

# Organic Aquaculture – From Niche to Growing Business

**The organic research project ORAQUA focused on the production of organic trout in Denmark.**

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*The demand for organic fish is increasing. The ORAQUA project: "Organic Aquaculture – the linkage between sustainable production and superior products" has contributed to firm establishment of organic fish farming in Denmark doing research within the loop connecting feed production, organic fish farming and the consumer.*

*Fish meal and fish oil are unique sources of protein and lipid in fish feed due to the optimum contents of amino acids and omega-3 fatty acids, respectively. However, these resources are seriously limited, and therefore the ORAQUA project focused on relevant alternative organic vegetables and made the way for additional organic crops in feed for production of organic trouts (Figure 1).*



**Figure 1.** Feeding of organic trouts. Photo: Alfred Jokumsen

## **Organic feed ingredients**

The main issue for the development of the production of organic fish in Denmark is the need for competitive vegetable protein sources with high protein content and a relevant amino acid composition in comparison to that of fish meal.

Grown plant crops generally have lower protein content than fish meal. For this reason only a limited fraction of the fish meal can be replaced by plant protein. The magnitude of this fraction is mainly determined by available technologies to produce concentrated protein fractions of plant crops according to organic regulations.

The research has been focused at protein concentrates of rape, pea, horse beans and lupine, where protein contents of 29, 52, 56 and 56 %, respectively, have been achieved. For comparison the protein content of fish meal is about 72 %.

## **Growth and Quality**

Series of experimental diets were prepared, where the content of fish meal was stepwise reduced from 59 % to 35 % and replaced by a matrix of the vegetable protein concentrates. The dietary amino acid profile was optimized by the composition of this matrix as supplementation with artificial amino acids is not allowed in feed for organic fish.

Similarly experiments were performed with diets, where fish oil was replaced by f. ex. rape oil or linseed oil, which both contains a significant amount of  $\omega$ -3 fatty acids.

The results of the experiments showed no significant effects of the substitutions on growth performance. Further, no negative effects on fish health were observed, while some changes were observed in the product quality related to taste and texture properties.

### **Case studies**

Case studies were performed on organic trout farms with the aim of describing and evaluating farming systems and methods along with collection of information about fish health, prevention and if at all disease treatment. It is urgent for the organic fish farmer to pay close attention to any risk of disease, as the permission to use medicine is very restrictive. Further, feed experiments were performed under commercial conditions using selected diets from the pilot experiments (cf. above).

The results of the experiments confirmed those of the pilot experiments and in addition the case studies provided important information about progress as well as new challenges for organic fish farming in Denmark.

### **Perspectives**

By the coming into force of the EU regulation for organic aquaculture by 1st July 2010 equality was established between the European organic fish farmers, but new challenges were faced by the Danish organic farmers. Therefore, further development and establishment of the organic fish production in Denmark requires a strengthened research effort within feed, feeding and nutrition, environmental aspects, farming conditions, health and quality to improve the competitiveness and efficiency in production of organic fish according to the current Danish environmental legislations within aquaculture.

By thinking of the basic organic principles including sustainability, resource management as well as environmental issues the use of green energy and water consumption may be considered.

The ORAQUA-project was carried out in cooperation with Technical University of Denmark, The Danish Aquaculture Organization, Danish Technological Institute, The Fish Feed Manufacturer BioMar A/S and the Danish organic fish farms.

Further information on [www.icrofs.dk](http://www.icrofs.dk)

#### **FACT BOX (1):**

##### **Aquaculture**

Aquaculture includes production in water of fish, shellfish, algae and water plants. Farming of fish is the fastest growing food producing sector in the world and amounts annually to about 50 million tons. This increase is caused by a combination of increased demand and falling catches in the commercial fishery. The Danish aquaculture production amounts to about 45.000 tons fish per year, including about 32.000 tons rainbow trout in fresh water and about 10.000 tons rainbow trout in net cages in saltwater. In addition to that about 2.500 tons of eel are produced in recirculation systems. The organic production currently amounts to about 1 % of the total trout production in Denmark.

#### **FACT BOX(2):**

Strict regulations are affiliated to the production of organic fish including: (1) Feed without gene modified organisms (GMO) and with artificial color; (2) Min. treatment with antibiotics; (3) High health and welfare.

#### **FACT BOX(3):**

ORAQUA is the English acronym for the project: "Organic Aquaculture – the linkage between sustainable production and superior products".