

Replacing “trash-fish” in aquaculture



Towards food security for a better life

Australian agricultural expertise is helping to expand aquaculture in the Asia-Pacific region, through a suite of Australian Centre for International Agricultural Research Centre projects

The **Australian Centre for International Agricultural Research (ACIAR)** is an Australian Government statutory authority that operates as part of Australia's Development Assistance Program within the portfolio of Foreign Affairs and Trade. It assists and encourages Australia's agricultural scientists to use their skills for the benefit of developing countries as well as Australia to achieve the objectives of Australia's Aid Program of advancing Australia's national interest through poverty alleviation and sustainable development.

CONTACT:
ACIAR
Communications and
Information Services
GPO Box 1571
Canberra
ACT 2601
AUSTRALIA
Ph: (02) 6217 0500
Fax: (02) 6217 0501
Email:
comms@aciar.gov.au

Webpage:
www.aciar.gov.au

Aquaculture has the potential to substantially increase the supply of fish without threatening wild stocks. If marine aquaculture is to continue to grow feeds that replace the use of ‘trash-fish’ are needed. ACIAR is working to develop low-cost feed substitutes to help poor smallholders achieve sustainable production

Rising global demand for fish and other aquatic resources has increased the pressures on wild fisheries with catches no longer able to satisfy demand. This is resulting in declining catch numbers and more juvenile fish being removed before they have bred. Some fishing techniques for capturing high-value species are destructive including using cyanide to immobilise fish and dynamite to blow-apart coral formations.

Aquaculture has grown rapidly, both in scale and across locations, in an effort to satisfy demand for aquatic resources. The Asian region has led the way.

Asia produces more than 90 per cent of all global aquaculture products, both for retail sale and as an important source of food security. Aquatic resources provide the most important source of dietary protein throughout many countries of the region. Aquaculture also has potential applications in South Pacific Island countries, with the climate and waters being well suited to several species.

Growing demand for seafood, including from live-fish aquaculture can improve incomes and socio-economic conditions, in both coastal and inland settings. Despite recent growth in aquaculture a key challenge remains; developing improved diets that do not rely on low-value fish.

Early culturing of high-value marine species relied on the collection of live juveniles from the wild. These fish were then grown to market size in small cages. Suitable foods were not always available and the removal of juvenile fish from the wild increased concerns relating to the sustainability of fisheries.

The alternative to wild collection is to hatch eggs and grow the larvae to juvenile size, before caging fish for growth to market size. ACIAR has focused research efforts on improving the growth and survival of grouper species from hatching. Specific diets and feeding strategies for rearing larval and juvenile grouper have been developed, significantly enhancing survival rates.

Fish that are placed in sea cages for grow-out require sufficient feed to meet their nutritional requirements as they mature. This is usually the most expensive part of rearing. In many parts of Asia farmers use low-value fish caught from the wild. These fish are known as ‘trash-fish’ and are also used for feeding domestic animals, to manufacture fish sauce and in some cases for human consumption.

The use of low-value trash-fish as feeds for high-value species is expanding to support the expansion of aquaculture. This is placing pressure on the long-term sustainability of the fisheries in which trash-fish are caught. ACIAR has been supporting research to develop improved feeds that match the needs of cultured species while minimising the use of trash-fish.

Grouper aquaculture in Indonesia

Larvae of fish require suitable levels of several fatty acids to meet their nutritional needs. A lack of nutrition was a primary reason for survival rates of 3% in estuary cod (*Epinephalus coioides*) and 5% in humpback grouper (*Cromileptes altivelis*), the subject of ACIAR-supported research.

Ensuring larvae get suitable levels of nutrition through fatty acids depends on delivering this in a digestible form. An increased knowledge of larval development allowed the identification of digestible dietary components. A species of super small strain rotifers (plankton-like animals) easily digestible and containing sufficient fats and nutrition was identified.

Grow-out diets using non-trash fish components have also been developed. Diets high in protein (>55%) and moderate in lipids/fats (12-15%) optimise nutrient retention and growth after the larval stage. Formulated diets can replace trash-fish but require high levels of protein and marine lipids. The protein source of choice has been fishmeal; cooked and dried fish.

Plant protein meals such as soybean and lupin can be used to replace between a third to a half of fishmeal. Australian meat and bone meal and wheat gluten are digestible. Local ingredients are being trialled.

When combining improved diets with other findings such as optimising environmental variables—temperature, salinity levels, aeration and light levels in tanks—survival rates for estuary grouper are now at 30% and for humpback grouper are at 50%.

Farmers surrounding the site of this research in Bali are now adopting this technology for use in backyard fisheries.

Mudcrab aquaculture

An increased understanding of the nutritional constraints of mud crab rearing has helped in the development of aquaculture for this high-value species.

By matching nutritional requirements with particular essential components needed by

larvae, including fats or lipids, it is possible to significantly boost survival rates. Suitable species of atremia, tiny brine shrimp, that provide the necessary fats have been identified. Dosing of less suitable artemia with lipids has also been proven as viable.

Testing of plant and animal ingredients to meet nutritional requirements is now being undertaken. The best of these diets are being tested against commercial diets.

Aquaculture in the Mekong Region

Tilapia and catfish are two widely cultured species in Vietnam, Cambodia and Thailand. Limited availability of ingredients often results in poor feed with low nutritional value. Local ingredients are being sourced and trialled for both species.

In Thailand, where research has already been undertaken on suitable ingredients, World Vision is disseminating low-cost feeds based on local ingredients for catfish and tilapia aquaculture. More than 600 families in Udon Thani and Surin provinces have already received training. Community centres have been established and are operating small-scale hatcheries to produce catfish and tilapia fingerlings and quality feeds using low-cost, local ingredients.

By adopting these changes profit margins have increased, as input costs have fallen and production has been maintained. The reliance of these farmers on expensive commercial feeds has also been reduced.

Outside the Mekong Region work is also underway in Papua New Guinea and Fiji to develop commercial and farm-made feeds for culturing tilapia and freshwater prawns.

Further information

Visit: www.aciar.gov.au for publications:

*Advances in Grouper Aquaculture
Mud Crab Aquaculture in Australia and Southeast Asia
Feeds and Feeding for Inland Aquaculture in Mekong Region Countries
A Survey of Marine Trash Fish and Fish Meal as Aquaculture Feed Ingredients in Vietnam*

Visit www.aciar.gov.au/web.nsf/projectdislist?openform&discipline=Fisheries for more information on ACIAR's work on aquaculture