

## Recent advances in marine aquaculture research – implications for Kenya and the region

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For coastal communities in the western part of the Indian Ocean the dual impacts of overfishing and rising populations have generated an urgent need to find alternative sources of food and income to replace or supplement capture fisheries. Aquaculture is a logical alternative, and its growth needs to be supported and sustainable.

The challenge for Kenya, and other countries in the region, is to develop and gain the economic benefits from coastal aquaculture enterprises, whilst conserving the ecosystem health of adjacent environments. In this context, recent advances in environmental management, selective breeding and aquafeeds have dramatically increased the production efficiency and sustainability of Australian aquaculture enterprises. These achievements are proven solutions to the concerns about the negative impacts that aquaculture can have by: increasing nutrient loads in adjacent environments, harvesting wild seed-stock for aquaculture enterprises, and using wild harvest fisheries products in aquafeeds.

The environmental management of Australian aquaculture is very strictly regulated; this has stimulated significant advances in site selection and environmental management technology. The CSIRO has developed and applied Geographic Information System (GIS), and bio-economic modelling to enhance the optimisation of aquaculture planning. These systems have been applied to broad-scale site selection and site-specific analysis of aquaculture enterprises. The development of recirculation or partial recirculation systems, together with simple discharge water treatment technology have enabled Australian prawn farms to operate adjacent to the Great Barrier Reef for 25 years with no adverse environmental impacts. The site selection and environmental management systems are directly transferable to the Kenyan coast.

Domestication and selective breeding are the sustainable alternative to using wild seed stock and are critical to improving productivity. Successful domestication and selective breeding of Australian stocks of black tiger prawns *Penaeus monodon*, has provided farmers with independence from wild broodstock. More importantly, the use of domestication alone has increased average harvest yields of *P. monodon* farms in Australia by 40%. Selective breeding of the domesticated stocks has improved growth rates, feed conversion efficiency, greater tolerance to gill associated virus (GAV) and enhanced market quality. *Penaeus monodon* is native to the Kenyan coast and the knowledge and technology required for successful domestication, and selective breeding of this species are directly transferable.

Every year 20–30 million metric tons of fish, one third of the global fish catch, is used to produce fishmeal to feed to farmed fish and crustaceans. There is a critical need to develop cost-effective alternatives to wild-harvest fishmeal in aquafeeds. Over the past 10 years, the CSIRO research team has progressively developed a novel prawn feed additive (Novacq™) that meets this need. Feeds containing Novacq™ improve prawn growth rates by 20 to 30% without using any wild fisheries products, a world-first achievement in sustainability. The Novacq™ technology is scalable and transferable.

In summary, the transfer and application of recent advances in environmental management, selective breeding and aquafeeds from Australia could significantly enhance the viability of new aquaculture enterprises in the coastal areas of Kenya, and other countries in the region.