



# **COAST DEVELOPMENT AUTHORITY**

## **KENYA CLIMATE CHANGE ADAPTATION PROGRAMME**

### **Mangrove Rehabilitation in Vanga & Gazi**

#### **In Kwale County**



*December 2017*

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

AF	Adaptation Fund
CBOs	Community Based Organizations
CDA	Coast Development Authority
CFA	Community Forest Association
EA	East Africa
EEZ	Exclusive Economic Zone
ERSWEC	Economic Recovery Strategy for Wealth and Employment Creation
GAGOCOFA	Gazi-Gogoni Community Forest Association
ISMEM	Integrated Shoreline and Mangrove Ecosystem Management
JEG	Jimbo Environmental Group
KCCAP	Kenya Climate Change Adaptation Programme
KEFRI	Kenya Forest Research Institute
KMFRI	Kenya Marine and Fisheries Research Institute
KWS	Kenya Wildlife Service
NEMA	National Environmental Management Authority
NIE	National Implementing Entity
SDG	Sustainable Development Goals
TARDA	Tana & Athi River Development Authority
UNFCCC	United Nations Framework Convention on Climate Change
VAJIKI	Vanga-Jimbo-Kiwegu

# 1. INTRODUCTION

## 1.1 Background

Coast Development Authority (CDA) is one of the six Regional Development Authorities under the Ministry of Planning and Devolution. CDA was established by an Act of Parliament (Coast Development Act CAP. 449 of 1990) to provide integrated development planning, coordination and implementation of projects and programmes within its area of jurisdiction that includes the whole of the Coast region, Southern Garissa and Kenya's Exclusive Economic Zone (EEZ).

CDA is guided by strategic plans which form the basis of CDA's commitment and guiding principles. The Strategic Plan (2012-2017) comes after the first and second CDA Strategic Plans (2003-2007 and 2008-2012) that were guided by the Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC) and the Vision 2030 respectively. It addresses the needs and aspirations of the Coast region communities in line with the Regional Development Policy, Vision 2030 based on three "pillars" (the economic, the social and the political) and Sustainable Development Goals (SDGs).

The Strategic Plan addresses the following development objectives: To contribute to food self-sufficiency in the region; To contribute to poverty reduction and improvement of livelihoods through empowerment of the communities; To contribute to the reduction of unemployment; To conserve and manage the natural resources for sustainable development; and To strengthen CDA's financial base for sustainability. These strategic objectives will be addressed through the following programme areas: Regional Development Planning; Development of River Banks, Water Bodies and Catchment Areas; Community Support and Empowerment; Integrated Basin-based Development and Financial base strengthening. Institutional Capacity Development is a cross-cutting activity in all the programmes/projects and takes cognizance of the Regional Development Policy, which shows direction in regional planning and development and emphasizes on rationalization of staff in line with Public Pay Policy for effective service delivery. The programmes fall within the Flagship Projects identified under *Vision 2030* Social and Economic Pillars.

The Kenya Climate Change Adaptation Programme (KCCAP) is a National program funded by the Adaptation Fund (AF) under the United Nations Framework Convention for Climate Change (UNFCCC). KCCAP is an integrated program aimed at building resilience and adaptive capacity to climate change to vulnerable communities in Kenya. The three year program which has room for up scaling is under the National Implementing Entity (NIE) of National Environment Management Authority (NEMA). The implementing entities of the program are; Coast Development Authority (CDA), Tana and Athi Development Authority (TARDA) and Kenya Forestry Research Institute (KEFRI). The program is aimed at addressing the following specific objectives;

1. To enhance Climate resilient agricultural, agro-forestry, pastoral and agro-pastoral production systems to improve food security in selected Counties in Kenya.
2. To improve climate resilient water management systems to enhance food security in selected Counties in Kenya.
3. To increase resilience to the effects of rise in sea level and shoreline changes through Integrated Shoreline and Mangrove Ecosystem Management at Vanga and Gazi in the Coastal region of Kenya.
4. To reduce climate related disaster risks among targeted vulnerable communities in Kenya.
5. To strengthen institutional capacity, knowledge management, awareness raising and promotion of adaptation mechanisms to improve resilience on climate change to selected vulnerable communities in Kenya.

## **1.2 KCCAP Components in the Coast Region**

The KCCAP program in Coast region covers three counties in the first phase namely Kwale, Taita Taveta and Kilifi Counties. The main activities are geared towards:

- 1 Establishing Climate Change resilient water management systems to enhance food security.
- 2 Increasing Climate Change resilience to the effects of sea level rise and shoreline changes through Integrated Shoreline and Mangrove Ecosystem Management (ISMEM) in Vanga and Gazi.

- 3 Establishing appropriate physical assets and infrastructure for water harvesting, storage and irrigation

CDA is implementing ISMEM in collaboration with partner institutions including KMFRI, KFS, KWS, NEMA, and KEFRI, CBOs, NGOs and the target beneficiaries from Kwale County. The main activities to be implemented under Integrated Shoreline and Mangrove Ecosystem Management (ISMEM) in order to increase the resilience to the effects of sea level rise include;

- Rehabilitation of Vanga and Gazi Mangrove Ecosystems
- Rehabilitation and protection of Coral Reef and Sea Grass Ecosystems
- Shoreline Stabilization
- Erosion and accretion control
- Setting up of an Inventory and GIS Database for the shoreline and mangrove ecosystems.

## **2.0 REHABILITATION OF VANGA AND GAZI MANGROVE ECOSYSTEMS**

The Gazi and Vanga mangrove forest blocks are managed by KFS Kwale in collaboration with the community. This is in line with the provisions of the new forest conservation management Act 2016 on participatory forest management. The Gazi Bay mangrove forest block covers 715-Ha inclusive of basin forest Chale Island which covers 100-Ha leaving Gazi-Makongeni area with 615-Ha (National Mangrove Management Plan of 2017). The forest block has a Community Forest Association (CFA) in place called (GOGACOFA) with 12 user groups. According to the National Mangrove Management Plan of 2017, 27% of the mangroves in Gazi Bay is degraded and require rehabilitation which translates to 166-Ha.

Vanga forest block is the third largest mangrove forest in the country with 4, 265-Ha (National Mangrove Management Plan of 2017). Currently 426.5-Ha requires rehabilitation which translates to 10% of the entire cover. Vanga area is under VAJIKI CFA which has several user groups whereby most of them are involved in the rehabilitation activities.

There were 3 ISMEM activities that were to be carried out under rehabilitation of



mangroves in Vanga and Gazi site according to the 2016/2017 Annual Work Plan. These were;

- Site identification and Mapping
- Nursery Establishment
- Mangrove planting

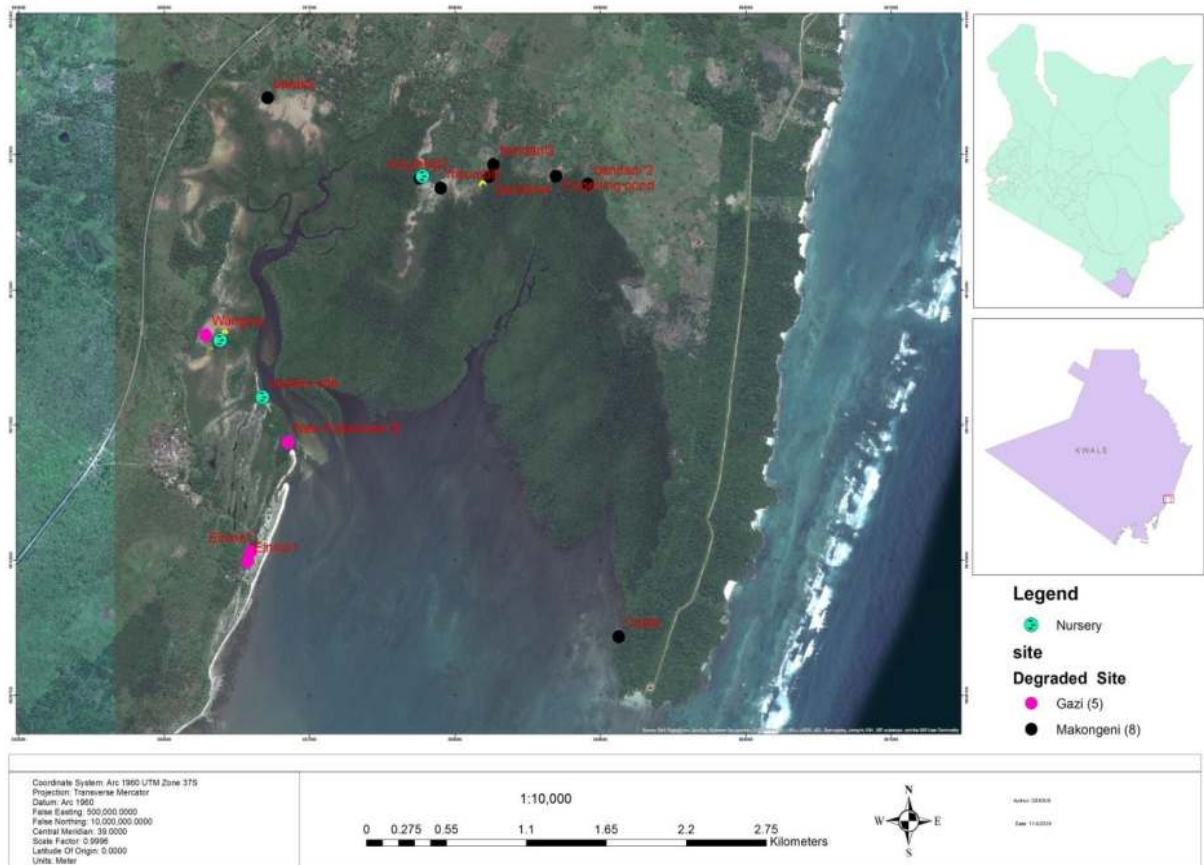
## **2.1 SITE IDENTIFICATION AND MAPPING**

The Kenya Climate Change Adaptation Program was officially launched in July 2016 hence the financial year 2016/2017 was the first year of implementation for the project. Therefore for the rehabilitation activities to roll out, it was critical that the sites were identified and mapped to enable the execution process. The site selection activity was undertaken from 17<sup>th</sup> to 20<sup>th</sup> August 2016 with participants from CDA, KMFRI, KWS and the community in Vanga and Gazi sites. The objective of the activity was to identify hot spot areas that were degraded that need intervention measure. Participatory methodology was applied in collecting information from key informants using questionnaires and visits to the sites to verify and come up with the best possible intervention measure. The information gathered included best species adapted in the area to be rehabilitated, the nursery and planting sites and the best planting method.

The main species identified for planting include; *Avicennia marina*, *Ceriops tagal*, *Sonneratia alba* and *Rhizophora mucronata*.

## Gazi Bay Sites

According to the findings there were 2 sites identified for rehabilitation in Gazi Bay i.e. Makongeni and Gazi sites.



**Figure 1** Map of Gazi Bay, Kenya showing the identified degraded areas and proposed nursery sites. Inset is map of Kenya locating the project area.

## Makongeni section

Makongeni village is situated 14 km South of Diani-Ukunda and there were seven (7) sites identified in Makongeni village section as described in the table below;

**Table 1; Description of sites visited and possible intervention Measure**

Identified site	Site description	Inundation class	Comment
Chale	<i>R. mucronata</i> trees that stood in the area had been cut down. However, natural regeneration has high potential particularly within the remains of the	1	Restoration crop here is <i>R. mucronata</i> and <i>S. alba</i> to



	dead prop roots		
Bandani 1	Sparse vegetation of <i>A. marina</i> . Area not necessarily degraded but has muddy substrate thus can easily be forested	3	Enrichment planting with <i>A. marina</i>
Bandani 2	Area has patches of remains of fingerling ponds established by members of Baraka conservation group. Adjacent <i>R. mucronata</i> vegetation shows signs of selective harvesting but natural vegetation closing up	3	Plant with <i>A. Marina</i> , <i>C. tagal</i>
Bandani 3	Mixed species forest formation in the vicinity. Area has stumps showing	3	Hydrological modification followed by planting mainly with <i>A. marina</i> but also <i>C. tagal</i> , <i>R. mucronata</i>
Bandani 4	Sparsely spaced <i>R. mucronata</i> and <i>A. marina</i>	3	
Msumbiji	Species in the vicinity is mixed but dominated by <i>A. marina</i> . Area had been earlier rehabilitated by KMFRI through Earthwatch program but leaving a few patches between the blocks	3	Area will be restored using <i>A. marina</i> mainly but <i>C. tagal</i> could be used in areas further from land
Ramnyonje	Area had been clear-felled in the past as stumps are visible though appear to be covered by sediment Changes over time must have resulted into highly saline conditions and unsuitable sediment hindering natural regeneration. Species in the vicinity is <i>A. marina</i>	3	Progressive restoration of the area to join up with what KMFRI had initiated with support from KCDP. This area will require advance preparation

### Gazi site

Gazi village is a small village situated about 17 km South of Diani-Ukunda. In this section of Gazi Bay mangroves, a total of 5 sites were identified as degraded and could either be restored or required some level of hydrological modification (Table 2). One particular site (New Fishermen beach) drew the attention of the crew as there was large loss of *Sonneratia alba* trees. According to Hamisi Kirauni, a local from Gazi village (who is also an employee of KMFRI), now 41 years of age, the area had healthy mangroves and the loss could easily be linked to large sediment deposition in the area. He explained that most of the once deep tidal inlets that would bring water into the site are now clogged with sand deposits hindering inundation of the sites. This was also confirmed by the team which visited the site.

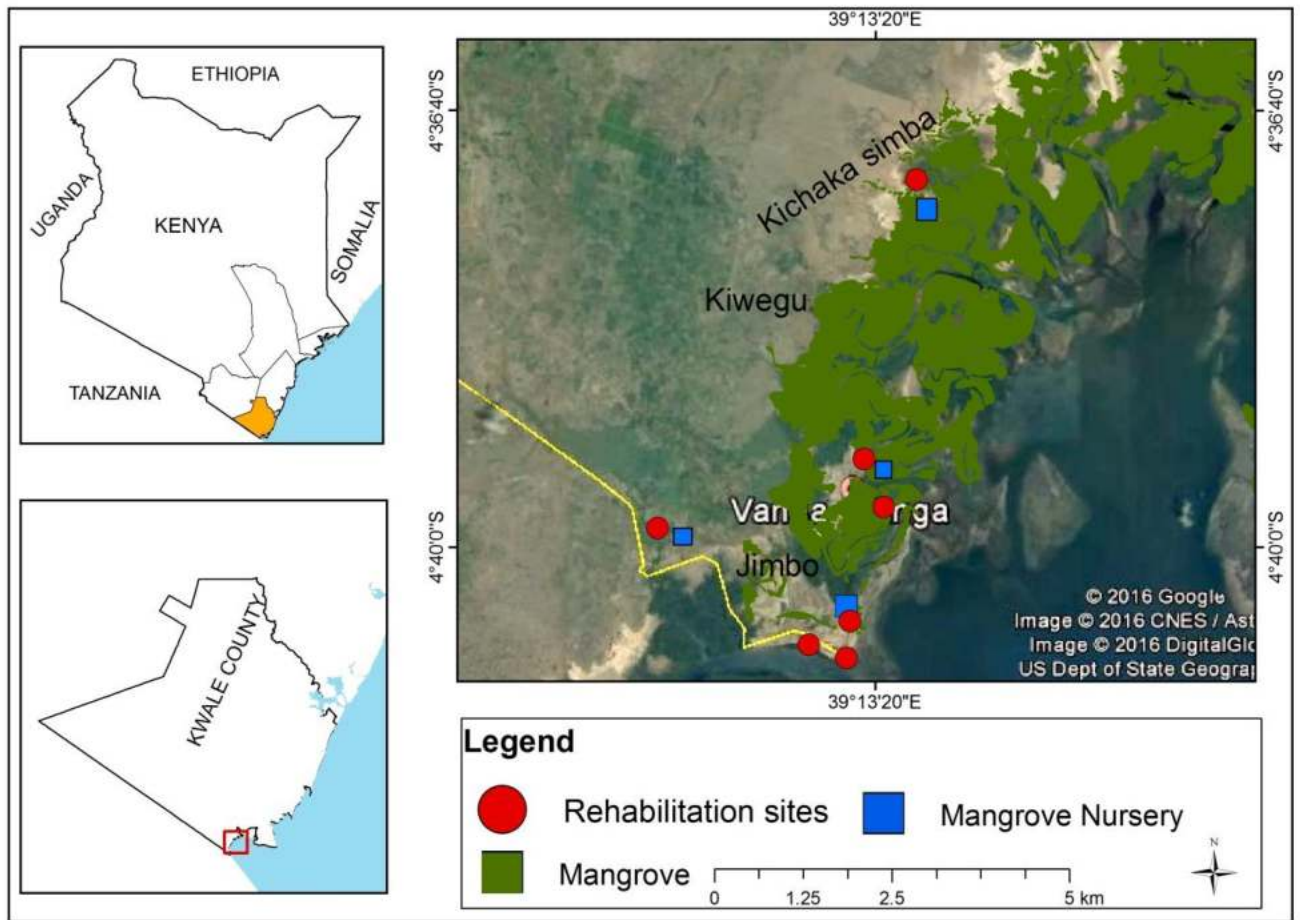
**Table 2; Site description of the identified areas in Gazi section and recommended intervention**

Site	Site description	Inundation Class	Action
Wangwa wa Manyani (W1, W2)	The area has sparse vegetation with a few old stumps indicating past exploitation of mangrove trees. The main species in the vicinity is <i>A. marina</i>	3	Enrichment planting with <i>A. marina</i>
Wangwa 3	The species in the vicinity are mixed <i>C. tagal</i> and <i>A. marina</i>	3	Enrichment planting with <i>A. marina</i> and <i>C. tagal</i>
Wangwa 4	The site has an abandoned fish pond with eroded banks	3	Knock down pond banks and restore the area using <i>A. marina</i> and <i>C. tagal</i>
New fishermen site	Large acreage of <i>S. alba</i> killed by sedimentation which mainly appears to be sea-borne	1	To establish cause of sedimentation rates and deposition at the site

El-nino plantation (E1)	Incidences of pole harvesting in the heart of the forest leaving empty patches	2	<i>R. mucronata</i> could be replanted by either direct planting or using seedlings
El-nino plantation (E2)	Other than pole harvesting, the area has tidal water stagnating hindering natural regeneration	2	Hydrological modification before replanting with <i>R. mucronata</i>

### Vanga Bay Sites

The Vanga Bay sites covered 4 areas that is Vanga, Jimbo, Kiwegu and Jasini.



**Figure 2; Map of Vanga Bay showing the rehabilitation and mangrove nursery sites**

### Vanga sites

There were 2 sites identified for rehabilitation in the area.

**Table 3; Showing identified sites and the recommended intervention measure**

Identified site	Site description	Comment
Mwagugu	Sediment deposition and consequent erosion of the channel by flooding tides due to narrowness of the channel hence possible increased wave energy	Community feels <i>R. mucronata</i> could be planted and this can be done in combination with <i>S. alba</i> and <i>A. marina</i> which are best species in the area.
Mwambiweje fish ponds	Abandoned Mariculture fish ponds	Area could be rehabilitated by combining hydrological modification with progressive planting of <i>A. marina</i>

### Jimbo sites

There were 3 sites identified for rehabilitation in Jimbo sites.

**Table 4: Description of the identified sites and possible intervention measure**

Site	Site description	Recommendations
Jimbo landing site	Area facing open sea prone to strong wave action	Establishment of gryones and leave the area to regenerate naturally. This would be monitored for a period one year after which planting of <i>S. alba</i> may be advised depending on the outcome
Baazo kubwa	The community group has planted almost 1000 <i>S. alba</i> mangrove trees. However those towards the landward zone are stunted but the cause could not be immediately	Action may involve researching on possible cause to come up with a fact-based solution

	established.	
Abandoned salt pan	A private developer dug basins for salt production but project failed to kick off. The first section of the basin has been colonized by a mix of species; the next block has <i>Ceriops tagal</i> plantation which appear stressed	Proposed nursery site. Some hydrological modification would be required before planting with both wildings and seedlings from nurseries

### Jasini site

Jasini village lies adjacent to river Uмба and was proposed for nursery establishment and planting of *R. mucronata* and *A. marina* mangrove trees on the lower edges of the bank of the river. Other additional future measures may involve sensitisation of the local community on GAP which included impacts of farming on riparian land. In addition there would be need to work together with other partners to rehabilitate the river banks which are heavily eroded resulting in soil infertility hence low food production.

Based on the identified sites the following groups were selected to be involved in the KCCAP activities as the community.

**Table 5; selected community conservation groups in the identified sites**

Name of the group	Name of CFA	Membership
Baraka Conservation Women group	GAGOCOFA	24
Gazi Boardwalk Women group	GAGOCOFA	30
Mwagugu Mariculture	VAJIKI	20
Mwambiweje Women Group	VAJIKI	30
Jimbo Environmental Group	VAJIKI	40
<b>TOTAL</b>		<b>144 members</b>

## 2.2 NURSERY ESTABLISHMENT

During a baseline survey exercise which was done in August 2016 by a team comprising of officers from CDA, KMFRI and the community it was established that the nurseries in the community groups were not adequate to meet the target of planting 175,000

mangroves to be planted during the FY 2016/2017. Few groups had very less than 5,000 seedlings like the Baraka Conservation Women group while some groups had no seedlings at all therefore the activity lacked planting stock in both Vanga and Gazi sites. Although experience has shown that using seedlings from nurseries is three times more expensive than direct planting of propagules, preparing planting stock in advance increases effectiveness of any reforestation exercise as seedlings are always made available whenever need be irrespective of the season. Moreover, in some cases particularly highly degraded areas, survival following plantation establishment has been shown to be higher when seedlings are used as opposed to direct planting. Choice of healthy planting stock thereby follows as an obligatory step in any reforestation exercise involving use of seedlings.

According to the 2016/2017 Annual Work Plan the target was to establish 2 nurseries in in each forest block ecosystem. The objectives of the activity include;

- To establish mangrove nurseries in different groups in Vanga and Gazi with a target of 40,000 seedlings of different species.
- To capacity build and demonstrate to 150 community members on how to establish mangrove nurseries.

The activity was carried out on different dates in the 6 groups identified during the site identification exercise.

### 2.2.1 Participants

The activity was carried out by participants from the following institutions/ organisations;

**Table 6: Summary of Nursery Establishment activity participants**

S.no	Institution	Participant	Responsibility
1.	CDA	Team Leader	Coordinate
2.	KMFRI	Mangrove Ecologist	Facilitate
3.	KFS	Forest Officer	Facilitate
4.	VAJIKI CFA	Mwagugu Mariculture	Community members
5.	VAJIKI CFA	Mwambiweje Conservation group	Community members
6.	VAJIKI CFA	Jimbo Environmental Group	Community members
7.	VAJIKI CFA	Nguvu Kazi Conservation group	Community members



8.	GAGOCOFA	Baraka Conservation Women group	Community members
9.	GAGOCOFA	Gazi Women Boardwalk group	Community members

(See annex -List of participants)

### 2.2.2 Methodology

Mangrove propagules have to be sown in a nursery bed before transplanting into the main field to ensure maximum germination and a higher success rate. The participating groups were taken through the steps to establishing a nursery using the prick out of wildings for *Avicennia sp* and use of seeds for *Ceriops sp* and *Avicennia sp*.

### 2.2.3 Seed Sowing

- Site selection; this should be near the planting site for ease of transfer during the planting so that the seedlings are not stressed.
- Selection of suitable soils for filling the potting bags; the soils should be the black sticky soils and not the sandy soils as these lack nutrients to sustain the seedling. The appropriate size for potting bags should be size 12.5cmx 20cm and 15cmx30cm depending on the species characteristics. The pots are arranged in 100s for ease of counting and maintenance of the nursery.
- Selection of seeds/sorting-seeds should be mature and healthy without deformation. *Avicennia sp* seeds should be soaked in fresh water overnight before sowing the seeds in the nursery. Mature mangrove seeds have developed roots.
- Sowing of seeds; bury the rooting part only as burying the stem causes rotting of the seeds.
- Putting up the shade; the nursery should be under a shade made of *makuti* to protect the seedlings against the sun.
- Making drainage system for the nursery; this is a channel through which excess water during the high tide will be drained off. This is necessary so that the nursery does not flood.
- The nursery should be monitored and replace the seeds that have been swept away by tide or failed to germinate.



Sowing *Ceriops tagal* seeds in Makongeni site

### 2.2.3 Pricking Out of Wildings

Wildings refer to seedlings that have naturally germinated in the mangrove forests that can be carefully be dug out and used as planting material. The use of wildings to establish nurseries is applicable for *Avicennia sp* and *Sonneratia sp* since as they are hardy than the other species. The wildings the pricked out carefully and replanted for rehabilitation. Therefore the seedlings should be pricked out with a ball of soils. Placing of the seedling into the potting bag should also be done carefully without exposing the roots. The wildings must be collected from sites near the nurseries to be established.

### 2.2.4 Nursery Establishment Achievements

1. Nurseries of 97,368 seedlings established of *Ceriops tagal* and *Avicennia marina* species; In Gazi 12,366 seedlings and in Vanga 85,002 seedlings.
2. A total of 144 community members from different groups from VAJIKI and GAGOCOFA CFAs capacity built on the nursery establishment process including selection of seeds; selection of suitable site for nursery and suitable soils for filling the potting bags and how to plant the seeds in potting bags. The group was taken

through site selection, seeds collection and sorting, planting of seeds and erection of the nursery shade.

3. Six (6) nurseries established; two in Gazi CFA and four in VAJIKI CFA.



Baraka Conservation Women group *Ceriops tagal* nursery

4. VAJIKI CFA and GAGOCOFA handed over working tools including; two (2) wheelbarrows, twenty (40) jembes, ten (40) spades, ten (20) pangas and fifty thousand (50,000) potting bags.



VAJIKI CFA receiving working tools

**Table 7; Summary of nursery establishment achievements**

<b>Name of the Group</b>	<b>No. of wildings</b>	<b>Propagules sown</b>	<b>Remarks</b>
Baraka Conservation Women group	7,000 <i>Avicennia sp</i>	560 <i>Avicennia sp</i> 4,000 <i>Ceriops sp</i>	The group has the potential to raise 30,000 seedlings
Gazi Women Group	-	806 <i>Ceriops sp</i>	
Mwambiweje Conservation Group	13,000 <i>Avicennia sp</i>	640 <i>Avicennia sp</i>	
Mwagugu Mariculture	12,500 <i>Avicennia sp</i>	2,647 <i>Ceriops sp</i>	
Nguvu Kazi group	4,038 <i>Avicennia sp</i>	3,000 <i>Ceriops sp</i>	
JEG	1,813 <i>Ceriops sp</i> 6,848 <i>Avicennia sp</i>	516 <i>Avicennia sp</i> 40,000 <i>Ceriops sp</i>	The group has raised approximately 40,000 <i>Ceriops sp</i> seedlings as group effort.
<b>Sub-Total</b>	<b>45,199</b>	<b>52,169</b>	
<b>GRAND TOTAL</b>	<b>97,368</b>		

### 2.3 MANGROVE PLANTING

According to the ISMEM framework, the planting target for FY 2016/2017 was 175,000 mangroves of different species planted in Gazi and Vanga ecosystems. The total area of the sites to be rehabilitated in Gazi was 166ha while for Vanga was 426.5-Ha totalling 592.5-Ha. This raised the need to have a proper strategy on how the actual implementation would be done to achieve the set target.

The specific activities involved; seedlings inspection and procurement, pre-planting preparations, planning meetings, planting kick off exercises and the actual planting by the community in all the identified sites.

#### 2.3.1 Seedling Inspection and Procurement

Seedling inspection is a requirement in the Public Procurement and Asset Disposal Act of 2015 before procuring of seedlings by any government institution. Therefore the exercise was



carried out from 6<sup>th</sup> to 8<sup>th</sup> September 2016 by a team from CDA, KMFRI, KFS and the community. Two sets of nursery beds were identified in Vanga, one at Baazo and the other at Vingobani (both in Jimbo). However, not all the seedlings were deemed fit for planting as they had a number of defects including partial defoliation, some parts of the stems eaten by crabs and partial wilting. Some of the seedlings had overstayed in the nurseries and had developed roots pushing through the potting bags on the ground.



*Seedling inspection at Makongeni, Gazi*



*Jimbo Youth Group Nursery*

**Table 8; Seedling Inspection findings in Vanga and Gazi**

Site	Nursery	Bed	Species	Seedlings	Available	
Jimbo	Baazo	1	<i>C. tagal</i>	979	930	
			<i>C. tagal</i>	1,260	1,187	
			<i>C. tagal</i>	1,092	1,068	
	Vingobani	1	<i>R. mucronata</i>	306	158	
			<i>B. gymnorrhiza</i>	110	79	
			2	<i>R. mucronata</i>	704	583
3			<i>R. mucronata</i>	908	243	
Gazi	Makongeni	1	<i>R. mucronata</i>	900	824	
			<i>R. mucronata</i>	650	577	
		3	<i>C. tagal</i>	700	359	
			<i>C. tagal</i>	700	42	
		<b>Total Jimbo</b>		<i>C. tagal</i>		3,185
				<i>B. gymnorrhiza</i>		86
				<i>R. mucronata</i>		984
		<b>Total Gazi</b>		<i>R. mucronata</i>		1,401
<i>C. tagal</i>				401		



### 2.3.2 Pre Planting preparations

This refers to the activities carried out on sites to be rehabilitated as some areas have been heavily silted and some eroded. Due to the technicality of planting the mangrove species identified there was need to undertake pre-planting preparations to increase chances of survival for planted seedlings. A methodology known as *hydrological modification* was recommended by the mangrove ecologist as the best measure to do the planting exercise in the tidal deserts. The exercise involved preparing tunnels to drain water during high tide. Due to siltation, the top layer is exfoliated to expose the dark clay soils which are suitable for mangrove planting. The activity was done from 25<sup>th</sup> to 29<sup>th</sup> April 2017 for Jimbo Environmental Group in Vanga and Baraka Conservation Women group in Makongeni, Gazi sites.



*Site preparation at Jimbo in Vanga*



*Site preparation at Makongeni Gazi*

### **2.3.3 Planning meeting**

The meeting was held at Jimbo in Vanga on 1<sup>st</sup> June 2017 whereby a total of eighty (80 no.) community members attended. The objective of the meeting was to strategize on how the planting was to be carried due to limited time. Vanga site was seriously affected by the heavy May down pour which made roads impassable making transport a challenge. The membership was from the following VAJIKI CFA groups;

- 8 Mwangugu Mariculture Conservation group- Vanga
- 20 Mwambiweje Women Group-Vanga
- 13 Vumilia Nguvu Kazi Group-Kiwegu
- 39 Jimbo Environmental Group members -Jimbo

Highlights on the activities undertaken under the KCCAP framework was given whereby it was noted with a lot of concern that there was delay in the planting due to the heavy rains which made the roads impassable. Members were informed that the target for the FY 2016/2017 was 175,000 mangroves planted in Gazi and Vanga but this had not been achieved as the 2016 short rains were very little and planting during the long rains was yet to start. There was therefore the need to plan how the planting will be done within the shortest time possible before rains came to an end (by end of June). The following were

the deliberations;

### **Nursery Establishment**

It was agreed that the community would continue to establish more nurseries since there was going to be another planting exercise next financial year and the seeds were currently available for most species to be planted.

The groups were tasked to determine the number of seedlings that were mature for planting and the species in their nurseries.

### **Planting kick off exercise**

It was agreed that there was going to be a planting demonstration for the groups before the proceeding to planting on their own to maximize on the rains. These kick off exercises were planned to be done from 5<sup>th</sup> to 8<sup>th</sup> June 2017 in order to pave way for the planting by the groups.

The groups agreed on the following targets;

**Table 9; Community Groups Planting targets per day**

<b>Name of the Group</b>	<b>Planting days</b>	<b>Number/day</b>	<b>Species</b>
JEG	Saturday, Sunday and Monday	1,250	<i>Avicennia sp, Rhizophora sp</i> and <i>Ceriops sp</i>
Vanga	Saturday and Tuesday	1,400	<i>Avicennia sp, Rhizophora sp</i> and <i>Ceriops sp</i>
Vumilia Nguvu Kazi	Wednesday and Thursday	1,250	<i>Ceriops sp</i>
<b>TOTAL</b>		<b>3,900</b>	

### **2.3.4 Mangrove Planting Kick off exercises**

Based on the deliberations of the meeting held on 1st June 2017 the kick off exercise were planned and implemented from 12<sup>th</sup> to 15<sup>th</sup> June 2017 in Vanga while for Gazi the activity was done on 10<sup>th</sup> to 13<sup>th</sup> May 2017 and on 22<sup>nd</sup> to 24<sup>th</sup> May 2017 at different sites. Several officers from CDA and other institutions were involved in the exercise.

### **Baraka Conservation Women Group**

The group has been involved in several mangrove conservation activities in Makongeni site. The group had previously worked with KCDP under KMFRI to implement the milk fish and prawn fish ponds in the area. The group was selected since it has made many efforts in the area. A total of 2,638 *Avicennia marina* seedlings were planted.



*The Managing Director CDA planting a mangrove seedling at Makongeni*





*Group photo taken during the Makongeni planting exercise in Gazi*

**Jimbo Environmental Group**

The CDA team had coordinated with KMFRI and Kenya Forestry Services (KFS) offices beforehand to secure the attendance of Dr. Judith Okello and Mr Edwin Misachi for the exercise. 40 community members from Jimbo Environmental Group participated in the exercise. The team was met by JEG Chairman Mr. Kai who organized the members for the activity, a total of 2,448 seedlings were planted on the material day. The group members however have continued to plant mangroves achieving more than 10,000 seedlings of *Avicennia sp* as at 30<sup>th</sup> June 2017.



*Planting at Jimbo site*

**Mwagugu Mariculture Conservation group**

The group has been involved in mangrove conservation activities in Vanga. A total of 1,047 mangrove seedlings and wildings were planted. The group has so far planted more than 12,000 seedlings of *Avicennia marina* species.



*Preparing the Mwagugu site before planting*



### **Mwambiweje Conservation group**

The planting exercise was in Vanga and where several community members were involved. There were 30 members of the group who participated in the exercise who were involved in transfer of seedlings, marking planting lines and actual planting. A total of 1,064 mangrove seedlings of *Avicennia marina* species were planted. The group has so far planted 13,000 seedlings in the site.



*Planting at Mwambiweje Women Conservation group site-Vanga*

### **Vumilia Nguvu Kazi Group-Kiwegu**

The kick off exercise began at 9.00 a.m. with a total of 30 group members participating in the undertaking. There were several sites identified within Kiwegu for planting and at least 2 sites were planted. Most of the areas were direct planting which means no preparation were made. A total of 978 seedlings were planted of 548 *Avicennia marina*, 296 *Ceriops tagal*, 72 *Rhizophora mucronata* and 62 *Bulgaria sp.* The group has planted more than 7,000 seedlings in the site.



*Planting at Kiwegu site*

**Table 10; Summary of group achievements as at 30<sup>th</sup> June 2017**

<b>Name of the group</b>	<b>No of seedlings planted</b>
Baraka Conservation Women Group	7,170
Jimbo Environmental Group	7,848
Mwambiweje Women group	14,064
Vumilia Nguvu Kazi group	5,016
<b>TOTAL</b>	<b>47,645</b>

### **3.0 CHALLENGES**

#### **Limited time allocated to site identification activity**

The sites selected restricted specific type of species to be planted. The time allocated for the site identification activity was not adequate therefore most sites selected were those near the land. This restricted the species to be planted.

#### **Seasonality of the seeds**

Due to the seasonality of the seeds, nursery establishment activities were greatly affected. In some cases the activities could not take off until the seeds are available.

### **Availability of planting material**

During the baseline survey activity it was discovered that there were no seedlings available for planting.

### **Group Dynamics**

Working with the community groups had its fair share of challenges as there are conflicts amongst the community members.

### **Adverse weather conditions**

During the drought period it was difficult to establish and even do the planting exercise. This also applied during the rainy season as rains made the roads impassable therefore some areas made inaccessible

## **4.0 WAY FORWARD/CONCLUSION/RECOMMENDATIONS**

- The planting of mangrove was restricted to seedlings and not propagules making the target of 175,000 seedlings very ambitious. This target can be achieved if this more sites are identified in the deeper forest instead of being restricted near the terrestrial land.
- Consultation and team work amongst the relevant institutions will play a key role in ensuring overall success and sustainability of the project.
- Proper planning is also key in project execution as it involves identifying relevant stakeholders in activities, proper activity scheduling and costing.
- Resource allocation for various activities should not compromise work output and the general quality of work done.
- Community groups to be sensitized on the government procurement procedures so that they can produce proper documentation for goods and services supplied.

## **5.0 ANNEXES**

### ***LIST OF PARTICIPANTS***

1. Dr. Judith Okello	-	KMFRI
2. Dr. Keinan Mohamed	-	CDA
3. Edwin Misachi	-	KFS
4. David Njumwa	-	CDA
5. Pamela Ngure	-	CDA
6. Debra Okello	-	CDA
7. Dullu Amuma	-	CDA
8. Esther Kirigha	-	CDA
9. Mwanasiti Bendera	-	CDA
10. Rose Mwadime	-	CDA
11. Rose Mweni	-	CDA
12. Luka Mwawughanga	-	CDA
13. Saumu Chasi	-	CDA
14. Violet Indiazi	-	CDA
15. Silvia Ingosi	-	CDA
16. Tabitha Achieng	-	CDA
17. Cathrine Kadenge	-	CDA
18. Angeline Mwashumbe	-	CDA
19. Fentus Mng'ong'o	-	CDA
20. Humphrey Baya	-	CDA
21. John Makadu	-	CDA
22. Lucky Baya	-	CDA
23. Maximila Chelimo	-	CDA
24. Moroa Japhet	-	CDA
25. Munga Ibrahim	-	CDA
26. Nuru Mohamed	-	CDA
27. Simon Loktari	-	CDA
28. Tsimba Nyae	-	CDA
29. William Fondo	-	CDA

30. Constance Baya	-	CDA
31. Fauzia Mohamed	-	CDA
32. Tsimba Nyae	-	CDA
33. Abdi Bashir	-	CDA
34. Sharon Adhiambo	-	CDA
35. Amina Njira	-	CDA
36. Edel Fuchaka	-	CDA
37. Joyce Ochako	-	CDA
38. Diana Mwangombe	-	CDA
39. Paul Chengo	-	CDA
40. Zeinab Sheikh	-	CDA
41. Caroline Muema	-	CDA
42. Hamisi Kirauni	-	KMFRI
43. Farida Swalehe	-	KMFRI
44. Obinga Alfred	-	KMFRI

**Baraka Conservation Women group**

1. Binti Ali Mwadzemba
2. Fatuma Bakari
3. Fatuma Hamisi
4. Fatuma Kassim
5. Fatuma Khalidi
6. Fatuma Mohamed
7. Fatuma Mwalimu
8. Khadija Bakari
9. Mariam Mwalimu Mohamed
10. Mariam Mwalimu Randuni
11. Mariam Salim
12. Maua Juma Salim
13. Mwanaisha Bakari
14. Zuhura Ali Mohamed
15. Maua Abdalla

### **Mwambiweje Conservation group**

1. Amina Rashid Abdalla
2. Fatuma Mohamed
3. Fatuma Shilingi
4. Hadija Bakari
5. Masika Shee Akida
6. Mpaji Mwarabu
7. Mwanaisha Bandika
8. Mwanaisha Rashid
9. Mwanajuma Abdalla
10. Mwanakombo Shee
11. Mwanakondo Mwinyi
12. Mwanamisi Omar
13. Mwanamvua Mwinyi
14. Mwasiti Bakari Mohamed
15. Mwasiti Kihawa
16. Mwasiti Mwangombe
17. Nsema Feruz
18. Richia Shee Gobo
19. Sofia Mohamed
20. Somo Jenga
21. Tima Mohamed

### **Nguvu Kazi group-Kiwegu**

1. Abdalla Kombo
2. Bakari Hassan
3. Fatuma Ramadhan
4. Hamawe Kassim
5. Hamisi Vunde
6. Ibrahim Abdi
7. Kibaya Omari
8. Mohamed Shee



9. Mwanaisha Juma
10. Mwanamkuu Hamisi
11. Omar Riko
12. Rajabu Twah
13. Riziki Kulamba

**Jimbo Environmental group**

1. Alawi Yusuf
2. Amina Mohamed Ali
3. Asna Baluwa
4. Hassan Bakari Mwarizo
5. Kajoli Kai
6. Mbwana Bakari Gunda
7. Mwanakaramu Kea
8. Mwanamtama Mohamed
9. Mwanamvua Kassim
10. Mwanamvua Msuma Faki
11. Mwanasiti Alawy
12. Mwangombe Mwinyi
13. Mwashamba Kai
14. Sauda Hassan
15. Tima Juma Salimu

**Mwagugu Mariculture group**

1. Abdalla Kassim
2. Daudi Faki
3. Diwani Mwalugha Abdalla
4. Harith Mohamed
5. Harubu Mbwana
6. Jalala Mchole
7. Juma Boyi
8. Kombo Faki
9. Kombo Issa

10. Mjaka Juma
11. Mohamed Hassan Ndaro
12. Yusuf Majani

**Gazi Women Boardwalk group**

1. Mwanaharusi Khalfan
2. Mwanamkuu Mdahoma
3. Maua Abdalla
4. Mwanahamisi Sammy
5. Riziki Mohamed
6. Fatuma Kassim
7. Halima Bakari
8. Salma Said
9. Mariam Ali'
10. Binti Ali Mwadzele
11. Mariam Salim
12. Khadija Makame
13. Mwanamgeni Abdalla
14. Mauwa Juma
15. Fatuma Hamisi
16. Fatuma Mohamed
17. Mwanahamisi Juma
18. Maku Salim
19. Tima Matano
20. Amina Ali
21. Mwanahamisi Mraja
22. Ramadhan Rashid
23. Said Athman
24. Takdir Masoud
25. Hafidh Omar
26. Zuberi Ali
27. Najat Vae

