

Environment and use of fertilizers

Dear Readers!

THE environmental impact of agriculture is the effect that different farming practices have on the ecosystems around them, and how those effects can be traced back to those practices. The environmental impact of agriculture varies based on the wide variety of agri-practices employed around the world. The connection between emissions into the environment and the farming system is indirect, as it also depends on other climate variables such as rains and temperature. There are two types of indicators of environmental impact: “means-based”, which is based on the farmer’s production methods, and ‘effect-based’, which is the impact that farming methods have on the farming system or on emissions to the environment. An example of a means-based indicator would be the quality of groundwater that is affected by the amount of nitrogen applied to the soil. An indicator reflecting the loss of nitrate to groundwater would be effect-based. The means-based evaluation looks at farmers’ practices of agriculture, and the effect-based evaluation considers the actual effects of the agricultural system. The environmental impact of agriculture involves a variety of factors from the soil, to water, the air, animal and soil variety, people, plants, and the food itself. Some of the environmental issues that are related to agriculture are climate change, deforestation, genetic engineering, problems related to irrigation etc.

Fertilizers enhance the growth of plants two ways: (i) the traditional one being additives that provide nutrients and (ii) in second mode some fertilizers enhance effectiveness of the soil by modifying its water retention and aeration. Fertilizers provide: three main macro-nutrients nitrogen (N), phosphorus (P) and potassium (K) secondary macro-nutrients, viz. calcium (Ca), magnesium (Mg), and sulphur (S); and micronutrients like copper, iron, manganese, zinc, boron etc. Although, fertilizers provide nutrients to plants, but they have some negative environmental effects. The growing consumption of fertilizers can affect soil, surface water and groundwater owing to dispersion of mineral use. It is important to be aware of the environmental effects of fertilizer in order to use them sparingly. The nutrients required for healthy plant life are classified according to the elements, but the elements are not used as fertilizers. Instead compounds containing these elements are the basis of fertilizers. The macro-nutrients are consumed in larger quantities and are present in plant tissue in quantities varying from 0.15% to 6.0% on a dry matter (0% moisture) basis. The four main elements of plants hydrogen, oxygen, carbon, and nitrogen. Carbon, hydrogen and oxygen are widely available as water and carbon dioxide. Although nitrogen makes up most of the atmosphere, it is in a form that is unavailable to plants. To be nutritious to plants, nitrogen must be made available in a ‘fixed’ form. Only some bacteria and their host plants (notably legumes) can fix atmospheric nitrogen (N_2) by converting it to ammonia (NH_3).

Various chemicals are used to enhance the efficiency of nitrogen-based fertilizers. In this way farmers can limit the polluting effects of nitrogen run-off. Nitrification inhibitors (also known as nitrogen stabilizers) suppress the conversion of ammonia into nitrate, an anion that is more prone to leaching. 1-Carbamoyl-3-methylpyrazole (CMP), dicyandiamide, nitrapyrin (2-chloro-6-trichloromethylpyridine) and 3,4-Dimethylpyrazole phosphate (DMPP) are popular. The conversion of urea to ammonia is catalyzed by enzymes called ureases; and its inhibitors are used to slow the hydrolytic conversion of urea into ammonia, which is prone to evaporation as well as nitrification.

The *Indian Farming* is regularly bringing out research-based popular articles on climate change; supply of fertilizers which is important in saving the environment; rainfed varieties of rice, wheat, maize, soybean etc. in its regular issues.