AN ASSESSMENT OF THE STATUS OF BLUE ECONOMY SECTORS IN KENYA

Sector Report on Coastal Agriculture

Presented by

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LIST OF ABBREVIATIONS

AFA	Agriculture and Food Authority
ASAL	Arid and Semi-Arid Land
CIDP	County Integrated Development Plan
EAC	East African Community
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Production
IFAD	International Fund for Agricultural Development
KEFRI	Kenya Forest Research Institute
KNBS	Kenya National Bureau of Statistics
MoALF	Ministry of Agriculture, Livestock and Fisheries
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
WRMA	Water Resource Management Authority

Section I

1.1 Background

The global oceans and seas cover more than seventy-two percent of the earth's surfaces and are critical for providing food, jobs, and recreation for a large portion of the world's population; has and have become significant drivers of global GDP (World Bank, 2017). Oceans provide a substantial portion of the global population with food and livelihoods and are the means of transport for 80% of global trade (UNCTAD, 2012). The last few years have seen a spectacular increase in attention devoted to the need to protect the world's oceans and seas through the blue economy with interest growing in the huge potential offered by the future development of ocean-based industries. The blue economy is therefore the sum of the economic activities of ocean-based industries, together with the assets, goods and services of marine ecosystems. The world's oceans and seas hold the promise of immense resource wealth. Moreover, they are increasingly recognized as indispensable for addressing many of the global challenges facing the planet in the decades to come, from world food security and climate change to the provision of energy, natural resources and environment[1]. At the core of the Blue Economy concept is the dissociation of socio-economic development from environmental degradation. To achieve this, the Blue Economy approach is founded upon the assessment and incorporation of the real value of the natural (blue) capital into all aspects of economic activity.

Worldwide, the economies of coastal communities and their resilience highly depend on the ecosystem services that Coastal Zones provide. Globally, the European Commission estimates that the Blue Economy represents over 5 million jobs and contributes €500 Billion per year (Malshini, 2019). Coastal ecosystems include mangrove forests, coral reefs, sea-grass beds, marshes, beach and dune systems as well as pelagic systems. In general, ecosystem services are defined as the immaterial services that are of benefit to humans with a monetary value which are generated. The economic value of coastal protection provided by coral reefs, mangroves and salt marshes in the Western Indian Ocean is estimated at US$1.2 billion annually. According to a UNDP Policy Brief of 2018, the estimated annual economic value of goods and services in the marine and coastal ecosystems of the blue economy in the Western

[1]OECD (2016). The Ocean Economy in 2030: The Ocean as a Sustainable Source of Economic Growth Policy, OECD Publishing, Paris

Indian Ocean is over US$22 billion, with Kenya's share slightly over US$4.4 billion (20%). The Kenyan coast is endowed with rich natural resources that support the local and national economy. Some of these resources include mangrove forests, coral reefs, terrestrial forests, sandy beaches and seagrass beds. Coral reefs, mangroves, salt marshes, seagrass beds and deep-sea habitats generate high biodiversity and productive waters which in turn support economies and livelihoods (Samoilys et al. 2015).

The richness of the region's world-class ocean ecosystems is under threat from both direct and indirect pressures through resource exploitation and human-induced habitat degradation. For example, mangrove coverage is diminishing in most countries in the region – Kenya and Tanzania lost about 18 per cent of their mangroves over 25 years, and Mozambique lost 27 per cent over a shorter timeframe (Bosire 2015). In addition, the coastal region is home to agriculture in form of crop and animal production, both large and small scale.

1.2. Place of Agriculture in Kenya's economy

Agriculture has been the "backbone" of the Kenyan economy since pre-colonial times to date. In the early 20th century, settlers were well aware of the fact that Kenya had great potential in wealth creation through agriculture and thus it became one of their primary activities. Before the colonial era, natives practiced subsistence agriculture using basic tools curated by blacksmiths and mostly organic farm inputs. During this period, some communities reared animals, for instance the Maasai and other nomadic or pastoralist communities, while others grew food crops. Most of the agricultural produce was for consumption while a small part of it would be used in barter trade. When the colonialists came to Kenya in the late 19th century, agriculture in the country underwent major metamorphosis with the introduction of more sophisticated and modern farming methods, exotic animal breeds and exotic crops like maize. During this period, the white settlers began to commercialize agriculture with the setting up of vast ranches and plantations. Locals were used as farmhands to enable production of enormous quantities for consumption overseas.

In the post independent Kenya, agriculture was focused on the following areas; land transfer initiatives, promotion of small scale farmers and encouragement of cash crop farming (Jabara, 1985.) This saw agriculture take a pivotal role in the building of the country's economy as one of the major contributors to the GDP. As of 1980, 80% of working Kenyans made a living from Agriculture (Library of Congress Research Division –June 2007). There are two types of

agricultural production systems in Kenya; rain-fed and irrigated agricultural systems (GOK, 2010). Rainfed agriculture accounts for majority of the cultivated area with irrigated agriculture which contributes 18% of the agricultural production and an estimated 3% of the Kenyan GDP but only undertaken in 1.7% of the Kenyan land (AFA, 2017). The production systems are carried out at three levels, small scale, medium scale and large scale. Small scale farming accounts for 75% of the total production (FAO, 2015; KALRO, 2017).

The agricultural sector is further divided into; crop production (food crops, industrial crops, and horticultural crops), livestock, and fisheries. Crop production alone contributes an estimated 27.8% of the GDP (KNBS, 2020). The key crops include, coffee, tea, tobacco, sugarcane, barley, cotton, pulses, cereals, fruits, flowers, and vegetables. These crops combined account for 55% of agricultural sector exports with tea, the leading crop, earning the country 104 billion in 2019 (KNBS, 2020).

According to the Ministry of Agriculture, Livestock and Fisheries (MoALF, 2015), horticultural production is driven by export and is the largest sub-sector of agriculture, contributing about 33% to the agricultural GDP and 38% of the earning from export (AFA, 2017). Livestock on the other hand contributes 4.0% of the country's GDP and 22% of the agricultural GDP, and is the main source of livelihood accounting for about 94% of the family income in the ASAL lands of Kenya (MALF, 2015; KNBS, 2020). Kenya is the 3rd country in Africa with the largest number of livestock, including 27.7m goats, 17.5m cattle, 17.1m sheep and 4m camel. Seventy percent (70%) of this livestock population is found in the ASAL areas, which account for 80% of the Kenyan land mass (MoALF, 2015; Kenya Markets Trust, 2019). Livestock also accounts for 30% of the agricultural export, and the main products of export consisting of live animals, meat, germplasm, hides and skins, dairy products and processed pork products (MoALF, 2015).

According to KNBS (2020), agriculture is the most dominant sector in the Kenyan economy. It is the Centre of the country's economic growth and development. In the year 2019, the Kenyan GDP was Ksh 9,740.4 billion, and agriculture alone contributed for more than one third of this GDP (34.1%). The sector is driven by other factors which include land, water and farmer institutions such as cooperatives and associations (AFA, 2017). According to WRMA, in the year 2015, an estimated 64% of water distributed in Kenya was allocated towards agricultural activities. Agriculture also employs about 69% of Kenya's economically active population and accounts for 65% of the total Kenyan export (MoALF, 2013; FA0, 2015). The sector also contributes 75% of the Kenyan industrial raw materials and accounts for 60% of

the total employment in Kenya (MoALF, 2013; KALRO, 2017). This sector is further divided into; crop production, animal production, support activities, and fishing/ aquaculture which respectively contribute 27.8%, 4.0%, 0.5% and 0.5% of Kenya's GDP (KNBS, 2020).

Agriculture, forestry and fishing sector accounted for a sizable proportion of the slowdown, from 6.0 per cent growth in 2018 to 3.6 per cent in 2019. Table 2 shows the growth of economic sectors in the country with Agriculture leading the rest.

Table 1: Growth in GDP from 2018 to 2019

Sector	Percentage growth in 2018	Percentage growth in 2019
Agriculture, Forestry and Fishing	6.0	3.6
Transportation and Storage	8.5	7.8
Construction	6.9	6.4
Tax on products	5.6	4.4
Other service sectors	6.7	6.6
Mining	2.7	2.5

Source; KNBS Economic Survey 2020.

1.3. Coastal and Marine Agriculture in Kenya

The coastal region of Kenya is made up of 6 counties namely; Kwale, Mombasa, Kilifi, Tana River, Lamu and Taita Taveta altogether occupying approximately 79,968.1 km^2 of land and accounting collectively for 17% of the Kenyan population (KEFRI, 2016). An estimated 75% of the coastal areas of Kenya lies in the arid or semi-arid zone (Muli, 2013). According to Waaijenberg (2000), 25% of the coastal land is non-agricultural, 50% is suitable for ranching and only 25% is suitable for crop farming.

Figure 2.1 is a map showing Kenya's agro-climatic zones. The coastal area in Kenya can be described as being semi-humid to semi-arid region.

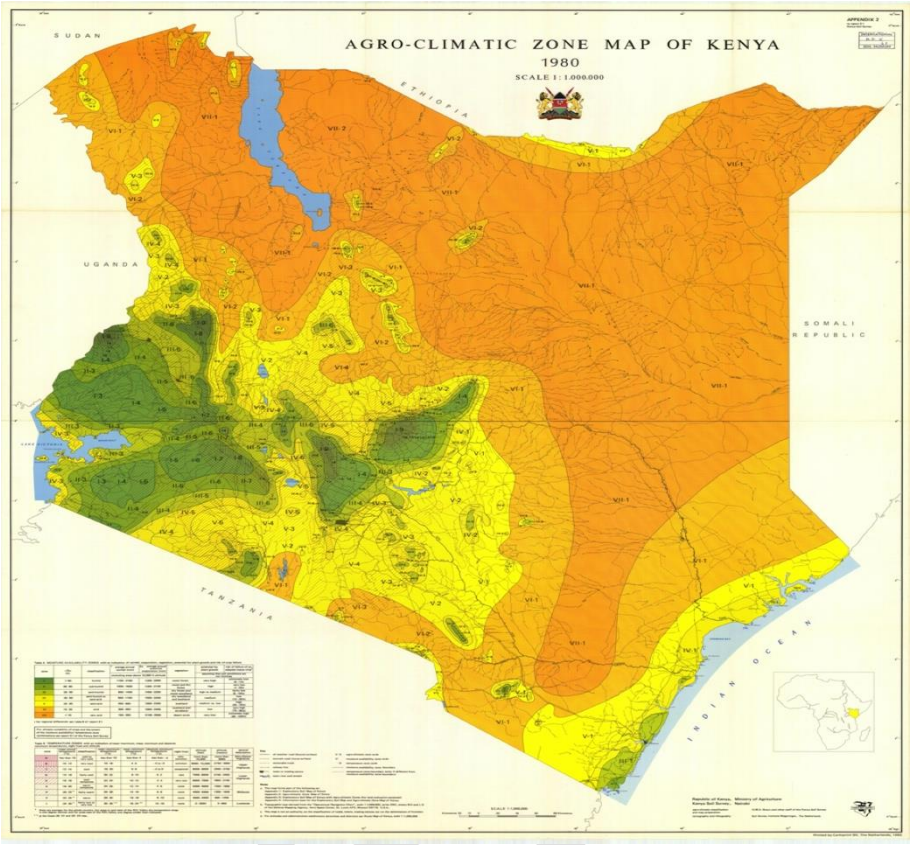

Figure 1: Kenya Climatic zones

The rainfall distribution is bimodal, usually referred to as the long and short rains. The long rains (LR) are received in March/April through July while the short rains (SR) are received in September/October, November and December. January and February are relatively dry months. The long rains season is the most important cropping season. Two thirds of the annual rainfall is usually received during this season. The region has mean monthly minimum and maximum temperatures of about 220C and 300C, respectively. The mean relative humidity is 80%. The region receives an average annual rainfall ranging from 500 mm (in the ASAL areas) to 1,200 mm (in the sugarcane zone in Ramisi).

The main crops farmed in the agricultural areas are cashew nuts, sisal, cassava and millet. Irrigation farming contributes a high percentage of the coastal agriculture the main crops being sugarcane and rice. Majority of the farming is rain-fed which means crop production is seasonal, where there is abundance of food during the rainy season and scarcity during the dry season.

Agricultural activities along the Kenyan coast produce both food and non-food products for subsistence and commerce. Livestock production contributes significantly to the Kenyan coastal economy, and there are 85 ranches within the coastal region, 25 of which are operational. Livestock production is mainly concentrated on the marginal land of the coastal region, which accounts for some 69 percent of the total coastal area. For example, the pastoral communities in Tana River County graze large herds of cattle in the lower ridges of the Tana River basin.

The main food crops grown on the Kenyan coast include cassava, sweet potatoes, maize, coconut, cowpeas and rice, which are grown in irrigated areas, marshes and floodplains. Vegetables and tropical fruits such as citrus, mangoes, bananas, pineapples and watermelons are grown for both subsistence and export. Other crops, which are mainly grown for export, include cashews, bixa and sisal. The average farm size on the Kenyan coast is between 6 and 8 ha, and tree crops (cashews, coconuts, citrus and mangoes) occupy about 50 percent of the coastal arable land.

Coastal agriculture is usually undertaken in low-lying and saline-prone soils where spatial competition with urban growth is an increasing problem. This land is usually sandwiched between land and sea. Coastal agriculture is thus more susceptible to climate change and anthropogenic disturbance compared to inland farming system such as temperature changes, erratic rainfall, sea-level rise, salinity, tidal processes, water stresses, waterlogging and land use changes such as increased population and pollution. According to USAID (2018), a sea level rise of 30 cm is estimated to threaten 17 percent (4,600 hectares) of Mombasa with inundation. This would greatly affect the available agricultural limited land for the coastal residents.

Just like in other ASAL areas of Kenya, irrigation plays a key role in agriculture in the coastal areas. The main source of irrigation water are the rivers that pass through these areas. Irrigation of crops such as sugarcane and rice in the coastal areas have contributed construction of a sugarcane factory in Kwale County and a rice miller in Tana Delta area. The main source of water for these irrigation activities are the surface water bodies such as rivers, shallow wells, springs, water pans, dams, boreholes etc. This is because, despite the closeness to the Ocean water, it is salty and there are have been only a few desalination projects such as for Kizingitini

Island and a clinic in Mombasa. Poverty levels in the coastal counties are way above the Kenyan average poverty level of 12.2%. The coastal region is unable to produce enough food to feed its population and has to import food from upcountry.

In Lamu County, the agricultural sector contributes 90% of the total household income. The main crops grown here are maize, cowpeas, dolichos, cassava, pigeon peas, and green grams. For commercial purposes, the main crops are mangoes, coconut, cotton, bixa, and simsim. According to Lamu County Integrated Development Plan (CIDP), 2018, the county is the largest producer of cotton (40%), simsim (50%) and bixa (40%) of all the amounts produced and grown in Kenya. Livestock accounts for 30% of all agricultural production. The main animals kept are cattle, sheep, goat and poultry (GoK, 2017). However, in the county only 20 percent of the farmers have title deeds for their land. Land tenure issues in the County have significantly contributed to lack of access to agricultural credit. This reduction on credit access partly explains why Poverty level in the County is about 31.6%, according to KNBS report of 2019.

In Kwale County, agriculture as a source of income accounts for 80.6% of all house household incomes. The sector employs about 62,681 in the county[2]

Kilifi County is classified as an arid and semi-arid area and 65% of Kilifi faces seasonal water shortage. Residents of those areas opt for rain water harvesting or depend on pans for regular supply of water for domestic and livestock use. The water pans however often dry up during the dry spells. The county has four main livelihoods zones including 44% Marginal Mixed Farming (MMF) of the population, 22% cash cropping/dairy, 11% Mixed Farming and 2 % ranching. Other livelihood zones include 3% fishing and mangrove, 14% formal employment and 2% forest/tourism and casual labour. Main food crops grown in Kilifi include cassava, maize, cow peas, rice, and green grams. Fruits such as mangoes and bananas are also grown as are horticultural crops including cashew nuts and coconuts (Kilifi County, 2017).

Taita Taveta has the largest area being an ASAL with only 12% (205,500 ha) constituting of arable land and being 3.7% of the national arable land. This area experiences high human population pressure as the largest part of the County (62%) is covered by Tsavo National Parks thus further restricting settlements in this area to reduce human-wildlife conflicts. The poverty

[2] Kwale County Government website
https://kwalecountygov.com/kwale/index.php?option=com_content&view=featured&Itemid=839

level of the County is at 57% and food poverty stands at 48% thus the County is not food self-sufficient. Land in the County is communally owned with approximately 35% having title deeds (Taita Taveta, 2017).

Section II

2.0. Post-harvest loss management and County Spatial planning

2.1. Food losses and waste Coastal Agricultural management strategy

Food loss and waste is a global phenomenon and is not restricted to Kenya or the Kenya Coast in this context. Approximately 30% of the food produced in the world for human consumption gets wasted. Food losses and waste amount to roughly USD 680 billion in industrialized countries and USD 310 billion in developing countries (FAO). Total quantitative food loss in sub-Saharan Africa has been estimated at a 100 million metric tonnes per year. For grains alone, the value of post-harvest losses are estimated to equate to approximately USD 4 billion/year (at 2007 prices), which could meet the annual food requirements of the entire Kenyan population and exceeds the annual value of grain imports into Africa and the value of total food aid received in sub-Saharan Africa over the past decade.

The main source food losses and waste have been identified to emanate from the production level exposure to adverse weather conditions, harvest and handling practices, as well as marketing challenges (FAO, 2020). There is need to develop a comprehensive coast specific food losses and waste management strategy by the coastal counties. This will be an integrated approach dealing with food losses by bringing together all possible forms of approaches across the entire agricultural value chain that together contribute to both quantitative and qualitative losses occurring during and post harvesting of grains, fruits, vegetables, oilseeds and all food crops, livestock and fisheries products (FAO, 2020). Such a strategy can borrow from one developed by the African Union Commission in August 2018. This strategy was informed largely by the 2017 regional scorecard for implementing Malabo Declaration as calculated in the Inaugural Biennial Review Report of the African Union Commission (AUC 2018). From the scorecard, it would appear that the key challenges facing the continent include lack of:

a. awareness and communication on the impact or consequences of post-harvest losses (PHL);
b. awareness of standardised post-harvest loss measurement methodologies;
c. targeted policies and / or strategies at the national levels on PHL;
d. appreciation of the economic value of PHL and its impact on food security;
e. research and development including lack of evidence-based PHL assessments;

f. institutional and organisational arrangements including lack of support for generation and dissemination of PHL best practices and knowledge; and
g. targeted financing and investment in PHL activities.

This strategy addressed these challenges from a continental perspective in support of actions to be taken in the same areas at the regional economic community level and ultimately at the Member States level. This Strategy focused on four strategic issues which form the four pillars of the Strategy, namely: (a) Policy, Awareness and Institutional Capacity; (b) Knowledge Management, Data, Skills and Human Development; (c) Technology, Markets and Infrastructure; and (d) Finance and Investment. This strategy was envisaged to be operationalised in five-year cycles allowing for progressivity based on experiences gained during the implementation of the one five-year period into the next. The implementation of identified interventions under each pillar in this strategy is prioritised in a manner that allows for quick impact and results.

2.2. County Spatial Planning and coastal Agriculture land use

Section 110(1)(a) of the County Governments Act 2012 stipulates that the County Spatial Plans shall give effect to the principles and objects of county planning and development contained in section 102 and 103 of the same Act. Further, section 110 (2)(c)(iv) of the Act requires that the County Spatial Plans should set out basic guidelines for a Land Use management system in the County taking into account any guidelines, regulations or laws as provided for under Article 67(2) (h) of the Constitution. In furtherance to this responsibility, the law obligates each County Government to prepare a ten-year GIS-based County Spatial Development Plan in respect of their area of jurisdiction. All coastal counties have developed 10 years spatial plans.

The coastal Counties Spatial Plans provide detailed analysis of the existing situation based on GIS base maps that bring out the configuration of sectors on space as well as the spatial interpretation of possibilities and constraints. The existing spatial analysis for each county comprises of the natural capital such as the soils and geology, rainfall patterns, energy including solar and wind, biodiversity and conservation, marine resources and its relationship with social economic system of the Counties leading to various outcomes; cultural and heritage capital of the County; the coastal people and the growth in numbers projected from a detailed trend analysis from as far back as 1960 to and beyond to 2030; land and human settlements

within the Counties, their distribution and level of services; the economic base of each of the counties or livelihoods (agriculture and rural development, livestock and range management, fishing, tourism and heritage, public sector, commerce and trade); transport, infrastructure facilities and services (both Physical & Social Infrastructure) and; Governance & Institutions (functions, of executive, policy arm and planning organisation at the County level).

The extent to which the developed spatial plans address competing and conflicting land uses is a matter that requires further detailed analysis.

2.3 Benefits of coastal Agriculture to the local economies

Coastal agriculture confers the following benefits to the local economies:

Reduced transport costs - Coastal agriculture contributes to reduced transport costs for the produce compared to inland agriculture, whether the produce is for export or for the domestic use thus reducing the market price of the produce. Majority of the population living next to the ocean depend largely on the ocean for their daily source of livelihood. This leads to the community depending on agricultural products from inland farming that reach the community at high prices e.g. Eggs and cabbage. However, the few that engage in agriculture provide direct fresh vegetables to the community at reduced prices thus reducing the high food poverty in the coast of Kenya.

Reduced pressure on the coastal fisheries and wetlands – The largest natural resource available in the coastal area of Kenya is the fisheries. However, there is high pressure on the ocean as source of fish leading to seasonal over exploitation. However, aquaculture helps reduce the pressure on these resources and also provides fish during the low fishing season as fish is one of the stable foods.

Increased demand for agricultural inputs and services and consumption goods and services. It created variety of products available in the market and leads to provision of services such as veterinary services and even construction of roads to allow transport of farm products to the market.

Increased supply of food and export crops – It increases generally the amount of agricultural produce available in the country leading to surplus products available for export.

Increased industrial raw materials which prompt construction of processing factories and industries in the areas leading to local economy and stimulate growth and employment.

The Livestock are a source of food, a storage of wealth, a means of transport, provide manure for agriculture and serve as means of exchange. In Lamu Island for example, donkeys serve as one of the main source of transport. Crops also provide food, raw materials for the industries, source of income; while aquaculture is source of food, raw materials, items of trade and source of income.

2.4 Blue Economy initiatives in Coastal agriculture

A summary of some of the agricultural initiatives taking place in Kenya's coastal area is shown in Table 2. Some are ongoing, while others have just started, a few others are either complete or facing operational and governance challenges such as the Galana-Kulalu irrigation scheme.

Table 2: Projects by the government of Kenya

Name	Crops	AREA	Location
Galana-Kulalu irrigation scheme	Sugarcane, maize and fruits	400,000 ha	Galana and Tana rivers
Ramisi sugar irrigation	Sugarcane	8000 ha	Kwale County
Bura (East and West) irrigation scheme	Green grams, cowpeas, maize, cotton, watermelon and onions.	2500 ha	Lower Tana River
Hola irrigation scheme	Maize	872 ha	Lower Tana River
Kinango Water harvesting (Mabasheni)	Horticultural	51 ha	Kwale County
Kinango Irrigation Project	Horticultural	152 ha	Kwale County
ChallaTuhire Irrigation Project	Maize and horticultural	2500 acres	Taita Taveta
Njukini Irrigation Project	Maize & horticulture	700 acres	Taita Taveta

Source: National Irrigation Authority, Kenya.

Annex 1 povides more information on historical developments of Hola irrigation scheme and Bura irrigation scheme.

2.5 Other ongoing initiatives include:

a) Kenya Climate Smart Agriculture Project (KCSAP) which aim is to upscale Climate Smart Agricultural Practices through strengthening Climate smart agricultural research, seed systems, agro-weather, market, advisory Services and contingency emergency response. The project is being undertaken in Lamu, Taita Taveta and Athi river counties in the coastal region among other counties in Kenya. The project is funded by International Development Agency (IDA-World Bank Group).

b) KCDP 2010 -2016. Project was funded by International Development Association (IDA) and Global Environmental Facility (GEF) - The main objectives were to enhance revenue generation and the effective management of Kenyan coastal and marine resources and strengthen the conservation and sustainable use of marine and coastal biodiversity. The project was carried out in Kwale, Kilifi and Lamu.

c) Cashew nut and sesame production and marketing by Farm Africa and Ten Senses Africa funded by the European Union's Emergency Trust Fund. Project areas are in Kwale, Kilifi and Lamu counties

d) Coastal Rural Support Programme (CRSP) from 1997 - Objectives were enhancing village organization and influence to form Village Development Organisations (VDOs) and enhanced soil and water conservation for agricultural purposes.

e) (Vijabiz) by the Technical Centre for Agricultural and Rural Cooperation (CTA) and the USTADI Foundation, with funding from the International Fund for Agricultural Development (IFAD) with the aim of Youth Economic Empowerment through Agribusiness in Kenya.

SECTION III

Challenges and opportunities for Coastal and marine agriculture in Kenya's blue economy

3.1 Challenges

a) Low agricultural productivity and production as a result of low input use, unsustainable soil and water practices and the diminishing size of average land holdings as the available land competes with other land use activities.

b) Very little or no water storage facilities and poor irrigation infrastructure for the farmers. This leads inadequate water available for the domestic and agricultural use.

c) Poor market facilities and market arrangements leading to low bargaining power for the farmers. It creates space for the scrupulous middlemen who exploit the farmers by buying at very low prices to sell at high prices making massive profits at the expense of the farmers.

d) High pre- and post-harvest losses due to limited knowledge on appropriate seeds and crops and farm inputs and inadequate storage facilities.

e) Low value addition contributing to an under developed agro-industry and low prices for farmers.

f) Inadequate research extension farmer linkages caused by lack of demand-driven research for the farmers in the region.

g) Few field extension officers with little experience and knowledge in farming in the areas leading to dissemination of conflicting extension messages to the farming community.

h) Poor or insufficient access to affordable credit. The high interest rates regime, with very short grace period are a drawback to finance procurement of inputs and capital investment in areas such irrigation infrastructure, value addition technologies, farm inputs general farm development. This also makes agriculture become relatively unattractive.

i) Lack inputs quality control and inspection personnel which encourages unscrupulous businessmen to sell and stock substandard and low quality seeds and other farm inputs which causes low productivity to the farms discouraging the farmers.

j) Over dependence on rain-fed agriculture. An estimated 80% of crops are planted during the long rains and the remaining 20% during short rains. This makes farming get affected at very high magnitude by the changing weather patterns in the onset of the climate change. This has caused a lot of losses especially in the recent years.

k) Climate change - The varying temperatures and rainfall are affecting the traditional farming patterns but also leading to increased flooding, erosion, drought periods, inundation, sea water intrusion, rising salinity, storm surges which affect the farms located near the different water bodies. An example is the flooding during the year 2020 which flooded the aquaculture ponds leading to losses of the fish and mixing of water and loss of farm crops.

l) Lack of knowledge of existing government and institution assistance in terms of agricultural knowledge and farmers training. This leads to underutilization of agricultural institutes in the region.

m) High insecurity, poor infrastructure and low literacy levels in the rural areas of the coastal areas especially in Lamu.

n) With 40% of the population living in river basins intensified agriculture will lead to competition of water increasing water stress and pollution (AFA, 2017).

o) Siltation, pollution and eutrophication correlated to an excessive use of pesticides, fertilizers, and poor farming methods and farming. E.g. Poor agricultural land use practices for example in the Athi-Sabaki River Basin for instance, has resulted in the increased discharge of huge volume of sediments in Malindi Bay with far reaching ecological consequences. The Tana River estuary is also characterized by highly turbid water that limits primary productivity (GOK, 2008).

p) Use of traditional outdated methods – In the coast of Kenya most farmers still practice shifting cultivation. Fire is used for clearing land before planting is undertaken. The method was practised in the traditional Africa because parcels of land were large. However currently like in the coast of Kenya, the same piece of land is burnt regularly and several times per year. This is of concern as it has on several times ran out of control burning other farm crops or reaching the forests and can also lead to destabilization of the coastal soils structures such as bluffs and dunes.

q) Declining Agricultural Performance- in terms of its growth has been one of the major concerns facing policy makers and those having interests in the sector.

r) Limited High Potential Agricultural Land and Over-Reliance on Rain Fed Agriculture- Only about 17% of the country's land is high and medium potential agricultural land where most intensive crop and dairy production take place.22 The rest is arid and semi-arid, not suitable for rain fed agriculture

s) Limited Diversification of Agricultural Production. - The sector is characterized by weak vertical integration, made worse by weak institutions and support services for agricultural exports.

t) Limited Exploitation of the Regional Market Potential-The regional markets that have resulted from regional integration, e.g., in the East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), and trade liberalization are yet to be exploited to a significant level(ibid)

u) Poor and Inadequate Rural Infrastructure-Poor infrastructure including poor rural roads, markets and transport systems that result in high transactions costs for farmers and inaccessibility to input and output markets are among the main concerns for the sector(ibid)

v) Inadequate and Declining Research in Agriculture-Inadequate research, especially demand driven research, coupled with ineffective extension and delivery system of research findings has been yet another concern(Teresa Salis, 'LECTURE II' (SlideServe, 2020) The decline in government allocation to the sector has contributed to this continuing trend(Africanexponent.com, 2020)

w) Agricultural Sector Financing and Related Activities. The lack of finance for agriculture limits increasing production and investment in value addition activities in agriculture(Ibid)

x) Lack of a Comprehensive Land Use Policy-the country lacks a clearly articulated land policy with the result that issues like land use, management, tenure reforms and environmental protection are inadequately addressed through the existing systems.(Greatrex, et al. scaling up index insurance for smallholder farmers: Recent evidence and insights. CCAFS Report No. 14. Copenhagen: CGIAR Research Programme on Climate Change, Agriculture and Food Security, 2015)

y) Climate Change-While average annual rainfall is likely to increase due to climate change, changes in the variability of rainfall are expected to be more significant for agricultural production. Climate impacts are likely to be crop-specific.(ibid)

z) Soil Fertility and Land Degradation-Soil fertility in Kenya is already poor and associated with low yields.

aa) Public Expenditure- In 2016/17, Kenya’s allocation to the agriculture sector was less than two percent of total expenditure, well below the average for sub-Saharan Africa of 4.5 percent (World Bank, 2018)

3.2 Opportunities

a) Availability of natural resources such as land and water - All the 6 counties in the coastal area have huge unoccupied lands especially in the rural areas as people in the coastal area segregate in villages towns, around the beaches and urban areas.

b) Irrigation exploitation opportunity - There is availability of a large source of water, the Indian Ocean. Desalinization of this water would be a key in solving the largest problem of the water scarcity. This coupled with high adoption of water harvesting technologies for surface runoff through water pan excavation, earth dam construction, negarims, shallow wells, zai pits among others would provide the needed water for irrigated agriculture and livestock.

c) Empowering and supporting the women and youth in the role they take in agriculture. According to FAO, 2014, 70% of the agricultural work force is provided by women. However, the women are deprived the power of decision making and secure tenure to the land they work in.

d) Awareness creation to the farmers on available government assistance institutes and personnel.

e) Emerging focus on value addition activities which will lead to diversifying of agricultural products in the market as well as reducing post harvesting losses.

f) Existence of new technologies – There are a lot of emerging innovation of technology and approaches ranging from hydroponics to metal silos and use of technology such as mobile phone systems and TV and radio based farmers training.

g) Existence of collaborating institutions such as learning institutions, Research organizations, UN and other international bodies which play a major part in contributing directly and indirectly throw research, awareness creation, funds facilitation and training of agricultural professionals.

h) Availability of national, regional and global markets – There is a large market and demand for agricultural produce that is ever increasing due to increased population. According to the World Bank, globally, millions of people are either not eating enough or eating the wrong types of food, resulting in a double burden of malnutrition that can lead to illnesses and health crises.

i) Kenya has accreditation and membership to various regional and international bodies such as ICA, WOCCU, ACCOSCA, ICA AFRICA, OIE, IBAR, IFAD, FAO, Desert locust

organization. This allows Kenya to get accreditation and standardization for various agricultural products and also partnership to trade and negotiate produce.

j) Identification by the Vision 2030 to drive the economic pillar –This has put agriculture in focus and centre of research and development and increased the allocated budget by the government.

k) Increased supportive policies and favourable political climate in the last few years – This policies include the ongoing allocation of title deeds to the land occupants in all the all the six coastal counties through the county governments and traditional leadership system.

l) Improvement in education, health, security and infrastructure such as roads and communication in the coastal region especially in the interior areas being undertaken by the government which will enable lead to more awareness and knowledge in agriculture dispersed to the communities and easy access to the markets for sale of agricultural products.

m) Agribusiness - Kenya has an active and innovative system that has a history of offering micro loans in remote rural areas coupled with mobile banking. This can be used by farmers to allow access to credit for farm inputs (FA0, 2014).

n) With the devolvement of the government and the agricultural sector, there is a likelihood of target-based region, county based agricultural services and research, enhanced farm input management, and enhanced technical capacity of the county government.

o) Employment - Expansion of agriculture and use of irrigation will lead to increased number of direct employments. According to AFA, 2017, irrigation alone has the potential of employing 15 persons per acre.

p) Increased food security - The coastal region has the highest number of food poverty levels and malnutrition. Improved agriculture would help in improving the health of the community members and creating food security.

q) Industrial development - There is need to create storage places and also use the surplus raw materials.

SECTION IV

Governance Framework for Coastal Agriculture

4.1 Policy framework

The following is a brief description of some of the policies that support agriculture in Kenya, including coastal agriculture.

a. Kenya Vision 2030: This is a national long-term development blueprint that aims at creating a globally competitive and prosperous nation with a high quality of life by 2030. The vision aims at transforming Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment.
b. Sessional Paper Number 10 of 2012 on the Kenya Vision 2030: The sessional paper aims at, among other things to transform key institutions in agriculture and livestock to promote agricultural growth; increasing productivity of crops and livestock; introducing land use policies for better utilization of high and medium potential lands; developing more irrigable areas in arid and semi-arid lands for both crops and livestock and improving market access for the smallholders through better supply chain management (Kenya Vision 2030).
c. National Agriculture Soil Management Policy: The aim of the Policy is to instigate a process by which key stakeholders will work together to achieve better soil protection.
d. Kenya Veterinary Policy: The Policy provides an enabling environment for safeguarding animal life, health and welfare as well as animal propagation and production for food security and economic development.
e. Sessional Paper Number 2 of 2008 on the National Livestock Policy: This policy seeks to put in place a conducive policy environment to facilitate enhanced and sustainable growth of the livestock sub-sector.
f. Sessional Paper Number 3 of 2009 for the National Land Policy: This policy which aims at promoting positive land reforms for the improvement of the livelihoods of Kenyans through the establishment of accountable and transparent laws, institutions and systems dealing with land
g. Sessional Paper Number 3 of 2013 on the National Productivity Policy: The Policy presents the paradigm shift required for productivity management in the country. It contains specific and targeted interventions, which when effectively implemented, would

contribute considerably towards the achievement of the goals of Kenya Vision 2030 and the Kenya Constitution 2010

h. The National Irrigation Policy of 2015: The policy seeks to amend and consolidate the laws relating to sustainable development and management of irrigation for the socio-economic development of the country; and to align existing irrigation laws to the Constitution of Kenya 2010

i. The National Agricultural Sector Extension Policy (NASEP): The policy spells out modalities for effective management and organization of agricultural extension in a pluralistic system where both public and private service providers are active participants.

j. The National Food and Nutrition Security Policy: The policy provides for an overarching framework covering the multiple dimensions of food security and nutrition improvement and has been used to create synergy to existing sectoral and other initiatives of government and partners, including county governments.

4.2 Global and regional frameworks

(a) Comprehensive Africa Agriculture Development Programme (CAADP) framework that commits member states to invest at least 10% of their annual budgetary allocations into agriculture (AU 2003 Maputo Declaration on Agriculture and Food Security)

(b) EAC Development Strategy and the EAC Agriculture and Rural Development Policy established by Article 43 of the Constitution. Article 43 states that Every person has the right to be free from hunger, and to have adequate food of acceptable quality.

4.3 Legal framework

This section summarizes the various legislations that support agriculture in Kenya generally and coastal agriculture specifically.

(a) The Constitution of Kenya: Article 43 of the Constitution of Kenya provides that every person has the right to be free from hunger and to have adequate food of acceptable quality. Article 53 of the Constitution further states that every child has the right to basic nutrition

(b) Crops Act No. 16 of 2013: The Act was established to provide for the growth and development of agricultural crops.

(c) Agriculture and Food Authority (AFA) Act, 2013: This Act stablishes the Agriculture and Food Authority with respective roles of the national and county governments in agriculture

(d) The Kenya Agricultural and Livestock Research Organization (KALRO) Act 2013: The Act provides for organs of the Organization; mechanisms for the co-ordination of agricultural research activities in Kenya, among other things.

(e) The Science, Technology and Innovation Act 2013: This is an Act through which Parliament facilitates the promotion, co-ordination and regulation of the progress of science, technology and innovation in the country. This Act assigns priority to the development of science, technology and innovation; and entrenches science, technology and innovation into the national production system and for connected purposes.

(f) The Biosafety Act, 2009: The act establishes a transparent, science based and predictable process for reviewing and making decisions on the development, transfer, handling and use of genetically modified organisms and related activities.

(g) Irrigation Act 2019 - An Act of Parliament to provide for the development, management and regulation of irrigation, in order to support sustainable food security and socioeconomic development in Kenya

(h) Agricultural Finance Act Cap 323, 1991 (revised 2012): This Act provides for the establishment of the Agricultural Finance Corporation and regulates the granting of loans to farmers

(i) Seed and Plant Varieties Act Cap 326, 1991 (revised 2012) - Outlines the intervention measures the government pursues in research, extension, seed production, multiplication, processing, marketing and distribution

4.4 Institutional framework

1. This Chapter provides a summary of some of the institutions that support the growth and development of agriculture in Kenya.
2. Department of Livestock: Responsible for livestock and veterinary policy.
3. Department of Fisheries: Responsible for fisheries policy.
4. Department of Agriculture: Responsible for crop policy and food security policy.
5. Ministry of Water and Irrigation: Responsible for water and irrigation policies and strategies and their implementation.
6. State Department of Cooperatives: Is responsible for policies and regulations on all small and large farmer cooperative movements.

7. Ministry of health: Responsible for matters of nutrition.
8. Kenya Agriculture and Livestock Research Organization: Is responsible agricultural research.
9. Intergovernmental Secretariat (IGS) created under the Intergovernmental Relations Act 2012 (IRA) in order to promote intergovernmental relations. It is meant to facilitate and improve coordination in the agricultural sector.
10. The Summit: This is a consultative body that brings together the COG and the national government to deliberate on issues that arise during the planning period. The role of the summit is to support strategies that result from sector- related consultative forums, and strengthen coordination between the two levels of government.
11. The Agriculture Council of Kenya (AgCK): This is the apex body for all agriculture sector private stakeholders. The private sector includes all value chain actors whose interest are commercial gains and includes producers, input suppliers, agro-traders (retailers and wholesalers) and agro-processors.
12. Research Institutions- Agricultural research is guided by the National Agriculture Research Systems Policy (NARSP). The main objective of NARSP is to provide direction for national research and sustainable development.

SECTION VI

Conclusions and recommendations

5.1 Conclusion

Agriculture is admittedly and overall, the backbone of Kenya. The sector has so much untapped potential that would guarantee a steep rise in not only the GDP but also on the quality of life. Ranging from the planting, nurturing through harvest, the processes involved are demanding but they certainly pay handsomely for all the stakeholders involved. Given the vast areas of agriculture that exist in the coastal regions ecosystem, when coupled up with modern means of farming and more suitable seeds and breeds, so many people can be involved in the feeding of the nation and its trading partners. The Blue Economy is not an ancient concept globally, therefore the country should not feel like it has been left behind. There are very many partners in the Blue Economy sectors who through research can unearth everyday new potentials within the sector. This can potentially guarantee improved standard of living and sustainable exploitation of the agricultural resources of the Blue Economy. Should the challenges presented by this study be addressed, then the country, and indeed the blue economy, stands to gain exponentially from developments in the sector.

5.2 Recommendations

This study makes the following recommendations;

I. Each of the 5 coastal Counties needs to develop her own There is need to develop a comprehensive post-harvest loss management strategy
II. There are too many policies and laws governing this sector. There are potentially many areas of overlaps which increase areas of conflict. Duplication in some areas essentially means that resources are not optimally utilized. There is need to harmonize policies and laws governing this sector.
III. There is need to carry out extensive awareness creation by the county governments, NGOs and Community Based Organizations among the locals on improved, modern agricultural methods, which includes post-harvest management
IV. Serious consideration should be given towards greater participation of the locals, especially women, who actually do the farming. Participation should be on decision making, formulation and implementation of policies, development of regulations and consultations concerning farming in the coastal regions.

V. Coastal County governments should consider providing farmers with quality farm inputs at a subsidized prices. Such farm inputs include fertilizer and the right seeds varieties which adapt well with coastal weather conditions.

VI. The county governments in collaboration with the Ministry of Agriculture should set up a collection point with efficient storage facilities like granaries for farm production so as to buy directly from the locals at a fair price to eliminate the middlemen who hoad farm products at the expense of the farmers.

VII. Stakeholders in the agricultural sector should set up manufacturing factories in order to add value to agricultural produce. Value added products fetch higher returns for the farmers and will create Jobs for coastal communities.

VIII. In order to enhance resilience of coastal agriculture to climate change, there is need to carry out Outcome-oriented analyses that evaluate adaptation interventions, adaptation programs and/or policies and also evaluate current interventions. Such research is expected to support more evidence-based adaptation policies and more accurately find gaps in policy processes to build climate resilience agriculture in Kenya's coastal communities.

IX. There is a need to carry out a detailed socio-economic mapping to explain for Agricultural land capability, versus its current agricultural land use in the coastal region.

Annex 1: Brief History of Agricultural Schemes in Kenya Coast

a. Bura Irrigation Scheme

The scheme is situated along the Tana River in Tana River County, Coast Province. It is 50km North of Hola Town about 400 km North-West of Mombasa Town. The construction of BISP started in 1978 and was funded by the World Bank, ODA, EEC, UNDP, Finnish Government, the Netherlands and the Government of Kenya. The Project was set up with to settle the landless persons and to cater for the unemployed or the under-employed persons in the area. About 6,700 hectares were targeted to be opened up in Phase I and another 5,000 hectares in Phase II. Plans for improvement and rehabilitating the environment by planting trees to provide fuel wool and building materials for the scheme's population and its surroundings were also put in place. In 2003, the scheme management changed hands from the Ministry of Agriculture to the Ministry of Water and Irrigation. These change saw revivals that grew maize to enable farmers attain a state of food self-sufficiency. For this purpose, one pump was revived while seeds and fertilizer were acquired and distributed free of charge to farmers. In December 2005, the Scheme was put under the management of NIB.

Bura Irrigation Scheme is presently faced with a number of challenges including:

- Frequent breakdown of the pumping unit.
- Silted canals ringed with prosopis Juliflora sp (popularly known as Mathenge in the region) bush which has been a big menace in the region and an environmental threat too Weak co-operative and other farmer's organizations.
- Inability of the users to internalize the changes in management i.e. from direct government to NIB's policy of Participatory Irrigation Management (PIM).

These challenges made farmers not to plant crops for 15 years (from 1990- 2005). Similarly they didn't plant even the maize for subsistence for 9 years (1994-2002). This resulted in famine, increased poverty levels and unemployment for the Scheme farmers and community. One would expect lack of initiatives since the community hosting the scheme is not a farming community as such but pastoralist. More so their staple food is not maize but rice. For the scheme to succeed plans should have been made on how to get labour and questions on for

whom to produce should have been answered before implementation. The scheme is now put under seed maize production irrespective of the original objectives.

The National Irrigation board intended to implement the following activities towards development of Bura gravity project by June 2019

I. Construction of gravity intake by fourth quarter
II. Construction and lining of the main canal
III. Carry out community sensitisation and capacity building

b. Hola (Tana) Irrigation Scheme

Hola (Tana) Irrigation and Settlement Scheme is amongst the oldest NIB Schemes having been started in 1953 by the colonial Government as a holding camp for detainee labor. The Scheme is located in Tana River County in the Coast Province. Its gazetted land area is 4,800 ha but the already developed area for farming purpose is only 900ha. Irrigation in the scheme is through pump fed gravity flow. The Scheme has 700 farming families settled in 6 villages. During the initial time main crop grown was cotton with other crops e.g. groundnuts, maize intercropped with cowpeas grown in small-scale as subsistence crops for farmers. Agricultural activities stopped way back in 1989 when river Tana naturally changed its course at the Laini water intake point thus leaving the scheme without water for irrigation. Since 1989, the irrigation operations ground to a halt; all what remained was general maintenance of the NIB assets. Most of the farm families went gone back to their original homes. The entire Scheme infrastructure collapsed leaving behind a few structures which are in dilapidated condition. Since 1990 when farming activities came to a standstill, the government has tried a number of measures in order to revive the scheme. The first step towards achieving this goal was realized when the government acquired funds from BADEA (An Arab Bank for Economic Development in Africa) to conduct a feasibility study for revival of the scheme (GIBBS 2003). After a successful feasibility study, the donor pledged to rehabilitate the scheme with funds in a tune of Ksh.500 million. This was to cover phase I of the rehabilitation programme, which focused on the earlier developed 900ha. There were further proposals to have the scheme expanded by developing an extra 2,500ha during the Phase II of the Schemes rehabilitation

programme. Similarly plans are underway to consider developing gravity systems for the Scheme.

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