



Case study: **Seaweeds**

Summary

Successful commercial production of seaweed in the Pacific region is presently based on one single species of red algae, the species *Kappaphycus alvarezii*, being Solomon Islands, Fiji, Kiribati and Papua New Guinea the 4 main producer countries, with a total production for the region of around 20.000mt (wet weight) and more than 10.000 families involved. This species was introduced from the Philippines and Indonesia to most Pacific Islands Countries and Territories along the 80's and 90's.

Other seaweed species that have been or are being tested within the region, we should mention the brown seaweed *Cladosiphon* sp., which is known to occur naturally in Tonga and New Caledonia, was cultured quite successfully in Tonga for many years, but farming ceased in 2007 due to market difficulties. Other edible species, such as *Cladosiphon* sp., *Caulerpa* sp., *Codium* sp. and *Gracilaria* sp. are currently being grown in several Pacific Island countries in very low volumes (we could say almost anecdotally in most cases). Sea grapes (commonly known as sea caviar), such as the species *Caulerpa racemosa*, have been cultured in Samoa and French Polynesia since 2011 with promising results in terms of growth and survival rate.

Three principal farming methods have been tried in the Pacific Islands region: 1) off-bottom (fixed monofilament lines between posts driven into the substratum); 2) floating rafts (bamboo floating structure); and 3) floating long-lines (rope-made floating structure). Commercial cultivation in Fiji, Kiribati, Papua New Guinea and Solomon Islands consists almost entirely of off-bottom farming.

The Pacific Island region is environmentally ideal for seaweed aquaculture. Seaweed farming from this region is currently making a useful contribution to supplement other world sources. It is an important economic boost for the less-developed outer islands, where few alternative income-generating opportunities exist.

Moreover, there is a wide range of suitable habitats for seaweed farming in the region, but a number of limitations constrain production and export, including isolation and distance from markets, small volume of production, vulnerability to world price fluctuations, socioeconomic issues, and limited skills and capacities for culturing seaweed.

Seaweed production in Pacific Island countries, however, continues to contribute to income and provides employment for some people in isolated coastal areas, and there are plans to expand seaweed production to new countries such as the Federated States of Micronesia and Samoa.



Case study:

Marine shrimp

Summary

The introduction of marine shrimp for aquaculture into Pacific Island countries and territories (PICTs) dates back from the 1970s and 1980s. In places like French Polynesia where the aquaculture development effort was the most intense and sustained during that period, there has been up to 13 species of marine shrimp introduced and a total of 26 introduction events recorded. PICTs who have introduced marine shrimp and continue producing shrimp as a result include Fiji, French Polynesia, Guam, Hawaii, New Caledonia and Vanuatu. The two main species of shrimp currently cultured are *Penaeus stylirostris* and *Penaeus vannamei*.

Production volumes are small by world standards with, in the last 10 years, the leading countries for volume and consistency being New Caledonia (1500-2000 metric tonnes per annum) and French Polynesia (40-120 metric tonnes per annum). Production in the remaining countries is only small (10-30 metric tonnes per annum) and limited by several constraints including: high production cost, competition from imported products, shortage of post-larvae supply, limited access to land, lack of technical capacity and insufficient private investment.

Given the scale of production, shrimp farming has limited direct environmental impact in the region except for some isolated cases associated with farm design. The record of *Farfantepenaeus merguensis* in Fiji is the only known report of an introduced non-native marine shrimp becoming established in the importing country. The impact of *Farfantepenaeus merguensis* in Fiji is not known. There has been several cases of infectious hypodermal and hematopoietic necrosis (IHHN) being imported with introduced stock of *P. stylirostris* (CNMI, French Polynesia, Guam, New Caledonia) but these have had no lasting impact on the farming of this species which is naturally resistant to IHHN.

Even though the spread and scale of marine shrimp farming remains limited in the Pacific region, the sector plays important roles for food security, job creation and aquaculture advancement. With all PICTs importing shrimp from outside the region, there is an existing market and opportunities for domestic production to grow. Two main challenges exist for the expansion of shrimp farming in PICTs: increasing hatchery output and the development of a profitable technologies and techniques adapted to the constraints of the region.



Case study: Tilapia fish

Summary

Freshwater aquaculture of tilapia has been prioritized by some Pacific island governments in response to pressing needs to produce more fish for food security. This is particularly so in the high-island countries of Melanesia and Polynesia with relatively large and growing human populations, that have sufficient land and surface water resources for pond aquaculture.

Tilapia was introduced over 50 years ago and is widely distributed in the Pacific region. Nile tilapia (but not Mozambique tilapia) has biological traits that make it the best option for freshwater pond aquaculture in the Pacific, when compared with indigenous candidates like mullet or milkfish.

Papua New Guinea is the leading Pacific country for tilapia farming with an estimated 60,000 tilapia farms in operation, mostly small-scale at household-level for food security. Fiji is next with around 500 farms, Samoa has 60 and Vanuatu around 30. Production of tilapia in the Pacific is very difficult to estimate, due to the remote locations of many farms and the subsistence nature of operations with little incentive for record-keeping by farmers. A trend in recent years is emergence of a small but growing commercialized tilapia production sector at SME level in peri-urban areas of Port Moresby, Goroka, Lae, Suva, and Apia.

There is no explicit evidence, or objective synthesis of information, to show that tilapias have brought about negative ecological impacts including loss of biodiversity in the Pacific region. Public perceptions about tilapia are generally positive. However the possibility of environmental consequences in the Pacific, including effects upon indigenous fish stocks, from introduced species such as tilapia has received much less scientific attention than in Asia. Any concerns that are expressed about tilapia as an introduced exotic species in the Pacific mainly relate to knowledge gaps, and application of the precautionary principle.

Tilapia will play an increasingly prominent role in the delivery of food and livelihoods in the Pacific, in a future where over-fishing, environmental degradation, and the projected impacts of climate change will continue to deplete an already depauperate indigenous freshwater fish fauna. Pond aquaculture of tilapia will become increasingly important due to the twin drivers of population growth and declines in coastal fisheries. This activity will be a beneficiary of the projected impacts of climate change so is one strategy for climate change adaptation. It is already playing a role in disaster resilience, such as in the aftermath of TC Winston in 2016.