



Methods of fertilizer application use in Agriculture

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APPLICATION OF FERTILISERS IN SOILD FORM

Broadcasting

In this process the fertilizer is spread over the entire soil area to be treated, with the main objective of distributing the whole quantity of fertilizer evenly and uniformly. This may be done before the land is ploughed, immediately before planting, or while the crop is standing. It may be of two types:

- 1. Broadcasting at planting:** This method helps to distribute the fertilizer evenly and to incorporate it with part of, or throughout the plough layer. Broadcasting at planting is adopted when nitrogenous fertilizers (like ammonium sulphate, ammonium sulphate-nitrate and concentrated organic manures) are to be applied to the soil which is highly deficient in nitrogen. This method is also useful when citrate-soluble phosphate fertilizers- like basic slag and ground rock phosphate, are to be applied to, from moderately acid to strongly acid soils.
- 2. Topdressing:** nitrogenous fertilizers containing nitrate nitrogen, like sodium nitrate, calcium ammonium nitrate, ammonium sulphate nitrate and ammonium nitrate, are applied as topdressing to closely-spaced crops. in addition, urea is also top dressed. This helps in supplying nitrogen in readily available from to growing plants. One to several topdressing is needed at the time of greatest need to the crops. It is essential to note that the fertilizer is not to be applied when the leaves. Such type of injury is greater with nitrogenous and potash fertilizers than with phosphate fertilizers.

Airplanes are used for fertilizers application in hilly terrains. For efficient use of an airplane, there must be an airstrip near the fields and suitable climatic conditions for topdressing operations.

Topdressing of basic slag or ground rock phosphate to acidic soils in hilly tracts in Assam and Nagaland is done. In New Zealand, the use of aircraft for application of superphosphate is very common.



Placement

Fertilizers are placed in the soil irrespective of the position of seed, seedling, or growing or after sowing the crops. The following methods are most common in this category.

Plough-sole placement: The fertilizers are placed in moist soil where they can become more available to growing plants during dry seasons. It is applied in a continuous band at the bottom of the furrow during the process of ploughing. Each band is covered as the next furrow is turned. This method has been recommended in areas where the soil becomes quite dry up to a few inches below the soil surface during the growing season, and especially with soils having a heavy clay pan a little below the plough-sole. This method results in less fixation of phosphorus and potassium than that which occurs normally when fertilizers are broadcast over the entire soil surface.

Deep placement: It is usually applicable for placement of nitrogenous fertilizers (like ammonium sulphate or ammonia-forming nitrogenous fertilizers like urea), especially in paddy fields. This is commonly used in Japan and India. The fertilizer is placed in the reduction zone, where it remains in ammonia form and is available to the crop during the active vegetative period. Deep or sub-surface placement of the fertilizer also ensures better distribution in the root zone, and prevents any loss by surface drain-off. The fertilizer is applied under the plough furrow in the dry soil before flooding the land and making it ready for transplanting. Puddling places the fertilizer deep into the root zone. Phosphate fertilizers are also used in the same way as suggested for nitrogenous fertilizers.

Sub-soil placement of fertilizers is recommended in humid and sub-humid regions where many sub-soils are strongly acid. Due to acidic conditions the level of available plant nutrients is extremely low and potassic nutrients are placed in the sub-soil for better root development.

Localized placement

Localized placement is the application of fertilizers into the soil close to the seed or plant. It is employed when relatively small quantities of fertilizers are to be applied. When fertilizers are placed along with or close to the seeds or plants in bands or pockets, the roots of the young plants are assured of adequate supply of nutrients. The application promotes a rapid early growth which makes early inter-cultivation possible for better weed control and reduces fixation. The following methods are used.

Drill placement or contact placements or combined-drilling:

It is the oldest method of fertilizer application in cereals and row crops which is done before sowing or planting or simultaneously with sowing. This method includes the drilling of seed and fertilizer together while sowing. These place the seed and small quantities of fertilizers in the same row. This method has been found to be useful for applying phosphate and potash fertilizers. For rain-fed areas drilling half at sowing and spraying half at sowing and spraying half on the foliage increases yield.

Band or hill placement: When the plants are spaced three feet or more on both sides, fertilizers are placed close to the plant in bands on one or both sides of the plant. For applying small amounts of fertilizers hill placement is usually most effective. The length and depth of the band and its distance from the plant varies with the crop and amount of fertilizer. In India, band placement is practiced for application of nitrogenous and phosphate fertilizer to oranges, bananas, papaya, apples, pears, coconut, cashew nut and other fruit trees. According to nature of application, this method may be classified into two classes:



1. **Row Placement:** When the seeds of plants are sown close together in a row, the fertilizer is put in continuous bands on one or both sides of the row by hand or a seed – drill. This method is practiced for potato, tobacco, vegetables crops, etc.
2. **Side – dressing:** In this method, fertilizers are spread in between the row or around the plants. As such, side – dressing is a very broad term covering various practices of applying fertilizers. The nitrogenous fertilizers are applied in between the rows by hand to broad – row crops like tobacco, cauliflower, cabbage, tomato, brinjal *etc.* It provides additional doses of nitrogen to the growing crop. Mixed or straight fertilizers application around the base of the fruit trees like papaya, bananas, oranges, grapes, apples, mango, guava, etc. is also common. This is done once, twice or thrice a year, depending on the age of the fruit trees.

Pellet application: It is a localized placement method. The fertilizer is mixed with the soil in the ratio of 1:10 and made in to dough. The pellets thus prepared are dropped in field which retain nitrogen against leaching or washing. Generally, it is used for applying nitrogenous fertilizers in paddy.

Application of liquid Fertilizers

Liquid Fertilizers are commonly use in foreign countries. There four primary methods for liquid fertilizer application:

Starter Solutions

Fertilizer solution or starter solution are prepared by dissolving the fertilizer salts in water. They mainly contain mixed fertilizer having N, P₂O₅, K₂O in the ratio of 1:1:2, and are applied to young vegetable plants at the time of transplanting. it is use in place of the watering which helps in rapid establishment and quick early growth of plants. Only a small amount of fertilizer is applied as a starter solution. This solution provided the nutrients which reach to the plants roots immediately. The solution is sufficiently diluted so that it does not inhibit growth. if watering is not a part of the regular operation- extra labour is required.

Foliar Application

Plant nutrients are also absorbed through the leaves of plants and this absorption is remarkably rapid and complete for certain nutrients. In this method spraying of leaves of growing plants with suitable fertilizer soluble is done. These solutions may be prepared in a low concentration to supply and one plant nutrient or a combination of nutrients. The demerits of foliar application of nutrients are: (i) marginal leaf burn or scorching when strong solution are used, (ii) several applications are needed for moderate to high fertilizer rates, and (iii) foliar spraying of fertilizers is costly compared to soil application if not combined with any other spraying (pesticides, insecticide or hormone spraying).

Direct Application of Liquid Fertilizers to the Soil

Liquid fertilizers containing to ore more of the major nutrients (N, P and K) or anhydrous ammonia (a liquid under high pressure up to 14 Kg. per square cm. or more) are directly applied to the soils with the help of special equipment. This practice is very little if the material is applied about 10 cm below the seed. In India (Mysore), an indigenous bullock- drawn devise has been successfully worked for applying anhydrous ammonia into the soil. The gas cylinder is mounted over the wheels and the gas enters under controlled pressure into the furrow behind a type of culture.

