(d) inventory	(d) before construction phase	Included in cost of further studies and RAP– see above – see above
	- Special plantations to grow and preserve indigenous tree/plant species of cultural value	n/a	PCMU Outgrower Scheme Mgt	(o) inspection	(o) continuous	USD5,000 per year

## **7.2 Institutional Set Up for the Operation of the Outgrower Schemes**

This section describes the institutional arrangements through which the implementation and management of the BASIC Programme will take place. The section outlines key executing institutions / agencies, provision of resources as well as roles and responsibilities. The programme will naturally involve both Public and Private sectors (PPP) in different phases and capacities and the key ones are outlined hereunder.

### **7.2.1 Programme Oversight**

Given the key role and the existing capacity of the Presidential Delivery Bureau (PDB) in achieving the goals of the BRN initiative, the PDB will be responsible for programme oversight. The PDB is able to call upon all Ministries and Departments of government for resolving bottlenecks, and MAFSC regularly reports to the Bureau on its implementation progress for this flagship programme, as required as it progresses towards achieving its other BRN objectives. The Bureau is available at all times to follow-up on key outstanding issues, and will specifically review the progress of the programme every six months, through programme progress reports, and monitoring the achievement of the Annual Work Programme and Budget (AWPB).

### **7.2.2 Programme Coordination and Management Unit (PCMU)**

A Project Coordination and Management Unit (PCMU) will be established and be based at Bagamoyo to oversee the day-to-day operations, coordination and management of project activities including all aspects related to environmental and social management and monitoring.

PCMU will be staffed with qualified personnel to enable it to effectively manage and supervise both field implementation and activities. It will have the following qualified professionals for the duration of the programme: Programme Manager, M&E officer, Process Managers (3) for Capacity Building, Irrigation Development and Wider Community Development, Financial Controller, and Procurement Officer. It will have the following staff as required, for shorter periods: Bulk Infrastructure Engineer and On-farm Development and Water Management Engineer (5 years), Climate and Environmental Officer, Agronomist, Livestock Officer, Agribusiness officer, Community Development Officer (gender, youth and HIV/AIDS) and Communications Officer for seven years. Support staff will include an administrative secretary, an administrative assistant, accounts assistant, procurement assistant and drivers.

In order to have successful implementation of the outgrowers' scheme and the industrial estate, the PCMU will have to closely and efficiently coordinate and harmonize planning, implementation, O&M and monitoring activities between the outgrowers, EcoEnergy and the GoT in a true PPP model. The PCMU will therefore have to continuously liaise with:

- **Ministry of Agriculture, Food Security and Cooperatives (MAFSC).** The MAFSC will be the Executing Agency and will house the PCMU and be responsible for the actual day to day implementation of the programme, providing technical inputs and advice to the out-growers through extension services. It will mobilize the relevant district officers (e.g. irrigation engineer, agricultural extension officers and water officers) in Bagamoyo to provide support to the outgrowers throughout the project life. It will ensure that the outgrowers grow a certain amount of food crops in parallel with sugarcane so as to ensure food security.



- **Bagamoyo EcoEnergy Ltd.** Bagamoyo EcoEnergy will be involved in all stages of the BASIC Programme. It will set up a Community and Outgrower Development Department which will work in partnership with the PCMU to provide capacity building for social cohesion, business development and operations, and sugarcane and food crop operations. During construction of the schemes they will provide support in terms of irrigation and farm design. They will coordinate between the outgrowers' schemes and the EcoEnergy's Agriculture and Infrastructure Department for the planning and implementation of infrastructure, and to train the outgrowers in scheme operation and maintenance. During scheme operation, they will draw up contracts between themselves and the outgrowers, in consultation with the Sugar Board of Tanzania, and provide a guaranteed market for the cane that the outgrowers produce.
- **Southern Agricultural Growth Corridor of Tanzania (SAGCOT).** SAGCOT will also have coordination-cum-supervisory role, particularly in terms of giving direction to facilitate the PPP aspects of the programme.
- **Ministry of Water.** The Ministry of Water, Department of Water Resources through the Wami-Ruvu Basin Water Office will be responsible for issuing water abstraction permits, and monitoring the amount of water abstracted. The outgrowers will have to obtain water user rights, and will be asked to form irrigator's organisations, in order that water use in the Wami River Sub-Basin can be monitored and managed.
- **Ministry of Lands, Housing and Human Settlements Development (MLHSD).** This ministry will ensure that the process of issuing the Certificates of Customary Rights of Occupancy (CCROs) is carried out and completed before beginning of the project. It will also be a key player in the resolution of land conflicts between Saadani National Park and Gama/Kitame and Matipwili villages, as well as Matipwili and Fukayosi villages.

### 7.2.3 Programme Integration at the District and Village Levels

Local authorities that will assist in the implementation of the project are:

- i. Bagamoyo District Council;
- ii. Ward Executive Offices for the villages within the project;
- iii. Village Governments under the project.

Programmes operating in the district are expected to follow the guidelines for decentralization by devolution. The Programme Manager will work closely with the District Council Management Team (CMT), which is the executive arm of the District Council Meeting. Other PCMU staff such as Community Development, Finance, Agronomist and Livestock Specialist will also be integral parts of the District Facilitation Team (DFT). Bagamoyo District staff from the relevant sector departments will be involved in the implementation of the project, for example, Agriculture and Irrigation, Community Development, Health, Education, Natural Resources, etc. This will allow for them to provide working support to their subject matter specialists that will function as facilitators in farmer field schools, especially for component two activities. The Programme Manager, in collaboration with CMT, will be responsible identifying capacity building needs of farmers and district staff, so that the programme can provide financing to respond to these needs. The Programme Manager will report back twice a year to the CMT about the status of capacity building activities.

The Ward and Village Governments will be responsible for assisting outgrowers to obtain access to land, keeping records related to project interventions in their villages and addressing emerging conflicts at their levels, for example, between livestock keepers and farmers. The WEO and VEO will also report to the District issues that are beyond their capacity to solve.

At village level, a process referred to as Opportunities and Obstacles to Development (O&OD) allows local planning to take place on an informed basis as development opportunities are discussed and prioritised. ASDP has sought to further enrich this process to capture issues beyond the social domain and more directly related to rural and agricultural development. This has led to the preparation of Village Agricultural Development Plans (VADPs), which are integrated within the District Agricultural Development Plan (DADP). BASIC will further support the “enhanced” O&OD process and bottom-up agricultural development planning process by taking it one step further towards village land use planning and implementing the resulting land use plans.

#### **7.2.4 Outgrowers Management Companies**

The outgrowers’ schemes will set up their management structures with guidance from the PCMU (particularly MAFSC, and EcoEnergy), so they will be able to operate the schemes in an environmentally and socially sustainable manner. It is estimated that between 25-30 companies will be set up comprising roughly 50 farmers each. The companies will appoint their own management personnel, and will employ either the farmers whose farms have become part of the schemes, or labourers sourced from the outgrower communities.

#### **7.2.5 Other Government Ministries and Agencies**

Other sector ministries/agencies will also be involved in the implementation of the project, either on a full time or ad hoc basis. These include:

- Ministry of Finance - the project will be implemented and will follow the National Public Financial Management System under the Ministry of Finance / Bank of Tanzania;
- TANESCO – construction of power transmission line to the outgrowers schemes and management of electricity;
- REA – to assist in sourcing finances for establishing a rural electrification scheme to serve the outgrower villages and farms;
- TANAPA – to deal with human-wildlife conflicts;
- NEMC – to ensure environmental compliance during construction and operation.
- Ministry of Natural Resources and Environment – to assist in the maintenance of the elephant migration corridor, and to assist in monitoring wildlife movement and numbers within the project area.
- Ministry of Energy and Minerals – as the sugarcane produced will contribute to the production of ethanol and bagasse for co-generation.
- Ministry of Infrastructure Development – to assist with the design and approval of the bridge across the Wami River, as well as road infrastructure to the project area.

Key players also include Sugar Board of Tanzania (SBT); Sugar Training and Research Institute of Tanzania (STRIT), and the Tanzania Network of Farmers’ Groups (MVIWATA). These institutions will be primarily involved in capacity building for both the district personnel, in particular staff from the District Agriculture Office.

### **7.2.6 Financing**

Financing is being sought from the African Development Bank (AfDB) and the International Fund for Agricultural Development (IFAD). As a condition of financing, these organizations require environmental and social safeguards to be implemented at all stages of the project (see Chapter 3). A financial analysis is presented in Chapter 9.

### **7.2.7 Institutional Responsibilities for the Implementation of the ESMP**

During the construction of the bulk infrastructure and putting up the agricultural infrastructure, and the defects liability period, the Contractor will be responsible for implementing the proposed mitigation measures, but the responsibility for supervision and to ensure that mitigation is actually implemented will lie with the Site Supervisor (or Engineer). However, the overall responsibility in all phases of the project lies with the Programme Coordination and Management Unit. The outgrowers' management will assist the PCMU in ensuring that emerging environmental and social issues are appropriately addressed.

When the scheme is operational, the respective scheme managements will be responsible for the implementation of mitigation measures and the ESMP, and will be guided by PCMU and EcoEnergy.

## **7.3 Other Measures to Enhance Environmental Management**

### **Training**

It will be necessary to give the outgrowers management teams training in environmental management. The level and contents of training required will depend on the qualifications of the members of staff, and their particular responsibilities.

Training should focus on imparting an understanding of the rationale for incorporating recommended mitigation measures, and the importance of implementing the monitoring plan.

Certain members of staff may have to undergo specialised training so that they are capable of implementing the monitoring plan, as well as sorting, storing, analysing and evaluating all the data that is collected.

### **Occupational Health and Safety Manual**

Before commencement of operations, an Operational Health and Safety Manual should be prepared which will describe, among others, day to day precautions which must be taken in order to render the outgrowers schemes, the dam, farm equipment, etc, safe for workers and the public, and so that the necessary safety equipment and protective gear is available and is used.

### **Integrated Management Systems**

A number of management systems/programmes/plans will be developed with assistance from EcoEnergy in order to ensure protection of environmental resources. These include:

- Integrated pest management programme;
- Integrated crop management programme;

- Integrated soil conservation and nutrient management programme;
- Integrated water resources management programme;
- Chemical management plan.

### **Emergency Preparedness and Response Plan**

Also before operation commences, an emergency preparedness response plan should be prepared to cover emergencies resulting from floods, fire, sabotage, drought and spills. The plan should focus on, inter alia:

- Safety training;
- Evacuation procedures;
- Public relations during an emergency.

### **Solid and Hazardous Waste Management Plan**

During construction, the contractor will have to develop and implement his Solid Waste Management Plan. During operation, the outgrower scheme managements will have to develop their own Solid Waste Management Plan.

In order to initiate good management practice for solid waste on the schemes, a policy of reducing, recycling, recovering and reusing waste will be introduced. All waste will be segregated at source. An inventory of waste streams will be prepared, and the types of waste categorised (in accordance with NEMC's guidelines on the classification of wastes). The quantity of waste generated should be determined. Thereafter the best methods of disposal for each type of waste will be identified.

The Waste Management Plan (WMP) Plan will specify provisions for re-use or recycling and disposal of wastes including solid and hazardous waste. The scope of WMP will include actions to be taken by Contractor (including Subcontractors personnel) for the management and proper and safe disposal of waste materials generated by the project activities.

A specific area at each scheme will be allocated for all waste storage, with appropriate signage and containment. Training of relevant personnel in the correct the storage and disposal of waste should be undertaken. Medical waste containers should be kept in specified containers and disposed of in accordance with NEMC guidelines. All outgrowers and persons involved in the schemes will need to be sensitised on disposal procedures for solid wastes, particularly those emanating from their respective areas of the schemes. A procedure should be developed for the disposal of clean up materials after a fire or a major spill.

## **7.4 Complementary Initiatives**

Included in Table 7.1 above, are three complementary initiatives which would enhance the overall objectives of this project. These are:

- A Wami River Sub Basin catchment conservation programme;
- A programme to enhance the value of traditional plants and trees;
- Training of members of the community in guiding/ecotourism ventures.

The Wami River Sub Basin catchment conservation programme would have to be initiated by WRBWO, as this would be beyond the scope and resources of the BASIC Programme. However, the other two initiatives can be done under the skills development or community outreach components of the BASIC Programme.

In addition, as recommended in the Water Resources Management and Development in Wami/Ruvu Basin (JICA, 2013), WRBWO is proposing to construct three reservoirs upstream of Mandera in order to harvest excess water from the Wami River during high flows. This is expected to ensure water availability in the Wami River during the dry season. The cost of these reservoirs has not been established as yet.

## 7.5 Environmental & Social Management Costs

Many of the costs associated with environmental management are included in the design costs, the cost of conducting further studies and preparing / implementing the RAP, as well as costs included in the Engineer's Estimate, and normal operating and maintenance costs. Compensation costs will be determined during the RAP. Once more definite details on the scheme design are known, the recommended further studies will establish mitigation costs more accurately. As it is not possible to predict costs on a long term basis, additional environmental and social management costs are provided for the first year, and then for the second to fifth years. The major costs over and above the afore-mentioned are summarised below.

**Table 7.2: Additional Environmental and Social Management Costs**

Cost Item	Costs in Year 1 USD	Cost in Years 2- 5 USD
<b>Management Intervention</b>		
Further studies, ESIA update and RAP	160,000	
Environmental flow assessments	100,000	150,000
Complementary initiatives <ul style="list-style-type: none"> <li>Catchment conservation, enhancing value of traditional plants, ecotourism training</li> </ul>	30,000	60,000
<b>Total Additional Management Costs USD</b>	<b>290,000</b>	<b>210,000</b>

## **8 Environmental and Social Monitoring Plan**

### **8.1 Introduction**

Monitoring is a long-term process, which should begin during construction and continue throughout the life of the project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. Monitoring involves the continuous or periodic review of construction and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted and averted.

The overall objective of environmental and social monitoring is to ensure that recommended mitigation measures are incorporated, and that activities carried out during construction and operation are environmentally and socially acceptable, and therefore sustainable.

### **8.2 Monitoring Indicators**

In identifying performance indicators, it is important to select indicators that are simple to monitor, and which will not necessitate the use of highly technical equipment or require specialized training. Performance targets have to be established before performance indicators are identified. In the case of this project, five overall performance targets can be put forward to cover the construction, operation and maintenance phases of the project.

- i. Improved environmental management;
- ii. Improved social management;
- iii. Enhanced occupational health and safety;
- iv. Increased gender sensitivity;
- v. Increased capacity at institutional level.

Various project impacts and aspects relate to these overall performance targets. When the activities and indicators are established, the first activity is to collect baseline data which serves as a benchmark and against which changes in the identified indicators can be measured. The types of parameters that can be monitored may include mitigation measures or design features, or actual impacts. In some cases, such as drainage structures and soil conservation interventions, monitoring is fairly straightforward and can be done as part of routine or periodic maintenance. However, other parameters, particularly those related to socio-economic and ecological issues can only be effectively assessed over a period of 2 to 5 years.

The monitoring plan in Table 8.1 below lists the indicators that should be monitored during the course of this project. It describes parameters that can be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action.

**Table 8.1: Environmental and Social Monitoring Plan**

Parameter	Activity	Performance Indicator	Baseline data	Responsibility for monitoring during design, construction	Responsibility for monitoring during scheme operation	Monitoring means d) = design (c) = construction (o) = operation	Recommended frequency of monitoring	Estimated Monitoring Costs
<b>ENVIRONMENTAL MONITORING</b>								
Water availability	Monitor water levels in Wami River	Gauge reading	Zero reading on gauge (average flow)	PCMU, Outgrowers Scheme management	PCMU, Outgrowers Scheme management	(c) (o) inspection, Monitoring records	(c) (o) daily	Included in O&M costs
	Monitor abstraction rates	Volume of water abstracted l/s	Permitted abstraction rate (from WRBWO)		PCMU, Outgrowers Scheme management	(c) (o) inspection, Monitoring records	(c) (o) daily	Included in O&M costs
Water quality in Wami River	Monitor water quality at given sample sites downstream of abstraction points	pH, salinity, EC, suspended solids, nitrates, phosphates, POPs, heavy metals concentrations in river water	Results of sampling of these parameters at given sites as baseline		PCMU, Outgrowers Scheme management	(d) baseline sampling (c) (o) test results	(d) once to set baseline (c) 2 samples per year (dry/rainy season) (o) 2 samples per year (dry/rainy season)	USD10,000 per year
Agrochemical releases into irrigation drains	Monitor water quality at given sample sites along drainage network, at collection pond, and point of discharge to river	pH, salinity, EC, suspended solids, nitrates, phosphates, POPs, heavy metals concentrations in river water	Results of sampling of these parameters at given sites as baseline		PCMU, Outgrowers Scheme management	(d) baseline sampling (c) (o) test results	(d) once to set baseline (c) 2 samples per year (dry/rainy season) (o) 2 samples per year (dry/rainy season)	As above
Agrochemical concentrations in fish populations	Monitor levels of pollutants from agrochemicals in fish	POPs, heavy metals concentrations in fish and shellfish in estuary	Results of sampling of these parameters of fish and shellfish at given points as baseline		PCMU, Outgrowers Scheme management	(d) baseline sampling (c) (o) test results	(d) once to set baseline (c) 1 samples per year (o) 1 samples per year	USD5,000 per year

Parameter	Activity	Performance Indicator	Baseline data	Responsibility for monitoring during design, construction	Responsibility for monitoring during scheme operation	Monitoring means d) = design (c) = construction (o) = operation	Recommended frequency of monitoring	Estimated Monitoring Costs
Soil erosion	Monitor erosion	Amount of siltation in drains (access roads and irrigation canals)	Zero siltation	Contractor, Site Supervisor	PCMU, Outgrowers Scheme management	(c) (o) visual inspection, records	(c) (o) monthly in dry season, weekly during rains	Included in O&M costs
	Monitor efficiency of erosion control measures	Amount of erosion in drains (access roads and irrigation canals)	Zero erosion	Contractor, Site Supervisor	PCMU, Outgrowers Scheme management	(c) (o) visual inspection, records	(c) (o) monthly in dry season, weekly during rains	Included in O&M costs
Soil quality	Monitor quality of soil for nutrient depletion and loss in structure and agrochemical contamination	Carbon content, Soil cohesiveness, pH, salinity, EC, suspended solids, nitrates, phosphates, POPs, heavy metals	Results of sampling of these parameters as baseline	PCMU	Outgrowers Scheme management	(d) baseline sampling (c) (o) test results	(d) once to set baseline (c) 1 samples per year (o) 1 samples per year	USD5,000 per year
Elephant migration	Monitor elephant movements, frequency of migration and times of year	Elephant sightings	Last recorded sighting – date, location, number of elephants and direction of movement. Records at SANAPA and District Wildlife Office	PCMU, SANAPA District Wildlife Officer	PCMU, SANAPA District Wildlife Officer	(d) baseline study (o) Independent study	(d)(c)(o) continuously for 5 years, extendable	USD100,000
<b>SOCIAL MONITORING</b>								
Economic activity in project area	Monitor changes in agricultural production and marketing	Crop yields - % sold - % consumed at home	Data from baseline study Records from District Agriculture Office	n/a	PCMU District Agriculture Office	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	USD50,000 for baseline USD50,000 for follow up
		Farming methods - % farmers adopting new farming methods	Data from baseline study. Records from District Agriculture Office	n/a	PCMU District Agriculture Office	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	



Parameter	Activity	Performance Indicator	Baseline data	Responsibility for monitoring during design, construction	Responsibility for monitoring during scheme operation	Monitoring means d) = design (c) = construction (o) = operation	Recommended frequency of monitoring	Estimated Monitoring Costs
		Food security - No. of times villages receiving food aid - Amount of food received as aid	Records from VEO/WEO	n/a	PCMU VEO, WEO District Agriculture Office	(o) Independent studies	(o) at start of scheme operation, then once in 5 years	
	Monitor changes in trade and commercial activities	- No. of people involved in trade and commerce - New industries and enterprises established	Data from baseline study District Trade Officer	n/a	PCMU District Trade & Industry Officer/ District Planner	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	
Socio-economic status	Monitor changes in poverty levels	- Monthly income earned - Monthly expenditure - Assets in households - Materials used for house structures	Data from baseline study, National Household Survey	n/a	PCMU	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	USD50,000 for baseline USD50,000 for follow up
	Monitor changes in health status	- No. of people visiting health facilities - Morbidity rates - HIV/AIDS infection rates	Data from baseline study, Records from district Health officer, District HIV Coordinator	n/a	PCMU District Health Officer District HIV Coordinator	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	
	Monitor changes in education levels	- Literacy levels - School enrolment - Dropout rates	Data from baseline study, Records from district education officers	n/a	PCMU	(d) baseline study (o) Independent studies	(o) at start of scheme operation, then once in 5 years	
	Monitor changes in crime rates/prostitution	- % increase in number of incidents reported	Records at the police stations in the project area	District Police Officer	PCMU Police Village government	(o) Independent studies	(o) at start of scheme operation, then once in 5 years	

<b>Parameter</b>	<b>Activity</b>	<b>Performance Indicator</b>	<b>Baseline data</b>	<b>Responsibility for monitoring during design, construction</b>	<b>Responsibility for monitoring during scheme operation</b>	<b>Monitoring means d) = design (c) = construction (o) = operation</b>	<b>Recommended frequency of monitoring</b>	<b>Estimated Monitoring Costs</b>
	Monitor changes in employment levels for both women and men	- Number of men and women employed on outgrowers schemes	Records from the EcoEnergy and the out growers companies	n/a	PCMU Outgrowers scheme management	(o) employment contracts, records	(o) quarterly	

IFAD has indicated that it will commission the Stockholm Environment Institute to carry out baseline studies and thereafter long-term monitoring of the entire BASIC Programme.

The initial baseline proposal focuses on four key areas of sustainability:

- i. **Livelihood Changes and Community Resilience.** This will build on the existing data for socio-economic livelihood dimensions (household and community level), and most critically fill in the existing gaps in terms of baseline data. Relevant and appropriate livelihoods dimensions will be addressed, that is physical, social, economic, financial and natural capital, including aspects such as agricultural production and marketing, farming methods, trade and commercial activities, poverty levels, health status (particularly an HIV/AIDS situational analysis), and education levels in the Programme area.
- ii. **Water and Nutrient Resource Management;**
- iii. **Greenhouse Gas and Energy Balances;**
- iv. **Ecosystem Services.** This would include various sub-activities relevant to ecosystem services:
  - A baseline to assess the impact of water quality on key indicator species of fish/aquatic ecology and prawn fishery at the mouth of the Wami river as a result of pesticides or other agrochemicals entering the Wami River.
  - A baseline on the the cultural services within the landscape will be developed to include sites for which they attach spiritual and sentimental values, such as the sacred forests and oxbow lakes.
  - Soil quality will be monitored.
  - Water flow assessments will generate information on availability and potential allocation of water for different competing uses.
  - A baseline for biodiversity which will cover large mammal wildlife such as elephants, and based on this, and available studies/data, it can be determined, if, how and to what extent elephants movements lead to human-wildlife conflicts in the area.

### **8.3 Environmental & Social Monitoring Costs**

Table 8.2 gives a summary of monitoring costs for the first year, and then for years 2 to 5. Monitoring costs will have to be updated after that.

**Table 8.2: Monitoring Costs**

<b>Monitoring Parameter</b>	<b>Costs in Year 1 USD</b>	<b>Cost inYears 2- 5 USD</b>
Water quality testing	10,000	40,000
Agrochemical concentrations in fish populations	5,000	20,000
Soil quality	5,000	20,000
Elephant migration study	50,000	50,000
Economic activity in project area (including food security)	50,000	50,000
Socio-economic status	50,000	50,000
<b>TOTAL MONITORING COSTS USD</b>	<b>170,000</b>	<b>230,000</b>

## **9 Cost Benefit Analysis**

### **9.1 Sugarcane Outgrower Development Financial Models**

The programme aims to develop outgrower companies producing irrigated sugar cane and another food crop if company members choose. The companies will be using modern irrigation and climate-smart mechanised farming technologies of their choice, in line with the soil characteristics, water availability and sugar crop varieties to achieve high levels of land and labour productivity. Illustrative models for farms of different sizes with different areas of sugarcane and rice have been developed. These four illustrative company models have been developed to show the expected financial returns per ha of crop cultivated, the investments required per hectare, as well as the scope of the estimated financial outlay per company, the type and source of financing obtained, and the financial returns to the company, without and with financing, as well as the internal financial rate of returns. The first three models show the variance of returns for three different areas covered by sugarcane, and the fourth model shows the returns for a greater area of rice cropping. The four models are:

- Model 1: 80 ha of sugarcane with 10 ha of irrigated rice
- Model 2: 125 ha of sugarcane with 10 ha of irrigated rice
- Model 3: 150 ha of sugarcane with 10 ha of irrigated rice
- Model 4: 125 ha of sugarcane with 40 ha of irrigated rice

Each company will be operated and managed by a professional management and technical staff that will be directed by the board elected by the shareholders of the company. The cost of company management covers staff costs for: the management committee, a farm manager, clerical staff, permanent skilled and unskilled labour; as well other operating overheads such as insurance, clothing and equipment, soil tests communication, accounting and auditing feeds, water and electricity, maintenance of irrigation and farm equipment, the cane growers levy and the annual charge for bulk infrastructure. The staff costs are largely fixed irrespective of the farm size, while the other overheads vary as a function of the size of the farm.

### **9.2 Company Investment Costs**

The investment cost for the four models of outgrower companies for cane and rice cropping has been developed on the basis on information collected by the mission from a variety of sources, including from EcoEnergy (with the actual costs from its completed procurements) and Illovo in Kilombero which has purchased new irrigation equipment in 2012-13 for about one quarter of its cane operations. The assumptions for the investment costs are broken down in four categories:

- Civil works for land preparation on land which is not currently utilised for farming, which include land clearing, stump removal, ploughing, construction of on-farm drain networks and farm roads, and bringing power from the farm boundary to where it is required (US\$2,000/ha);
- Irrigation Investment for the installation of either modified drag-lines (MDLs) or pivot, including the pipes and equipment, farm-specific water storage and electrical pumping

stations, the construction of a farm office, agrochemical storage area, shed(s) and fencing. The cost of MDLs is estimated at about US\$2,300/ha, while pivot is about US\$3,300/ha. Companies will determine the type of irrigation they wish to install depending of the area covered. An average irrigation investment cost of US\$3,000/ha has been used as a proxy in the illustrative models.

- Farm equipment including tractors, tip trailer, accessories for no till cropping, a cane harvester and other miscellaneous equipment. Some of the farm equipment items are of a specific size, so the larger the farm, the lower the per hectare cost for farm equipment investment. The equipment for sugar cane is more costly than that for rice, mainly due to the green harvester cost.
- Sugarcane crop establishment is an investment cost, because of the 7 year duration of the crop. The cost of crop establishment is US\$1,889 and includes ridging, the purchase of seed cane from EcoEnergy, agricultural chemicals, and planting. There is no “establishment” cost for rice as these costs are included in the crop budget.

The cost per hectare cost by type of investment by model is presented below in Table 9.1. It assumes that most of the costs are scalable, except for those for on-farm equipment.

**Table 9.1: Estimated Investment Costs/Hectare by Type of Investment**

Type of investment	Model 1 (80+10 ha)	Model 2 (125+10 ha)	Model 3 (150+10 ha)	Model 4 (125+40 ha)
Land preparation	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000
Irrigation Equipment	\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000
Farm Equipment-Sugar	\$ 2,330	\$ 1,592	\$ 1,373	\$ 1,592
Farm Equipment-Rice	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000
Sugarcane Crop Est.	\$ 1,900	\$ 1,900	\$ 1,900	\$ 1,900

### 9.2.1 Total Company Investment Costs

The total investment costs (civil works, irrigation and farm equipment and sugarcane establishment) for establishing each of the four model companies, 90 hectare, 135 hectare, 160 hectare and 165 hectare are summarised below in Table 9.2. Civil works for land preparation will be undertaken as part of on-farm construction works and directly paid from the IFAD loan; the cost of these works will be included in the companies balance sheets so they have a positive financial position when requesting bank loans, and are an equity contribution by IFAD. The total investment cost and estimated financing amounts by company size are shown below.

**Table 9.2: Cost of Investments by Type of Investment and Financing Requirement**

Type of investment (sugar & rice)	Model 1 (80+10 ha)	Model 2 (125+10 ha)	Model 3 (150+10 ha)	Model 4 (125+40 ha)
Civil works (equity)	\$ 180 000	\$ 270 000	\$ 320 000	\$ 330 000
Irrigation & farm equip (8 yr loan)	\$ 466 400	\$ 614 000	\$ 696 000	\$ 734 000
Cane establishment (3 yr loan)	\$ 151 120	\$ 236 125	\$ 283 350	\$ 236 125
<b>Total company investment</b>	<b>\$ 797 520</b>	<b>\$ 1 120 125</b>	<b>\$ 1 299 350</b>	<b>\$ 1 300 125</b>
<b>Company financing (irr&amp;farm equip +cane)</b>	<b>\$ 617 520</b>	<b>\$ 850 125</b>	<b>\$ 979 350</b>	<b>\$ 970 125</b>

### 9.3 *Financing*

IFAD will provide finance land preparation as a contribution to company equity as well as making an equity contribution to offset the increased cost of equipment and farm operating costs associated with implementing climate-smart cropping practices and green harvesting. The purchase of farm and irrigation equipment is to be financed by the AfDB for 70% of the cost, with a 10% financial contribution by farmers, and a 20% equity contribution by IFAD, with repayment over 8 years at 12% interest. The cost of cane establishment will be financed 100% through commercial loans, as banks are already providing this type of financing to smallholder sugar cane outgrowers, repayable over 3 years at 12% interest. The table below summarises the investment costs and the financing share of each investment. Short-term bank financing will also be obtained to cover the variable and operating costs of cane and paddy production, for an average of four months costs. Table 9.3 summarises the financing percentages:

**Table 9.3: Financing of Company Investments by Type**

Type of investment	Financing Percentage			
	IFAD	AfDB	Loan	Farmers
Civil Works (equity)	90%			10%
Irrigation & Farm Equipment	20%	70%		10%
Sugarcane Crop Est.			100%	
Variable & Operating Cost			100%	

#### 9.3.1 Depreciation (Capital replacement costs)

The provision for depreciation is crucial for farm sustainability. Without it, the farm companies will gradually erode their capital and eventually fail. With proper provision for depreciation, companies would not need to borrow to replace capital items when their replacement is due, thus ensuring sustainability of the investment. The deposit of depreciation into a capital savings account is critical to the long term sustainability of the companies, and there will be intensive training and monitoring of this aspect of financial management. Companies will be encouraged and enabled to deposit these provisions into savings accounts, preferably with the banks financing their loans, from year 2 of operations, so these depreciation savings accounts can be considered can be used as a form of security for later bank financing for expansion.

#### 9.3.2 Crop budgets

Two crop budgets for the outgrower companies have been developed, one for irrigated sugarcane and one for irrigated paddy. The crop budgets present the total annual gross revenue and costs, to show the gross margin earned for each of the crops.

#### 9.3.3 Sugarcane Gross Margin Analysis

The analysis has been developed from the information provided by EcoEnergy based on their cane financial model for the nucleus estate, and adapted to the specific conditions and costs expected for the outgrower companies. The crop budget is based on the following assumptions:

- Irrigated sugar cane is establish in year 1 and harvested for 7 years, when the cane is replanted. The model assumes cane yields of 120 t/ha the first year after planting, which declines to 91 t/ha by year 8. Cane is replanted in year 9, with yields starting at 103 t/ha

reaching 111 t/ha and gradually declining until the end of the second planting cycle. The average yield is 95 t/ha

- The base case assumptions for the four models are (a) an international sugar price of \$367/ton with a 100% tariff being applied by GOT to imports for a national price of \$735/t, and (b) a sucrose content estimated at 13.5%, the percentage achieved by the nucleus estate, because the outgrower company will be using the same cane varieties, irrigation, cropping and harvesting technologies as those used by the nucleus estate, with substantial capacity building.
- The price paid to outgrower companies for their cane is based on the division of proceeds formula (based only on sugar production which represents 87% of the proceeds from cane processing), with 53% for outgrowers and 47% for the miller.
- The unit costs for sugarcane production for one hectare include annual land preparation, the purchase and application of agricultural chemicals, weeding, and irrigation, along with the variable costs, which include harvesting and transport based on the level of yields achieved each year for two sugar crop cycles over a 15 year period.

Gross annual revenue for sugarcane over a 15 year period averages US\$5,360 per hectare per year; variable costs for production, harvesting and transport fluctuate due to the gradual decline in yields, averaging US\$1,980 per hectare per year, resulting in an gross margin per hectare of cane of US\$3,380 per year for 15 years.

#### **9.3.4 Gross Margins for Rice**

The analysis is based on the experience gained with irrigated rice in Tanzania and similar areas in southern Africa. The crop budget is based on the following assumptions: the expected yield is a conservative 5 tonnes of paddy/ha per crop and a farm gate price of US\$ 350/t. The average variable costs include fertiliser, the application of agricultural chemicals, manual harvesting and transport. The gross annual revenue per crop/ha is US\$1,750, the variable cost is US\$1,110, resulting in a gross margin of US\$ 640 per hectare.

#### **9.3.5 Cropping Patterns for Both Crops**

The company cropping pattern is assumed to be 80 per cent of the total area for sugarcane planted in year 1 and the balance of 20 per cent planted in year 2. The cropping pattern for paddy, with a cropping intensity of 1 in year 1, rising to 2 in year 2, and 2.5 in year 3 and continued for the duration of the model.

### **9.4 Results of Company Models**

The financial model brings together all of the above investments and operating costs, to show the company cash flow over a 15 year period, with and without financing. The charges for bulk infrastructure for the first two years have been reduced because of lower initial demand for water and no initial need for bulk infrastructure maintenance and capital replacement. Full depreciation has been included in the model. The cost of sales is a most important indicator of the robustness of the investment. The model is based on farmers being paid only for the sugar processed from their cane, but it is expected that all proceeds will be included in the DOP, so farmers will earn about 10-13% than project in the model. With a cost of sales of 68-74%, the analysis demonstrates that company cane and rice production can withstand even substantial increases in

costs or reductions in prices received or yields obtained. Table 9.4 below summarises the returns by size of company, and shows the internal rate of return, with and without financing.

**Table 9.4: Summary of Sugarcane Company Models Financial Analysis**

<b>Sugarcane+Rice</b>	<b>Mod 80+10</b>	<b>Mod 125+10</b>	<b>Mod 150+10</b>	<b>Mod 125+40</b>
<b>Crop budget</b>				
average cane gross revenue (\$/ha) - 15 yrs	\$5,354	\$5,354	\$5,354	\$5,354
average cane gross margin (\$/ha) - 15 yrs	\$3,374	\$3,374	\$3,374	\$3,374
average rice gross revenue (\$/ha) - 15 yrs	\$1,750	\$1,750	\$1,750	\$1,750
average rice gross margin (\$/ha) - 15 yrs	\$587	\$587	\$587	\$587
<b>Company investment costs</b>				
Cost irrigation equip/ha	\$3,000	\$3,000	\$3,000	\$3,000
Cost farm equip/ha	\$2,330	\$1,592	\$1,373	\$1,592
Seed cane/ha	\$1,889	\$1,889	\$1,889	\$1,889
Total cost/ha - sugar	\$7,219	\$6,481	\$6,262	\$6,481
Total cost/ha - rice	\$4,000	\$4,000	\$4,000	\$4,000
<b>Company annual operating costs</b>				
Annual overhead operating costs	\$106,301	\$130,016	\$143,191	\$140,906
Per ha average	\$1,181	\$963	\$895	\$854
Annual depreciation	\$55,209	\$74,732	\$85,579	\$82,832
Per ha average	\$613	\$554	\$535	\$502
<b>Company returns</b>				
average cash flow cane (\$/ha)-15 yrs	\$1,320	\$1,700	\$1,742	\$1,554
average cash flow rice (\$/ha) -15 yrs, 2.5 crop intens	\$1,446	\$1,446	\$1,467	\$1,577
cost of sales %	74%	68%	66%	69%
average yr 2-9 incl loan repayment (\$/ha)	\$361	\$790	\$895	\$718
average yr 10-15 after loan repayment (\$/ha)	\$1,161	\$1,515	\$1,626	\$1,403
IRR without financing	16%	25%	28%	26%
IRR with financing	3%	11%	0%	14%

#### 9.4.1 Analysis

The above table shows that on a per hectare basis, annual operating costs and depreciation are more expensive the smaller the company, while the average cash flow per hectare is higher the bigger the company. Cash flow for the 90 hectare company after loan repayment in years 2-9 is US\$361 per hectare, which about 45-50% less than the average cash flow of US\$ 718-895 of the three other larger companies. These differences are clearly brought out of the internal rate of return calculations without and with financing, which show that the 90 ha company has a financial internal rate of return (FIRR) of 16% without financing, but this drops to only 3% with financing. The larger companies are more robust, with FIRRs of 25-28% without financing and 11-14% with financing. While all four companies are financially viable, the smaller the company the great the challenge to achieve and maintain financial viability.

#### 9.4.2 Earnings per Shareholder

Table 9.5 below shows the company debt divided by the number of shareholders. It also shows the earnings of 50 farmers each owning a 2% share of the company. Not surprisingly, the estimated annual earnings per shareholder for the 90 ha company is US\$ 2,090 compared to US\$ 4,631 for the 165 ha company and US\$ 5,203 for the 160 ha company cultivating 150 ha of cane. This difference shows why villagers should be encouraged to establish farms that are as large as possible relative to their social cultural affinities.



**Table 9.5: Shareholder Debt Levels for Sugarcane Outgrower Models**

Sugarcane+Rice	Mod 80+10	Mod 125+10	Mod 150+10	Mod 125+40
<b>Level of indebtedness by individual 2% shareholder in 50 members</b>				
Debt/2% member	-\$13,200	-\$18,072	-\$20,839	-\$17,681
Average earning/2% member yr 2-15	\$1,268	\$2,134	\$3,865	\$3,339
Average earning/2% member yr 2-9	\$650	\$2,134	\$2,863	\$2,370
Average earning/2% member yr 10-15	\$2,090	\$4,091	\$5,203	\$4,631

#### 9.4.3 Sensitivity Analysis

In order to determine the robustness of the model by size of company an IRR analysis has been carried out without and with financing using: a lower and higher price of sugar (US\$ 800/t and US\$ 680/t), together with DOP of 53% and 60%, and a sucrose content of 13.5% and 11%. The results of the analysis are shown below in Tables 9.6 and 9.7.

**Table 9.6: Comparative Analysis, Sucrose Content 13.5%**

Sugar price	\$/t cane	DOP	Mod 1 (80+10)	Mod 2 (125+10)	Mod 3 (150+10)	Mod 4 (125+40)
\$800	\$57.24	0.53 without financing	23%	32%	36%	32%
		0.53 with financing	10%	18%	21%	21%
\$735	\$52.59	0.53 without financing	16%	25%	28%	26%
		0.53 with financing	3%	11%	14%	14%
\$680	\$48.65	0.53 without financing	10%	19%	21%	20%
		0.53 with financing	-3%	5%	7%	8%
\$800	\$64.80	0.60 without financing	33%	36%	47%	42%
		0.60 with financing	20%	22%	32%	32%
\$735	\$59.54	0.60 without financing	26%	44%	39%	35%
		0.60 with financing	13%	29%	24%	25%
\$680	\$55.08	0.60 without financing	20%	29%	32%	29%
		0.60 with financing	7%	15%	18%	17%

**Table 9.7: Comparative Analysis, Sucrose Content 11%**

Sugar price	\$/t cane	DOP	Mod 1 (80+10)	Mod 2 (125+10)	Mod 3 (150+10)	Mod 4 (125+40)
\$800	\$46.64	0.53 without financing	6%	15%	18%	17%
		0.53 with financing	-8%	1%	4%	4%
\$735	\$42.85	0.53 without financing	-3%	7%	10%	10%
		0.53 with financing	-20%	-7%	-4%	-3%
\$680	\$39.64	0.53 without financing	-18%	-1%	3%	4%
		0.53 with financing	...	...	..	...
\$800	\$52.80	0.60 without financing	17%	26%	28%	26%
		0.60 with financing	4%	12%	14%	14%
\$735	\$48.51	0.60 without financing	10%	18%	21%	20%
		0.60 with financing	-4%	5%	7%	7%
\$680	\$44.88	0.60 without financing	2%	12%	15%	14%
		0.60 with financing	...	-2%	0%	1%

The above analysis shows that the model is far less sensitive to a change in the DOP than in the sucrose content of the cane sold by the outgrower companies, and clearly brings out how vulnerable the 90 ha company will be relative to the three larger companies (135 ha, 160-165 ha). The base model with a sucrose content of 13.5%, a cane price of US\$ 735 with a DOP of 53% is quite robust for the three large companies and is satisfactory for the smaller company, though there is a greater risk if sugar prices fall under a lower DOP scenario. With the 13.5% sucrose content and a rise in sugar prices to US\$ 800 and a DOP of 60%, all of the companies do well, reaching FIRR of 33-45%. With a sucrose content of 11%, using the base model assumption of

US\$ 735 with a DOP of 53%, the companies are more vulnerable, and the IRR with financing turns negative for all of the companies. With the 11% sucrose content, together with an increase of the DOP to 60% with a cost of sugar of US\$ 800, the companies are viable. The analysis clearly shows the importance of achieving the planned sucrose content rate of 13.5%. The likelihood of this outcome is greatly enhanced by using the proposed green conservation based technology for production.

## 10 Decommissioning

The expected operational life of a programme is estimated at 25 years, but may be longer given that the EcoEnergy lease for the core plantation is 99 years. It is not certain whether or not the outgrowers schemes' operations will extend beyond this 25 year period. If indeed the schemes are to be decommissioned after the projected programme life, then decommissioning would be subject to prevailing technologies and regulatory requirements applicable at that time. There is also a minor risk that due to some unforeseen event or force majeure, such as a catastrophic flood or tsunami, there may be a need to end the programme life earlier than anticipated.

This section gives an outline of measures to be followed in decommissioning the schemes, with the aim to ensure that there are no residual environmental or social impacts.

However at this time it is uncertain what the prevailing environmental and social conditions in the programme area will be at the time of decommissioning, and therefore it is impossible to predict what impacts may occur at that time. Therefore an ESIA will have to be undertaken at the time of decommissioning in line with NEMC's requirements to be submitted to NEMC 3-6 months before decommissioning activities begin. The ESIA should include a decommissioning plan. Typically, the decommissioning plan should, as a minimum, describe:

- The proposed end use of the scheme areas;
- Relevant environmental guidelines and standards to be followed for decommissioning activities, eg disposal of solid and/or hazardous wastes, treatment of water in lagoons or tanks; Identification of required licences and permits for discharge, disposal or treatment;
- Stakeholder consultations to obtain views about the impacts of decommissioning and compliance requirements;
- Procedures to be followed for closure of major programme facilities and removal of infrastructure, including unearthing and disposal of underground facilities such as pipes and cables;
- Procedures for reclamation, restoration and/or remediation;
- Processes and methods for disposal of waste materials removed from the sites;
- Procedures for the closure of the decommissioning contractor's camp after works are completed;
- Monitoring requirements after decommissioning;
- A timetable for decommissioning activities;
- Responsibilities for decommissioning and monitoring activities; and
- Costs of decommissioning.

Issues that need specific attention include:

- Soil erosion due to removal of infrastructure and removal of sugarcane and exposure of open areas to the elements;
- Testing for contamination (especially at the workshop);
- Removal of debris, waste, scrap from project area to safe or appropriate disposal
- Disposal of hazardous materials (such as fertilizers, chemical inputs, oils, fuel) in line with national guidelines and NEMC regulations;
- Remediating contaminated areas if necessary;

- Recontouring and revegetating the site, allowing natural regeneration of vegetation in disturbed areas and restoring the habitat to its original state;
- Removal of all introduced plant species to the programme area
- Sociological impact of decommissioning, in terms of livelihoods (loss of employment/income), impacts on the local economy and social structure of the programme villages.
- Demolition of all unwanted infrastructure, including any barriers hindering wildlife movement

## 11 Summary and Conclusions

### 11.1 Key Findings

The BASIC Programme in tandem with the EcoEnergy Project on Razaba Ranch will no doubt have numerous benefits to the communities in the outgrower villages of Kiwangwa, Matipwili and Gama/Kitame. The overall objective of the Bagamoyo Sugarcane Out growers Scheme Project is to develop irrigated sugar cane in line with modern agricultural standards and techniques for smallholder farmers in three villages on 3,000-3,500 ha of land surrounding the industrial estate, producing an estimated 300,000 tons of sugarcane annually at full capacity. This will contribute to addressing the enormous sugar deficit currently being experienced in the country. The project will create jobs for the outgrowers as well as other members of the outgrower communities. The communities will be empowered to run this agricultural venture as profit-making businesses; they will learn to own, manage and make money from modern irrigated farms. This will improve their standards of living and allow them to be food secure.

The schemes will have access roads, and bring water and electrical power from the National Grid to the outgrower villages. The villagers will then be able to connect to, or make use of, these utilities. The dam that will store excess water when the Wami River is in flood may be used to supplement water supply to outgrower villages, as well as other neighbouring communities in times of drought.

However there are a number of specific issues that are considered significant and have implications on the project:

- Land disputes/conflicts between EcoEnergy and Saadani National Park; Saadani National Park and Matipwili and Gama/ Kitame villages; and livestock keepers and farmers in all three outgrower villages;
- Communication gaps between the various players – the key sector ministries, EcoEnergy and the outgrowers, and the village governments and the outgrower communities;
- The ability of the farmers to work as a group, since they have only been working as individuals;
- The willingness of the farmers to work on the schemes and their capacity to choose a company strategy based on well informed choices;
- Obtaining CCROs in order for the outgrowers to form their companies;
- The availability of water for irrigation particularly in the dry seasons, given the current situation with regard to water demand in the Wami Catchment, proposed future developments along the river upstream of the project's offtake points and the effects of external factors such as climate change and deforestation in the upper reaches of the catchment;
- Related to the preceding point, the adequacy of environmental flow downstream of the scheme;
- Land acquisition for the bulk infrastructure for the project as well as for the farms. As the scheme designs have not yet been drawn up, the locations of the various infrastructure cannot be determined at present, and therefore the affected land owners cannot be identified at this time;

- Whether food security is assured;
- The use of agrochemicals.

Futhermore, concern was raised at all levels about delays in implementing the BASIC Programme, in view of the delays experienced by the EcoEnergy scheme which has resulted in growing suspicion among the local communities as there have been many studies and much talk about the scheme, but until recently, nothing physically visible on the ground.

## **11.2 Recommendations**

Recommendations have been made for mitigation in Chapter 7 of the report, and these measures have been included in the environmental and social management plan, while proposals for monitoring are made in Chapter 8. However, these recommendations for mitigation and monitoring will have to be further developed during the recommended additional studies and RAP to be undertaken during the design phase when the actual land areas of the schemes have been established, and the locations of the various bulk infrastructure components determined.

Further studies have been recommended in order to:

- Prepare a Resettlement Action Plan to address the issue of land acquisition if found necessary, and loss of property, trees and crops for the schemes, including land to be taken for the dam or other water storage facilities, and the cane fields. The RAP will have to identify the exact number of project affected people and affected property, and will have to comply with national and AfDB and IFAD requirements for compensation and resettlement, including valuation of affected properties, livelihood restoration plans, and grievance mechanisms.
- Update environmental flows in the Wami River from Mandera to Matipwili to the mouth of the river where it meets the Indian Ocean;
- Re-assess the environmental and social impacts of establishing and constructing bulk infrastructure, once it is determined which options will be pursued, the location of the infrastructure, and design details of the structures, specifically for the water storage facilities (dam, oxbow lakes) in line with the World Commission on Dams guidelines, the bridge across the Wami River at Matipwili, the dykes on the north and south banks of the river, access roads, power lines, and canals;
- Confirm the availability of water for irrigation and other uses, and assess whether the storage facilities proposed for diverted flood water are adequate;
- Develop an agrochemical management plan describing the use, application of agrochemicals and disposal of expired chemicals and chemical containers, so that impacts on soils and water quality and human health are eliminated, or at least minimized. Options for organic /non-polluting inputs should also be explored.

In addition, the studies will have to establish detailed baselines for water quality in the river and chemical concentrations in fish and shellfish, daily flow levels in the Wami River, soil quality (nutrient content and soil structure) and the elephant migration, and will have to include a socio-ecological assessment of all coppices in the scheme areas to determine their cultural importance and value to the local communities. The studies will also have to enhance the socio-economic baseline prepared during this study, focussing on land issues (access, control and use), agricultural production and marketing, farming methods, trade and commercial activities, poverty

levels, health status (particularly an HIV/AIDS situational analysis), and education levels in the project area.

Diligence on the part of the Contractor and proper maintenance during scheme operation are key to ensuring sound environmental and social management during the construction and operation phases.

Due to the reasons cited in Section 11.1 above, it is recommended that the project is phased so that EcoEnergy starts to work with the outgrowers at Kiwangwa and Matipwili villages. Gama/Kitame should be taken on last as the communities there indicated that they were not particularly interested in agriculture (their mainstay has been fishing and the salt works). Moreover, the area identified for the outgrowers' scheme is within Saadani National Park, and until the park is degazetted and its boundaries reverted to the original reserve boundary or at least pushed back to the Wami River, there will be continued disputes with TANAPA. However, once the land dispute between Saadani National Park and EcoEnergy and Gama/Kitame village has been resolved, the environmental and social impacts resulting from the Gama/Kitame scheme should be updated before preparatory works and construction works begin there.

### **11.3 Conclusions**

The Bagamoyo Sugar Infrastructure and Sustainable Community (BASIC) Programme is likely to achieve its intended objectives, as well as realise a number of benefits for the local communities provided that:

- The land use conflicts are resolved amicably;
- The environmental flow downstream of Matipwili is maintained;
- The use of agrochemicals is controlled and supervised, and a move is made to change to organic cultivation of sugarcane;
- All land acquired for the purposes of the project is promptly and fairly compensated for, and that any relocation of affected persons or property is carried out in accordance with national legislation and international guidelines;
- Provision is made to grow food crops also, either through intercropping or reserving land for this purpose;
- The mitigation measures proposed in this report for addressing adverse environmental and social impacts are implemented; and
- Recommendations made for environmental and social management and monitoring are adhered to.
- Sugar importation is regulated to protect market for the local sugar industry.

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## **Appendices**

- 1: Maps and Schematic Drawings
- 2: List of Stakeholders Consulted
- 3: List of Members Consulted from the Outgrower Communities
- 4: Minutes of Public Consultations
- 5: Sample of Household Questionnaire
- 6: Terms of Reference for Further Studies