

FEEDING

Existing aquaculture feeding strategies include:

1) No fertilizer or feed input: This option involves a basic rearing system where fish/shrimp growth is totally dependent upon the consumption of live food organisms and plants naturally present within the water body. Fish/shrimp growth will therefore vary depending on the natural productivity of the water body and the density and total biomass of the cultured species present; fish/shrimp growth increasing with increasing natural productivity and decreasing stocking density. This feeding strategy is generally employed within extensive pond farming systems with low fish/shrimp stocking densities.

2) Fertilization: Here, chemical and /or organic compounds (termed ‘fertilizers’) are externally applied to the water body containing the cultured fish or shrimp so as to increase the production of live food organisms and plants naturally present, and so increasing the fish/shrimp production capacity of the culture system; fertilizers serving primarily as a direct source of essential nutrients for the resident natural food chain within the water body. Organic fertilizers are used here to include animal manures (applied by hand or through livestock integration), green manures (fresh plant cuttings), and fresh or composted agricultural by-products. This feeding strategy is typical of extensive and semi-intensive farming systems.

3) Supplementary diet feeding

When fish/shrimp stocking density and standing crop is such that the natural productivity of the water body alone cannot sustain adequate fish or shrimp growth, an exogenous supplementary diet can also be fed as a direct ‘supplementary’ source of dietary nutrients for the cultured fish or shrimp; the dietary nutrient requirements of the cultured fish or shrimp species being supplied by a combination of natural live food organisms and supplementary diet feeding. Supplementary feeds usually consist of low-cost agricultural/animal by-products, and may involve the use of a single food item in its fresh or unground state (i.e. such as mill sweepings, beer waste or rice bran) or the use of a combination of different feed items in the form of a feed mash or pellet. Although supplementary feeds are used as a direct source of dietary nutrients for the farmed species, when used in excess these products may also exert a fertilization effect on the water body. With this feeding strategy higher fish and shrimp stocking densities are possible and consequently higher fish/shrimp yield per unit area. This feeding strategy is typical of a semi-intensive farming system.

4) Complete diet feeding

In contrast to the previous feeding strategies, complete diet feeding involves the external provision of a nutritionally ‘complete’ high quality diet containing a predetermined nutrient profile. Traditionally, complete diets have taken the form of a dry or moist pelleted feed consisting of a combination of different feed ingredients, the overall nutrient profile of which approximates to the known dietary nutrient requirements of the fish or shrimp species in question under conditions of ‘maximal’ growth. Alternatively, complete diets may consist of a single food item of high nutrient value (i.e. trash fish, cultured live food organisms - *Artemia nauplii*), or a combination of both. In view of the high fish/shrimp stocking densities generally employed with this feeding strategy, no nutritional benefit is assumed to be gained by the cultured fish or shrimp from natural food organisms present within the water body. This feeding strategy is typical of an intensive culture system.

Choice of feeding strategy

A prerequisite to the selection of appropriate fertilizers and feeds for use within an aquaculture feeding strategy is first to conduct a survey of the fertilizer and agricultural feed resources of the area, district, state or country in question, where these resources are geographically located, how

much is available and when, who is currently using this resource and how, and the composition and cost of these resources at source and with transportation.

In addition, many important economical, sociological, biological and environmental factors will have to be considered by the farmer before choosing an appropriate fertilization, supplementary diet or complete diet feeding strategy, including:

- Market value of fish/shrimp species to be farmed
- Financial resources of the farmer - amount of capital available for investment
- Farming traditions, 'taboos', and managerial ability of the farmer
- Time available for the farming activity - full or part-time farming activity
- Labour availability, training requirement and cost
- Service availability and cost - electricity, gas, water, fuel
- Fertilizer and/or feed availability and cost
- Fertilizer and/or feed transport and processing cost
- Feeding habit of fish/shrimp species to be farmed - carnivore, omnivore or herbivore
- Feeding behaviour and nutrient requirements of fish/shrimp species to be farmed
- Water quality requirements of fish/shrimp species to be farmed - oxygen, temperature, salinity, ammonia, pH, suspended solids
- Intended production system - cage, tank, earthen pond, recirculating aquaculture system, flow-through or stagnant water systems
- Intended fish/shrimp stocking density for all stages of the culture cycle
- Water exchange rate within intended production unit
- Natural productivity of the water body
- Food and feeding cost/unit of production/unit time
- Fixed and non-food cost/unit of production/unit time

However, the relative importance or value (if at all) of these factors will depend, in turn, on whether the proposed farming activity envisaged is geared toward a subsistence/home consumption farming activity, a commercial/market cash-income farming activity, or a combination of both.