

# Important considerations for feed and feeding management during Indian catfish culture

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*Different feed ingredients used for catfish feed preparation.*

Natural feeds present in ponds contribute to some extent to the nutrition of fish cultured therein. But these natural food stocks become insufficient as production intensity rises. In semi-intensive and intensive systems, nutritional inputs must be partly or wholly supplemented using external feeds to support higher growth and productivity.

Feed cost is always more than half of the production cost in catfish pond culture systems. Good quality feed is essential to achieve higher production. Poor quality feeds not only result in poor growth, but also cause deterioration of water quality due to rejection and poor biological utilisation. The selection of proper feedstuff and good formulation to meet the requirements of the cultured species will enhance acceptance and utilisation. Care should be taken to meet the nutritional needs of fish during both rearing and grow-out phases. Proper feed management is essential to reduce the production cost and achieve optimum growth for successful catfish culture.

## Feed ingredients

Catfish feed is prepared by mixing feed ingredients of animal and plant origin. Different ingredients are used in variable proportions to provide the desired nutrients for the fish at stages. Ingredients of animal origin are an important source of essential amino acids, required for muscle growth and different physiological purposes. Animal-origin ingredients used for catfish feed preparation include fish meal, blood meal, fish and chicken offal, meat, and bone meal. Well-accepted plant ingredients used in catfish feeds include groundnut oil cake, mustard oil cake, soybean meal, maize, and rice bran. As the ingredients of both origins are required, the proportions should be in such a way that the prepared feed should have a good and balanced nutritional value, be well accepted by fish, easily digestible and cost-effective. Oils and vitamin minerals are also important ingredients in catfish feeds.

## Nutrient requirements

Proteins in the feed play a major role in the growth of muscle tissue. The protein from the ingested feed is hydrolysed into amino acids, that are used for the synthesis of muscle tissue and the excess is stored as energy. The dietary requirement of protein for catfishes varies from 25-45%, depending on fish size, sex, water temperature, species, and rearing practices. Carbohydrates are an energy source, and excess carbohydrate will result in energy storage through fat deposition. Starch is the most important carbohydrate source in catfish feeds. Starch is digestible up to 50-80% but cellulose components are largely indigestible. Fish growth is not directly affected by dietary carbohydrate levels, which are preferred as a low-cost energy source and binder for other feed ingredients. Catfish feeds usually contain up to 40% carbohydrates and 2-10% fibre. Grain by-products are the main ingredients used in catfish feeds as carbohydrate sources. However, mono and di-saccharides are not well utilised by fish limiting the inclusion of carbohydrate in feed.

Lipid is the most important source of energy in the catfish diet. Normally 3-4% supplemental lipid in the form of oil is added to the feed. The use of excess lipids in feeds should be discouraged to avoid a decrease in weight gain. Increased fattiness is also a problem if fed high lipid diets. A suitable proportion of lipids in the catfish diet will increase the flavour of the muscle. Vitamins and minerals are added to improve the nutritional quality of feeds. These are required for good growth, skin colour, and good health of fish. Generally, 2-3% of vitamin and mineral mixture is used in catfish feeds.

## Feed types used in catfish culture

Water stable feed is usually preferred by farmers. Floating, sinking, and slow-sinking feeds are mostly used for catfishes during their rearing. The size of pellets usually varies as per the age of the fish. Usually dust feed, small crumbles and pellets of 1-2 mm size are fed to catfish larvae, fry, and larger fish respectively. Floating feed as well as sinking feed is used in southeast Asian countries for *Pangasius* and *Clarias*



Sun drying pellet feed prepared by farmers during their training at pond site.

during their rearing. It is always better to provide sinking feed for *Clarias* as it is a bottom feeder. Dust feed made into small compact dough form is fed to *Pangasius pangasius*, *Clarias batrachus* and bagrid catfishes such as *Rita chrysea*, *Horabagrus brachysoma*, and *Mystus cavasius* larvae during their indoor rearing. Uniform spreading of dust feed in the nursery ponds is sometimes conducted during larval rearing of *P. sutchi*.

## Feed selection

Farmers usually select feed based on cost and quality. The cost of catfish feed is higher compared to carp feed as it contains more animal protein. Apart from this, the type of feed to be used during rearing should be selected as per the feeding behaviour of the species. Improper feed selection such as a floating feed for a bottom-feeding species like *C. batrachus* larvae may hinder rearing success of this catfish. Similarly, pangas catfish accepts floating feed during fry stage and thereafter.

## Ration size

The ration size during catfish culture is given usually based on their body weight. Small fish eat more compared to their body size and need to feed more frequently. More feed

must be provided in ponds to ensure access by larvae and fry. Ration size should be strictly followed during fingerling production until market size. The ration changes as the fish grows. But it is not easy to monitor on daily basis. So monthly sampling is the usual practice followed to estimate growth and adjust the ration size during catfish culture. Provision of feed @2-3% of body weight is sufficient for growth of larger fish and is the typical ration for Asian and African catfish culture. However, there is a deviation in the case of highly predatory fish like Wallogo attu. The ration size in catfishes is also influenced by water temperature and they accept feed less efficiently during winter days. We have observed that the *M. cavasius* fry and fingerlings consume 10 and 7% of their body weight, respectively during the water temperature ranging 27-29°C, which is reduced to 3-4% during winter months (17-20°C). Hence the usual ration size should be judiciously monitored depending on the situation to curtail feed cost. A decrease in feed ration should also be observed in the event of stress, adverse weather condition, management practice and so on.

## Feeding rate

The appetite of catfish is not constant during the rearing period. It depends on size, season, environment, and acceptability of feed. Even the feeding rate of one meal may vary between the proceeding or succeeding meal. So, the fish



Feed in dough form fed to *H. brachysoma* larvae during indoor rearing.

manager will decide when to give more feed from the total ration required for the fish. It will not only reduce the wastage of feed but also the fish will utilise the feed as per their need. The feeding rate in catfish is usually observed during late hours of the day compared to early morning hours.

## Feed distribution and frequency of feeding

Feeding to catfish is undertaken by providing feed in few places of the tanks or distributing the feed on the water surface. Fish take a few hours to consume the ration. Some catfishes such as *H. brachysoma*, *P. pangasius*, and *P. hypenthalmus* accept feed quickly. The wastage of feed during basket feeding is due to currents created by quick rushing of fish for feeding. Larger and more competitive individuals suppress the feeding of smaller and less competitive individuals, resulting in size hierarchies, which is frequently observed in *C. batrachus*, *C. magur* or *Heteropneustes fossilis* during their rearing. So, farmers must take care to provide uniform access to feed by all the fishes stocked. Correct feed distribution enables farmers to reduce size differences among harvested catfish and reduces the wastage. Sometimes the total ration is divided into a few instalments to reduce competition. The frequency of feeding is important during seed rearing in early stages of catfishes and also in highly cannibalistic catfish such as *W. attu*.

## Feeding schedule

It is a usual practice to feed once or twice in traditional or extensive culture systems. We have also seen that some farmers practice a feeding holiday during the week to reduce the nutrient load on the environment. Feeding schedules change with water temperature. Catfish farmers feed a minimum twice a day when water temperature is above 25°C to ensure access of less competitive individuals to feed during the second instalment. The fry and fingerlings of *M. cavasius* eat less (30-50%) when temperature is low compared to optimum conditions. So, it is always beneficial to account for such factors by adjusting the feeding schedule to reduce feed wastage while maintaining good growth of catfish during their rearing.

## Daily feed allowances

The daily feed offered in catfish ponds varies during the culture period. The day-to-day variation in feed consumption is due to water temperature, size of fish, culture condition, water quality and so on. So the usual feed allowance of 2-3% of body weight may be adjusted as per the response of fish to the feed. Successful catfish growers always monitor feed consumption patterns before manipulating the feed allowances.

## Feeding time

All fishes show a rhythmic pattern of feeding and may be categorised as nocturnal, diurnal and crepuscular feeders. A suitable time for feeding catfish depends on the nature of a particular species and can have great effect on feed utilisation and growth. A positive effect on growth due to feeding during night hours has been reported in Indian catfish such as *H. fossilis*. We have also observed that access to feed of *C. batrachus* / *C. magur*, *M. cavasius*, *H. brachysoma*, *Ompok pabda* / *O. bimaculatus* is reduced during the morning in winter months. Hence it is advisable to feed during mid-noon to fishes irrespective of period during the year. Hence the optimal time for feeding is an important management consideration to improve feed efficiency during catfish culture as feed intake matters for the somatic growth.

## Effect of season on feeding

The suitable temperature required for optimum growth of catfish is approximately 30°C. A decrease in water temperature as well as high temperature reduces the feed consumption. The usual feed consumption in catfish is hampered when the water temperature falls below 20°C in tropical waters. So the normal feeding schedule during this regime may lead to wastage and an accumulation of uneaten feed on the pond bottom. This will create water quality problems due to oxidation of unconsumed feed in the pond. Feeding during these periods should be reduced. The usual feeding ration of 2-3% of body weight in general should be reduced on winter days. Sometimes catfish farmers stop giving feed to fish, which leads to weight loss. It is always beneficial for judicious feeding during these days to keep the fishes healthy. Alternative day feeding or at two-day gap may be followed. But a non-response to feed is not noticed on summer days. However, there may be a problem on the acceptance of floating feed during mid-day in summer due to the high temperature of the surface water. Hence the use of slow sinking feed to catfishes is preferred during these days. But it is not problematic to feed bottom dwelling catfishes during these days.

## Feeding technique

Several feeding techniques such as hand feeding, baskets and automatic feeders are used in catfish farming. The feeding technique always depends on the level of production and the type of catfish in the culture ponds. Hand feeding is a simple practice in a small farm. It helps to know when the fish reach satiation so further wastage of feed may be reduced. Catfishes like *P. pangasius*, *P. hypenthalmus*, *H. brachysoma*, *M. cavasius*, *M. vittatus* etc are the most suitable to be fed by



*Feed baskets in pond during catfish rearing.*

hand with floating feed. Basket or tray feeding is also another device for catfish feeding. It has similar advantages to hand feeding. The farmers can lift the basket to observe the state of feed acceptance. If feed remains continuously in the basket, it may indicate disease, a poor environment, stress on fish or over supply of feed. So it is easier for the farmers to monitor the situation to protect the fish stock. This basket or tray feeding is commonly used while culturing bottom dwelling catfishes, which are more difficult to observe. Many bagrid and pangasid catfishes are also fed through basket method during their culture. Automatic feeders are most advanced feeding device used during intensive aquaculture. But they are expensive and small farmers can't afford them. It may be suitable for surface and column feeding catfishes but may not be suitable for bottom dwelling catfishes. In many instances, feed is provided in gunny bags with small hole at the bottom hung in series through a rope for feeding of carp and catfishes, which may function as an indigenous automatic feeder.

## Conclusion

Although natural foods provide some nutrition to pond cultured catfish, the supply of prepared feed is required as culture intensity increases beyond levels that natural productivity can support. High quality, and an optimum quantity of cost-effective feed is always desirable for good growth and high production. Catfish farmers should select an appropriate feed format for the species under culture to ensure efficient growth for successful catfish culture.



*A row of gunny feeding bags during grow out culture.*