



**KENYA MARINE AND FISHERIES RESEARCH INSTITUTE**

**KMFRI Mariculture Publication No. 002/2018**

# **Mud crab Farming Policy Brief - 2**

**Improving livelihoods through mud crab farming in coastal Kenya**  
**“Research innovations for food security and livelihoods”**







KENYA MARINE AND FISHERIES  
RESEARCH INSTITUTE

# Mud crab Farming Policy Brief

Improving livelihoods through mud crab farming  
in coastal Kenya “Research innovations for food  
security and livelihoods”

**This policy brief is prepared by Kenya Marine and Fisheries Research Institute (KMFRI)**

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Cover image by James Mwaluma and photos by David Mirera

**Citation:**

Mwaluma, J., Mirera H. O. D., Wairimu, M. E., Wainana, M. and Kimathi, A. (2018). Mud crab farming policy brief – 2: Improving livelihoods through mud crab farming in coastal Kenya; research innovations for food security and livelihoods. KMFRI Mariculture publications number 002/2018.

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## Executive summary

After three decades of mud crab research in Kenya where Kenya Marine and Fisheries research Institute (KMFRI) has played a center stage, the industry is now providing income and employment to rural villages where it could have been difficult to attract any enterprise. Through investigative and follow-up studies, mud crabs are now fattened for 1-3 months in floating plastic cages fabricated locally using ordinary plastic crates and other local materials. Juvenile crabs that are less than 80g are farmed in earthen ponds constructed in intertidal mangrove areas. The crabs are grown to more than 350 g before they are transferred to fattening floating cages before they are taken to the market.

About a decade ago, market size crabs were sold to tourist hotels, private homes and middlemen who were rather exploitative (150-350 ksh/kg). However, with the development of local community eco-restaurants like crab shack restaurant at Dabaso-mida creek that are providing market for crab, farmers are now getting better prices (400-550 ksh/kg). Research has assisted the Dabaso group to develop a mud crab value added product "samosa" that is earning them 200 ksh/piece i.e. 2000 ksh/kg of crab (one crab of 500 g can make 5 "samosa" @ 200sh). Mud crab farming has the potential of becoming a multi-million industry in the coastal region. However, to avoid the negative impacts that may occur due to dependency on wild seed, there is a dire need to harness efforts to finalize the 1<sup>st</sup> marine hatchery at Shimoni to supply seed to the farmers.

## History of *Artemia* production in Kenya

Production of *Artemia* in Kenya started in 1984. This was through a project that was executed between 1984-1986 through a bilateral cooperation funding between the Government of the Republic of Kenya and the Government of the Kingdom of Belgium in the field of *Artemia* Research for aquaculture Development. By the end of the project in October 1986, the technical feasibility of the production of the brine shrimp *Artemia* in coastal salt works in Kenya had been demonstrated. It was further established that Kenyan cysts were of very high quality and *Artemia* which was then abundant in the saltworks of the Kenyan coast could be considered as a new natural source to be further developed for improved salt production and for use as food in Aquaculture.

Since then *Artemia* has continued to be re-inoculated in the commercial and artisanal salt-farms due to the major role it plays in ensuring improved quality and quantity salt production. Besides having a good production of cysts, both the salt and commercial farms have not been producing *Artemia* cysts for commercial purposes yet their demand country wide continues to increase on a yearly basis. This is as result of lack of information. This manual will therefore assist the salt farmers to produce and package quality *Artemia* cysts hence increasing its supply in the Kenyan market.

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## Introduction

The world is currently faced with one of the biggest challenges due to the need to feed more than 9 billion people by 2050 (FAO, 2016). Other than population increase food security is also impacted by climate change, economic and financial uncertainty and increasing demand for natural resources. Further, the situation is made worse as a result of the life style diseases like blood pressure and diabetes that have made world populations skew towards consumption of seafood. In an effort to curb the situation, UN member states adopted Agenda 2030 for sustainable development where fisheries and aquaculture were given centre stage in addressing food security, nutrition and socio-economic development of the people.

However, its unlikely that capture fishery in Sub-Saharan Africa that largely comprises of artisanal fishers who are extremely poor with rudimentary gears will be able to attain vision 2030 projections. Indeed, even in cases where they earn more than other rural people, fishers are often socially and politically marginalized and can afford only limited access to healthcare, education and other public services. Therefore the more reason why a sizeable and growing share of fish consumed in developed countries consists of imports from developed countries to meet the steady demand and static or declining domestic fishery production. Indeed in 2017, fish imports from China to Kenya rose to \$11.4 million from \$10 million in 2016 that is indicative of the potential deficit that exists.

Thus the more reason as to why KMFRI is undertaking critical research in high value fish species like mud crabs to enhance the fish productions in the country. In this regard also the Institute creates an awareness of the vital part that oceans must play in providing food, nutrition and employment to current and future generations and in achieving commitments under the 2030 Agenda for Sustainable Development and the 'Big four' presidential directive (Food and nutrition, housing , health and manufacturing). Underscoring this fact, KMFRI has in the last two decades facilitated communities to undertake mud crab farming as a source livelihood.

Mud crab (*Scylla serrata*) is a decapod crustacean that spends most of its life in the mangrove environment. It has high meat quality and nutritional value hence its farming and fishery forms a significant economic activity in coastal areas in the tropics and sub-tropics. They form an important source of food and income for most local communities (Mirera 2017).

Mud crab farming is undertaken using different approaches i.e. Long-term grow-out culture of juvenile crabs to market size for 3-5 months; short-term fattening of lean crabs for 15-45 days; and recently, soft-shell crab production (Quinitio 2017). There are different methods of farming crabs being practiced today and the common ones are Pens, Ponds and Cage. All these methods of culture are done in the intertidal area. With proper supply of fresh seawater crab farming can be done in-house to produce soft shell crabs. Diverse benefits are accrued from crab farming that include; income, ecotourism, employment and food. Indeed the contribution of mud crab farming interventions to UN Agenda 2030 is clearly seen in community mud crab silviculture (mix of mangroves, mud crab farming and eco-tourism) farms along the coast of Kenya e.g. at Mida creek where Dabaso conservation group is making a living out of the intervention. Through these interventions, communities have developed local market-based measures commonly known as mangrove crab restaurants where they sell "crab samosas" among other products thus providing market for fellow crab farmers.

## History

Mud crab (*Scylla serrata*) culture was introduced in Kenya in the 90's as a motivation for mangrove conservation in addition to the desire to offer income alternatives for the coastal fisher communities (Mwaluma, 2002; Mirera, 2011, 2015). Participation in mud crab farming was strengthened by the legislation of the Kenya Forest Act of 2007 and now 2016 that gave forest user groups (community or village) a mandate to manage mangrove forests in partnership with the government. In this approach communities were given user rights in the mangrove forests where they could undertake beneficial enterprises that are non-destructive through an umbrella Community Forest Associations (CFA). Crab farming in Kenya has evolved from the simple pens and floating/drive-in cages made of "fito" within the mangrove forest by local communities to the use of floating bamboo cages (Figure 1). A number of communities have ventured into mud crab farming with some level of success although the most stable and profitable community interventions where KMFRI has persistently provided technical and financial support include Dabaso conservation group at Mida creek, Ihaleni and Kibokoni mariculture groups at Kilifi creek both in Kilifi county; COMENSUM group at Mtwapa creek is located in Mombasa county. In addition, there have also been efforts to develop a mud crab hatchery by a private investor at Marereni in Kilifi County that has not been finalized. Dabaso

conservation group was created in 2002 and started mud crab farming as one of their activities 2004. In 2004 the organized community group (OCG) at Dabaso was making 1500 ksh/month from sale of crabs, which rose to 2700 ksh/month in 2007. Currently, the OCG is making about Kshs 1.4 M annually and is employing more than 60 members directly and 7,000 indirectly. Other activities undertaken by the group include mangrove afforestation and re-afforestation and ecotourism.

Other than the support received from KMFRI, Dabaso conservation group which is the most successfully currently has also received technical and financial support from other organizations like; Moi Univeristy, Coast Development Authority (CDA), Ramsar, Kenya wildlife Service (KWS), Kwetu Training Centre, Watamu Turtle Watch, Rufford grant, Toyota conservation grant, UNDP, State department of fisheries, NjaaMarufuku, Ministry of agriculture, WWFefn, Nature Kenya, Kenya Forest service, CDTE, UNDP and a number of individual members (Mwaluma *et al.*, 2014).



Figure 1: (a). Mud crab pen, (b). Drive-in fito mud crab cage (c). Floating fito mud crab cage

## Research and technology development

Research innovations have played a major role in the development of mud crab farming in Kenya. The research is spearheaded by KMFRI in collaboration with other stakeholders along the coast. Earlier interventions involved research on the performance of mud crab farmed using different structures i.e. 1. Pens constructed within the mangrove forests (Reid, 2002; Mwaluma, 2002; Mirera, 2009); 2. Drive in and floating cages made using fito and mangroves in mangrove forests and channels (Mwaluma, 2003; Mirera, 2009; 2011, 2015; Mwaluma and Kaunda, 2012); 3. Earthen ponds constructed in intertidal areas (Mirera and Moksnes, 2015).

The research established that pen cultures could not be suitable for farming crabs in the Kenyan coast due to the mud nature in the mangroves. Cages are stocked at the rate of one crab per compartment and floating cages have improved survival of farmed crabs compared to drive in cages. The floating cages are also easy to operate and blended well with eco-tourism in the mangroves although they are suitable for only short culture periods i.e. less than 2 months. The cages could suitably be made using bamboos as a strategy to minimize mangrove degradation that could be evident when using "fitos" (Figure 2). However, the cages have been observed to have high maintenance costs due to the frequent repairs involved.



*Figure 2: Floating bamboo crab cages*

Research onto the use of earthen ponds has established faster growth for juvenile mud crabs (less than 80 g) however, when crabs are 300g and above, cannibalism is high in ponds leading to low survival. Thus earthen ponds could be used to grow juvenile mud crabs to suitable sizes when they can be transferred to cages i.e. more than 300 g. Once in the cages, the mud crabs can be fattened for 1-3 months and then they are ready for market. Cages are suitable methods used for production of the soft shell crab that is currently gaining popularity in the market.

Taking cognizance of the significance of cage systems in the farming of mud crabs, Kenya Marine and Fisheries Research Institute has innovatively developed a plastic floating cage that is locally assembled using plastic crates, waste pipes and marine plywood. The innovated cages are more durable and less costly than the imported

plastic cages from Asia (Figure 3). These cages are also lighter to operate and easy/faster to fabricate.



Figure 3: (a). Construction of the innovated plastic cages  
(b). Imported plastic cages from china

Over the years, farmed mud crabs at the coast of Kenya have been obtained from the wild due to lack of marine hatchery where seeds can be produced. Whereas reliance on wild seed collection creates new business opportunities like collection of seed for sale, there are negative impacts like reduced recruitment. The wild seeds are bought from collectors at 30 – 100 ksh/piece for stocking in the farms. However, to solve the problem of seed, there are efforts by KMFRI to construct a marine hatchery in the Shimoni Centre that has got initial funding from the National Research Fund (NRF). The hatchery is expected to help undertake more research in mud crab farming in addition to providing solutions of mud crab feed since currently farmers use fish offal, trash fish and *Terebraliapallustris* (gastropods).

### Production economics, marketing and value addition

Research has established that grow-out cultures of small juvenile crabs to market size could be profitable if the market price was pegged at 340 ksh/kg or (\$US 3.4 kg<sup>-1</sup>). However, if survival is improved, profitability can be achieved even at lower market prices. In addition, fattening of crabs between 1-3 months is more profitable since survival rates are high and operational costs are lower as currently practiced at Dabaso, Mida creek by the OCG. Using the case of Dabaso conservation group, the production and income from mud crab farming has significantly increased from 2004 to 2017 (Figure 4).



A significant pick can be noted from 2013, due to support from a world bank project, Kenya Coastal Development Project (KCDP) that provided the required infrastructure for full operationalization of the mangrove eco-tourism facility that lead to an increase in demand crabs in the mangrove restaurant.

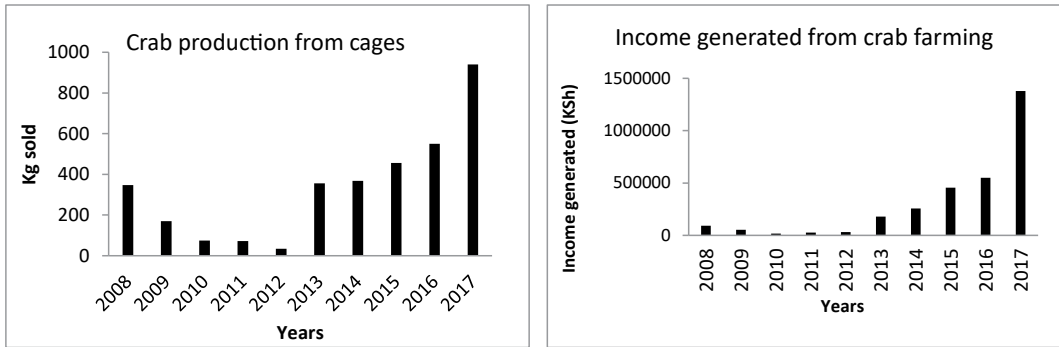


Figure 4: Mud crab enterprise yearly production (kg) and income (Ksh), the case of Dabaso (a). Production and (b) Income generated

Farmed mud crabs are sold in local tourist hotels, private homes and to middlemen supplying to exporters. Due to long chain involved in the marketing of mud crabs locally, the prices have been dismally ranging between 150 – 350Ksh/kg based on the point of sale. However, research has shown that any price that is less than 340 ksh will not be profitable for farmed mud crabs. Underscoring this fact, KMFRI in working with Dabaso conservation group at Mida, in Kilifi County has established a value added product, which is made from crabs (crab “samosa”). The crab “samosa” is sold in the famous crab shack restaurant in the mangroves that is operated by Dabaso conservation group members. By making “samosa”, one crab of more than 500 g weight can make upto five Samosa each selling at 200 ksh (one crab of 500 g can fetch 1000sh in the restaurant through a value added product). Through this model, that is combining crab farming, value addition, mangrove restaurant and eco-tourism, sustainability of mud crab farming has been attained. Indeed the OCG at Dabaso is currently providing immediate and profitable (400 -550 Ksh/kg) mud crab market for other crab farming groups like Kibokoni and Ihaleni at the coast.

The mud crab enterprise at Dabaso has employed over 60 people directly as restaurant, assistant cooks, crab handlers, watchmen, waitresses and indirectly as crab suppliers, vegetable suppliers, water vendors and transporters. Members of the organisation share the profits through dividends at the end of the year based on individual shares

in addition to accessing loans through the bank savings.

Potential customers to the crab shack restaurant at Dabaso include tourist, schools and colleges, Individual members/families, NGOs, meetings of County and national governments all with an estimated number of visitors being 60-100 people per day and an income of 60,000 – 240,000 Kshs/day (Figure 5). Also the group has ventured into other income generating activities through offering training services to other groups in crab farming, book keeping and mangrove management in different areas. This is in addition to provision conference services through hiring of the mangrove conference room developed through funding from KCDP.



*Figure 5: Crab shack restaurant and value added crab products*

## Challenges and possible policy interventions

Whereas mud crab farming is thriving in some villages along the coast of Kenya, there are challenges impacting the expansion of the industry that need different policy interventions.

- The mud crab farming industry depends on wild seed that is likely to impact recruitment into the fishery. Thus immediate interventions are needed to finalise and operationalise the NRF marine hatchery that is being developed at Shimoni-Kwale County. This is in addition to providing enabling environment to marine hatchery investors.
- There was high maintenance cost of the cages especially those made of bamboo, which has been addressed through the innovative plastic crates that are locally made.
- Currently, mud crabs are farmed using live feeds that may degrade environment in addition to competing with humans and domestic animals like cat and dogs. Thus there is need for research to develop an appropriate formulated feed.
- Currently we have two tiers of government i.e. National and County. Based on this forgoing, there is need to define the appropriate extension structure and system for use in aquaculture to support farmers.
- Dependency on wild seed for aquaculture needs a policy regulation that is currently missing .
- The management structures on the ground to monitor fishing activities are the Beach Management Units (BMUs). Although BMUs lack capacity to monitor crab fishers as they do not land their catch in designated areas. Since County governments are new, most of the capacities in data collection and management of fisheries is lacking. Thus it's important to enhance capacities in different aspects.
- Mud crab aquaculture requires consistent funding to develop infrastructure and empower farmers before they can start making profits. Thus there is need for research and development funds for the sector.
- Low prices have been a major problem for the mud crab farmers although



with the coming up of local entrepreneurs like Dabaso OCG, the problem is temporarily solved. Thus there is need for better policy instruments as a long-term solution.

- Research on different culture facilities and technologies for mud crabs is highly required. This will involve research into operationalization of the innovated plastic cages that are in use currently.
- Currently few communities are undertaking mud crab farming along the coast of Kenya. There is need to conduct suitability studies in other areas and work with county governments to provide the farming technology to the farmers.

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