

Auctioning Aquaculture Licences

The need for sustainable aquaculture

Fishing and aquaculture provide an essential contribution to global food security and nutrition. They also are a main source of income for many countries.

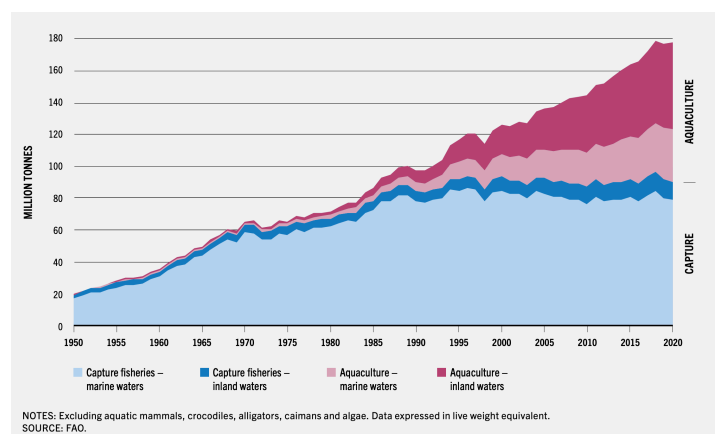
The total output of capture fisheries¹ and aquaculture² has increased from around 20 million tonnes per annum in 1950, mostly from capture fisheries, to almost 180 million tonnes in 2020, with almost half coming from aquaculture. Over the last two decades, this growth has been driven mainly by aquaculture, reflecting dwindling fish stocks and growing concerns about over-fishing.

With capture fisheries having reached (and potentially overstepped) the limit of sustainable production, aquaculture will remain an (increasingly) important source of aquatic food. However, while replacing wild catches with farmed aquatic livestock addresses the problem of overfishing, it comes with its own challenges.

Aquaculture has often grown at the expense of the environment.³ Waste products from intensive farming cause nutrient build-up in the water, leading to algal bloom and a reduction in oxygen. High densities of fish can facilitate the growth of parasites and result in a rapid spread of disease. Heavy use of antibiotics to deal with these concerns causes further problems. Effects often spread into the wider ecosystem, endangering wild fish, shellfish, and plant populations. Without proper management, aquaculture can cause irreversible damage to oceans and rivers. Future

growth needs to be sustainable to allow the industry to fulfil its promise.⁴

The fundamental problem is that aquaculture draws on scarce environmental resources. Without control over who uses these resources and to what extent, we just face another ‘tragedy of the commons’. An important building block of sustainable growth is therefore the ‘*identification and allocation of aquaculture zones, streamlining of*



licencing procedures in association with good environmental practices and monitoring.⁵

Regulating aquaculture activity through a licencing regime that limits the scale of the production helps to keep the use of natural resources under control. However, this raises the question of how to assign and manage licences, and how to revoke or curtail them when necessary to protect the environment.

¹ Wild fish catches landed for all commercial, industrial, recreational and subsistence purposes.

² Farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants.

³ See, for example, <https://www.globalseafood.org/blog/what-is-the-environmental-impact-of-aquaculture/>. Different methods will have different problems, but the fundamental concerns apply across all methods (see <https://innovate-eco.com/environmental-impacts-of-aquaculture/>).

⁴ For a detailed discussion of this, see FAO. 2022. The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation. Rome, FAO. <https://doi.org/10.4060/cc0461en>

⁵ Ibid., p 112.

Allocating aquaculture licences by auction

As we know from many other areas, auctions are a good way of allocating scarce resources efficiently. They can mimic the outcome of market processes where markets for various reasons may not exist. They are typically more transparent than other allocation mechanisms (such as, for example, beauty contests) and can be quicker and more flexible. They assign scarce resources to those who value them most, which should be those who can generate the greatest value for society. However, these benefits only apply if the auction is well designed. This caveat is important.

First, we will need to make sure that the value bidders place on licences is not driven (mainly) by the prospect of economic profits (i.e. profits that result from the exploitation of market power). This means that winning a licence must not give the successful bidder market power. Even though running an auction might allow the seller to extract much of the monopoly profit a successful bidder expects to earn, the fundamental inefficiency associated with monopolistic markets remains. This problem can be addressed relatively easily by imposing limits on the share of the total available resources that an individual bidder can acquire, keeping downstream markets competitive.

Second, we need to create a level playing field for different types of users. For example, by allowing bids for production capacity in tonnes rather than assigning permits for pre-defined production levels, we give different bidders more flexibility to obtain the combination of resources that best matches their business plan, regardless of size. A possible downside of this approach is that it may expose bidders to the risk of ending up with licences for a total production capacity that is below the minimum efficient scale. The auction design needs to deal with these concerns.

However, well designed auctions can be a good solution for allocating aquaculture licences in a manner that supports the growth of sustainable operations. The design of an auction that works well for this type of resource needs to deal with a

few challenges, but these are all surmountable. The approach taken by the Norwegian Ministry for Trade, Industry and Fisheries is a good example.

An example: Norway

Norway accounts for more than 45% of the total aquaculture output in Europe (measured by live weight) and is globally the largest producer of farmed Atlantic salmon and rainbow trout. Farming takes place along the entire coastline from Troms/Finmark to the southernmost tip at Adger. Production has been regulated by government licensing since 1975.⁶ In 2017, the Norwegian government adopted a new process for the assignment of new licences of aquaculture, based on auctions.

The process starts with an assessment of the scope for increasing aquaculture production capacity in different production areas. This assessment is made on the basis of the levels of sea lice in the area, and adopts a traffic light system code with *red* for areas with excessive levels of sea lice (where licensed capacity will be curtailed), *amber* for those where sea lice levels are tolerable but should not be increased (where licensed capacity will be maintained) and *green* for those with low levels of sea lice (where licensed capacity can be increased). Part of the available capacity increase in *green* areas is offered at a fixed price (specific to each production area) to existing licence holders prior to the auction, thus providing them with the possibility to increase their capacity without having to compete against other bidders, and thus with an incentive to control this parasite infestation. The remaining additional capacity made available is offered by auction, open to existing and new producers.

The most recent Norwegian auction, run in 2022, adopted a 'clock auction' format. It allocated 24,644 tonnes of capacity, raising a total revenue of NOK 3.8 billion (€371 million).

Can auctions do more?

Sustainable growth in aquaculture requires efficient mechanisms for the allocation of licences that reflect the use of scarce environmental resources. At present, one response to the environmental risks from intensive aquaculture activity is to favour land-based fish farming because of its lower and more controllable impact

⁶ For an overview of the Norwegian aquaculture industry, see for example https://firms.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=naso_norway.xml&lang=en

on the environment, compared with open net pen farming in coastal waters.⁷

However, the lower environmental cost of land-based farming must be balanced against the higher investment costs, considering the large amount of energy required to pump, clean and filter freshwater. Licensing production capacity for open-net pen farming in coastal waters (within defined areas) and strict controls on the emission of nutrients or waste products is an alternative that must be considered. Ignoring the option of managing aquaculture in coastal waters in a sustainable way can easily result in regulatory failure.

A traffic light system, as seen in Norway, could be implemented for any variable that is of concern, such as nutrient build up, prevalence of disease, or oxygen levels. This can then be used to determine the available supply and allocate production capacity through an auction procedure.

Auction mechanisms can go further than this. The rules for establishing who wins how much and at what price need not focus exclusively on price. It is possible to allow the algorithm used for selecting auction winners and prices to capture the differential impacts arising from licence use, where these may vary across different bidders.

For example, if there are differences between different producers in terms of the environmental impact of their activities, an auction mechanism could allow bidders to specify the chosen farming model together with their willingness to pay for capacity. This would then enable the auctioneer to trade off revenues (which can be spent on mitigating environmental damage) against environmental costs depending on the farming model. A simple way of implementing this would be to use 'bidding credits' that specify a discount on the price a prospective user who commits to more sustainable operations has to pay relative to its bid.

Auctions can also be used for determining potential reductions of licenced capacity in those areas where a decrease in farming activity is

needed to protect the environment. The cost of capacity reductions may be very different across producers. Therefore, simply curtailing licenced capacity pro rata across all licence holders in an area may not be efficient. An auction mechanism could be used to determine who will end up bearing the burden of having to scale down production by allowing producers to bid for not having to reduce their output (or offer capacity reductions in exchange for compensation), possibly again with the relative impact of their reduction on the environment.

Of course, all of this requires a more detailed specification of licences, but auctions can work with complex objective functions. Making sure that the process remains understandable and transparent for bidders can be a challenge, but one that can be addressed and resolved. Thinking creatively about how licences can be allocated and what trade-offs can be handled creates opportunities for more environmentally friendly aquaculture operations at a larger scale and with lower costs. This is an opportunity that should not be missed.

DotEcon has supported the Norwegian Ministry for Trade, Industry and Fisheries in implementing some of its aquaculture licence auctions, designing the process and auction rules and implementing the auction on its secure online bidding software (WebBidder™).

DotEcon works more widely on the application of auctions for the allocation of scarce public resources, including environmental resources.

⁷ For example, Canada is planning to eliminate open net pen farming in British Columbia completely by 2029.