Journal of Fisheries & Livestock Production

Kaushal, J Fisheries Livest Prod 2023, 11:5

Review Article Open Access

The Importance of Aquaculture for Feeding the Populations Growth

Shijin Kaushal*

Department of Fisheries and Animal Science, University of Fisheries, Brazil

Abstract

The required natural resources for the production of aquaculture feed are also increasing in importance as aquaculture becomes increasingly important for feeding the expanding global population. Although terrestrial feed ingredients have the potential to replace fish meal and fish oil, it is essential to comprehend the benefits and drawbacks of this development. The utilization of feed with a huge extent of earthly feed might decrease the strain on fisheries to give feed to fish, and yet it might essentially press freshwater assets, because of water utilization and contamination in crop creation for aquafeed. Here, the major farmed species, which account for 88% of total fed production, have their green, blue, and gray water footprints associated with the production of commercial feed determined for 2008. Alternative diets showed that substituting terrestrial feed ingredients for fish meal and fish oil could put even more pressure on freshwater resources. At the same time, especially for carnivorous species, economic consumptive water productivity may decrease. The present study's findings indicate that freshwater consumption and aquafeed-related pollution must be taken into consideration if the aquaculture industry is to sustainably expand.

Keywords: Aquaculture; Fish oil; Fisheries; Freshwater; Aquafeed pollution

Introduction

The consumption of fish and shellfish by humans around the world relies heavily on this resource. Global consumption of fish increased to 115.1 million tonnes in 2008 from 95.8 million tonnes in 2000. However, the FAO states that there is cause for concern in marine capture fisheries due to the rising percentage of overexploited, depleted, and recovering stocks and the decreasing percentage of underexploited, moderately exploited stocks. Some regions have seen measurable reductions in exploitation rates as a result of management measures like the implementation of catch quotas; however, unless exploitation rates are further reduced, a significant portion of stocks will remain collapsed. In addition, the utilization of wild fish as inputs for aquaculture feeds in the form of fish meal and fish oil is dependent on marine species that are renewable but frequently overexploited for human consumption. In this setting Cao express that a critical inquiry for the fate of the seas is the means by which China - being the super worldwide hydroponics maker fosters its hydroponics area and whether such improvement can ease strain on wild fisheries (Figure 1) [1].

The non-fed species share in global production has decreased from approximately 50% in 1980 to approximately 33% in 2010, strongly influenced by shifting Asian practices. The outer stockpile of

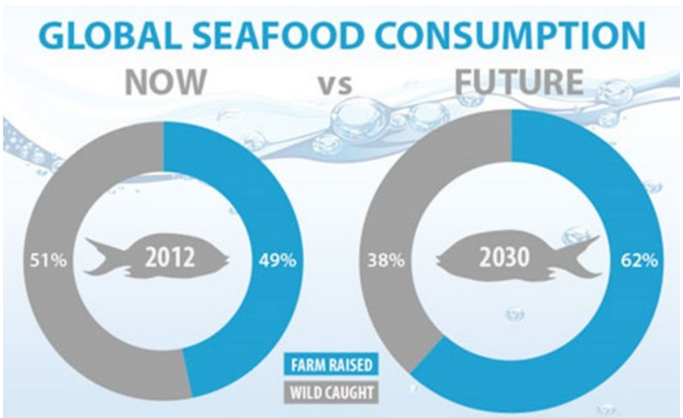

Figure 1: Global seafood demand.

supplements and in this way feed fixings should continue to increment to keep up with the development of creation in the area, which found the middle value of 6% yearly somewhere in the range of 2000 and 2008. About 31.5 million tonnes of farmed fish and crustaceans, or 46% of the total aquaculture production of fish, crustaceans, molluscs, and aquatic plants, were dependent on external nutrient inputs in the form of fresh feeds, farm-made feeds, or commercially manufactured feeds in 2008 [2].

The production of fed species is dominated by a few nations, with China playing an exceptional role, just like aquaculture production as a whole. In 2008, the top fifteen nations produced 28.8 million tonnes, or 91% of the world's fed species production, with China accounting for 50%.

There will be developing contest over feed fixings, like soybean, corn or wheat, among hydroponics and animals feed businesses later on. The same is true for the bioenergy sector, which is experiencing an increasing need for feedstocks. Since aquaculture feed is made from crop by-products and food-quality products, feeding a growing world population will also play an increasingly important role in aquaculture development decisions [3]. Even though the ratio of wild fish input to farmed fish output has been steadily decreasing, from 1.04 in 1995 to 0.63 in 2007, many production systems still have a ratio well above 2. The decrease reflects a partial shift from the use of aquatic feed ingredients in aquaculture to terrestrial feed ingredients, which is reflected in the growing volume of omnivorous fish farmed [4]. The various alternatives for aquatic feed ingredients' sustainability are questioned as a result of this development. Fish oil and fish meal are in short supply, and for aquafeeds, fish oil may become scarcer than

***Corresponding author:** Shijin Kaushal, Department of Fisheries and Animal Science, University of Fisheries, Brazil, E-mail: kaushal.shijin@gmail.com

Received: 25-Apr-2023, Manuscript No: JFLP-23-98880, **Editor assigned:** 27-Apr-2023, PreQC No: JFLP-23-98880(PQ), **Reviewed:** 11-May-2023, QC No: JFLP-23-98880, **Revised:** 16-May-2023, Manuscript No: JFLP-23-98880(R), **Published:** 23-May-2023, DOI: 10.4172/2332-2608.1000419

Citation: Kaushal S (2023) The Importance of Aquaculture for Feeding the Populations Growth. J Fisheries Livest Prod 11: 419.

fish meal in the future. Moreover, express that, because of the huge extent of non-predatory species in hydroponics creation, it very well may be expected that the maintainability of the hydroponics area will be connected to the supported stock, market accessibility and cost of earthbound creature and plant proteins, oils and starch hotspots for aquafeeds (Table 1).

The following terrestrial alternatives to forage fish are summed up by Naylor: terrestrial proteins derived from plants; earthly plant-based lipids; oil and protein from one cell; what's more, delivered earthly creature items. The reasonableness of lessening or barring search fish in feed for hydroponics creation is as yet the subject of escalated research. Specifically for business compound aquafeeds, the ideal dietary protein, lipid and starch levels are researched in logical examinations on hydroponics nourishment. Because different feedstuffs can fulfil the intended dietary requirements, the inclusion level of feed ingredients can vary even if these levels have been identified [5]. In a nutshell, the previously mentioned research on aquaculture nutrition demonstrates that terrestrial plant- and animal-based proteins and lipids can be substituted for fish meal, fish oil, or whole fish in aquaculture systems. In any case, other natural issues emerge. Land use intensification, high energy-dependency ratios, greenhouse gas emissions, and high nutrient and chemical input use and loss are all possible outcomes of the production of terrestrial feed ingredients. The aquaculture industry's sustainable expansion is clearly a multifaceted challenge.

Gephart imply freshwater investment funds through human utilization of marine fish protein rather than earthly protein. In that work, it was assumed that marine capture and marine aquaculture fisheries have a near-zero water footprint. Additionally, it was estimated that if current marine protein were replaced by terrestrial protein, the water footprint of global food production would increase by 4.6 percent, ignoring the feed-related water footprint of marine aquaculture. Troell adds to Gephart's work by determining the marine aquaculture feed's water footprint [6]. According to Naylor, "the farming of herbivorous fish such as carps and tilapia could severely limit itself if there is an increase in the scarcity of freshwater resources." There is even more pressure to create ecologically and socially responsible marine aquaculture systems when freshwater systems are subjected to more stringent restrictions.

Using a "water use index," which is defined as water use divided by production, Boyd and Boyd investigated direct on-site water use in aquaculture systems. Going one step further, Verdegem, Verdegem, and Bosma take into account pond aquaculture's use of water, both directly and indirectly. Verdegem prioritize research on lowering the amount of grain used in aquafeeds. In addition, Verdegem recommends selecting feed ingredients that require little water to produce in order to cut down on the amount of water used in current aquaculture [7]. Stonerook finds that the environmental impact of the systems studied could be largely attributed to agricultural feed production in a comparison of common aquaculture systems to beef, pork, and broiler chicken production.

We discuss the connection between the use of freshwater and aquaculture production in this paper. We gauge the business feed-related water utilization and contamination of fish and shellfish creation in hydroponics, involving the water impression as a pointer. A process, product, producer, or consumer's or a specific geographic area's water footprint can be quantified and located using water footprint accounting, which reveals the omitted connection between water use and consumption. There are three colors in the water footprint: blue, green, and gray. The green water footprint is the amount of rainwater used, the blue water footprint is the amount of surface- and groundwater used, and the green water footprint is the amount of surface- and groundwater used [8]. Additionally, the studied species' economic green and blue water productivity is evaluated. Ultimately we survey feed sytheses that target decreasing the utilization of fish dinner and fish oil and talk about likely effects on freshwater assets.

Table 1: Global Fish Production (2018).

Type of Aquatic Product	Production (million tonnes)
Total Fish Production	179.8
Aquaculture	114.5
Wild Capture Fisheries	65.3

Materials and Methods

The FAO appraises that overall around 600 sea-going food fish and green growth species are cultivated in hydroponics, of which around 330 are finfishes and 60 shellfish. This study examines in depth the 39 major fish and crustacean species fed commercial aquafeed. An important component of the aquaculture industry is production based on farm-made and semi-commercial aquafeeds. However, there is currently a lack of statistical data on the size and scope of farm-made or semi-commercial feed-based production. Species, for example, shellfish, mussels, mollusks, scallops and other bivalve species, which are developed with food materials that happen normally in their way of life climate in the ocean and tidal ponds, are not viewed as in this review. Silver and bighead carp, two types of filter feeders, consume planktons that have been produced through deliberate fertilization as well as the wastes and leftover feed materials of fed species that have been grown in the same multispecies polyculture systems. The study excludes farming of such fish species because it does not also require artificial feeding. Aquatic plants are the same. In 2008, fed freshwater fishes with a classification of "not elsewhere included," or whose species is not included in official statistics, produced 1.24 106 tonnes. Since the feed formulation is unknown, these are not taken into consideration in depth here (Figure 2) [9, 10].

Tacon says that out of the 31.5 million tonnes of farmed fish and crustaceans, approximately 17.5 million tonnes were fed commercially manufactured feeds, while the remaining 14 million tonnes were fed farm-made feeds and fresh feeds. Tacon exclude major Indian carp. Veerina, on the other hand, claims that commercial aquafeeds were the basis for 8% of Indian major carp aquaculture production [11]. According to a recent study by Ramakrishna, this practice did not change significantly over time. It was found that in Andrah Pradesh in India 1.3% of the ranchers depended exclusively on business aquafeed, 33.3% utilized business compound aquafeed to enhance ranch made feed and the greater part utilized ranch made feed as it were. Here we make the modest approximation that 10% of Indian significant carp creation depended on business aquafeed in 2008. Ramakrishna was the source of the feed conversion ratio [12]. A total of 17.9 million tonnes of commercially manufactured feeds are used in aquaculture production when Indian major carp are added to Tacon's data. The 39 fish and scavanger types considered here consequently amount to a development of 15.7 million tons, for example 88% of the all-out creation in view of business feed is remembered for the examination.

Information on aquafeed creation, the feed change proportions for the major developed species gatherings and the level of those gatherings that is refined utilizing business feed given by Tacon and Metian and refreshed by Tacon for the year 2008 are utilized here. In 2008, 29.7 million tonnes of commercial aquafeed were produced. The proportion of commercial aquaculture feed production worldwide by major species group.

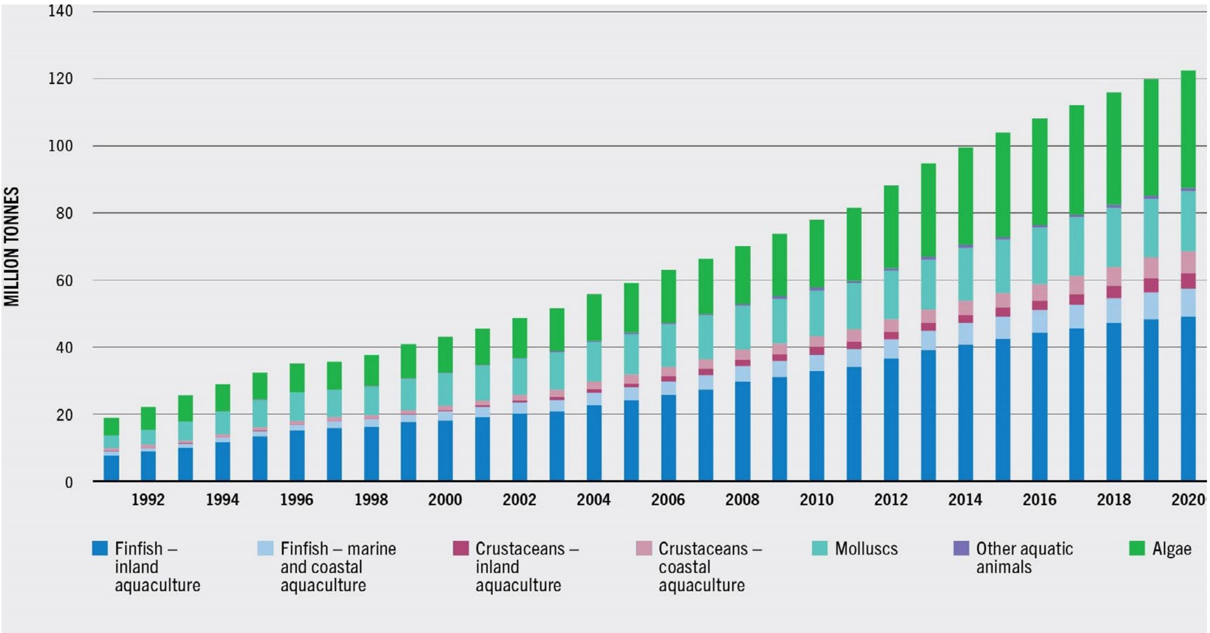

Figure 2: Growth in aquaculture production.

Table 2: Benefits of Aquaculture Production for Feeding the Populations Growth.

Benefit	Explanation
Sustainable Fish Farming	Aquaculture can reduce the pressure on wild fish stocks and provide a sustainable source of protein.
Efficient Food Production	Aquaculture is more efficient than traditional livestock farming, and requires less land, feed, and water resources.
Nutritious and Healthy Food	Fish are a good source of protein, omega-3 fatty acids, and other nutrients that are important for human health.
Economic Development	Aquaculture can provide employment, income, and economic development in rural and coastal areas.
Food Security and Poverty Alleviation	Aquaculture can help to decrease poverty and hunger by providing a reliable source of food and income for communities.

Results

With the exception of the red swamp crawfish, all of the fish species examined here have a feed-related water footprint, meaning that they use water indirectly in the supply chain rather than directly in operations. Carnivores typically have water footprint values that are lower than those of omnivores, planktivores, and herbivores. However, there are some exceptions that can be traced back to particular feed ingredients.

Following that, a close examination of the feed formulation and a comparison of the species' water footprints are used to identify and discuss feed ingredients that significantly affect individual water footprint values. Rice bran, a feed ingredient with a low water footprint, plays an important role in the diet of Indian major carp, with an inclusion level of 39% in the commercial diet by Biswas used here [13]. As a group of freshwater fish, Indian major carp's water footprint values were found to be significantly lower than those of Chinese carps. For dark carp the subsequent water impression values for the two eating regimens given by Hu and Sun concentrated on here were similar, with the dim water impression values contrasting most. Figure depicts the typical values for water footprints (Figure 2). 4 and were utilized for additional computations. The higher WF values for dark carp contrasted with other Chinese carps is to some extent because of the greater degrees of soybean dinner remembered for the eating regimens given by Hu and Sun. The high levels of soybean meal and groundnut oilcake described in the reference diet used here by Mohanta are the reason for the comparable high total WF values of silver barb, which are higher than the values found for the other cyprinids studied here (Table 2) [14]. These green, blue and dark water impression values coming about because of the two eating regimens were arrived at the midpoint of and utilized for additional examination. The total water footprint values of the omnivorous Pangasiid, Channel, Hybrid, and North African catfish are comparable. Paripatananont provides a description of a diet that differs from FAO AFFRIS for pangasiid catfishes. The Paripatananont diet depends generally on fish dinner and rice wheat, which brought about lower upsides of the green water impression when contrasted with the FAO AFFRIS diet. Here, mean values were also used [15]. Among the omnivorous Amur and Yellow catfish, the inclusion of soybean meal and the use of soybean oil instead of fish oil account for the Amur catfish's higher water footprint values. The Yellow catfish diet incorporates elevated degrees of fish dinner and fish oil, which brings about equivalently low upsides of the water impression. Yuan's reference diet for Asian swamp eel contains a lot of alpha starch, which makes the water footprint values relatively high [16]. Natural feeding behavior, which is omnivorous and abundant in plants and fruits, is reflected in the feed formulations for Characidae used in this study. Averaged were the correspondingly high water footprint values.

Due to the inclusion of soybeans and other plant ingredients, like copra meal in one of the diets, in the two feed formulations of FAO AFFRIS that were examined here for diadromous milkfish, high water footprint values were obtained. The mean values were used once more. According to Weimin and Mengqing, a general diet formulation was adopted for each flounder and turbot in the ISSCAAP marine fishes group of flounders, halibuts, and soles [17]. Soybean meal and grain content make up the majority of the soybean meal and grain content in these two reference feed formulations, while fish meal makes up 28% and 32% of them, respectively, and fish oil makes up 4% and 5% of them.

This study's Saoud-formulated diet for the crustacean redclaw crayfish contains a lot of soy, wheat, and wheat starch, resulting in comparable high water footprint values. Due to the inclusion of soybean and wheat gluten meal in Weimin and Mengqing's diet at all life stages, the water footprint values of fleshy prawn feed are also high. The green, blue, and gray feed-related water footprint for species-specific production in 2008 has been calculated using the values for each species' water footprint [18].

Discussion

Feed formulations that are thought to be standard for a particular species have been chosen for this study. In any case, the dietary prerequisites of fish and scavangers are as yet being concentrated broadly. It should likewise be viewed as that feed details are frequently named "standard" in the writing, however aquafeed for a specific fish type might vary fundamentally from one country to another or inside nations, contingent upon the maker's training, feed fixing accessibility, monetary method for the ranchers and the cultivating framework [19]. It is difficult to accurately quantify the overall uncertainty associated with feed formulations. Tacon express that posting a fixing inside an aquafeed plan similarly as "fish dinner" or "soybean feast" is insignificant, as there are in real sense scores of various sorts and grades of fish feast, and less significantly of soybean dinner, contingent upon the species and beginning of the crude fish or bean and handling technique utilized [20]. If precise conclusions are to be drawn, it is evident that comprehensive ingredient descriptions and data on the nutrient composition are required. The accuracy that can be achieved with the data that is currently available stands in stark contrast to this level of detail.

Conclusion

Protein, fat, carbohydrates, vitamins, and minerals, among other things, are essential to the survival of each fish and crustacean. The question is how these requirements can be met sustainably while also taking into account the strain on freshwater resources. As can be deduced from the results presented here, a shift toward higher plant protein inclusion levels should also take into account freshwater consumption and pollution in order to determine sustainable future feed formulations. Although the use of fish meal and fish oil is decreasing, However, substituting terrestrial feed ingredients for fish meal or fish oil can significantly increase aquafeed's water footprint and, consequently, aquaculture production as a whole. The current study's selection of species is not exhaustive, but the conclusion is universal. Aquafeed ingredients derived from pelagic marine fishes, for example, that do not require external feed, should be replaced with terrestrial feed ingredients whose production process pollutes and consumes water in a related way. There will, of course, be differences between terrestrial plant-based proteins and lipids in terms of their green, blue, and gray water footprints. These differences must have an impact on achieving various objectives, such as reducing pollution or the overall water footprint. Since the decision is based on the objective, we do not attempt to make specific recommendations regarding the ingredients used in terrestrial feed. However, it is essential to realize that this discussion must take into account all kinds of fish. The market for aquafeed is expanding at the same rate as the aquaculture industry.

Fish oil and meal are currently important feed ingredients for crustaceans, freshwater carnivorous fishes, diadromous fishes, and marine fishes. These species typically have higher economic green and blue water productivity than herbivorous and omnivorous freshwater fishes do. According to the findings presented here, fish diets with higher proportions of particular terrestrial plant feedstuffs may result in a decrease in economic water productivity as a result of larger water footprints.

Acknowledgement

None

Conflict of Interest

None

References

1. Mukherjee S, Ikbal A, Ngasotter S, Bharti D, Jana S, et al. (2020) Impact of COVID-19 on Indian seafood industry and potential measures for recovery: A mini-review. Curr J Appl Sci Technol 39: 519-527.
2. Meharoof M, Gul S, Qureshi NW (2020) Indian seafood trade and Covid-19: anticipated impacts and economics. Food Sci Rep 1: 54-58.
3. Ngasotter S, Panda SP, Mohanty U, Akter S, Mukherjee S, et al. (2020) Current scenario of fisheries and aquaculture in India with special reference to Odisha: A review on its status, issues and prospects for sustainable development. IJBSM 11: 370-380.
4. Antler E (1977) Women's work in Newfoundland fishing families. Atlantis: Critical Studies in Gender, Culture & Social Justice 2: 107-113.
5. Coulthard S (2012) Can we be both resilient and well, and what choices do people have? Incorporating agency into the resilience debate from a fisheries perspective. Ecology and Society 17.
6. Gustavsson M (2020) Women's changing productive practices, gender relations and identities in fishing through a critical feminisation perspective. J Rural Stud 78: 36-46.
7. Harper S, Grubb C, Stiles M, Sumaila UR (2017) Contributions by women to fisheries economies: insights from five maritime countries. Coastal Management 45: 91-106.
8. Hapke HM (2012) Capturing the complexities of globalization in fisheries: Gendered divisions of labour and divisions of labour and difference. Asian Fish Sci S 25: 75-92.
9. Kronen M, Vunisea A (2009) Fishing impact and food security–Gender differences in finfisheries across Pacific Island countries and cultural groups. SPC women in fisheries information bulletin 19.
10. Thomas A, Mangubhai S, Fox M, Meo S, Miller K, et al. (2021) Why they must be counted: Significant contributions of Fijian women fishers to food security and livelihoods. Ocean & Coastal Management 205: 105571.
11. Premapriya M, Jeyaseelan M (2020) Issues and Challenges of Fisher Folk Women During Covid-19 Lockdown: A Sociological Case Study Analysis With Special Reference to Puducherry. JCR 7: 3613-7.
12. Silva MRO, Silva AB, Barbosa JC, Amaral C, Lopes PF (2022) Empowering fisherwomen leaders helped reduce the effects of the COVID-19 pandemic on fishing communities: Insights from Brazil. Marine Policy 135: 104842.
13. Gozzer-Wuest R, Sueiro JC, Grillo-Núñez J, De La Puente S, Correa M, et al. (2022) Challenging the tradition of a fishmeal producing country: An economic overview of the fishing activity of Piura, Peru. Mar Fish Sci (MAFIS) 35: 263–286.
14. Clissold R, Westoby R, McNamara KE (2020) Women as recovery enablers in the face of disasters in Vanuatu. Geoforum 113: 101-110.
15. Green KM, Selgrath JC, Frawley TH, Oestreich WK, Mansfield EJ, et al. (2021) How adaptive capacity shapes the Adapt, React, Cope response to climate impacts: insights from small-scale fisheries. Climatic Change 164: 1-22.
16. Kusumasari B (2015) Women adaptive capacity in post disaster recovery in Indonesia. Asian Social Science 11: 281.
17. Lau JD, Kleiber D, Lawless S, Cohen PJ (2021) Gender equality in climate policy and practice hindered by assumptions. Nature climate change 11: 186-192.
18. Rao N, Mishra A, Prakash A, Singh C, Qaisrani A, et al. (2019) A qualitative comparative analysis of women's agency and adaptive capacity in climate change hotspots in Asia and Africa. Nature Climate Change 9: 964-971.

19. Purkayastha S, Salvatore M, Mukherjee B (2020) Are women leaders significantly better at controlling the contagion during the COVID-19 pandemic?. J Health Soc Sci 5: 231.
20. Oxfam (2020) World in the midst of a 'hunger pandemic': conflict, coronavirus and climate crisis threaten to push millions into starvation