

Fertilizers ! *

by

T. K. THANGAVELU

Fertilizer - What is it? How should it be used? How should it be applied? What grade is the best? Is its use profitable? How can economic purchases be made? These are all vital and pertinent questions that should be considered by a farmer or anyone planning to use a fertilizer.

In this training programme, Deputy Directors of Agriculture and other extension officers and co-operative personnel will be informed of fertilizer, its grades, the doses, when to apply, methods of handling and distribution, improvement in crop production, etc. Also there will be detailed talks by experts here on soils, soil acidity, water and other soil factors which influence availability of mineral elements to crops, etc.

The need for feeding plants to increase yields has been recognised from the earliest times. Ancient writings reveal the use of such fertilizers as were available. Some of the first materials used as fertilizers were animal manures, wood ashes, bones, fish guano, lime, old village site earth, etc.

The farmer planted his crops. If he was lucky he got a good harvest. There were droughts, insect pests and diseases and weeds. Since he could do little about these misfortunes, then he accepted these as acts of God. After crops were raised for one or two years the soil became less productive. He shifted to new land. The land once cultivated was rested and allowed to revive. This is shifting cultivation. Sometimes the cultivated soil was lost by erosion. New land could not be had for ever. Improved methods of refreshing tired soil were found and adopted. Soil conservation and scientific farming resulted. Agriculture became less of a gamble or guess work and more of a science.

Today the value of Scientific farming is known widely; Agricultural Colleges, experimental stations and extension services and research laboratories help to study and solve farming problems.

Chemical Research came to help the farmer. Today he relies on chemical products like fertilizers, insecticides, fungicides, hormone sprays, etc. for increasing his crop yields. The chemist found ways of refreshing tired land. The essential materials removed by growing crops had to be replaced to maintain crop yields. Lack of knowledge about nutrients in manures and of the importance of functions of different plant foods seriously handicapped ancient farmers. In course of time they found out apparent decreasing fertilising value of manures. It was discovered that when bones were added to manures the crop responses were greater. Bones

* Part of address delivered by Sri T. K. Thangavelu, Joint Director of Agriculture (Inspection & General), Madras on the occasion of the inauguration of the First State level Training Programme on proper use of Fertilizers at the Agricultural College & Research Institute, Coimbatore on 26th September, 1963.

furnished phosphorus, one of the important plant nutrients in which manures were deficient. Gradually a trade in bones developed. The supply was small and demand more. It was felt that a more readily soluble source of Phosphorus was needed for safeguarding crop yields.

Chemists explained for the first time the nature of plant nutrition and showed that certain materials increased crop production because they contained Nitrogen, Phosphorus, Potash, Calcium and other nutrients in a form available to the plants. This paved the way for the establishment of a fertilizer industry. In the early years of the industry, waste products like fish scrap, oil cakes and bones were used. Today such materials have been replaced with highly concentrated chemical compounds. Today fertilizers are either separate materials for direct application or carefully prepared mixtures of materials according to definite formulae developed for specific soils and crops as a result of research and experiments. In mixed fertilizers the materials are tested, mixed in accurate proportion, cured, remixed and supplied to the farmer.

Nitrogen: Nitrogen is required not only by plants but also by animals. The proteins of our flesh are nitrogen compounds. Nature has arranged the balance of this element "Nitrogen" in the air, minerals, plants and animals in a very ingenious way. It is called the nitrogen cycle. First there is the Nitrogen of the atmosphere existing in the free state as a gas 4/5 of it

Certain bacteria in the roots of legumes take nitrogen from the air and convert it into nitrogen compounds used to nourish these and other plants. When plants are eaten by animals or when one animal eats another which has fed on plants, the nitrogen compounds build up body proteins. Finally nitrates are returned to the soil, free Nitrogen to the air, through the decay of plants and animal bodies and excretions.

Farming today upsets this cycle of nature, it removes Nitrogen compounds and other elements from the soil much faster than this cycle could replace them. So the Chemist has come in to make up the shortage in forms that plants can use easily.

Man knew that land had to be enriched, long before the modern chemist came in. The organic manures contain nitrogen and other compounds but also improve the physical condition of the soil. Mineral fertilizers came later. Potassium nitrate, Sodium nitrate, crude salt Petre were found to be good sources of nitrogen. Chemists made "Ammonia" a useful product by synthesis.

Nitrogen out of the air, plentiful as it is, will not combine easily with other elements to form fixed nitrogen compounds. It is only in the form of its compounds most plants use nitrogen. Certain bacteria attached to roots of legumes can do this. During lightning and storms nitrogen of the air combines with oxygen in the air and is washed down by rain. But much of this potential fertilizer is lost when the rain water drains it. We see that immediately after a

rain grass in a lawn looks green whereas 10 days watering will not make the lawn green. This is due to dissolved nitrates in water. The Chemist evolved the electric arc process which was replaced by the synthetic ammonia and cyanamide processes. The Haber Bosch process developed by the Germans used steam, hot coke and nitrogen and oxygen to form ammonia and nitric acid. The chemist makes fertilizers, plastic, lacquer-coated fabrics, cinema film, starting from synthetic Ammonia; Urea was synthesised. This is a concentrated fertiliser containing double nitrogen than Ammonium sulphate. Synthetic urea is made in India today. Neiveli will make it. Dilute urea solution sprayed to crops supplements fertilizer added to the soil. Because of high nitrogen content of urea it requires less storage space and handling less quantity, easy to apply, and does not spoil the soil.

Phosphorus : If our children are to be strong and healthy, they must have phosphorus compound in their diets. Where can they get this essential phosphorus? A large part of it comes from the vegetables, grains, fruits, etc. eaten. Phosphorus is essential for all living tissue. Without this element life processes cannot function. Phosphorus along with nitrogen and Potash is essential for the proper growth of these crops. Phosphorus though a common element, is not found free in nature because it is very active chemically. It is found in the form of phosphates. Since animals convert phosphorus into sturdy bone it is not surprising that the first source of phosphorus fertilizer was bones. Later phosphate rock deposits largely replaced bones. Natural phosphates are not good fertilizers because they will not dissolve in water and therefore cannot be absorbed by the roots of plants. So it was upto the chemist to discover ways of transforming it into materials that could be used efficiently. The first answer to this was acid phosphate or Super phosphate. This is obtained by treating natural Rock phosphate with sulphuric acid. It gives a more soluble material, one that can be used better by plants.

A number of new methods came into use. The most important of these is the one used in making ammonium phosphate which supplies the soil with nitrogen and phosphorus. Rock phosphate is treated with acids like nitric or sulphuric acid or phosphoric acid followed by the addition of ammonia.

Potassium : Potassium is the third of the three big elements among fertilizer ingredients. Like potash it is too active chemically to be found free in nature and is found only combined with other elements. Potassium increases vigour and health of the plant, makes stalks stiffer, helps young roots to form and grow and is involved in the plants manufacture of sugar and starch.

Without it, leaves discolor and may fall victim to fungus diseases and yields become lower. Potassic fertilisers are imported mostly from Germany in the form of muriate of potash and sulphate of potash.

The grade of a Fertilizer shows the percentage contents of plant nutrients 5-10-5, 16-20-10 N. P. K.

A 5-10-5 Fertilizer has the nutrient ratio 1 : 2 : 1 but the nutrient content in 5-10-5 is 20% whereas in 8-16-8 it is 32%. Materials containing only 2 nutrients are designated 0-39-40 or 0-20-20. Single nutrient fertilisers are designated as 50% muriate of Potash, 18% Super, etc. A farmer is a businessman. His business is subject to a number of hazards over which he has little or no control. Consequently he is a cautious even pessimistic individual when it comes to planning his farm operations. Often this caution attitude affects his fertilizer expenditures. He may well think that he is on the safe side by using less fertilizer than recommended by authorities or used by more successful farmers. Actually far from playing it safe he almost certainly is cutting his prospective profits. Risk increases as fertiliser use decreases. To really play it safe he should apply as nearly as possible the amount of fertilizer that experiments have shown to be most profitable.

Farm Management practices for high yields and profits require the following :—

Preparation of a good farm plan; correcting soil acidity or alkalinity; maintenance of good soil physical condition and maintenance of high soil fertility, provide adequate drainage of low-lying land and irrigated land, use of approved irrigation practices, selection of superior quality seeds, preparation of a good seed bed and planting a full stand with proper spacing, control of weeds, insects and diseases, harvesting efficiently and at the right time, handling the produce carefully and storing and marketing intelligently. Above all he should avail of the facilities offered by Government - various aids, concessions, loans, etc., to increase his crop yields.

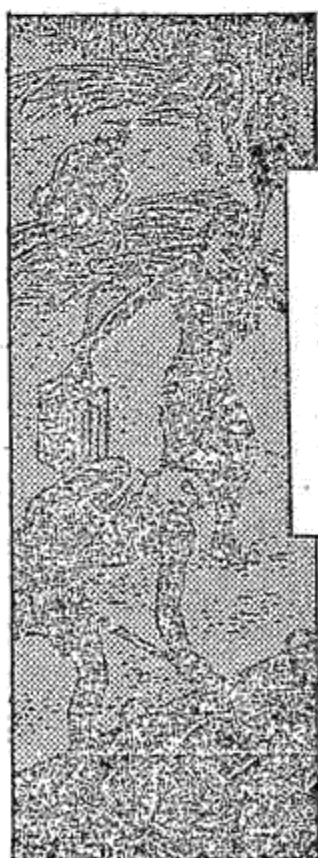
In point of view of high acre-yields and fertiliser consumption, Madras stands foremost in India.

The Third Five Year Plan target of fertilizer requirements are 275,000 tons Ammonium sulphate, 75,000 tons Urea, 100,000 tons Ammonium sulphate nitrate, 9,850 tons Calcium ammonium nitrate, totalling 583,000 tons in terms of Ammonium sulphate; Phosphatic fertilizers 320,000 tons, Potash 90,000 tons, in the last year of the Plan. We have used in 1962-63 nitrogenous fertilizers in terms of ammonium sulphate 2.4 lakh tons, super phosphate 64,400 tons and Potassic fertilizer 14,716 tons. Newer fertilizers are coming into production and use such as Calcium ammonium nitrate, Ammonium phosphate (granulated) and nitrophosphate.

Recently, Israel has manufactured Potassium metaphosphate containing 60% Phosphate and 40% Potash.

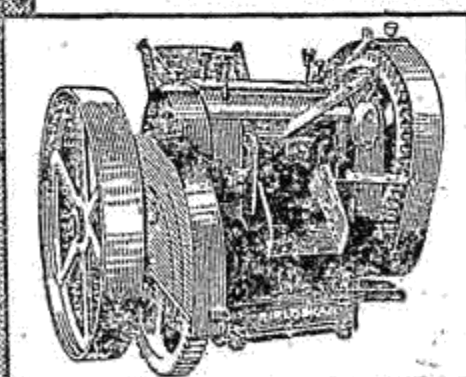
Without doubt, good fertilizer, correctly and harmoniously used can do more to lower cost of production per unit of crop and increase yields and profits than any other normal agricultural practice. Doubling of crop production frequently results from the proper application of adequate amounts of fertilizer

and yield increases of 3 to 4 times are possible. The income or return on money invested in fertilizer is good. The practice of fertilizing crops is a profitable one. Cultivation to produce food and other provision crops for an ever increasing population is not only a worthy activity but a necessity in providing the food required for the survival of humanity. It is anticipated that these training classes will provide sufficient inspiration to our officers and the co-operatives and in turn to farmers leading to a greater use of better fertilizers to produce higher incomes for farmers and more and better food for the population.



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