

# The Issues Surrounding Aquaculture Feeds and the Current Measures Associated with Them in Japan

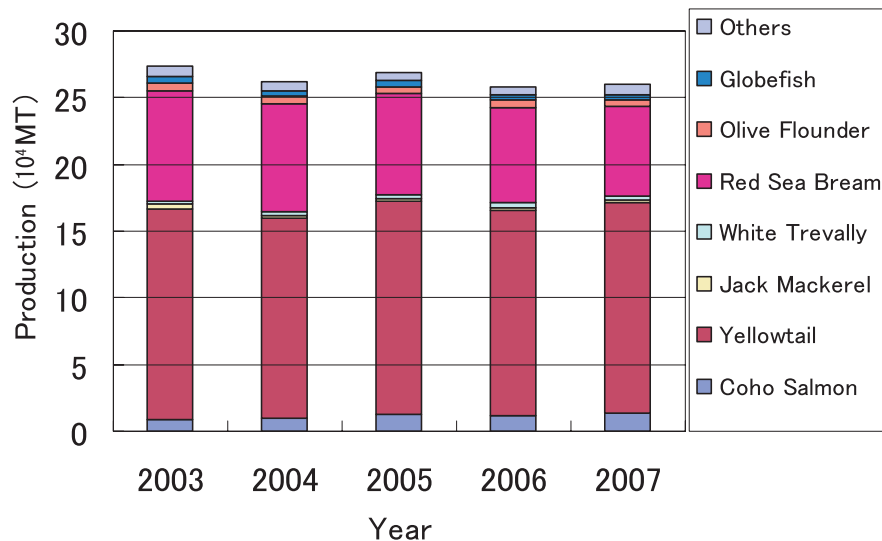
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**Abstract :** In recent years, the annual aquaculture production of marine fish in Japan has remained stable at about 250,000 tons and has occupied an important position in Japanese marine fish production. However, the high price of fishmeal since 2006 has inflated the price of aquaculture feeds, which has led to the deterioration of management by fish farmers. Therefore, it is necessary to promote sustainable aquaculture production, for example, through development of aquaculture feeds that contain little or no fishmeal and through the introduction of self-feeding systems to prevent excessive use of aquaculture feeds.

**Key word :** aquaculture feeds, fishmeal, sustainable production

Annual production from marine fish aquaculture in Japan has reached around two hundred fifty thousand tons during the past years (Fig. 1). Highest production has been through the production of yellowtail, mainly *Seriola quinqueradiata* and *S.*

*dumerili*, followed by red sea bream (*Pagrus major*). Those species account for about ninety percent of the production. Other cultured species include coho salmon, olive flounder and globefish.



**Fig. 1.** Recent production of marine fish aquacultured in Japan.  
Source : 2003-2007, *Annual Statistics on Fishery and Aquaculture Production*,  
Statistics Department, Ministry of Agriculture, Forestry and Fisheries.

2010年6月21日受理 (Received, June 21, 2010)

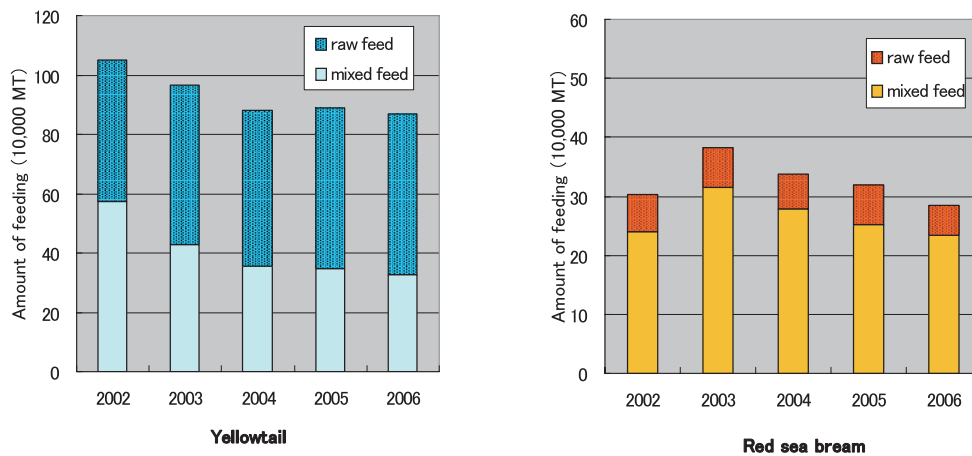
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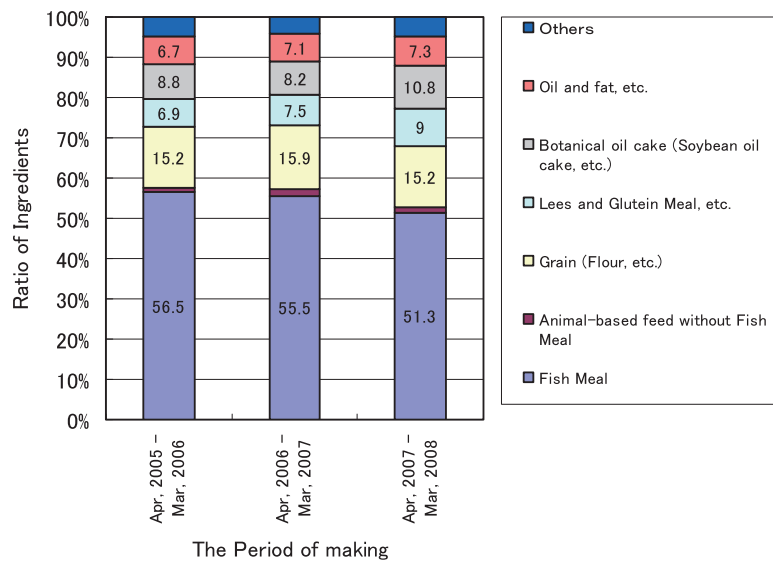
**Mixed Feed**

The annual feed amounts used for yellowtail production consist of raw feed used directly and mixed feed which is made in feed processing plants, range from 800,000 to 1,000,000 tons and feed used in conjunction with red sea bream production ranges from 300,000 to 400,000 tons (Fig. 2). Mixed feed accounts for about 40% of yellowtail and 80% of red sea bream production.

Exact annual amounts of feed used is not known, however judging from the data on cultured fish production, feed production of major makers and other information concerning the raw feed marketing trade, we estimate that the production of mixed feed has reached approximately 450,000 tons and the production of raw feed is about 800,000 tons. The details on ingredients for mixed feed production in the last three years in Japan showed fishmeal accounted for more than half (Fig. 3).



**Fig. 2.** Amounts of raw feed and mixed feed fed to yellowtail and red sea bream.  
 Source : 2002-2006, *Annual Statistics on Fishery and Aquaculture Production*, Statistics Department, Ministry of Agriculture, Forestry and Fisheries.



**Fig. 3.** Raw materials for aquaculture feed in Japan.  
 Source : 2005-2007, *Monthly Feed Statistics, Agricultural Production Bureau*, Ministry of Agriculture, Forestry and Fisheries.

Most of fishmeal is imported from overseas. Peru and Chile are major sources of fishmeal for Japan. Increasing prices of fishmeal, fish oil and other feed ingredients will certainly affect the amount and cost of mixed feeds. The monthly average amount and price of imported fishmeal since January 2004 are shown in Fig. 4. The price has been increasing gradually since 2004, and jumped to ¥140,000 per ton in the middle of 2006.

We don't have any official statistics on the price

of mixed feed used for fish aquaculture, either. We were able to obtain information from feed manufacturers and assumed that the price of mixed feed increased by 20 to 30% in 2006 and remained at the same level later. Though the price of imported fishmeal has decreased from 2007 to 2008, it was difficult for the suppliers to reduce their feed prices. A certain major maker explained that the prices of other commodities such as fish oil and vitamins have been increasing.

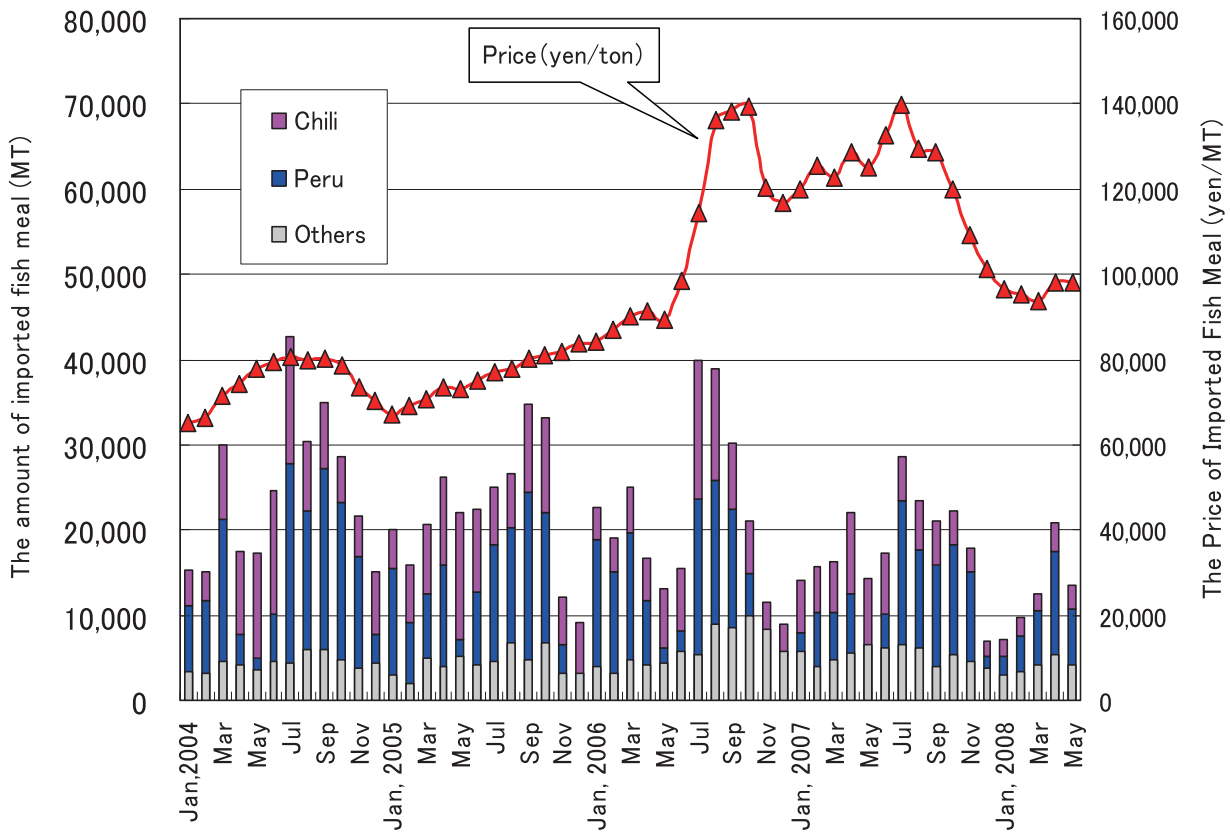
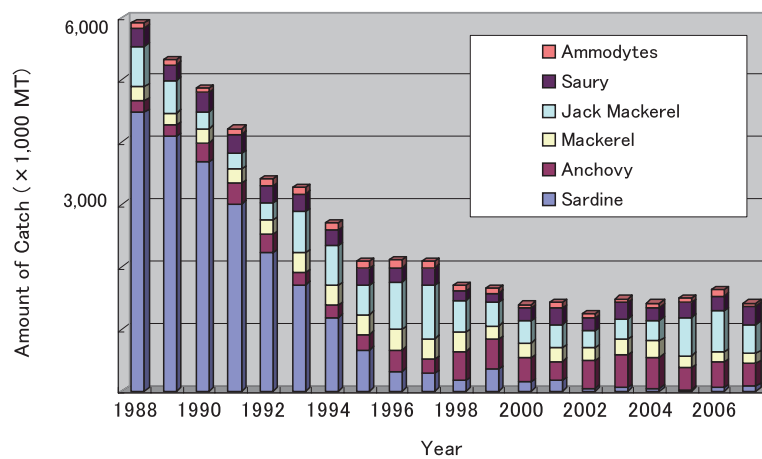


Fig.4. Amounts and prices of imported fishmeal.  
 Source : 2004-2008, *Trade Statistics of Japan*, Ministry of Finance.

### Raw feed

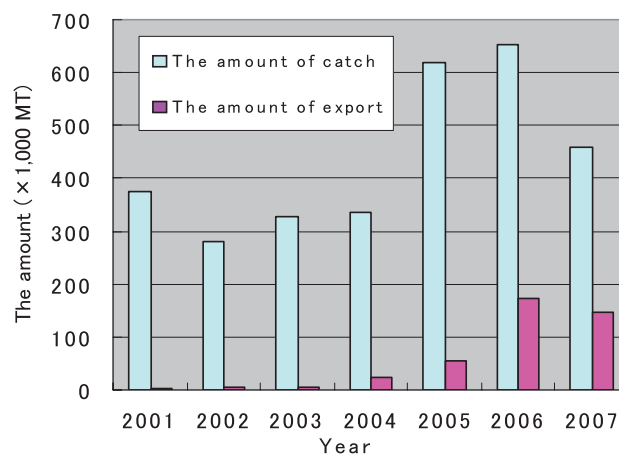
Raw feeds are widely utilized for yellowtail production in Japan (Fig. 2). Sardines, anchovies and jack mackerel (called large captured pelagic fishes) are low value species commonly utilized as raw feed. The catch amounts of these large captured pelagic fishes in Japan are shown in Fig. 5. For example, 4.5 million tons of sardines were landed in 1988. At that time, sardine were a very important as raw feed for fish aquaculture. Since that time, the catch of sardines has gradually decreased until it reached a very small amount in recent years. Thus, raw feed for fish aquaculture has a

tendency to be from by anchovy, jack mackerel and saury fisheries in addition to sardines. Jack mackerel is now an important species for use in raw feed (Fig. 5), however, the amount of export is gradually increasing (Fig. 6). The catch of mackerel decreased by 200,000 tons in 2007 compared with 2006, however, the amount of export didn't decrease to the same extent. It seems that the demand for low-price fishes such as mackerel has been increasing in places such as China, Korea and southeastern Asian countries. The prices obtained for raw fish for export and food are higher than for aquaculture feed.



**Fig. 5.** Amounts of coastal catch in Japan (sardines, anchovies, mackerel, jack mackerel, saury and ammodytes).

Source : 2006-2007, *Annual Statistics on Fishery and Aquaculture Production*, Statistics Department, Ministry of Agriculture, Forestry and Fisheries.



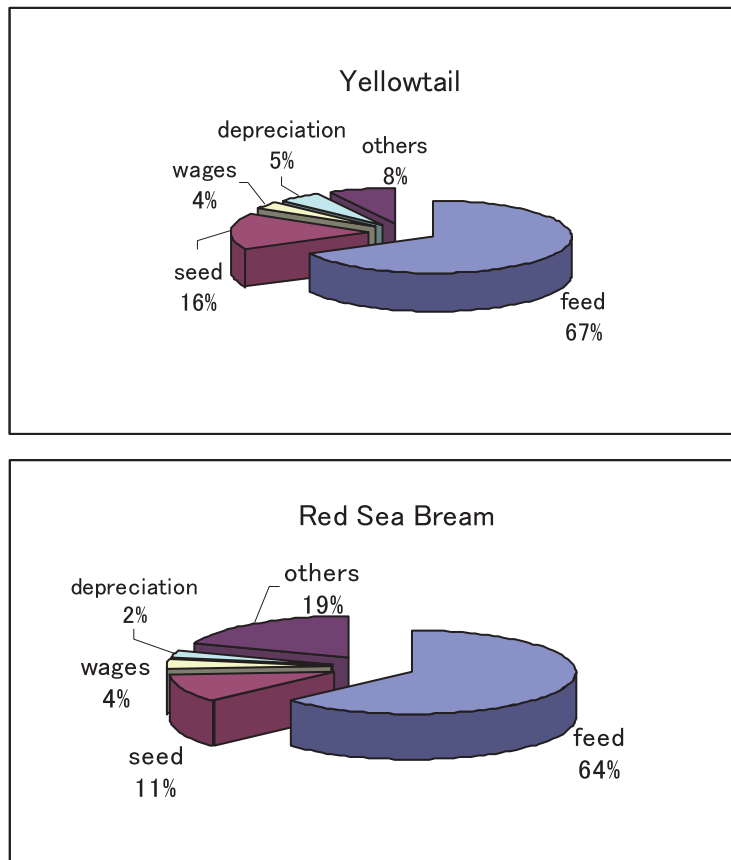
**Fig. 6.** Amounts of coastal catch and export of mackerel.

Source : 2006-2007, *Annual Statistics on Fishery and Aquaculture Production*, Statistics Department, Ministry of Agriculture, Forestry and Fisheries. & 2001-2007, *Trade Statistics of Japan*, Ministry of Finance.

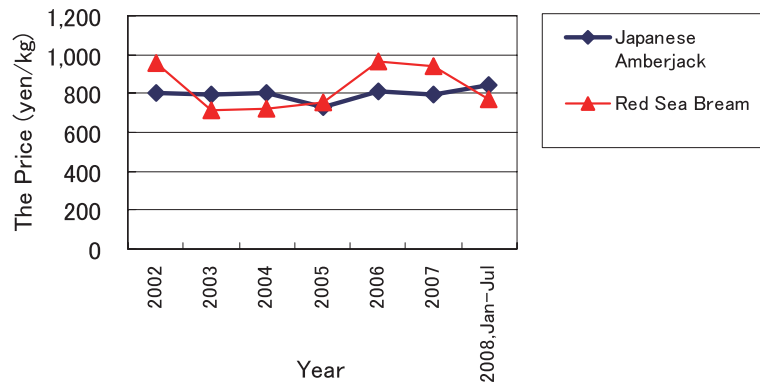
**Cost**

The details production costs for yellowtail and red sea bream are shown in Fig. 7. The proportion of feed cost to total production one was 67% in yellowtail and 64% in red sea bream in 2006. It seems that a sudden rise in prices of mixed and raw feeds has affected the management practices of

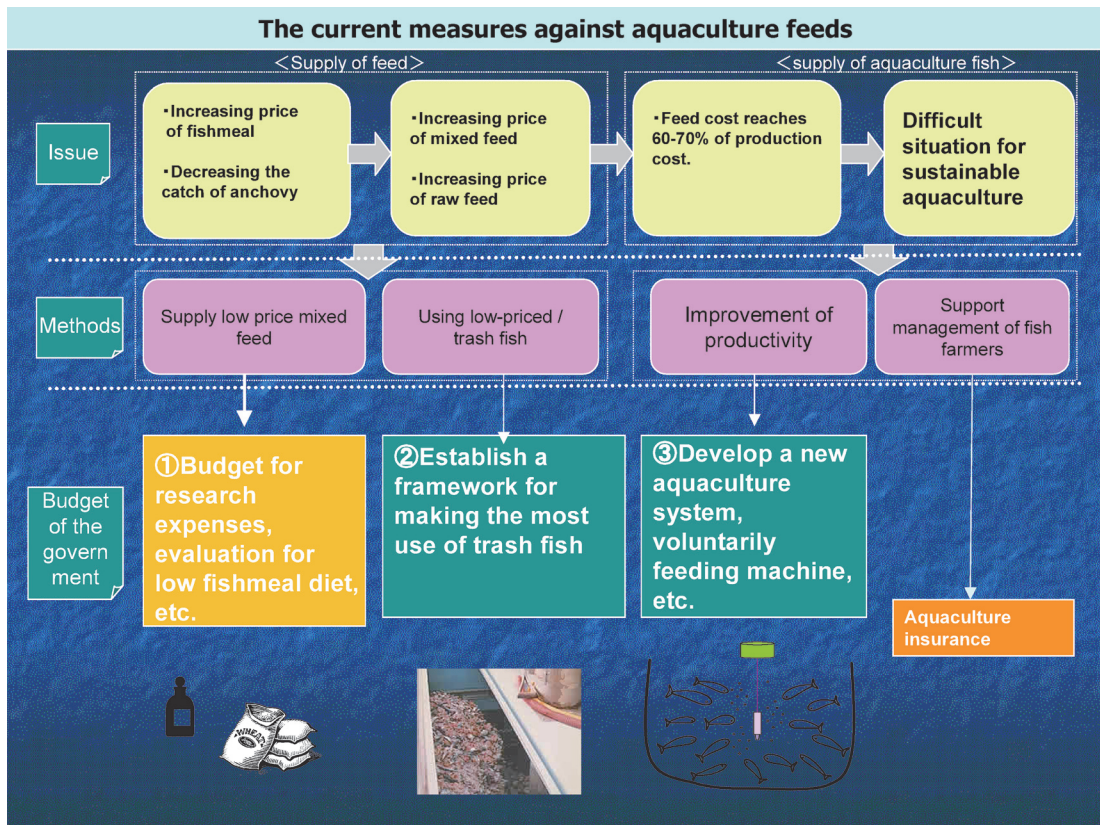
aquaculture farmers as the feed costs have increased as a percentage of total production costs. It can be assumed that fish farmers have not passed the increased cost of feed to the market prices of their products because there has been little change in the average prices of yellowtail and red sea bream since the significant increase in feed costs (Fig. 8).



**Fig.7.** Details of production costs of yellowtail and red sea bream.  
 Source : 2006, *Report of Statistical Survey on Fishery Management*, Statistics Department, Ministry of Agriculture, Forestry and Fisheries



**Fig. 8.** Prices of aquacultured fish in the Japanese market.  
 Source : Monthly bulletin of Japan Sea Water Fishery Cultivation Association. No.449-No.527. (Market report of Tokyo, Yokohama, Osaka, Kobe, Hiroshima, Kitakyusyu and Fukuoka)



**Fig. 9.** Current measures associated with aquaculture feeds.

### Administration policy

The Japanese government (Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries) is comprehensively and systematically promoting measures related to fisheries, including aquaculture, by developing sustainable production targets according to the Basic Plan for Fisheries Policy, which was established in 2007 based on the Basic Law on Fisheries Policy. The plan describes the means to address the issues related to aquaculture in Japan, including the promotion of creation and improvement of aquaculture grounds, prevention of diseases and introduction of new species for aquaculture, as well as improvement of the quality of aquaculture products through the improvement of breeding methods.

With respect to aquaculture feeds (Fig. 9), some laboratories have been carrying out investigations on new types of mixed feeds that can reduce costs. Studies have included evaluation of some low-cost materials such as lees (sediments) from *shochu*, which is a clear liquor distilled from sweet potatoes. In addition, studies have evaluated artificial taurine as a means of reducing the amount of fishmeal in mixed feeds. The Japanese government supports the

investigations and budgets for them.

It is important for fish farmers to obtain feeds at reasonable prices. However, the prices of such feed components as fishmeal and fish oil have been increasing recently. In addition, the recent depression has beaten down the price of products. Therefore, many fish farmers are being confronted with financial difficulties that can lead to the closure of their businesses, with the consequence being reduction in aquaculture production. To address the situation, the government has promoted the mechanization of aquaculture through, for example, the use of voluntarily feeding machines which can improve the efficiency of feed utilization and provide more eco-friendly farm sites. The government is also attempting to establish a framework for providing a consistent supply of trash fish for use as feed by fish farmers.

To achieve sustainable aquaculture, we established a fisheries mutual aid system which played an important role in risk management by fish farmers. As Japan is one of the most advanced countries for aquaculture and one of the largest consuming countries of fisheries products, we are responsible for the development of sustainable aquaculture, must discharge that responsibility and we can!