RECIRCULATING AQUACULTURE SYSTEM-BASED SALMON FARMING

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Thomas Hofmann has been working in aquaculture for 15 years. He progressed from technician to researcher then project manager in Australia, Denmark and Spain, and has now joined Veolia as the aquaculture process manager in the Water Technology Aquaculture Business Unit. Since 2015, he has been providing assistance to Swiss Alpine Fish, a salmon farming site based on a recirculating aquaculture system in Lostallo in the Swiss Alps.

The Swiss Alpine Fish indoor salmon farm uses a recirculating aquaculture system that combines optimal resource management, respect for the environment and a high-quality product for the end customer. In the village of Lostallo in the Swiss Alps, the salmon are grown in a controlled environment, using no antibiotics or chemicals, in full compliance with sanitary standards. This sustainable and economically viable farming model could be used in urban settings where there is suitable infrastructure and access to good quality water, making this an encouraging prospect for private investors and consumers alike.

THE SWISS ALPINE FISH AG FARM

Swiss Alpine Fish is located in Lostallo, a village of 400 inhabitants located 200 kilometers from Zürich. Last summer, the farm harvested its first Atlantic salmon (*salmo salar*). Based on the RAS2020 technologies developed by Veolia, the farm uses a recirculating aquaculture system: water in the tanks is filtered seven times in a closed-loop circulation system in which the fish are not removed, no chemicals or antibiotics are used, and the need for freshwater is reduced. The farm is aiming for annual production of 600 metric tons of salmon, which will meet between 3-4% of demand in Switzerland. Some 50,000 eggs are imported from Iceland every 10 weeks, and it takes 24 months to produce a 4-kilo salmon. The farm employs a full-time total of 15 people working in different activities that range from fish growing to product processing and direct onsite sales. The remaining production is sold in supermarkets via specialist distributors or sold online under the Swiss Lachs brand. Set up by British investor Julian Connor, the farm should make its first profit this year, four years after the site was built.

1. The Swiss Alpine Fish salmon farm is mainly based on a recirculating aquaculture system. What are the advantages of this technology in both environmental and sanitary terms?

Thomas Hofmann: The alpine farm consists of an indoor installation in which the salmon are grown in tanks of clean mountain water, using no antibiotics or chemicals. This technology has three main advantages: (1) optimal resource and waste management, (2) a short-circuit system with a low carbon footprint and (3) production of very high-quality salmon for the end customer.

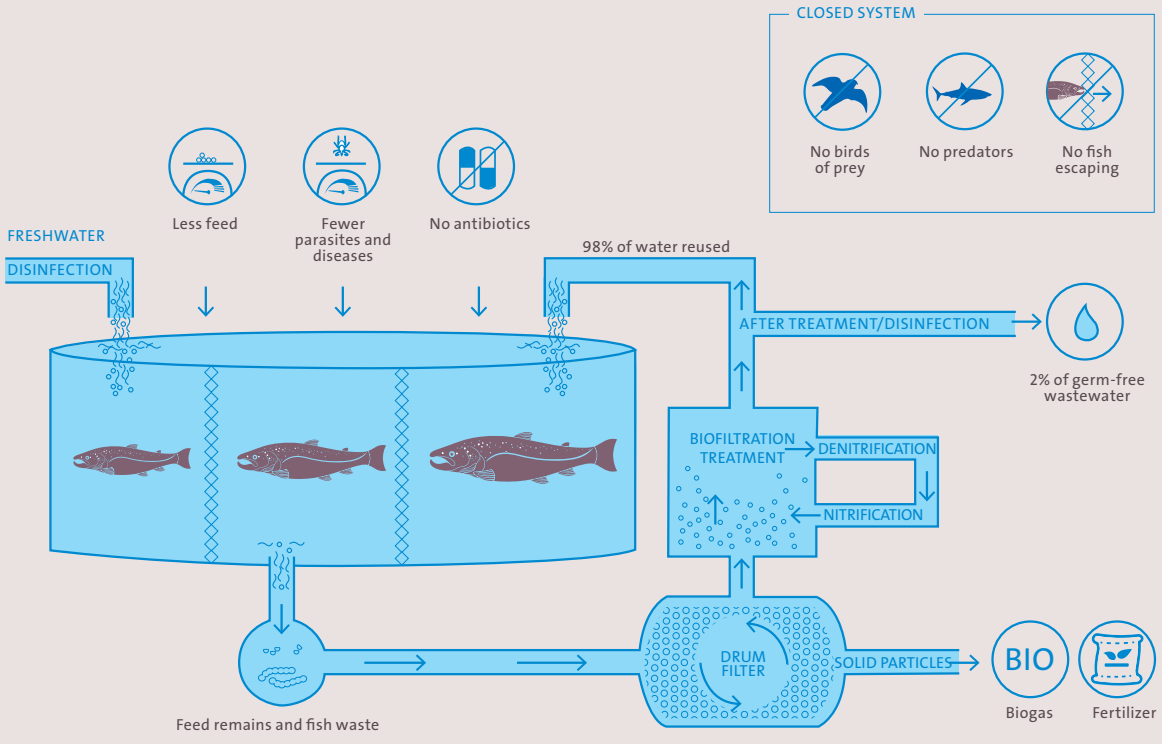
From the viewpoint of resource management, the *recirculating aquaculture system (RAS) recycles* 98% of the water needed for fish growing. The potable spring water is extracted at a depth of 25 meters and is continually recirculated in tanks after mechanical and biological filtration that removes ammonia, nitrites and nitrates. Only 1% of the water leaves the circuit and is returned to the river after treatment. Management of the farm's organic waste is also sustainable because the fish excrements and any uneaten food are concentrated in containers and used locally to produce biogas.

Transposing this installation, which is on the outskirts of a small Swiss village, to a Paris suburb could easily be envisaged

As for the distribution circuit, conventional fish growing involves phenomenally high transportation costs: fish that is harvested in Norway or Scotland is often processed in Poland before being sent back to Norway for distribution throughout Europe. Under this system, it takes seven to eight days for the fish to reach consumers. At Swiss Alpine Fish, all these processes take place on site and the salmon can be on the market, with no freezing needed, in just a few hours. So the products have a smaller carbon footprint, especially as the electricity we use in Lostallo comes from a hydropower plant. Also, the continuous harvesting of the fish means we have many different sizes, so we can meet demand from customers flexibly while also ensuring full traceability.

Lastly, the salmon grow in a controlled environment where they are protected from disease and parasites such as sea lice, so they can be grown without using antibiotics or chemicals. The water quality and temperature settings, as well as the techniques for transferring them between the different tanks, also avoid stressing the fish. Their food, which is fish meal made in Norway from

Recirculating aquaculture system



Source: Swiss Alpine Fish

The aquaculture farm and its products - ©Swiss Alpine Fish

European fish, is free of ethoxyquin, a harmful antioxidant that is often used to conserve fish meal imported from South America.

2. Your farm is located in a village of 400 inhabitants. Could this model of salmon farming be replicated in urban areas? If so, under what conditions could RAS be used in urban settings?

T.H.: The Swiss Alpine Fish farm is very compact. The salmon growing tanks are in a 60 x 30 meter building that is 10 meters high. That's a big advantage for setting up in a city. As well as the low land take, visual pollution can easily be reduced by choosing a suitable material for the façade – in Lostallo, it's wood – and salmon farming does not produce any offensive smells. The project has created employment and has been warmly welcomed by the local community. Transposing this installation, which is on the outskirts of a small Swiss village, to a Paris suburb could easily be envisaged.

The only vital condition for setting up a site using RAS is access to good quality water, whether freshwater or saltwater, with the possibility of discharging the water that is not recirculated. The cost of the water is an important component of the business model and being close to a lake or river is a definite advantage. Switzerland is of course well known for its freshwater reserves, but there are many possibilities for installing this kind of farm in cities in Europe. It's also possible to combine fish farming with using a hydroponic system to grow plants and form an aquaponic system.

3. The farm is expected to make a profit this year. What are the factors that explain this result?

T.H.: I see three main factors for our success: an advanced technology, and an attractive business model that pays well and also meets strong demand for high-quality, local products.

First, the RAS, with its filtration and water treatment systems, is the key to the farm's success, because it lets us create a very high-quality product that respects the environment. Next, the Swiss market, which is the farm's main market, has high purchasing power and is also very drawn to "Made in Switzerland." The water in the tanks where the Lostallo salmon grow is salted with Swiss salt! For a top-quality product – and, in the case of salmon, one that is seen as being for special occasions or even as a luxury product – the Swiss are very willing to pay even more for a Swiss product. In terms of price, a whole gutted fish sells for €14 a kilo and smoked salmon for as much as €90 a kilo. Consumers increasingly want to know what they're eating, and conventional Norwegian and Scottish salmon farms have badly damaged the image of the product and its environmental impact. A responsible approach to producing salmon is one that appeals to the consumer.

Lastly, salmon farming with RAS offers investment possibilities with high returns, good growth curves and low financial risk. The business model has attracted investment from major companies in the retail sector and from private investors who want to put their money into a sustainable project.