Pamoja for Transformation

Building Peace & Development Opportunities

END OF PROJECT REPORT

CAPACITY BUILDING FOR MSMES WITHIN MARI-CULTURE VALUE CHAINS AT THE KENYAN COAST

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

The Blue economy project is undertaken as one component of the European Union (EU) "Coastal economic development in Kenya" Programme. This is based on partnership between the EU and the Government of Kenya (GoK) to advance the blue economy agenda through coastal development- the so called "Go Blue" initiative. A part of the EU Action, in particular, specific objective is being implemented by the EU Member State Organisations and the UN, including Germany through the GIZ.

The overall project goal is to contribute to coastal economic development in an inclusive, integrated, participatory and sustainable manner by strengthening sustainable blue economy value chains through skill development and matching, and value chain development. Through the programme, GIZ will leverage on the existing value chain structures to build capacity in kenya as envisaged in the egional program "E4D frame (Employment and Skills Development for Africa) which aims to promote employment, raise incomes and improve working conditions through cooperation with the business and the public sector thereby influencing the economic growth of the coastal counties; Kwale, Tana-River, Taita-taveta, Mombasa, Kilifi and Lamu Counties. The main purpose of the project is to therefore contribute to coastal economic development in an inclusive, integrated, participatory and sustainable manner by strengthening inclusive and sustainable blue economy Value Chains through skills development, matching and value chain development.

As an implementing partner, Pamoja for Transformation has steered the aspect of Capacity building for the Mariculture MSME value chains. The proposed program's expected outcome is improved employment rates and productivity of youth, young women and low-income youth in the 5 coastal Counties by 2025. The direct project beneficiaries are 1,400 persons (youth, vulnerable male and female) wishing to gain knowledge in the field of Mari-culture/aquaculture technologies. Out of this target, Pamoja reached 1,382 beneficiaries. The implementation commenced in November 2021 with and inception and MSME identification and recruitment into the project. The project activities began effectively January 2022. The implementation adopted a flexible and adaptive approaches bringing together MSMSEs drawn from the following areas; (fish farmers), input providers, the county and national government officials from line departments, key GIZ partners and a team of experts in building the capacities of the mariculture MSMEs.
This report contains an account of the implementation summarized below:

Section One: Executive Summary.
Section Two: Introduction; Description of the project context.
Section Three: Purpose and Scope of the project
Section Four: Implementation approach and Strategy.
Section Five: - Key Activities and Achieved Results.
Section Six: Greening the Blue Economy
Sections Seven: Sustainability and Upscaling.
Section Eight: - Lessons learn and Business Case
Section Nine: - Challenges
Section Ten: Recommendations
Section Eleven: Appendices

2.0 INTRODUCTION AND DESCRIPTION OF THE PROJECT CONTEXT

Mariculture in Kenya has made some progress over the past decades, through development of simple innovative technologies, such as construction of inexpensive ponds, pens and cages. Culture species most commonly farmed at the Kenyan coast includes the finfish (milkfish species) that accounts for about 90% of production followed by the mullet contributing about 10% of the aquaculture production e.g Crabs, Prawns, Milkfish etc (KMFRI 2017). Under the national development blue print, Vision 2030 and MTEF/P 2013-17, Kenya aims to realize sustainable fisheries development through 'innovation and commercially oriented fisheries sector and improving the value gained in the production and supply chain' so as to improve food security for human wellbeing and attain mid-income economic status by the year 2030.Despite the high poverty levels at the coast, the growing population increases pressure on fisheries making aquaculture a good alternative to meet the demand. Sustainable aquaculture is not only a source of high-quality food, but also create jobs and promote economic growth. This potential is however not fully exploited. In order for this to happen and for the sector to grow, it is crucial for the sector to become more competitive and therefore lower the cost of production while at the same time engendering the sector by including and organizing youth and women in the aquaculture value chains for inclusive and sustainable growth.

It is against this realization that this capacity building for MSMEs within Mari culture value chain at the Kenyan Coast project was developed to enable existing and potential Mari culture producers and actors to benefit from fish production in an economically and environmentally sustainable manner. The project was the first step in identifying and targeting priority interventions and solutions that can support local marine-based communities, as suggested interventions help spearhead the work of trialing key concepts along Kenya's coastline. It promoted local income-generating businesses that provide support services to the Mari culture sector.

The project was implemented in collaboration with County Government Fisheries Department, CBOs and BMUs, as well as other partnering organizations in order to encourage commercially viable fish farming practices and to promote the benefits of responsible Mari culture. The approach used integrated public and private sector investments in the Mari culture value chain with community-wide initiatives that promote employment creation, improved livelihood, increased income and food security. The project designed need-based trainings tailored to the specific needs among different target groups with an aim of enhancing smallholder commercial fish farmers with Mari culture knowledge and up-to-date practical skills (technical and business/financial literacy skills) to help sustainably manage, grow the sector and make it more inclusive.

The project attached a lot of focus on seaweed farming, milkfish/prawn farming, mud crab farming as key opportunities and targeted 5 counties, Kwale, Mombasa, Kilifi, Tana River and Lamu. 1381 MSMEs (723 females, 658 males) were reached including women and youth. Indirect beneficiaries included members of communities that were not directly receive training or support from the programme but benefited from the opportunities that the new economic environment created such as improved access to affordable, nutritious food, and employment opportunities. The project covering the entire Mari culture production chain (from production to the market) directly addressed production and sustainable Mari culture management issues. Its intervention resulted in an increased knowledge of the environmental and socio-economic value of the ecosystem, mangrove restoration and biodiversity

conservation, small scale Mari culture demonstrations, leadership and conflict management among the farmer groups.

During the project implementation period (October 2021 to Dec 2022), the project cited some of the socio-economic issues that has led to the low output of Mari culture fish ponds in the coastal region which include; lack or limited technical and business knowledge in Mari culture management, the social orientation of the Mari culture farmer groups, poor access to quality fish seed/fingerlings and feed, which results in low yields. In addition, government regulations allow easy conversion of the government land to aquaculture, but there is underutilization of the available resources, trade is constrained by inadequate market and trade infrastructure and poor policy implementation. These lead to high transport costs, complex and unaligned trade rules and deficient market information, all of which prevent the aquapreneurs from optimizing the social and economic benefits available. Lack of skilled human capital has seen fish farms underperforming, resulting in losses causing farmers and investors to lose interest in the aquaculture industry.

To boost the MSMEs technical knowledge and unlock the latent potential, the project provided trainings in best production management practices of Mari culture, seaweed and value addition with topics also covering fish pond construction and management, fertilization, business skills among others.

Through the interaction with Lamu groups and data gathered from other stakeholders, it was noted that the potential in the county is immense but apart from other inhibiting factors, inter and intra group conflicts has had serious ramification in to their progress. It was noted that the neighbouring groups; mokowe mainland and Dolpine had perennial conflicts which affected the internal operations of these groups and subsequently growth, they since the training buried the hatchet and committed to work together. This was made possible through sessions which were done jointly.

3.0 PURPOSE AND SCOPE OF THE PROJECT

a) Train at least 1,400 Mariculture MSMEs on the below-mentioned mariculture value chains: Mudcrab fattening, Octopus, Milkfish/Prawns (in tidal ponds), and Seaweed.
b) Create horizontal and vertical linkages in the mariculture value chains.
c) Liaise with the master trainers in all mariculture value chains and 4-6 semi-independent youth aquaculture agents on technical and networking support.

The geographical scope and species of the project is the Coastal Counties Economic Block, which are broken down as follows:

Kwale	**Tana River**	**Kilifi**	**Mombasa**	**Lamu**
Milkfish/ Prawn, Sea weed	Crab fattening, Prawns	Prawn/milkfish, Crab fattening	Prawn/ milkfish	Octopus, Crab fattening

4.0 IMPLEMENTATION STRATEGY AND APPROACH

As indicated by these three specific objectives of the PfT Project outlined above, the PfT strategy was to respond to fish farmers' concerns as they emerged. Project training content was designed to reflect this strategy, allowing for technical/entrepreneurial assistance that is tailored to Mari culture MSMEs' needs as identified in the baseline survey.

Partnership and collaboration: Working closely with the national and county Government of Kenya (GoK), department of Fisheries and Aquaculture Development, the JKP and other stakeholders, strengthened community groups and individualMSME to improve their entrepreneurship potential by upscaling their Mari culture enterprises.

Skills development and matching: Trained at least 1,400 Mari culture MSMEs (youth, vulnerable male and female farmers and other value chain players) on the below-mentioned Mari culture value chains: Mud crab fattening, octopus, Milkfish/Prawns (in tidal ponds), and Seaweed. The skills development was based on a three-pronged approach combining and integrating technical knowledge and skills on mariculture as the first set; business entrepreneurship and financial literacy as the second set and leadership and conflict management as the third set of the capacity trainings offered to 1,382 MSMEs.

Value chain development: through the partnerships and collaboration, the project created horizontal and vertical linkages within the Mari culture value chains. This enabled the beneficiaries to increase awareness and opportunities within the value chains, marketing platforms for their products, peer learning Further, beneficiaries understood the flows of products, consumption patterns, money and information flows, and supporting organizations within the mariculture sub-sector for strategic partnerships.

Improved Mari culture infrastructure: the project envisaged to identify and support at least 5 demos sites, mostly tidal ponds and crab cages were improved as follows:

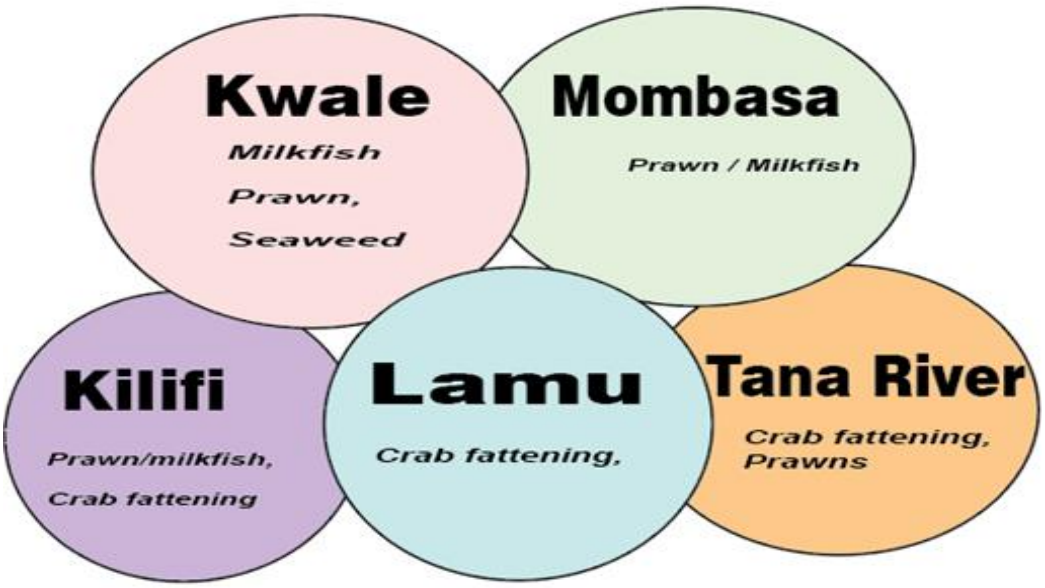
i. At least 7 tidal ponds were renovated to the expected standards (size, in and outlet setting to regulate salinity.
ii. Pond management improved including fertilization MSMEs were able to renovate their ponds, restocked and started keeping their feeding records
iii. Increased productivity and improved livelihoods from the increased sales and quantities
iv. Increased awareness of Mari culture best management practices (pond management, feeding patterns and rations etc.
v. Increased participation of women and youth in sustainable Mari culture developments.
vi. Increased technical and entrepreneurial capacity of Mari culture MSMEs as well as market and financial access through business improvement plans.

5.0 KEY ACTIVITIES AND ACHIEVED RESULTS

The below achievements summarized below relate to the project activities and the respective indicators.

5.1. Youth and women have been provided with market-relevant skills in selected blue value chains to improve their economic and employment opportunities.

Four selected county specific species identified and prioritized due to the availability of seeds, suitability of soils and tidal range, high market value, ease of scalability/profitability, unexploited potentials and ease of MSME mapping and linkages towards the achievement of project results. The choice of milkfish/prawns was informed by the fact that the two species can be co-cultured in ponds. The species were observed to contribute significantly to the Mari culture output and Mari culture development in the coastal counties. Apart from the four target species, it was noted that some of the beneficiary farmer groups especially in Kwale and Tana River counties culture acclimatized tilapia which is supplied by KMFRI.



5. 2 Capacity building Training

5.2.1 Business and Financial Literacy Training.

1,382 MSMEs provided with market-relevant skills in the selected blue economy value chains. To spur further growth in Mari culture and ably meet the growing demand for fish, 1381 MSMEs (50 enterprises) received trainings in all technical and entrepreneurial aspects to understand Mari culture as a business. A total of 866 mariculture fish farmers were trained on technical and business aspects which include planning for Mari culture as a business at the farm level (essential elements to account for and common steps to follow), preparing a business plan through hands-on exercises to determine and simulate the profitability level and financial feasibility of a Mari culture project under different

scenarios (management, prices, etc.) and the components of managing a Mari culture farm as a business and elements of fish marketing while 515 MSMEs were trained on the business and leadership. The trainings were tailored towards tapping the full production potential and enhancement of productivity in Mari culture sector by promoting pond culture for high value species like milk fish, prawns and mud crabs.

Less than a year after the trainings, results show positive impacts on the adoption of good record-keeping practices (4 out of the 7 types of records being promoted e.g. harvest record, sales record, stocking record, feed record, debit/credit note). The virtual marketing and processing advice through the trainings has contributed to higher incomes by the adopted enterprise e.g. the Mtongani Kidunduu group.

5.2.2 Mari culture Technical Training

The training achieved its overall objective of enabling the fish farmers and the value chain players along the Coastal region increase their Knowledge in sustainable fish production practices and develop the entrepreneurial skills in Mari culture to promote sustainable livelihood and self-dependence. Before the project, the MSMEs had little or no business management skills. It also bridged existing financial and technical gaps and encouraged cohesiveness in groups. During the project implementation, it was realized that most of the groups started the fish farming projects as a welfare initiative of generating income to solve problems that they were facing at the household and community level and not as an enterprise, with income, profit and expansion focus.

Through the delivery of theoretical knowledge and practical skills on crab, milkfish/prawn and seaweed farming, the project increased the productivity of the farmers within the specified value chain. 90% of the farmers have seen increased growth in production which has led to improved economic status with six of the enterprises experiencing lower fish mortality, faster growth rate and increased quantity fish at harvest. Mokowe Dolphin group in Lamu county for example, have been able to increase the production from 30 crabs to 100 crabs within three months with reduced death rate. As a new method of improving the livelihood of the community, the group has been able to upgrade the project to medium size by improvising the cages from 20 litre jerricans with a capacity of

raising up to 700 crabs every 7 months. The group expects to raise at least Kshs 140,000 per harvest with a net profit of Kshs 70,000 per harvest. Mokowe Mainland group that have been doing crab farming have acquired 50 floating cages that can hold up to 250 crabs through the support from Lamu County Government. This was to boost their production with focus to seek an international market. As a result of the technical trainings, the Lamu crab farming projects have attracted a lot of interest from other communities and county government line departments on fisheries.

The trainings also played a role in mobilizing other farmer groups to adopt mariculture as a sustainable approach for business growth , for instance, Bonje group in Kwale county and Mashundwani in Lamu county started fish farming after gaining the technical knowledge.

The project through its technical trainings contributed to the rehabilitation of 15 ponds in four Coastal counties that were initially prepared without prior technical knowledge on pond construction. This has resulted to the multiplier effect of increased stocking density and improved pond management practices such as: water management (increased number of farmers reportedly checking water quality more often, at least weekly and improved water exchange in ponds) and on productivity (such as better feeding practices and better transportation and handling method for fingerlings) and incomes by reducing overstocking, improving fingerling sampling, maintaining water level for fish ponds and establishing physical barriers, following advice and recommendations on feeding practices and complementing feeding practices with farmers' own feed formulation (which involves a combination of maize germ with coconut oil).




Below is the training summary achievement:

County	Overall Targeted Population	Targeted Female	Total Reached	Targeted Male	Total Reached
Kwale	450	135	202	315	199
Mombasa	250	75	102	175	67
Kilifi	450	135	268	315	166
Tana River	150	45	104	105	121
Lamu	100	30	47	70	105
Total	**1,400**	**420**	**723**	**980**	**658**

5.3 Creation and Retention of employment.

The project has promoted economic growth through creation of 100 jobs (which has significantly contributed to improved living standards of the group members and the community. On the remarks made by the trainers with respect to technical capacity development coupled with the project team monitoring and follow up, action on employment creation had been taken by the responsible groups. Mtongani and Dabaso conservation groups in Kilifi County have created jobs for both members and non-members in the community through their restaurants. Kadzifitseni women group has also created new jobs through addition of 12 new members to their mangrove conservation group after realisation of the economic benefits of mangrove. Through the increase in demand of value added products of seaweed, Shangani Amani group have enhanced job creation for 7 women after realization that the value added seaweed products can fetch better market prices leading to increased profits.

The jobs created and retained do not fulfil the decent jobs indicator threshold due to the following factors:

1. The minim wage of KES 7,622 weekly for 20hours per week is not attainable given that the revenue streams for the MSMEs is realized at least after every 3-6 months.
2. They are organized into social groups of at least 20 members, and they share the revenue after every harvest which is 3-6 months.

3. They mostly work on part time basis because they have a rotational duty roster. As such their salary cannot be computed based n a monthly income as they would not fulfil the total calendar days required for a full month pay.

5.3.1 Group formalization and upscaling

Through knowledge transfer of financial management and technical requirements for accreditation of businesses and technical skills enhancement during the trainings, the project contributed to a group's process towards getting the accreditation as a private limited company i.e. Mtongani Kidunduu group that was formerly registered as a community based organization as a social group is now able to operate as a private limited company and is recognized as a fully registered business enterprise. This accreditation has resulted to improved working conditions and increased income both from the pond operations and the restaurant as displayed on the group financial records. The group which also does bee farming as an extra economic activity has increased their sales through integration of information and communication technologies through more enhanced record keeping, social networking and creation of virtual markets. From group management perspective it is important that the group member is properly supervised, all documents are controlled and a clear management system is present. Compliance with requirements and application for a license and certification from the labor and social protection office for legal operations have been initiated by some of the groups that have not been fully registered to enable participation in the Mari culture field and market access.

5.4 Horizontal and vertical linkages fostered.

The project adopted open field day as a strategy to ensure MSMEs interacted among themselves as well as with the duty bearers. Six farmer field days organized in the four project counties i.e. Kilifi, Tana River, Mombasa and Kwale which reached 527 (295 females, 232 males) farmers and value chain players. This promoted networking, peer to peer learning and enhanced the stakeholders' knowledge on the different mariculture species within their counties. The linkages resulted in market growth. For example the seaweed farmers, reduced post-harvest losses which in turn drives increasing farm production.

Shangani Amani group and Tumbe seaweed farmers in Kwale county, processing and marketing seaweed-based product reported being able to connect with other farmers and buyers from the Kwale and Lamu counties such as Baraka group, kibuyuni and Mokowe dolphin group (potential seaweed farmers) , thereby increasing opportunity to access market for their products and receiving higher prices for their raw materials which have resulted in ripple effect both in production and profitability. Through the new market, their production increased from 900kg to at least two (2) tones per harvest with a sale of kshs 35 per kilogram which is much higher than the initial buyers. They have invested the new earnings in a table banking and merry go round initiatives that has improved livelihood and created more employment and increased wider range of product lines.

The horizontal linkages created during the trainings enhanced the uptake, expansion and utilization of the knowledge by the mud crab farmers on the appropriate culture method for Mud Crabs in both bottom and floating cages in Lamu County. The Mokowe mainland group in Lamu County started crab fattening but experienced challenges mainly related to high mortality and limited technical skills. Through knowledge sharing, they have adopted cage as an appropriate culture technique for mud crabs to maximize harvest.

As part of supporting commercialization of Mari culture, PfT strengthened linkages with county officers from the fisheries sector, as well as other key stakeholders which promoted a mutually beneficial engagement. The project brought on board JKP through the CEO who reiterated that Coastal region is currently focusing on venturing into fish value chain for economic growth therefore, the government has set aside Kshs 3.5 billion in realization of the same. The project also provided opportunity for the MSMEs to exhibit their products through the Mombasa Agricultural show. This resulted to strong inter stakeholder coordination at the local and national level and strengthened government and farmer groups cooperation on aquaculture production. The linkages created resulted into increased sales and promoted an opportunity for the Mari culture farmers to meet potential new customers, suppliers and to learn more about their competitors which resulted to market growth. It also enhanced knowledge on the Lamu potential in seaweed farming.

Below is the data summary for the open farmer field days:

	KILIFI	TANA RIVER	MOMBASA	KWALE	LAMU	TOTAL
FEMALE	127	40	65	63	0	295
MALE	101	38	36	57	0	232
TOTAL	228	78	101	120	0	527



5.5 Leadership and Conflict management

The project design acknowledged limited capacity for the MSMEs to address group dynamics that threatened the stability of the businesses. Suched dynamics faced included intergenerational and cultural challenges that limits involvement and effective participation of women and youth in mariculture. Culturally, women do not take active leadership roles although this has since changed since the training with Mtongani allowing women to take leadership roles, hence causing perennial conflicts due to the perceptions towards women and youth. The project has recorded improved accountability and openness on finances, and number of enterprises where more women have been included in the management. Baraka for instance had a huge potential to grow over the past years but as established there has been lack of financial disclosure by the leadership resulting to resentment and lack of commitment. This changed after the leadership trainings, there has been immense changes in light of how the group operations are being undertaken.

5.6 Gender Transformation.

There has been an increase in inclusion of women and youth in Mari culture based on the empirical information provided by the fish farmers and from observation during the project implementation. 723 women (51.6%) and 560 youth (40.0%) were involved in the project's capacity development activities thereby bridging the gap of low levels of skills and knowledge in the enterprise and poor access to technical and market information as a limiting factor to women's involvement in Mari culture. Through this engagement, women were provided with primary benefit of income. During the project implementation, greater inclusion of young women was observed in seaweed farming (57), fish farming (410) and in leadership positions (11) within the Mari culture farmer groups. Women continue to be predominantly engaged in low-return roles in Mari culture, with very few women crossing gender boundaries into the higher value nodes. Therefore, the project promoted women empowerment and engagement in decision making both at the household and at the business sphere through the leadership and gender mainstreaming trainings.

Five out of the 48 groups restructured their leadership system to include more women in the managerial positions. E.g. Mtongani Kidunduu group included 3 more women in leadership, Katsangani CBO included 2 more women in leadership after restructure and Ihaleni kakuluni group added 1 woman in the managerial position. Baraka fish farm, Shangani Amani, Kadzifitseni women and Tsunza Fish pond groups have taken the bold step to involve youth (200) and women (228) in mangrove replantation and in the downstream segments of the value chain including processing, value addition and trading that do not require assets needed for production. In particular, it promoted human and social capital in the form of increasing self-esteem, confidence, appreciation and respect from themselves.

Gender segregation analysis data

	FEMALE			MALE			
Age Bracket	18-24	25-35	>35	18-24	25-35	>35	TOTAL
KILIFI	19	74	171	16	53	101	**434**
TANA RIVER	8	34	59	14	50	60	**225**
MOMBASA	10	40	57	6	26	30	**169**
KWALE	14	58	131	12	51	135	**401**
LAMU	5	28	15	8	34	62	**152**
TOTAL	**56**	**234**	**433**	**56**	**214**	**388**	**1381**

To reduce the challenge of low youth and women inclusion in Mari culture ventures, some of the beneficiary groups especially within Kwale county such as Baraka fish farm, Shangani Amani and Tsunza Fish pond have taken the bold step to involve youth and women in mangrove replantation and in the downstream segments of the value chain including processing, value addition and trading that do not require assets needed for production. In general, the project team observed that through their contribution to food and income security, sustainable employment, poverty reduction and income generation among the women youth, women were also allowed to take leadership decisions in the management of Mari culture ventures as a result of their acquired knowledge.

6.0 GREENING THE BLUE ECONOMY.

Green technology is key to economic growth in fisheries and aquaculture however, there is still low adoption of non-destructive fishing techniques. The project mooted a model that aims to restore the health and productivity of oceans and marine ecosystems by promoting responsible stewardship among the MSMEs through biodiversity conservation. The project promoted interest in climate change mitigation since the project beneficiaries are now intensively involved in raising mangrove tree seedlings for planting in degraded areas along the coastline as a way of reducing carbon emmission and also for sale. They are also involved in waste management through cleaning the ocean, restoration of the wetlands and conservation of vegetated habitats that are highly effective at sequestering carbon and forming a habitat for wild fish. The MSMEs have adopted the use environmentally-friendly fish feeds such as snails, algae and wastes from fish) or supplementary feed (agricultural by-products like wheat/maize germ/corn-based feeds) which do not affect the marine environment in any way and is more efficient, economically viable and sustainable.

These two approaches of mangrove reforestation and wetland restoration along the coastline has increased local availability of wild fish (fingerlings) and opened up economic opportunities in areas

where the creation of such water bodies may have resulted in the loss of other livelihoods. Seaweed farming which is largely done in Kwale county contributes to climate change mitigation and adaptation by purifying surrounding water and maintains ecosystem health. Naturally, seaweed acts as a carbon dioxide sink by trapping atmospheric carbon dioxide and carbon that maybe buried in sediments or exported to the deep sea and converts it to carbohydrates using sunlight. It is also used as fertilizer in improving soil quality. The farmers also use the seaweed as a cattle feed. Seaweed develops a dense canopy, which reduces the waves' strength, which could cause coastline erosion and creates micro-habitats for marine organisms. They support high diversity of fish and provide a place where fish can hide, breed and feed.

Based on economic expectations from the beneficiary households, poultry has also been incorporated especially for some of the farmer groups that have ponds and those that were targeted without ponds but potentials for subsistence fishing interventions for easier supply of organic manure and increase in yield productivity. The coconut palm tree that is also grown by the fish farmers along the coastal region produces nut throughout the year when climatic conditions are favorable and is one of the most important food security crops. It is also practically used by these farmers to increase diet flavor (aroma) in fish feed and thus to serve as an attractant to enhance feed intake. In addition, it was also observed that the coconut oil is also used by the fish mongers (mama karanga) to deep fry fish due to its neutral taste.

Due to the high costs of commercial cages and high initial labor costs for the constructions of crab fattening cages which consist of building the cages out of mangrove sticks (2 persons working for a total of 20 h to build a cages with 50 individual compartments), the crab farmers have resorted to use of plastic cages. Plastic waste management and recycling activities practiced by the mud crab farmers have the potential to reduce the environmental impacts of plastic pollution and to tap the economic value of would-be waste materials.

Practice of bee keeping by the fish farmers within the mangrove ecosystem. Honeybees play an important role in climate change mitigation and poverty alleviation. It has been observed that majority of the Mari culture groups especially those within Kilifi, Kwale and Lamu counties e.g. Mtongani, Magangani, Tsunza, Mokowe Dolphin groups etc. do beekeeping alongside fish farming as an economic activity and individually as a well-established household activity and most importantly as a practical tool for raising the awareness of these coastal communities on the importance of forests management and for stimulating their conservation by improving their biodiversity. The groups also run educational programs on beekeeping for community members, students and tourists. The green growth aspect in bee keeping seen in the maintenance of biodiversity and pollination of crops (agricultural and horticultural plants) as the most valuable services provided by bees. Crops pollinated by bees have been proven to produce higher yields and better quality, often at no extra cost for the farmer, rather crop seed yield increment. Beekeeping is an environmentally friendly and non-farm business activity that has immense contribution to the economy of segments of the society and to a national economy.

In order to protect the marine ecosystem, the government has laid down legal frameworks and policies against illegal fishing gears that threatens our ocean resources and the communities that depend on them for their food security and livelihoods. For example, the Fishery Management Act 2016 has banned the use of monofilament nets which has been termed destructive to the marine

ecosystem. The government has also laid down strategies that promotes investments in renewable energy, resource-efficient and clean production, pollution control, waste management, environmental planning and governance and restoration of forest ecosystems in an effort to promote green economy in aquaculture sector.

7.0 PROJECT SUSTAINABILITY AND UPSCALING

The project ensured its sustainability through capacity development of women who play a significant role in the aquaculture sector, operating in a range of activities relating to hatcheries, production, processing, trading, and marketing. Adoption of good management practices by the farmers during the project implementation would also promote its sustainability. Since there is considerable potential for development in Mari culture, its expansion and long-term sustainability would require good spatial planning and management, starting with the appropriate zoning and selection of sites, followed by the adoption of good area management practices. Spatial planning by the county government will

help determine where and how to best develop Mari culture enterprises that are socially inclusive, equitable and environmentally responsible, and that provide opportunities for sustainable and profitable aquafarming and decent work, as well as from the additional economic activities that support it. This can be achieved through the adoption of training and coaching model (SME-LOOP model) and integration of the same in the TVET institutions. Supporting sustainable growth through investments, loans, credit, and financial services that match producer needs, timelines, and risk profiles, while ensuring the availability of competitive, transparent, secure markets and modes of transaction to strengthen investor confidence would also enhance sustainability of the Mari culture projects.

In addition to capacity building, the farmers' contributions to income and food security should be supported by an improvement in fish feed and seed sustainability. The project enhanced the business and technical capacity of seaweed farmers but there is still an obstacle from fully utilizing the potential in seaweed farming despite seaweed being identified as a good prospect for social and economic development in the south coast area. Better governance and coordination with increase access to markets should be the key to overcome these obstacles and attract more investments in the seaweed industry.

8.0 LESSONS LEARNT

From the implementation of the project, we draw several lessons that demonstrate the potential for strategic investment, upscaling, upskilling and business growth within the mariculture sub-sector as follows:

i. Mari culture projects are mainly driven by existence of donor funds rather than benefits gained from successful interventions a fact that has led to stagnation of production and Mari culture growth, despite significant efforts from development/ conservation organizations and government. Current production is sold either at the farm gate or in local hotels, initiated by the farming groups. Fisheries being a devolved function, the go blue projects needs to be streamlined into the respective CIDPs. This policy framework for mariculture value chains to creating wealth and transform the lives of not just the people living in the coastal areas, but those of other Kenyans would also be a foundation for economic transformation for the maricultre industry.

ii. The average annual fish production in the country stands at 165,000 metric tons against a demand of 475,000 metric tons[1]. This implies that there exists a fish demand gap of 310,000 metric tons of fish annually. The gap between demand and production is projected to increase to 360,000 metric tons per year by 2025, resulting in rising prices and a continuing decline in fish consumption. In order to bridge this gap, such projects should be upscaled by increasing

[1] Phoebe Owuor et.al Value Chains Analysis of Aquaculture in the Coastal Counties Economic Block; Lamiro Consult LTD, 2021.

the number of producers, more technical and business trainings for the current and additional MSMEs would as well be necessary.

iii. There is limited research a documentation on the mariculture sub-sector including the socio-economic potential. Economic performance of the aquaculture sector in Kenya sector is neither well understood nor documented. Documenting the economic status of the MSMEs by way of building business profiles would make the mariculture enterprise understood as business. A lot of literature exists about fresh water Tilapia that forms the foundation of farmed fish in Kenya. Similarly, Kenya is not competitive in the regional seaweed market. . However, there is immense potential in farming the mariculture species (mudcrab, milk fish, prawn, sea weed) which are among the largest cultured with Milkfish accounting for upto 90%. In order to succeed, there programs need to attract both the new farmers and utilize productive space at full capacity

iv. Women continue to be predominantly engaged in low-return roles in Mari culture, with very few women crossing gender boundaries into the higher value nodes. Therefore, the project promoted women empowerment and engagement in decision making both at the household and at the business sphere through the leadership and gender mainstreaming trainings that saw some of the groups restructure and involve women in leadership and decision making roles.

v. Majority of the MSMEs involved in the production mariculture enterprise are social groups organized as community based organizations. These groups present a ripe opportunity for transformation into social enterprises so that they can not only expand their operations into other value chains that are aligned to mariculture, but also making them bankable. Other areas that could be integrated into the Blue Economy project include: ecotourism, environmental management systems, and reef and marine recreation management. The GoBlue project should identify some opportunities for supporting such in the coast.

vi. Majority of the Kenyan mariculture production is done in simple innovative technologies, such as construction of inexpensive tidal ponds, pens and cages. These can be expanded and integrated to other renewable energy opportunities that would promote value addition as part of greening the blue economy. Such may include, solar powered lighting and refrigeration, organic fertilization of the ponds as well as recycling of biodegradable waste to manufacture organic feeds of the fish species to help reduce on post harvest loses as well as guarantee quality and quantity products.

9.0 CHALLENGES AND LIMITATIONS

The project experiences several challenges and limitations that were both impediments to full implementation but also limitations to the desired growth of the mariculture value chains.

1. **Lack of government policies:** Aquaculture is a devolved function that falls under the county governments. However, extension service delivery in the aquaculture subsector is disorganized and uncontrolled as different actors design conflicting programs that are not guided by any specific blue print. The services and support is offered by government extension officers and private sector agents that offer significantly varying technical information to the farmers and as a result, farmers end up being confused and sometimes at conflict among their groups and with other partners whose program designs are different and do not necessarily satisfy their expectations. Besides, both private entities and government engage in the aquaculture sector based on short term projects that does not guarantee sustainability as the counties only seem to have recurrent budgets, but not programmatic budgets to continuously support the aquaculture value chain.

2. **Leadership and Conflicts:** the formation of the mariculture MSMEs is not informed by capacity and knowledge on leadership and conflict management. This contributes to divisions and wrangles within groups that destabilizes their operations. Besides, most of the groups membership are homogeneously clan or families that makes them difficult to adopt and apply the business principles. Such conflicts lower the potential of the entrepreneurship potentials and stagnates their operations unless a donor comes inn**.** There have been no good social relations and lack of trust among the farmer groups and this has translated to unhealthy business relations which is not beneficial to the community and the growth of Mari culture.

3. **Limited technology and experts:** unlike the fresh water aquaculture, mariculture does not seem to have advanced technologies and many experts to support the implementation. Most of the experts are international who are expensive and the local ones exist within the academia who are mostly not in touch with the community dynamics of mariculture. Whereas there are similarities with the fresh water aquaculture, the unique circumstances within the salt waters cannot be fully replicated.

4. **Impact of donor driven conservation projects** that is not aligned to the government policy and regulations and also not aligned to mariculture undermines the gains within mariculture. Besides, the MSMEs are primarily organized as conservation groups thereby the conservation agenda and focus overrides that of mariculture management. The same donor projects are short term and do not invest so much in building the capacity of the local communities and MSMEs thereby weakening sustainability and continuity.

5. **Capital investment and gender disparity**. The project had targeted to involve women and youth in the mariculutre value chains. it was hover realized that youth and involved in Mari culture are few due to inadequate finances, limited incentive and inaccessibility of credit despite the increasing rate of unemployment among the youth. This has not only affected the project's youth target, but overall discourages the involvement of women and youth and

women who have a weaker financial muscle. Besides, the social orientation of the coastal communities and the fishing industry is traditionally dominated by men thereby excluding women. Youth on the other hand are not consistent and pertinent to reap from the mariculture investments that take longer before maturity.

6. **Access to markets and financial services**; as described above, mariculture has immense business potential. However, the existing local markets are exploitative and therefore a limiting factor towards the volumes that the MSMEs can produce and sell to external markets. Further, there are no market regulations to mitigate enforce market controls to the benefit of the small scale fish holders. Besides, the lacking post harvest loss management mechanism like storage and transportation lowers the quality of the products.

7. **Mismatch in County Government Priorities;** Limited support from the government especially in Tana River has resulted to stagnation of Mari culture in the county. The county government has prioritized livestock and crop farming and due to this poor perception of Mari culture as a tourist activity, it has been difficult to promote its commercialization, as most potential investors and the government are not convinced that aquaculture can be a profitable enterprise in the county.

10.0 RECOMMENDATIONS.

1. The government and the private sector should tap on the full potential of aquaponics through technical trainings since aquaponics promotes a symbiotic relationship between plants and fish and presents an economic opportunity and a reliable food source in areas where aquaculture and soil-based agriculture are challenging. It is an easily adaptable system to provide fish protein, produce and profits to families and small communities. The fish produce waste including ammonia (NH_3), which bacteria convert into nitrate, a nutrient for plants. The plants uptake the nitrate, a nutrient for plants, and other nutrients from the water, purifying it before it returns to the fish tank.

2. The Coastal community should be encouraged to fully tap into "blue energy" resources in an attempt to boost the Kenya's efforts towards meeting its energy requirements for national development. The sea offers vast potential for renewable "blue energy" production from wind, wave, tidal, thermal and biomass sources which is underutilized and is a great measure towards marine conservation.To promote a sustainable Mari culture production as a business, there is a strong need to have enabling aquaculture policies in place. Mariculture should be anchored within the CIDPs to inform long term investment and engagement by any potential stakeholder.

3. Farmer groups should be encouraged and organized into social enterprises and form associations for easy marketing. Joint marketing of the cluster business activities by farmers' increases market access. Capacity training on aquaculture as a business should be extended to other aquaculture practitioners, extension workers and managers. There should be support towards market access to ensure continued and expanded profitability of fish farmers' operations and to give incentives for increased investments and infrastructural changes in

their fish farms. Such support could include the construction of regional fish markets and hubs to help in accessing export markets.

4. Research and adoption of smart design technology that can promote sustainable cold storage solutions in the fisheries sector with an approach to climate-neutral cooling through the use of energy-efficient cold storage powered by renewable solar electricity and the use of cooling systems with natural, low-GWP refrigerants. This is because the refrigeration and air conditioning industry is responsible for a significant share of global greenhouse gas emissions since many appliances use fluorinated gases as refrigerants which deplete the ozone layer.

11.0 THE BUSINESS CASE