

The potential of integrating marine biotechnology with aquaculture for human health in Kenya

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In Kenya, fish-demand exceeds supply due to declining natural fish stocks. To offset the imbalance, aquaculture has gained popularity. Owing to the perceived potential of aquaculture in stimulating economic growth by creating business opportunities, employment and providing food security, Kenyan government supported aquaculture development by introducing an economic stimulus program (ESP) in 2009/2010 financial year. Through ESP, 48,000 fish culture ponds were introduced in 160 political constituencies at a total cost of about USD 15 million. The ESP program concentrated on promoting the culture of Tilapia (*Oreochromis niloticus*) and catfish fish (*Clarius gariepinus*) species because of their popularity as local food and quick production. The culture of marine fish species was not included in the program despite the potential present at the Kenyan coast.

The following challenges have been identified as preventing full development of aquaculture in Kenya: 1) inadequate extension services, 2) lack of quality fingerlings and feed, 3) lack of knowledge and skill in aquaculture technology and management, 4) inadequate aquaculture policy. Various aquaculture forums have identified collaborative research and development program as an effective approach in addressing these issues. These forums have identified three major researchable areas for achieving rapid results: 1) improved fish breeds, 2) affordable and ecologically clean quality fish food, 3) efficient fish production systems. These rapid result strategies can be achieved through institutional collaboration in: 1) capacity building, 2) access to capital, 3) value addition and 4) marketing. The application of biotechnology has been emphasized as a thematic area in: 1) improving fish breeds through selective breeding, fish strain comparison, identification and introduction of candidate local fish species, 2) identification and introduction of highly nutritious natural, live and formulated fish food with minimal residue, 3) introduction of fish production systems with potential to conserve water, stabilize favourable water quality, integrate with other agriculture systems and bio-accumulate macro- and micro-nutrients in fish tissue for improved human health and nutrition.

Sustainable use of coastal and marine resources in Kenya can greatly be enhanced by utilizing its biotechnology opportunities to develop aquaculture. For instance: 1) culturing, bio-accumulating and bio-encapsulating macronutrients in marine live feeds such as *Artemia*, fresh and brackish water *Caridina*, zooplankton, micro-algae, biofilms and bioflocs and, 2) extracting and incorporating gelatine and agar, from marine fish and sea weed, in formulating fish food can promote introduction of fish food which is ecologically clean, water stable and has potential to upgrade the nutritive value of fish tissue for improved human health and nutrition. In the light of the above observations, Karatina University has introduced an academic and research programme for Aquaculture and Fisheries Technology to build capacity and undertake innovative research to continuously improve aquaculture development in Kenya.