

Soil Fertility Management in Agriculture

India is losing 5,334 million tonnes of soil every year which is about one millimeter of top soil being lost due to soil erosion because of indiscriminate use of fertilizers, insecticides and pesticides over the years (The Hindu, 2010). The organic matter content, on an average, has gone down to a critical level and several micro-nutrient deficiencies are surfacing rather quickly in different parts of the country (The Hindu, 2017).

Nagaland loses an average 30.62 metric tonnes of soil area per hectare annually due to 'thum', shifting cultivation in the form of soil erosion and 'turbulent velocity of run-off' leading to destruction of prime agriculture and forest lands due to landslides, flash floods and sedimentation. Around 1,35,339 rural households practice shifting cultivation on 947.37 sq km of land on hill slopes, which is 5.71% of the State's geographical area (The Hindu, 2018).

Soil fertility is the status of the soil to supply nutrients to plants in adequate amounts and in suitable proportions. It is a combination of soil physical, chemical and biological properties which directly or indirectly affect the nutrient dynamics and availability.

In order to assess the fertility status of the soil, soil testing is an integral part to find out the quantity of essential nutrients available to plants and other relevant physical and chemical characteristics.

Ways to manage soil fertility status in agriculture

- I. **Acidic soil and its management:** Acid soils are soil that has a pH of less than 7.0 (neutral). Soil acidity is among the important environmental factors which influences plant growth, and limits crop production particularly in high rainfall, hilly and mountainous regions of North East India. Soil acidity can be managed by flooding, use of organic matter, addition of wood ash, liming and growing of acid loving and tolerant crops.
- II. **Biofertilizers:** Biofertilizers are the preparations containing live micro-organisms which on application to seed, root or soil, mobilize the availability of nutrients by their biological activity in particular and help build up the microflora and in turn improve the soil health. Biofertilizers are usually available either in moist powdered form or in liquid form. There are two types of biofertilizer:
 - A. **Nitrogen fixers-** Rhizobium for legume crops eg. Soybean, pea, groundnut, cow pea, green/blackgram, Azotobacter and Azospirillum for non-legume crops. Blue green algae (BGA) and Azolla for lowland paddy.
 - B. **Phosphate solubilizers/mobilize:** Phosphotika for all types of crops.
- III. **Azolla:** Azolla is one of the potential compo-

nents available for nutrient management in organic agriculture. Azolla an aquatic fern is regarded as "Live Nitrogen Manufacturing Factory as it fixes atmospheric nitrogen and the size is about 1.5-3.0 cm in length and 1.0-2.0 cm in breadth. Locally found Azolla is Azollapinnata, while some better species like Azollacaroliniana can be obtained from research institutes. Azolla supplements nitrogen to rice crop by fixing atmospheric nitrogen in the soil for crop growth, crop production and thereby maintaining of soil fertility. Besides these, Azolla can also be used as a feed for pig, duck and fish. It has high protein content and on dry weight basis, Azolla can be mixed up to 10 % of the purchased animal feed and Azolla can also be used as compost.

- IV. **Vermicomposting:** Vermicompost is enriched compost where we use earthworms which generally live in soil, eat biomass and excrete it in digested form which is rich in humus. Earthworm breeds commonly used for vermicomposting are Eiseniafetida, Eudrilus excavata, Lumbricusrubellus, Perionyx excavata, Perionyxcaribicola and Jai Gopal (Perionyxceylanensis). Almost all types of biologically degradable and decomposable non-toxic are used for vermicomposting.
- V. **Green Manuring:** Green manuring is the practice of ploughing or turning into the

soil the green plant tissue for improving the physical condition as well as fertility status of the soil through green manuring in situ and green leaf manuring. Green manuring crops should be fast growing, produce abundant green materials, well adapted to local condition, legume family, quickly decomposable and tolerant to pest and diseases

- VI. **Mulching:** Mulching is the covering of the soil. Mulching improves soil temperature and moisture regime, Control weeds and on decomposition enriches the soil. Organic mulches are straw, dry leaves, grass clippings, bark chips and other similar materials. Inorganic mulches refer to stones, brick chip, plastic etc.
- VII. **Crop rotation:** Crop rotation method involves growing of set of crops in a regular succession over a same piece of land (field with) in a specific period of time. Crop rotation is practiced so that the soil of farms is not used for only one set of nutrients. It helps in reducing soil erosion and increases soil fertility and crop yield. In addition, crop rotation mitigates the buildup of pathogens and pests that often occurs when one species is continuously cropped, and can also improve soil structure and fertility by increasing biomass from varied root structures.

- VIII. **Farm Yard Manure (FYM):** Farmyard ma-

nure refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. It supplies all the macro and micro nutrients in almost all balanced proportions. It has been estimated that FYM from all the animal excreta in India can potentially supply 6.33 million tonnes of N, P₂O₅ and K₂O per year.

- IX. **Integrated Nutrient Management (INM):** Integrated Nutrient Management (INM) envisages the use of chemical fertilizers in conjunction with organic manures, legumes in cropping systems, use of biofertilizer and has shown to produce higher crop yields than when each is applied alone. This is attributed to the proper nutrient supply as well as creation of better soil physical and biological conditions. Fertilizers supply available forms of nutrients readily to plants on application while organic manures make available only a fraction of total nutrients in the first few weeks after application.

Thus, the principle of 'living soil' is that instead of trying to feed the plant directly, the objective should be to nourish the soil with the motto "Feed the soil and the soil will feed the plant"

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