Frequently Asked Questions on Aquaculture

Does aquaculture rely heavily on wild fish for feed?

Many species frequently used in aquaculture, like tilapia, milkfish and catfish, are herbivorous (plant eating) or omnivorous. These can be produced without relying on wild fish for feed, although sometimes fishmeal is used to promote growth. Bivalves and seaweeds, common in aquaculture use worldwide, are not dependant on any external feed since they rely on natural productivity from the water. Other aquaculture species, such as salmon, shrimp and prawns that are carnivorous are dependent on fishmeal and fish oil derived from wild caught fisheries. With new technologies, the amount of fish in processed aquaculture feed has been reduced through the use of other feed sources, for instance soy [1] . Plant products, sea food by-products and algae have been suggested as possible substitutes for fishmeal and fish oil for future aquaculture [2].

Does aquaculture affect biodiversity?

When properly designed, sited and managed, aquaculture can have little or no affect on biodiversity. The majority of the world's aquaculture is inland pond production located away from coastal areas and so avoids biodiversity impacts in sensitive coastal zones such as mangroves and other wetlands. Cultivation of seaweed, bivalves and clams reduces the level of nutrients in the water, and can thus have a positive effect on aquatic biodiversity. What is important is that aquaculture operations are not located in highly ecologically valuable or sensitive areas.

When cultivated fish escape into surrounding environments there can be effects on natural populations. However, some of the species considered invasive, for instance tilapia, have proved to be important species for improvement of food security in many nations [3]. A number of trade-offs between different environmental and social impacts, for instance risk of escapes versus the benefits of cultivating an herbivorous species not demanding large amounts of fish meal, thus need to be considered when planning responsible aquaculture for the future.

Are there big quantities of antibiotics used in aquaculture?

Antibiotics are used in the treatment of certain infectious diseases in humans, plants and animals and have played a crucial role in the battle between man and microbe. As in other agricultural sectors, antibiotics can be used in fish to effectively treat bacterial diseases.

The use of antibiotics in aquaculture varies a lot among species, production systems and countries, being largely associated with more intensive farming. High density salmon, shrimp and *Pangasius* culture have been suffering from unwanted attention due to usage of high levels of antibiotics in the production process. For salmon cultivation in Norway however, the amount of antibiotics used in the production has largely declined in spite of increased levels of production [4]. This clearly shows that an expansion of the aquaculture sector does not have to be connected to usage of higher levels of antibiotics. Furthermore, small scale, low intensive aquaculture operations located in developing countries relies little on inputs such as antibiotics, feed and chemicals.

Does aquaculture cause water pollution?

Many forms of aquaculture do not cause significant water pollution, and the problem is largely confined to more intensive farming methods. Water quality concerns often associated with intensive aquaculture include oxygen depletion, cloudiness of the water and excessive nitrogen and phosphorus. In the aquaculture sector, eutrophication and associated oxygen depletion is mainly caused by discharge of waste water and uneaten feed from intensive farms. The eutrophication effects of aquaculture differ considerably depending on the species produced. Intensive cultivation of finfish such as salmon and tilapia tend to cause eutrophication to a relatively high extent, whereas seaweed and bivalves in fact reduce the level of nutrients in the water (see report, Blue Frontiers: Managing the environmental costs of aquaculture). In comparison to other animal food producing systems, the majority of aquaculture production systems perform well showing lower emissions of nitrogen and phosphorus per kg protein produced. Re-circulating aquaculture systems where many species (for instance seaweed, bivalves and fish) are cultivated together (so called Integrated Multi-Trophic Aquaculture, IMTA) is also an interesting option for reducing the fertilizing effects of the aquaculture sector [5].

Can confined fish become a breeding ground for diseases or pests, which can be transmitted in some cases to wild fish?

High stocking densities together with poor water quality leads to a higher susceptibility to diseases among cultivated fish. Other parameters such as salinity, pH and temperature may also have an impact on the resistance to virus, bacteria and parasites [6]. Occurrence of fish disease outbreaks is a serious threat to the development of the aquaculture sector and consequently the future world seafood supply. There are several existing management measures which aim to prevent disease outbreaks. Promotion of good water quality, moderate stock sizes and preferable abiotic conditions (temperature, pH etc.) are of great importance. Usage of specific pathogen free shrimp and fish is another effective way to prevent occurrence of diseases [7].

To what extent does aquaculture release carbon dioxide* (**CO_2**) *and contribute to climate change?

Aquaculture operations release CO_2, but do not contribute significantly to climate change. Up till now, studies analysing energy consumption and global physical and biological demands of the aquaculture sector have been scarce. The Life Cycle Analysis of global aquaculture conducted by the WorldFish Center (see report, Blue Frontiers: Managing the environmental costs of aquaculture) shows that the sector performs well compared to terrestrial animal food producing systems when it comes to release of green house gasses such as CO_2. Earlier work on energy consumption of the aquaculture sector has showed that feed production is often the major energy-consuming stage in the production process and could make up as much as 90 % of total energy use [8]. To minimize future impact on climate change as the sector grows, planning of aquaculture systems should focus on efficient energy use and minimizing energy demand. Aquaculture operations should not be located in areas high in sequestered carbon, for instance in mangroves, seagrass beds or forests.

Can aquaculture reduce hunger and improve livelihoods in developing countries?

Yes. For many developing country communities, especially those living close to coastal and inland waters, fish are the dominant animal source food. Accounting for more than 50% of the animal protein in the diet for 400 million poor people in Africa and South Asia, fish provide both quality animal protein and critical micronutrients. This nutrition is especially important for vulnerable groups, such as infants, children, pregnant and nursing women and those living with HIV/AIDS. Globally, about 47% of fish for human consumption is now supplied by aquaculture. Increased investment in knowledge, technology, with policies and action to promote sustainability will lead to a sector that helps meet the world's future food requirements, in ecologically sustainable ways.

Are fish used in aquaculture genetically altered or hybridized for quick growth?

Selective breeding of fish has been practiced for more than thousand years and is considered a responsible way to improve and increase the production from aquaculture. Substantial improvements of growth have been accomplished through natural breeding programs of, for example tilapia, catfish and salmon. Increased fish size by the time of harvest and reduced susceptibility of diseases can improve food security and alleviate poverty in many regions in the world. Research by the WorldFish Center on genetic improvement of tilapia through natural breeding has increased the growth rate of the fish by as much as 85%. Hybridization and chromosome manipulation are examples of genetic engineering applied on aquaculture species. However, these forms of genetic improvements are more expensive and technically demanding than selective breeding.

FAO- glossary for aquaculture terms

http://www.fao.org/fi/glossary/aquaculture/

Further information:

UN FAO Aquaculture: www.fao.org/fishery/aquaculture/en

Aquaculture Department of the SE Asian Fisheries Development Center (SEAFDEC/AQD): www.seafdec.org.ph

Seafood choices alliance: www.seafoodchoices.com

Network of Aquaculture Centres in Asia-Pacific: www.enaca.org

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