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Editorial Open Access

# The Re-Authorization of Non-Ruminant Processed Animal Proteins in European Aqua feeds

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## Editorial

Today, the global community is challenged to meet the pressing food needs of a growing population with finite natural resources. Fish and seafood have always been considered as an important part of human diet and it has long been recognized as a health-promoting food for human nutrition [1]. Globally, fish provides about 4.3 billion people with almost 15% of their average per capita intake of animal protein, with the global annual per capita consumption having doubled since the 1960s [2]. This change mainly was due to rising living standards, population growth, rapid urbanization and opportunities for trade and transformations in food distribution. This has led to a growing demand for proteic food products, in particular fish and meat. Fish consumption is expected to continue rising due to an expected increased demand, which is driven by population and income growth and dietary diversification. The European Union (EU) is by far the largest single market for imported fish products, with imports reaching US$47.0 billion in 2012 representing 36% of total world imports [3]. The dependence of the EU on imports for its fish consumption is growing, underlying the positive trend in consumption, but also evidences the constraints within the EU on further expansion of supply. In this respect, the current reform of its Common Fisheries Policy aims to rebuild its fish stocks, as well as boosting its aquaculture production.

As fishing has become more industrialized, it is causing depletion of fish stocks and many of the more valued fish species are now on the verge of extinction or are no longer commercially viable [3]. Given the stagnating capture fisheries, aquaculture appears to have a significant potential to meet the increasing demand for fish products. In 2012, world aquaculture production attained another all-time high at 66.6 million tonnes of food fish (US$137.7 billion total value) still being the fastest growing animal food producing sector [3]. Since the mid-1980s, its contribution to world food fish production for human consumption has raised by almost seven times outpacing the growth of world population [3]. Particularly, it is the fed-species culture subsector that achieved faster growth due to the development and improved availability of industrially manufactured aqua feeds for finfishes and crustaceans.

The continued growth of farmed fish production, however, is not as steady as it seems and it is challenged by several constrains and obstacles. One of the most critical issues that threatens the sustainability and further growth of aquaculture production is its dependency on fishmeal (FM) that is included in industrially compounded aqua feeds. The high protein content, the balanced amino acid profile, its high digestibility and palatability to fish, and its lack of anti-nutritional factors make FM the primary protein source of choice in diets for most farmed fish species. Particularly, the intensive production of carnivorous species such as European sea bass and gilthead sea bream is heavily dependent on continuing supplies of high quality FM. This is the crude flour obtained after milling and drying fish or fish parts, and it is produced from whole fish, fish remains or other fish by-products resulting from processing. Although a growing percentage of FM is being obtained from the latter, food grade fisheries, in particular small pelagic such as anchoveta, are the main groups of species used for the reduction of FM, whose volume annually produced fluctuates according to the fluctuations in the catches of these species. FM global annual production is around 6 million tonnes being static for the last 15 years, with its price being steadily increased since 2000 [4].

Within the animal husbandry sub-sectors, aquaculture sector remains the largest consumer of FM using 60% of world production as compared to the 10% share back in late 1980's. Over the last two decades, a vast number of studies have been conducted trying to reduce dependence on FM. These studies researched the partial or full replacement of FM with sources of plant origin in aquafeeds of most farmed species [5]. Plant feedstuffs that were used for such purpose were mainly oilseeds, legumes and cereal grains. Findings of the two major collaborative projects funded by European Commission (PEPPA, AQUAMAX) revealed that significant reductions of the inclusions levels of FM in feeds for most carnivorous species can be achieved without leading to detrimental effects on fish growth [5]. Since 2006, this increased knowledge has led to a considerable reduction in the average inclusion of FM in aquafeeds for the major groups of farmed species. At present, another EC-funded project (ARRAINA)[6] is running targeting to develop alternative feeds based on low fishmeal inclusion levels tailored to meet the nutrient requirements of the main farmed European fish species, and study the long-term effects of these on metabolism, performance, quality and waste management over the full life-cycle (egg to broodstock).

The plant-based alternatives of FM are now widely in use, and will be increasingly used in the near future. However, the use of plant proteins in aquafeeds is not without its drawbacks. Research findings up to date also clearly reveal that FM cannot be fully replaced by plant proteins in aquafeeds of most cultured European farmed fish species because a full replacement results in loss of fish growth performance in most studied species due to reduced levels of essential amino acids, the presence of several anti-nutritional factors and reduced palatability of plant feedstuffs [5]. Moreover, plant feedstuffs can also reduce nutrient bioavailability in fish body resulting in nutrient loss to the aquatic environment, which in turn produce an undesirable disturbance to the balance of organisms present in the aquatic environment [7]. Furthermore, aquaculture competes in the international marketplace for the use of these plant alternatives with the animal husbandry sector, the biofuel production as well as with the use for direct human

consumption. Prices of all agricultural commodities have increased significantly over the past years as a result of increasing demand for their use in feeds and foods [8]. These commonly used plant ingredients in aquafeeds are internationally traded commodities and thus the aquafeed production is subjected to any common global market shocks and volatility [8]. Finally, many of the dietary plant alternatives to FM come with their own sustainability issues for example, the destruction of rainforest to increase the production of soya in South America, or the destruction of native forest in South-East Asia for the increased production of palm raising issues of their sustainable production [9]. Thus, FM will continue to make an important contribution to aquaculture production as its high protein value makes it a key material in aqua feeds. In future, this marine resource will be used as sparingly as possible and will become a strategic ingredient in special diets targeting at the critical stages of the life cycle of farmed fish, especially the carnivorous ones [4,9].

If the production of farmed fish is to contribute in global fish availability it is essential for the sector to continue searching for suitable raw alternatives to FM that are both economically viable and environmentally friendly for aqua feed production. In order to be a viable alternative feedstuff to FM in aqua feeds, a candidate ingredient must possess certain characteristics including wide availability, competitive price, plus ease of handling, shipping, storage and use in feed production. Furthermore, it must possess certain nutritional characteristics, such as low levels of fibre, starch, especially non-soluble carbohydrates and antinutrients, plus have a relatively high protein content, favorable amino acid profile, high nutrient digestibility and reasonable palatability.

Processed animal protein (PAP) [10], previously known with the more consumer conscious name "Meat and Bone Meal", is an important ingredient in feed for food-producing animals throughout the world. Animal by-products are protein-rich feedstuffs derived from the rendering of animal tissues providing very useful and cost effective protein to animal feed manufacture, whilst also providing a valuable means of animal by-products utilization. PAPs have a high nutritional value making them an excellent alternative to imported proteins such as soya. They have a significantly higher protein value [11] than plant feed ingredients such as oilseeds, legumes and cereal grains and provide valuable minerals to rations. Particularly, they are rich in phosphorus (10% on as fed basis), which is a limiting mineral in most feedstuffs.

The EU Commission defines PAPs as "animal protein derived entirely from Category 3 material, which have been specially treated so as to render them suitable for direct use as feed material or for any other use in feedstuffs" [12]. Raw materials used in its production come from animals approved for human consumption at the point of slaughter (known as category 3 material), and the finished product is fully traceable and quality assured that make their use safe in aquafeed industry. It is worth mentioning that these materials are made from animal by-products fit for human consumption gained from healthy (and not dead) slaughtered animals and should not be misinterpreted with meat bone meal, which is a by-product of the human food chain processed from category 1 and 2 by-products of meat production. There are several types of processed animal protein, categorised by the species from which they are made: pork PAP, poultry (chicken, turkey, duck) PAP, feather PAP and blood meal.

Considerable public and political concern about the safety of foods of animal origin had developed in recent years as a result, in particular, of the bovine spongiform encephalopathy (BSE) problem but also of food-borne bacterial infections [13] There has been a total ban on the use of mammalian meat and bone meal protein in feed for all farmed animals in the European Union since [14]. In 2011, research published by the European Food Safety Authority (EFSA) confirmed that processed animal protein in feed for food producing non-ruminants, respecting the proposed ban on intra-species recycling, presents a negligible risk to human health [10]. From 1st of June 2013, EU has adopted [15] the lifting of the ban on animal proteins in feedstuffs and thus it is now permissible for fish farmers to feed fish stocks with meal derived from non-ruminant processed animal proteins. According to the EC, the relaxation of animal feed regulations is consistent with the latest scientific evidence which points to a negligible risk of BSE transmission between non-ruminant animals, provided that intra-species recycling (cannibalism) is prevented. Thus, for the first time since 2001, fish farmers would be permitted to use PAPs in aquafeeds.

EFPRA (2014), representing the animal by-product processing sector estimates that there are more than 500 rendering plants processing PAPs in European Union. Annually 400,000 tons of pork meal, 400,000 tons of poultry meal and 200,000 tons of feather meal are processed. It is believed that these volumes could substitute 1.5 to 1.8 million tons of imported soy or 3-5% of total soy imports into the EU. Prices of PAPs for the feed industry are still vulnerable as the product has not been in use for ten years. Worldwide, about 2.3 million tonnes of processed animal proteins (PAP) were produced in 2011 that were delivered mainly in petfood [16]. In non-European countries, the use of terrestrial animal protein meals and oils within compound aquafeeds is increasing for both high- and low-trophic-level fish species groups (e.g. salmons, trouts, marine finfishes, marine shrimps, catfishes, tilapias, carps and mullets), although the type and level vary depending upon species. Despite the apparent increasing trend, it is estimated that the total usage of terrestrial animal by-product meals within compound aquafeeds ranges between 0.15 million and 0.30 million tonnes, or less than 1% of total global compound aquafeed feed production [2]. There is, therefore, a lot more to go on this field.

Considering the approved reintroduction of Processed Animal Proteins (PAPs) in the aquafeed chain of European Union, it becomes a necessity to evaluate their suitability in terms of fish production and quality of fish end-product to the consumer. Future research should focus on investigating the suitability and maximum inclusion levels of PAP, further replacing fishmeal in the aquafeeds for most of the cultured fish species in Europe. Research insights could help the aquaculture sector to potentially reduce further the inclusion levels of fishmeal enhancing their production sustainability and production efficiency as well as European Union to reduce dependency on fishmeal imports and thus contributing to the Common Fisheries Policy reform goals of pairing sustainable wild fisheries with the sustainable development of aquaculture.

In particular, the suitability of PAP-based aquafeeds could help the aquaculture industry to potentially achieve:

a) less fishing pressure on wild stocks that were intended for fishmeal production

b) further reducing the dependence of aquaculture sector on a finite and continuously diminishing resource such as fishmeal

c) increasing E.U. sufficiency and availability of aquafeedstuffs

d) reducing E.U. imports of particular plant feedstuffs that currently are used extensively in aquafeeds, although not mainly produced within E.U. such as soybean meal, corn etc.

e) reducing the production costs of aquafeeds

f) the development of a final fish product that potentially meets consumers' needs, wants and preferences both in terms of quality, price and environmental concerns

g) the development of an innovative 'best practice' scheme that assures quality and safety management practices as well as environmental sustainability

h) the monogastric E.U. sector could achieve economic benefits by obtaining added value in its end by-products, in case of promoting them as primary ingredients in the PAP production process

i) the E.U. aquaculture industry could be more efficiently vertically integrated taking advantage the local production of PAPs based on the local production of monogastric's end by – products.

Considering the increasing global population and the stagnating marine capture fisheries, in order to maintain the current level of per-capita fish consumption, it has been estimated that by 2030 the world will require at least another 23 million tonnes of food fish, which aquaculture will have to provide [2]. Essentially, this will depend on the availability of quality aquafeeds in the adequate quantities. Parallel to implementing practises for reducing the inclusion levels of fishmeal in the aquafeed formulations, the sustainability and competitiveness of the aquaculture sector is likely to be enhanced by the supply and use of processed animal proteins in aquafeeds.

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