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**Aquaculture Department**

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# Farm-made aquafeeds

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# Farm-made aquafeeds

The bulk of aquaculture production of fish and crustaceans in Asia is from semi-intensive ponds. The majority of these ponds, particularly those for freshwater non-carnivorous fishes (which account for over 80% of the total fish production in Asia) depend upon the use of farm-made feeds. Some intensive systems, notably cage culture of marine fishes and some carnivorous freshwater fishes (e.g., snakehead and catfish) also use farm-made feeds. Only about 10% of Asian fish production and 50% of shrimp production is based on commercial feeds.

There is an increasing tendency for farmers to utilize commercial feeds as nutritionally complete diets in semi-intensive systems. However, nutrition and feeding of fish and crustaceans in semi-intensive ponds are complex and poorly understood. Little or no information is available on dietary requirements of the cultured species in such ponds. It is difficult to quantify the contribution of natural food organisms in the

*Farm-made feeds are pellets, crumbles, flakes, or wet feeds consisting of artificial and natural feed-stuffs, produced for the exclusive use of a particular farm and not for commercial sale or profit.*



overall nutrition of pond-raised fish or crustaceans.

Farm-made feeds make use of locally available agricultural products and wastes of agro-processing industries that would otherwise have little or limited use within the community. The use of wastes in farm-made feeds has significant environmental advantages. However, commercial and, to a lesser extent, farm-made feeds require expensive animal protein sources. Hence, there is a need to identify and utilize alternative protein sources that are both inexpensive and sustainable. Although farm-made feeds are cheaper than commercial aquafeeds, production costs can still be reduced with appropriate feed management techniques. Some farmers who initially use farm-made aquafeeds shift to the more convenient commercial feeds.

The FAO Expert Consultative Meeting on Farm-made Aquafeeds, held on 13-20 December 1992 in Thailand, recorded for the first time the scale and importance of farm-made aquafeeds in the Asia-Pacific region. The meeting recommended the following:

- The information and technology on farm-made aquafeeds should be widely disseminated to governments, international agencies, and potential donors to: (1) alert them to the importance of these feeds to small-scale aquaculture and the need for technical support; and (2) persuade donors that future aid concerning feed development should concentrate on farm-made feeds. Public sector funding should primarily assist small-scale farmers, not feed manufacturers.

- The approach towards research and extension of farm-made feeds should be "bottom-up" rather than "top-down." Pre-conceived ideas should not be forced on farmers but it should be demonstrated that: (1) farmers' existing practices can be improved without compromising environmental quality; and (2) the improvements can lead to greater profits.

- Simple and cheap methods of increasing the nutritional value of feeds for fishes and crustaceans should be developed, with particular reference to digestibility, removal of toxic substances, and palatability.

- Simple and cheap machinery for the

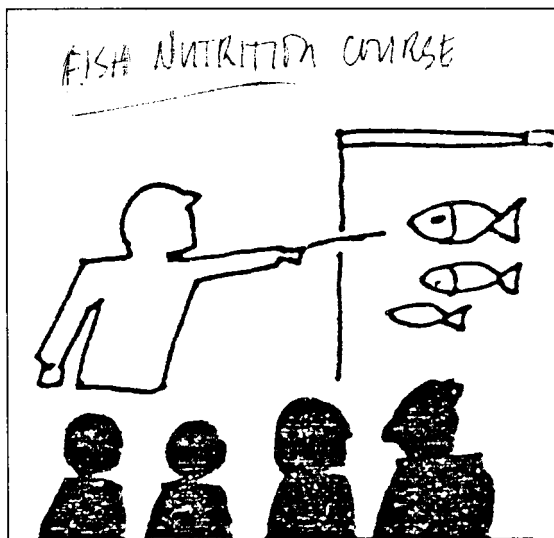
production of farm-made feeds and techniques for on-farm processing and storage should be developed and improved, with funding provided when necessary.

- Feed advisers should formulate feeds taking into account: (1) locally available ingredients; (2) nutritional requirements of farmed species; (3) minimal use of vitamin premixes, binders, and other expensive ingredients; (4) the contribution of natural food in semi-intensive farming systems; and (5) overall quality.

- Feeding strategy should be improved through research and development in: (1) feeding frequency; (2) methods of feed presentation; (3) two-component systems (i.e., alternation of different feeds or feeding rates); (4) reduction of feed wastage; (5) farmer-friendly sensory methods of assessment of ingredient quality; and (6) biomass assessment of farmed species.

- Village-level training can be designed in the local language to teach farmers simple formulation, ingredient choice, feed processing, storage, and on-farm feed management. Instructional videos and simple booklets in the local languages can complement the training course.

Source: Report of SEAFDEC/AQD Scientist RM Coloso regarding his attendance to the FAO Expert Consultative Meeting on Farm-made Aquafeeds; 13-20 December 1992; Bangkok, Thailand.



## Feeding fish without fouling the environment

Fishes excrete ammonia as a waste product of protein breakdown. Ammonia is a toxic pollutant in aquatic systems without plants. The only effective ways to reduce ammonia output are to:

- 1) balance the protein and energy in the diets;
- 2) ensure that the protein in the diet is highly digestible; or
- 3) balance the amino acids.

Protein is composed of sequences of 22 different amino acids. Ten of these cannot be made by the fish and have to be provided in the diet; they are termed essential amino acids. Fishes require the same 10 essential amino acids as humans do, but in different proportions.

Fishes use amino acids for protein building only up to the level of the first limiting essential amino acid (see figure next page). The excess amino acids, those out of balance, will be used for energy and excreted. The ammonia output from the fish farm thus increases.

Protein produces lean muscle tissue. It is essential that the amino acids are balanced and supported by the correct level of digestible energy. Fish oil is the preferred energy source for salmon and trout, providing about twice the energy per gram of protein or carbohydrate.

The protein content declaration on a bag of feeds is of limited value because it gives no indication of quality or digestibility. A diet can be formulated with what appears to be a satisfactory protein level, but if the digestibility is poor, and the amino acids are not balanced, then growth will be poor and ammonia output high. Feed manufacturers are beginning to provide more useful information, such as digestible energy, digestible protein, and a list of ingredients (e.g., fish meals, fish oils, soya proteins, cereals, cereal by-products, vitamins, minerals, pigments, antioxidants and stabilizers, binding agents). Such data are still of limited use for determining the nutritional quality of the feed if the sources of ingredients and the processing parameters are not known. Sources of ingredients are kept confidential because companies spend a lot of time and money locating and evaluating