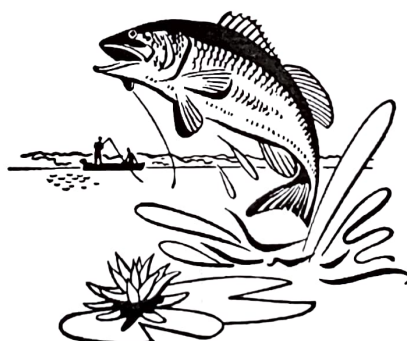


Khulna Agricultural University
Department of Aquaculture
B. Sc. Fisheries (Hons.) Level III, Semester II
Course No: AQ 3103, Course Title: Fish Nutrition
Credit: 3.0

Chapter 01: Nutritional Terminology

Introduction: Terminology used in fish nutrition.



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Nutritional Terminology

Fish Nutrition: Fish nutrition is a branch of science that deals with the study of various processes by which a fish takes in and assimilates food for promoting growth and replacing worn or injured tissues.

Energy: It is defined as the capacity to do work and is derived by animals through the catabolism of carbohydrates, lipids, and proteins within the body.

Food: Food is any substance consumed to provide nutritional support for an organism. Food is usually of plant, animal, or fungal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals.

Natural feed: is found naturally in the pond. It may include detritus, bacteria, plankton, worms, insects, snails, aquatic plants, and fish. Their abundance greatly depends on water quality.

Artificial Feed: A wide variety of feed ingredients are used to prepare artificial feeds. The simplest fish feeds are prepared by using locally available raw materials such as corn or rice bran and rice mill sweepings as sources of carbohydrates. These are mixed with animal proteins such as fish meal, trash fish, and snail meat.

Probiotics: are live bacteria and yeasts that are good for you, especially your digestive system. We usually think of these as germs that cause diseases. But your body is full of bacteria, both good and bad. **Probiotics** are often called "good" or "helpful" bacteria because they help keep your gut healthy.

Caloric: A caloric is a unit of energy. In nutrition, calories refer to the energy people get from the food and drink they consume and the energy they use in physical activity.

1 Cal = 4.184 Joules (J)

Gross Energy (GE): Gross energy (or heat of combustion) is measured as the energy released as heat when a compound undergoes complete combustion with oxygen in a bomb calorimeter. It can be predicted relatively accurately from the chemical composition.

Digestible Energy (DE): Digestible energy is the amount of energy in the feed minus the amount of energy lost in the feces.

Metabolizable energy (ME): The amount of energy in the feed minus the energy lost in the feces and urine.

Net Energy: It is the amount of energy used either for maintenance or for production of both.

Dry matter (DM): It refers to the moisture-free residues of a sample. It is determined by keeping a sample in an oven at 105°C until it reaches constant weight (usually 24 hrs.)

Diet: In nutrition, **diet** is the sum of food consumed by a person or other organism.

Balanced diet: Most fish farmers use complete diets, typically made up of the following components and percentage ranges: protein, 18-50 percent; lipids, 10-25 percent; carbohydrate, 15-20 percent; ash, <8.5 percent; phosphorus, <1.5 percent; water, <10 percent; and trace amounts of vitamins and minerals.

Ration: The total amount of feed (diet) Allotted to one animal for 24 hours.

Supplement: A feed, either alone or in combination which is used to increase the availability of nutrients and also performance of animals. It can be protein, energy, vitamin, and mineral supplements.

Meal: Describe the physical form of a feed that has been reduced to a particle size larger than flour.

Additive: Feed materials such as antibiotics, flavors, hormones, and medicines.

Adulteration: An adulterant is a substance found within other substances such as food, cosmetics, pharmaceuticals, fuel, or other chemicals that compromise the safety or effectiveness of said substance.

Or, when substances that look similar to the constituents of the food are added to it, to increase its weight and gain more profit. Example- mixing of pebbles, stones, marbles, sand, mud, filth, chalk powder, contaminated water, etc.

Purified diets: These diets are prepared from purified materials (casein, various sugars, etc.) for which the contents and origins of various nutrients are known. These diets are widely applicable to situations in which the adjustment of specific nutrients is needed (which can be difficult using natural materials), to situations in which the preparation of a pathological status is required (such as a deficiency or an excess of specific vitamins or minerals), and for various nutritional studies.

IU Meaning: A unit used to measure the activity of many vitamins, hormones, enzymes, and drugs. An IU is the amount of a substance that has a certain biological effect. For each substance, there is an international agreement on the biological effect that is expected for 1 IU. Also called International Unit.

Food conversion ratio: A good example of food utilization is expressed as food conversion ratio (FCR). The food conversion ratio is defined as the amount of feed it takes to grow a kilogram of fish. For example, if it requires two kilograms of feed to grow one kilogram of fish, the FCR would be two.

$$\text{FCR} = \frac{\text{Feed 2 Kg}}{\text{Live weight gain 1 Kg fish}} = 2$$

This means that when a feed has a low FCR, it takes less feed to produce one kilogram of fish than it would if the FCR were higher. A low FCR is a good indication of a high-quality feed.

Why is FCR important? FCR is a valuable and powerful tool for the fish farmer. It allows for an estimate of the feed that will be required in the growing cycle. Knowing how much feed will be needed then allows a farmer to determine the profitability of an aquaculture enterprise. This means that FCR allows the farmer to make wise choices in selecting and using the feed to maximize profitability.

Is FCR always the same for everyone? Unfortunately, it is not. Your technician can give you an approximate FCR for any feed/fish combination. However, many things will influence the FCR.

For example, FCR can change as a fish gets older. FCR for small fish is generally lower than the same species of fish that is larger. For example, growing a fish on a formulated feed from 1 gram to 50 grams may result in an FCR of less than one, but the same species of fish and the same feed are likely to have an FCR between one and two when producing a larger size of fish.

Every farm has many other unique things about it that change the way fish respond to feed. FCR can be influenced by things like water quality, pond management, temperature, how and when feed is presented to the fish, and the health of the fish, all of which can alter the FCR of a feed. This is why it is important to keep good written records of your farm activities. With good information collection, you will eventually be able to calculate an accurate FCR for your specific pond/feed/fish combination.

Can the FCR be less than one? How can 1 kg of feed produce MORE than 1 kg of fish? It is possible because the fish contains water in its flesh while the feed does not contain much water. When the fish converts dry food into moist flesh using a highly efficient diet, it can produce more moist flesh than the weight of dry feed that was used. If we dried the fish to the same degree that the feed is dried before weighing it, FCR less than one would not be possible.

It is also possible to get an FCR of less than one if there is a lot of natural food in the pond. The fish will eat both the manufactured feed and the natural feed and grow better than when they eat the manufactured feed alone.

Are there any other advantages to a low FCR? Yes! In general, very good feeds that have a low FCR allow for more fish to be grown in a pond because there is less waste polluting the water. With better water quality the carrying capacity of the pond is increased.