



## In brief:

1. *KMFRI's Aquaculture Director Dr Munguti's strategy to revamp Kenya's ailing aquaculture sector*
2. *Sumptuous fish recipes to try out this festive season*

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#Aquaculture #RecoveryStrategy  
@KmfriResearch

## KMFRI's Dr Munguti proposes post-Covid recovery strategy to turn around Kenya's fish farming fortunes

**K**enya Marine and Fisheries Research Institute (KMFRI) Aquaculture Director Dr Jonathan Munguti is leading fellow research scientists in developing a recovery strategy aimed at turning around fish farmers' fortunes following the hard blows the subsector suffered, thanks to Covid-19.

The longer-term adaptive measures involve coming up with a government incentive package to reverse the decline on the fisheries and aquaculture sector occasioned by the pandemic. This includes improving farming operations and winning market trusts. The seasoned research scientist also recommends adoption of digital technologies with intelligent sensors, camera systems and automated, or, remotely controlled monitoring and feeding strategies that make aquaculture venture less labour-intensive.

His proposals are contained in a research paper titled **'Reviewing the impacts of Covid-19 pandemic on the Kenyan aquaculture sector and future adaptive strategies'**.

Dr Munguti says these measures and policies if implemented will cushion the sector against future shocks caused by such devastating pandemics, and other unforeseen calamities and disasters.



*KMFRI's Aquaculture Director Dr Jonathan Munguti during a Training of Trainers on fish value addition.*

As governments around the globe struggle to recover from the global shock waves of Covid-19, the aquaculture industry, is also reeling from the effects of the corona virus which almost brought the sector to its knees, thanks to Covid-19 restrictions which slowed down the sector's growth.

And although capture fisheries dominate fish supplies in Kenya, aquaculture is the fastest growing subsector of the Blue Economy. The milestones can be attributed to the introduction of Fish Farming Enterprise Productivity Programme (FFEPP) in mid-2009 that targeted the improvement of fish farming in the country.

The highly seasoned aqua-culturist says through the Aquaculture Business Development Programme (ABDP), the International Fund for Agricultural Development (IFAD) funded the Kenyan government.

The money was given to support smallholder fish farmers in accelerating and boosting aquaculture



production and trade in the country by leveraging the farmers' potential.



"More so, fish and fish products constitute an important part of a healthy diet," concluded Dr Munguti.

Research has revealed that aquaculture is viewed as an alternative to bridging the widening gap between fish demand and its supply in Kenya.

According to statistics, fish production in Kenya has increased to 20,973 metric tonnes in 2021 from 12,356 metric tonnes in 2017. This represents 41 per cent growth.

## When the rains started beating us

The first case of Covid-19 was reported in Kenya in March 2020. The government through the Ministry of Health acted fast and rolled out strict health guidelines to minimize the spread of the virus.

Covid-19 safety protocols such as movement restrictions, physical distancing, and suspension of large gatherings of people all have had far-reaching consequences on the aquaculture value chain to the point of almost eroding the gains made by the subsector in the past years.

Of the measures rolled out, curtailed movement of people to cities where main fish markets are domiciled, curfews and reduced trading hours, dealt the fish value chain the biggest blow.

Fish farmers and traders were not able to do business, and this hurt livelihoods. Fish consumption also declined because fish was not readily available.

The survey carried out by Dr Munguti reveals more than 90 per cent of traders changed their business working hours, about 40 per cent used longer routes to transport their products to beat curfew or travel restrictions, while about 70 per cent reduced staff in the fish chain.



### Fish farming

Consequently, many Kenyans started farming fish as an alternative source of income and livelihood. Some of the reasons that made farmers embrace aquaculture include unreliability of terrestrial farming fueled by erratic climatic conditions, overused land, declining farms and expensive agricultural inputs.

"Aquaculture is a viable and sustainable source of livelihood which if fully embraced and supported can supplement terrestrial farming," says the Aquaculture Director. "Aquaculture is the fastest-growing food production sector and is recognized worldwide as among the most sustainable options for improving food security and eradicating poverty," he adds.



Aquaculture value chain includes fish production, adding value to fish through various technologies such as preservation or development of fish products such as samosas, burgers, sausages, among others. The chain also involves transportation, distribution, wholesale marketing and retail marketing which are crucial to the supply chain's business performance. The disruption of the value chain by Covid-19 effects therefore grounded most of these operations.

For instance, there was acute shortage of fish farming inputs. The problem was reinforced by minimal technical support, reduced market, limited transport for fish supply, and export restrictions on fish and fisheries products. As a result, the price of fish dropped drastically and significantly, and traders were left counting losses.

And as the ravages of the pandemic continued, fish production also hit rock bottom leading to inadequate supply, as farmers retained unanticipated stock, leading to massive losses.

Open-air markets were also shut and fingerling traders had nowhere to take their merchandise because movement to counties was curtailed by road blocks mounted on the borders, which greatly undermined fish business and production.

The multi-faceted effects of Covid-19 constrained households financially reducing demand for fish. The decline in domestic demand occasioned by extensive containment measures also lowered imports.

Foreign income, especially for live fresh or chilled fish products dwindled. Consequently, restaurants were shut down and tourism grounded. The disruptions to both local and foreign supply shook the aquaculture subsector to the core necessitating significant reforms.

Extension services were not spared either. In adherence to Covid-19 protocol, public gatherings were limited to 10, and farmers' trainings were

therefore put on hold. Support services were



*Top, women traders display deep-fried tilapia for sale. Bottom, visitors admire various types of fish*

suspended indefinitely, hindering adoption of aquaculture's best practices. This led to low uptake of aquaculture by prospective farmers, while existing fish farmers lost the drive to keep farming.

Inability to hold trainings further hampered dissemination of information to targeted farmers following suspension of educational visits.

And with heightened movement restrictions on Kenya's borders, Dr Munguti says the fish feed industry suffered acute shortage of imported ingredients. This made the feed price to go through the roof, causing more anguish to farmers.

Scarcity of feed ingredients such as maize, wheat, rice by-products, soybean, sunflower, cotton and fishmeal, as well as chemical preservatives from East African countries and international markets created a huge deficit in production.



The shortage or lack of raw materials was compounded by labour crisis, low fish feed sales, and rising transportation costs by between 20 and 60 per cent. Factories had to buy soap, hand sanitizers, masks and gloves for use by customers and staff which pushed up operational costs, forcing them to increase their prices.

And in the spirit of abiding by physical distancing rules, the feed manufacturers expanded sitting spaces in high-traffic common areas such as waiting bays, and set up hand-washing points which required extra budget. The extra cost was passed on the consumers and the burden continues to weigh them down.

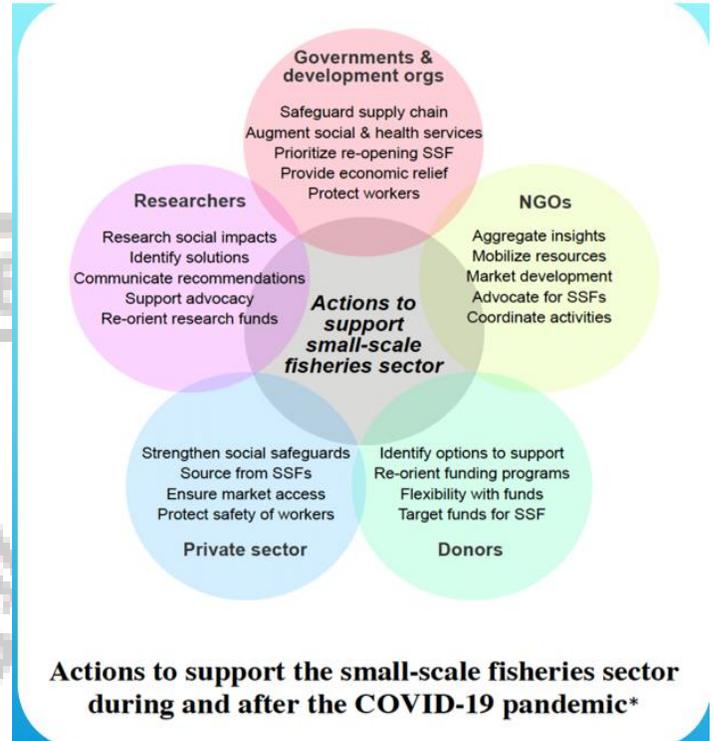
Fish hatcheries which are the chief sources of seed, remained unattended due to shortage of labour, while farmers abandoned their fish in culture ponds due to diminishing returns.

The low price of fry, high transportation costs, and prohibitive maintenance costs demotivated fish traders and producers, converting them into a packet of misery.

It is against this background that Dr Munguti is optimistic that the recovery strategy will restore aquaculture to its former glory and make it immune to pandemics and other catastrophes, and hopefully ensure the venture remains profitable and sustainable.

“While moderate dietary impacts occasioned by the pandemic have been noted, existing levels of poverty, malnutrition, and food insecurity prior to COVID-19 pandemic - according to the Kenya National Bureau of Statistics- make the smallholder fish farmers and other stakeholders in the aquaculture value chain vulnerable,” says Dr Munguti.

“Cushioning these farmers is therefore crucial.”



**Actions to support the small-scale fisheries sector during and after the COVID-19 pandemic\***

***The research paper dubbed ‘Reviewing the impacts of Covid-19 pandemic on the Kenyan aquaculture sector and future adaptive strategies’ was authored by Dr Jonathan Munguti. Co-authors include Dr Jacob O. Iteba, Dr Nicholas Outa, Dr James G. Kirimi, Dr Daniel Mungai, Dr Domitila Kyule, Dr Kevin Obiero & Dr Erick O. Ogello***



Try this at home:

## Fish Burger

#fishRecipe, #ValueAddition #KmfriResearch

This is a sandwich consisting of a fried cake of minced fish served on a bun, often with other ingredients

### Ingredients

½ kg minced fish makes 18-22 burgers  
½ tsp salt  
2 strands leeks  
2 cloves garlic  
½ tsp black pepper  
½ tsp white pepper  
3 large chopped onions  
2 eggs  
1 bunch dhania  
1 tbsp soy sauce  
Sizeable ginger  
200g bread crumbs  
220g wheat flour  
Brioche bread

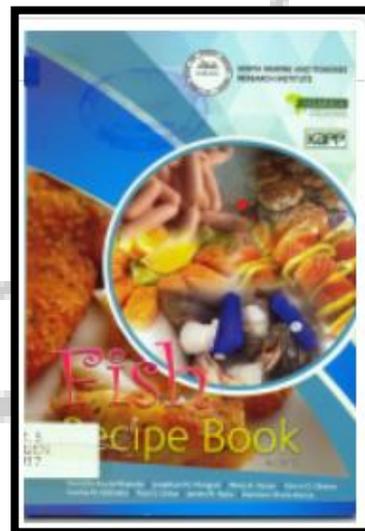
### Method

1. In a clean basin, place minced fish and add leeks, ginger, garlic, black and white pepper, onions, dhania and salt to taste
2. Sprinkle soy sauce sparingly to give a pleasant look and taste
3. In a separate bowl, beat the eggs and whip thoroughly
4. Add eggs to the fish mixture for binding
5. Add bread crumbs until rolling consistency is maintained



Fresh fish burgers prepared by KMFR I research team| Photo by Jane Kiguta

6. Sprinkle wheat flour to the mixture and mix thoroughly
7. Mould the mixture into a disc-like plate
8. Bake the cakes in an oven at 150-200 degrees for 30-45 minutes
9. Let the cakes cool
10. Take brioche bread and cut it in two halves and place the cakes in between
11. Apply some mayonnaise, garnish with tomatoes, cucumber and lettuce
12. Enjoy the fish burger





## Fish Sausages

#fishRecipe, #ValueAddition #KmfriResearch

This is a minced fish encased in an edible skin, typically sold raw to be grilled or fried before eating.

### Equipment and ingredients required

The following items are used in processing fish sausages;

1. Fish filleting knife
2. Weighing scale
3. Mincer
4. Mixer
5. Minced fish
6. Sausage filler

### Ingredients

- 2.5 kg of fish fillet (products 150-180 sausages)
- 1 kg bread crumbs
- 500 g maize flour
- 500 g solid vegetable oil
- 400 g corn flour
- 500 g soya meal
- 40 g sausage spice
- 40-50 g common salt
- 10.8 g mace
- 15 g sodium metabisulphite
- 1-5 g erythrosine for colour
- 4-5 g monosodium glutamate (MSG)
- 5 g cardamom powder
- 3.5 g ascorbic acid
- Sausages casings
- 1 litre of water



*KMFRI team trains fish stakeholders how to prepare sausages  
| Photo by Jane Kiguta*

### How to prepare raw fish sausages

1. Place maize flour, solid vegetable oil, corn flour, soya meal, bread crumbs and one litre of water in already cleaned mixer and mix thoroughly until evenly mixed
2. Place part of the minced fish in the mixture and run the mixer
3. Add the remaining minced fish and mix thoroughly.
4. In a separate bowl, mix sausage spice, erythrosine, MSG, cardamom powder, ascorbic acid, mace and common salt with 250ml water.
5. Add this mixture to the first mixture with all ingredients and blend until a good viscous mixture is attained.

### Processing and packaging of the fish mixture

1. Feed the mixture in a manually operated fish sausage making machine
2. The mixture is received in the casing
3. Manually size and pack the extruded cased mixture tying consistently to rod shaped sausages
4. The sausages are ready to be repackaged or cooked for supply or for human consumption



## We need fish in our diets

Fish is a perishable food commodity that requires proper handling and preservation to increase its shelf life and retain its quality and nutritional attributes. Fish provides a rich source of high-quality proteins containing all essential amino acids, minerals and micronutrients such as iron, zinc, omega-3 fatty acids, omega-6 fatty acids and vitamins, often in highly bioavailable form.

However, micronutrient deficiencies still persist in developing countries where they affect hundreds of millions of people including women and children.

The associated burdens of micronutrient deficiencies include increased risks of perinatal and maternal mortality, growth retardation, child mortality, cognitive deficits and reduced immune function.

As aquaculture or fish farming in Kenya continues its steady growth trend, it is necessary to ensure that it is supported by favourable, attractive and profitable marketing enterprises. The need to develop superior farmed fish products niche is therefore inevitable. This is possible through the development of value addition technologies for aquaculture products that meet consumer preferences and needs.

## Fish value addition is key

Since fish is a highly perishable product, the development of fish handling techniques for fish harvesting, handling, processing and storage are crucial at a time when aquaculture development is fast gathering momentum.

Appropriate processing and handling of fish promote maximum production of value-added products, which can promote profitable enterprises and reduce post-harvest losses. Value addition is the most popular word in the food-processing industry, particularly in enhancing the value and profit margins of products.

Value addition promotes safety, increases shelf-life, helps maintain a high level of quality, opens new market opportunities and increases fish trade.



*KMFRI Sagana Centre Director Dr Domitila Kyule, with her Sang'oro counterpart Dr Kevin Obiero and technologist Neema Ogettii teaches stakeholders from various counties fish value addition technologies during TOT training| Photo by Jane Kiguta*

*The sumptuous recipes are contained in the Kenya Marine and Fisheries Research Institute's Fish Recipe Book authored by Dr Domitila Kyule. Co-authors include Dr Jonathan Munguti, Dr Mary Opiyo, Dr Kevin Obiero, Cecilia Githukia, Dr Paul Orina, Prof James Njiru & Dr Harrison Charo-Karisa. Copies are available at KMFRI's Sagana, Sang'oro and Kegati stations and Mombasa headquarters at Sh500.*

