

Primary Keys of Aquaculture: Fertilizers and Manure

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Introduction

Fertilizers and manures are substances that boost nutrient concentrations in ponds to promote the growth of primary producers. Activating the entire food chain through the development of primary producers (Phytoplankton) increases the productivity of aquaculture. Planktons, which are natural food creatures, are more plentiful when primary production is higher. By increasing the availability of plant nutrients through the use of fertilizer and manure, primary output of aquaculture ponds may be increased. Manure and fertilizer are two soil additives that enhance the quality of the soil and aid in plant growth. Manure is just animal waste; fertilizer, while it may be natural, may also include chemicals and other unidentified additives in it. This is the fundamental distinction between the two. Pigeon, horse, cow, chicken, and bat guano are examples of manure. Among the various types of fertilizers are synthetic chemical mixtures, minerals, and compost made from decomposing organic materials.

Organic Manure:

Carbon-rich organic manures also have trace levels of nutrients like N and P (Nitrogen and Phosphorus).

A variety of manures, including;

- i. Cow dung
- ii. Poultry litter
- iii. Pig dung
- iv. Duck droppings
- v. Goat and Sheep droppings

Numerous types of fertilizers:

***List of a few key fertilizers**

- (a) **Straight Nitrogenous Fertilizers**

- i. Ammonium Sulphate
 - ii. Urea (46% N) (While free flowing)
 - iii. Anhydrous Ammonia
 - iv. Urea (Granular)
 - v. Urea Ammonium Nitrate (32%) (Liquid)
- (b) **Straight Phosphatic Fertilizers**
- i. Single Superphosphate. (16% P_2O_5), (Powdered)
 - ii. Triple Superphosphate
- (c) **Straight Potassic Fertilizers**
- i. Potassium Chloride (Muriate of Potash)
 - ii. Potassium Sulphate
- (d) **Straight Sulphur Fertilizer**
- I. Sulphur 90% Powder
 - ii. Sulphur Granular
- (e) **N. P. (Nitrogen and Phosphorus) Complex Fertilizers**
- i. Diammonium Phosphate (18-46-0)
 - ii. Diammonium Phosphate (16-44-0)
- (f) **N.P.K. (Nitrogen, Phosphorus and Potassium) Complex Fertilizers**
- i. N.P.K (10-26-26)
 - ii. N.P.K. (12-32-16)
- (g) **Micronutrients**
- i. Zinc Sulphate Heptahydrate ($ZnSO_4 \cdot 7H_2O$)
 - ii. Manganese Sulphate
 - iii. Borax (Sodium Tetraborate) for soil application
- (h) **100% Water Soluble Complex Fertilizers**
- i. Potassium Nitrate (13-0-45)
 - ii. Mono Potassium Phosphate (0-52-34)

What is the difference between manure and fertilizers?

Fertilizers	Manures
Nutrients derived from synthetic sources	Natural sources of nutrients

Mineral Origin	Organic or natural origin
High level of nutrients	Less nutrients than those found in fertilizers
Plain salts	Highly complex
Only a certain vitamin	All nutrients are included in organic nutrients.
Very expensive and difficult to find.	Affordable and conveniently accessible
Easily accessible	Nutrients release gradually
<p style="text-align: center;">Advantages</p> <ul style="list-style-type: none"> • Easily accessible nutrients. • Quick to react. • Nutrients can be administered in the right quantity. • There is no oxygen loss. <p style="text-align: center;">Disadvantages</p> <ul style="list-style-type: none"> • Very expensive. • Not readily accessible. • Fertilizer combinations are needed. <ul style="list-style-type: none"> • No source of carbon. • Short-term cause of nutrients being lost by seepage. 	<p style="text-align: center;">Advantages</p> <ul style="list-style-type: none"> • Reasonable and easily accessible. • Offers all the necessary nutrients. • Longer-lasting availability of nutrients. • Improves bottom soil, increasing its capacity to store water. • Reduces turbidity. <p style="text-align: center;">Disadvantages</p> <ul style="list-style-type: none"> • Large quantity of applications is required. • Slow nutrient delivery makes it difficult to keep up with plankton production throughout the growth phase. • May also result in DO depletion. • Water pollution. • Pathogens' potential to cause disease.

Fertilizer Resources

✚ **Inorganic Fertilizer:** The main sources of important agricultural fertilizers are Urea for Nitrogen, Single Super Phosphate (SSP), Di Ammonium Phosphate (DAP), Triple Super Phosphate (TSP), and Triple Super Phosphate (DAP) for Phosphorus, as well as Murate of potash for Potassium. These resources also meet the inorganic requirements for soil fertility and better rich fertilizer water.

✚ **Organic Fertilizer:** As fertilizers for fishponds, a wide range of organic materials can be used, including animal manures (such as livestock dung, liquid manure from livestock holding facilities, and night soil), agricultural by-products and processing wastes (such as hay, mudpress, cottonseed, groundnut, and sunflower seed cake, and

soybean wastes), green manures (such as grass, leaves, and reeds), domestic wastes (such as sewage), and industrial wastes (Such as effluent from distilleries, leather and milk factories, sugar refineries, fish canning plants).

✚ **Non-conventional fertilization:**

1. Use of Biofertilizers: *azolla* @ 40 ton /hac/yr = 100 kg Nitrogen, 25 kg phosphorous, 1500 kg organic matter
2. Bio processed organic material: Biogas slurry
3. Leguminous plants are grown at the pond bottom and ploughed into soil before filling water.

Grade of fertilizer used in aquaculture

Application and dosages of fertilizer in aquaculture:

Organic Manures	Total dose kg/hac/yr
Cattle dung (CD)	10000-20000
Poultry drooping (PD)	4000-8000
CD+PD (1:1)	12-15000
Pig dung	3000-5000
Biogas slurry	6000
Inorganic Fertilizer	Total dose kg/hac/yr
Urea	100
SSP	50
Potash	20-25

Note:

- ❖ Doses suggested in the Tables are according to Handbook of Fisheries and aquaculture by S. Ayyappan and Freshwater aquaculture by R.K.Rath
- ❖ Doses are subjected to vary according to inherent qualities of soil base, water and pond productivity.
- ❖ If mahua oil cake is used as fish poison than dose of cattle dung 5000/hac/year only.

Method of fertilizer dispensing

- ✚ **Broadcasting:** The whole surface of ponds may be broadcast with instantly soluble nutrients. Before leaving the epilimnion (The water in the upper layer of the pond is the hottest and is often stable in temperature), the particles will disintegrate. This

encourages the soil to absorb phosphate, and in ponds with poor water circulation, nutrients that dissolve in the bottom water may not reach the sunlit upper layers for usage by phytoplankton. The last stages of fertilizer dissolution take place while the fertilizer is lying on the pond bottom, not while it is dissolving through the water. Fertilizers that are solid and granular are frequently spread on pond surfaces.

- ✚ **On Platforms and with bags:** Platforms can also be used to expose water to fertilizers with controlled releases. As nutrients breakdown in fertilizer that has been placed onto the platform, water currents spread the nutrients. One platform with an area of around 4 m² will be sufficient for 2-4 hectares of pond area, and platforms should be roughly 30 cm underwater. Utilizing this technique decreases the need for fertilizer by 20–40%. By preventing phosphorus fertilizer from settling to the pond bottom, this technique appears to slow down the pace at which bottom mud absorb phosphorus from the fertilizer. On the other side, upper side of plastic fertilizer bags may be cut away and set on the pond bottom to expose the fertilizer to the water. The nutrients disperse and leak out of the bags so that water currents can combine them. Platforms are preferable to any of the bag procedures discussed above, but their construction needs more work than the usage of bags. Fertilizers have also been put in porous bags and suspended in pond water at various locations in the pond.

Fertilization Practices

Examining the pond's requirement for fertilizer:

1. Through Secchi disc transparency

Secchi Disc Transparency	Bloom condition	Pond productivity status
>40 cm	Poor bloom	Unproductive; requires fertilization.
20-40 cm	Normal bloom	No more manuring or fertilizing is required because it is productive and fruitful.
<15cm	Thick bloom	Extremely fruitful and prolific. No fertilizing is necessary; just the bloom has to be removed.

2. Through soil and organic matter profile

Soil type and organic matter	Fertilizer to be used

Sand or sandy loamy soils with little organic matter	Organic manures
Medium-level organic matter in loamy soils	organic manures and inorganic fertilizers
Soils rich in organic materials that are clayey or clay loam	Inorganic fertilizers

3. Through soil pH

Soil type	Fertilizer to be used
Alkaline soils	Ammonium sulphate
Acidic soils	Calcium Ammonium Nitrate
Acidic to neutral soils	Urea

Conclusion

The primary stimulants of the pond ecosystem are manure and fertilizer. These organic and inorganic fertilizers aid to start the food cycle in ponds. Manure and fertilizers have various kind of positive and negative prospective in concern of its use but mainly application of these stimulants in pond reduces the overall requirement commercial supplemented fish feed by producing natural biota for the better growth performance of fish from early days of its life to market size. Manure and fertilizers are readily available and nutrient-rich feed for phytoplankton in ponds. Application of manure and fertilizers are favourable to farmers in all prospectives.