Kellogg Rural Leadership Project

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"An Exploration Of Fin Fish Farming In New Zealand"

Presented By Stuart Davey

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Dear Tony,
This report was researched and compiled for the purpose of presenting to the 2007 Kellogg Rural Leadership group.
While researching the information needed for this project, I have had to use various methods to gather information. Accessing reports on fish farming that have been published in the media and on the internet were the main sources used.
Communicating with people who will be affected by the introduction of fish farming has given me a wider understanding of the effects on society. I have gained skills in the use of power point software, and practised presenting the project to a group of friends.
I have used the report to gain knowledge on the subject of farming fish, and understand what risks this industry would have on the environment.

Executive Summary

What is it that requires fish to be farmed? Is it the need for food? Is it the need to protect the wild fish stocks? Or is it because it makes economic sense?
This report gives an insight into how where and why fish are farmed.
Most of the earth is being farmed to potential and as the world population increases so does the demand for food. The world is two thirds water so perhaps there is more potential to produce food from the sea than from the land. Combine this with the fact that most of the worlds fish stocks are being depleted by over fishing and the obvious answer is to use the sea to farm the species of fish that are in most demand.
Farming fish does not come without risks and effects on the environment, this report looks at those risks and gives methods to mitigate these.
Farming fin fish is a relatively new industry for New Zealand, but has the potential to provide significant economic gains for the economy.
Wild fish stocks around the world can not sustain the current rising demand being put on them, fish farming will have a direct positive effect on reversing this.

Yours sincerely

Stuart Davey

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"AN EXPLORATION OF FIN FISH FARMING IN NEW ZEALAND"

I chose this topic because I wanted to learn how, where, and why fish are farmed. It is a relatively new industry for New Zealand, and most people like eating seafood, but not all like going to the time and expense of catching fish themselves. On land, we have dug it, planted it, grown it, and harvested everything possible on it, but two thirds of the earth is water, so perhaps there is more potential to produce food from the sea than from the land.

Define Topic

This is a study into the advantages and disadvantages of New Zealand developing it's fin fish farming industry. I have taken into consideration the groups of people and communities who will be affected by the changes this would bring about. Also the effect this industry would have on the environment, both long and short term. I have not considered the implications of captive spawning and rearing of juveniles of various species to feed the farms with adequate numbers of fish.
Nor have I taken into account the future economic value that could be expected from markets, or costs associated with farming fish.

Introduction

I have investigated the possibility of New Zealand developing a fin fish farming industry. At first glance you would wonder what negative reasons there are for farming in the sea, after all it must be similar to farming the land. All you need to do is put a fence around your chosen species to stop them wandering off, provide feed – either grown or brought in, and keep your stock healthy and sell them at the right time for the best possible price. So transfer those guidelines to the ocean and your fence becomes a net , food could be naturally in the environment or provided artificially, and when grown to the right size, scoop out the fish and sell them.
Already there are people commercially fishing the sea and selling fish live or dead, locally and overseas. Surely there would be no difference if the fish were held captive while waiting to be sold.

History of fish farming in New Zealand

Because of the diminishing supply of wild fish in the worlds' oceans, fish farming has been developed in many countries around the world. The first use of sea cages was in Norway and Scotland to farm salmon in the 1970's. New Zealand's first farms were established in 1982 in the Marlborough Sounds and now have spread into Akaroa Harbour and Stewart Island. There are also salmon farmed very successfully inland in rivers and lakes. At present there is a trial kingfish farm already established in the Marlborough Sounds.
Over 20 years, salmon production has increased from 150,000 tons to 1.7 million tons. In New Zealand king salmon is the only species of fish farmed and accounts for half the world's King salmon production.

Industry

The Aquaculture Industry aims to grow to a one billion dollar industry by 2025.
The New Zealand government has announced a five point plan to help the future growth of aquaculture in New Zealand. The plan supports regional councils in their planning process, better public information, promotes Maori involvement and help for industry development, markets and products. The government has provided 2.9 million dollars to councils to assist with information gathering, policy development, and community processes required for good aquaculture planning. A web site has been established which includes information and links to all related sites to make information gathering and sharing easier.
If it is done right, we can prove to the world that New Zealand's aquaculture industry is environmentally sustainable which will give us an edge with consumers who are demanding eco friendly food products.
In the area I live the council has commissioned a consultant to complete a development strategy. The strategy identifies aquaculture as the number one priority for development in our region. Wilson's Bay in the Hauraki Gulf has been identified by the National Institute of Water and Atmospheric Research as having the best water temperature and environment to farm King Fish.
In many small costal towns, aquaculture has meant jobs have been created, living standards improved, and populations have gown. Also tourism is another important industry associated with aquaculture, with tours being held to show people how farms are set up and what methods are being used to be successful at farming fish. For some businesses tourism is a very important sideline.
Fish farming has a higher return per hectare than dairy farming, and the potential earnings from finfish are lucrative. For the same reasons New Zealand has been successful at exporting primary products, means we can also be successful at exporting seafood. New Zealand has the potential to be an international leader, providing high quality products to the world. Our clean green image gives the industry a natural advantage in the global market place.
Most of New Zealand's aquaculture is focused on mussels, salmon and oysters, currently earning about $325 million per year. To reach a target of one billion dollars, the industry needs to diversify into new species of fin fish – the likely ones being King fish, short fin eel, hapuka, tuna and bluenose.
New Zealand has an extensive coastline with a wide range of latitude and many possible sites that are suitable for a wide range of fish species.

The technology has to be taken away from harbours and into open water. The design and construction of farms has to be adapted to areas where there are stronger currents and bigger wave action. Among reasons for this is environmental effects and to be out of sight of other marine users like high water traffic areas, recreational boating, and environmentally sensitive areas.

The fin fish industry in New Zealand is small by comparison with other countries. For example, Australia has a target to grow their industry to one billion dollars by 2010. Initially, of course, fin fish farming in NZ would be a very small percentage of the industry, but with the ability to grow very large.

You may have heard of the "Tuna Cowboys" – these are commercial fishermen who round up tuna in huge nets out at sea, then tow them closer to land where they fatten the fish and then sell them. This is happening right here in NZ and all around the world.

Disappearing stocks of blue fin tuna has lead to Japan to cuts it's catch of this species by 23%, of course Tuna is known for it's use in the traditional sushi.

According to a recent United Nations report nearly half of all fish eaten globally comes from farmed fish. The demand for fish, especially by developing nations continues to climb, at a time when commercial outputs from wild fisheries seems to have reached a ceiling. The United Nations report goes on to say there will be a shortfall of 40 million tons of seafood by 2030.

At this rate, it will not be long before tuna is as scarce as North Atlantic cod, which was the first of the big fisheries to kill itself though greed. Another report says the world has not only reached, but exceeded the limit of natural seafood production, pointing out that there are very few fish populations that have not been exploited , and if nothing changes, all seafood populations face collapse by 2048.

One of the main reasons for farming fish, would be to reduce the pressure on existing stocks of wild fish. This means the spat needed to stock the fish farms would need to be bred in captivity and grown to the appropriate size then released into the farms. The salmon farming industry has perfected this technique, and NIWA has been cultivating fingerlings (young King Fish) at Bream Bay in Whangarei. The food needed to feed farmed fish is in a pellet form and can be made from trash fish that are a by product of the fishing Industry, and also fish offal from processing of fish..

Environment

Effects Fin Fish Farms may have on the Environment

From the sky, King Fish pens look like large dimples in the ocean (although other shapes are possible).Most are 25m in diameter, and a typical king fish farm would have 15 to 20 pens.

Directly beneath fish pens there is a build up of uneaten feed and faeces. This is a very localised problem and within a few hundred metres of the farm there is a rapid improvement in environmental conditions.

These conditions are reversible but this may take months or years after the disestablishment of the farm. In extreme cases of deposit build up, bubbles can be seen rising from the sea bed. The main nutrients in this sea floor build up is nitrogen, potassium and phosphate.

Within the vicinity of the farm, water nutrient enrichment of the water column will occur. These conditions have the ability to stimulate algal blooms, but studies in New Zealand and overseas have not linked blooms to fish farming activities

These problems can be reduced by locating farms in well flushed areas or in areas where habitats and species of special value are not present.

A range of other steps to mitigate effects have been used at salmon farms in New Zealand, like stocking densities managed to maintain the environment and feed wastage kept to a minimum.

The amount of nitrogen released during fish production is important because this is related to algal blooms. It is estimated that an average sized Marlborough Sounds salmon farm would discharge 111 tonnes of total nitrogen per year. Although combined with other sources of nitrogen i.e. land run off and seabed recycling, the "new" nitrogen from salmon farms is reasonably small.

Habitat Creation

Fin fish farms have the potential to encourage fouling communities to grow. Aquaculture structures are known to attract pest organisms. Developing fin fish farms in New Zealand has the potential to increase the spread of pest organisms. Various management practices can be implemented to reduce such risks, like anti fouling treatments.

It is well known that the population of wild fish around artificial structures increases, many of these fish feeding on waste feed, thereby attracting larger fish. It has been shown that wild fish can reduce the amount of food that reaches the seabed by 60-80%. This also applies to shell fish farms where snapper fishing in the mussel farms usually results in a fish bin full of good sized fish. Fin fish farming must have a two fold effect on the problem of natural fish stock declining, where by farms will produce a fish product to satisfy the market while also promoting an environment for natural wild fish stocks to thrive. This will result in a situation where recreational fishermen will be able to catch their limit of fish without the fear of depleting fish stock any further.

Sea bird and Marine Animals.

Effects on mammals relate mainly to the changing of their environment, entanglement in structures or exclusion from a habitat.

New Zealand fur seals are a problem species which has led to predator exclusion nets being used. In 25 years of cage salmon farming in New Zealand, four entanglements (two seals and two dolphins) have been reported. Changes to net design and repairs and maintenance has improved and so this is unlikely to be an ongoing issue.

Disease transfer and escaped fish

The risk of disease spreading among farmed fish in New Zealand is not a problem. For King Fish and other trial species, the industry plans to breed from wild sourced brood stock so therefore disease spread will not be a problem.
Pharmaceutical medicines are used overseas to control diseases, most medicines are water soluble and break down readily in the environment.

Rotation of sites

Some methods trailed to reduce organic enrichment under farms are harrowing of the sea floor area, collection of particles before they reach the sea floor, building artificial reefs to help process waste, and pumping and collecting waste. Also the mooring systems have been changed using a single point mooring, similar to a boat swinging on an anchor, to allow a greater area to spread sea bed effects over. Co-culture is also an idea trailed to increase production while decreasing environmental effects. This could involve growing mussels or oysters along side a fish farm, so the increase in nutrients could increase phytoplankton production which is the primary food source of bivalve shellfish. In the Marlborough Sounds, removal of nitrogen from the system by the harvest of farmed mussels is more than the loading from salmon farming.

Summary of environmental effects

Higher levels of minerals and metals are found beneath fish farms, mainly zinc and copper which is used for antifouling treatments. These metals generally bind with sediments and other material which helps to reduce the risk on the environment.
Site selection is pivotal and many problems relating to deposits build up, effects on sea bed organisms and shading leading to algae blooms can be reduced significantly if not totally, by sitting farms in greater than 30m of water and in high current areas. This will result in the least impact on the environment and therefore, could be classed as a sustainable activity for regional councils. One of the ways to assess whether activities such as fin fish farming impacts on the environment is to determine if the changes are long term or permanent or are these reversible once the source is removed. Studies in New Zealand and overseas show recovery on sites vary from months to years.
One way to control this could be site rotation or fallowing of farms. It has been shown rotation of sites will allow the sea bed to recover in less than six months.
One example of sea bed recovery in New Zealand is the Marlborough Sounds farm. This was completely fallowed with all structures removed in November 2001. On farm removal, the sea bed was highly enriched with out gassing evident at the surface. After six years, the sea bed is still enriched and full recovery to pre farming conditions will require the complete breakdown of residual organic materials. These final stages are expected to take three or more years.

Opposition

The aquaculture industry has faced opposition from commercial fishers and recreational users of the sea, and must consider compensation for them when they loose the right to fish or use an area. Also, the aquaculture council may have to decide whether an area should be developed into aquaculture or a marine reserve. Once a decision has been made it is likely to be permanent.

Survey

To gauge the reaction to fish farming in our area, I have surveyed a few of the locals who I know spend a large part of their recreational time fishing.
The questions I asked were:

How would a fish farm in the Hauraki Gulf affect you as a recreational fisherman?

How would a fish farm in the Hauraki Gulf affect you as a commercial fisherman?

As a recreational fisherman how would you feel if a fish farm was established in an area you would normally fish in?

How would a fish farm erected in the Hauraki Gulf, effect your customary rights?

These questions revealed some interesting facts. The main concern among recreational fishermen was the unknown. Where would the farms be located and how much space would be taken up by them.
Already the parts of the Hauraki Gulf are becoming cluttered with Mussel and Oyster Farms. These create navigation hazards, and in some cases restrict access to parts of the Gulf. Recreational fishermen thought fish farms should be established in areas that were not popular for sport fishing, and therefore less disruptive for the sport.
Commercial fishermen were concerned about the effect on wild fish movements, It is suspected Flounder are reluctant to swim under mussel farms. So as the number of mussel farms increase, this could limit where Flounder will migrate to.
Commercial fishermen were not generally concerned about being restricted on where they could catch fish because of farming activities.
However commercial fishermen would agree that it is imminent that consumer demand and economics will dictate the speed at which fish farms are established. The consumer is becoming more discerning and demanding, they want a regular supply of fresh fish and if their favourite fish is not available because bad weather has prevented fishing boats from fishing, the consumer will buy another product. Also technology will bring the cost of establishing farms down to the point where it becomes cheaper to supply fish to the market from fish farms than through traditional fishing methods.
Those who have customary rights to the fish stocks of New Zealand, didn't have any objections to fish farms being established in the Hauraki Gulf. They know through experience of fishing among other forms of Aquaculture, that recreational fishing is enhanced by the presence of artificial structures and farming activity in the water

Conclusion

How fish farming impacts on the parts of the environment will depend on how the Aquaculture council decides on final limits of the four main areas.

Four areas
- physical capacity – area, space
- ecological capacity – farm density
- production capacity - stock density
- social capacity – recreational effects

Consultants with international experience will have to be used when deciding which areas are suitable for which species of fish, and minimum standards for design, layout, and safety for other marine users. Fish farming requires the exclusive occupation of sea space, so all affected users of the sea have to be considered. Regional councils need to start making some decisions around resource consents and how they will allocate these. Should sites be leased, with a license to farm fish within it, or the right to use a water space is also part of the consent to farm the fish. How will the sites be monitored once they are operational, and a well planned wind up strategy if results are not as anticipated. In the Marlborough Sounds, the council has 50 different monitoring methods and or site reports that allow them to keep tabs on what is still a new and unknown activity. Two of these sites have failed due to poor flushing and warm water.

Councils will have to ensure local communities who rely on the sea as a source of food and employment are not at risk, but make sure that opportunities for economic development from what is a new emerging industry, are not lost but enhanced. Allowing fin fish to be farmed would bring significant benefits to local communities and New Zealand as a whole in terms of export returns. Good recreational fishing opportunities will become more sought after around the world. New Zealand will be well placed to benefit from this demand and should develop new opportunities for tourism where appropriate.

Councils and communities have to decide if there should be a charge for occupation of public sea space, and should private enterprise profit from the use of a public space which will exclude all public. Also how should the money from rent be spent and who should benefit from it.

These are some of the many questions that will have to be answered as we explore the establishment of a new and exciting industry for New Zealand.

Wild fish stocks around the world can not sustain the current rising demand being put on them, fish farming will have a direct positive effect on reversing this.

Thank you,
Stuart Davey.

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