USE OF ORGANIC MANURE FOR SUSTAINABLE LAND PRODUCTIVITY IN NORTH EAST INDIA

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Introduction

A flourishing agricultural sector is far more important for the development of North-East India, since farming is less a business than a tradition in the region, even at the semi-industrialisation stage about 80 per cent of its population still lives in the rural areas and directly or indirectly depends on agriculture for its livelihood. Fertilisers constitute the most important input in modern agriculture and act as a major contributor to increased production. In the regions like Northeast India, agriculture growth very much depends upon the new technology. In such areas because of rising population and virtually non-existing possibility of extension of cultivated area land augmenting technical change is one of the preconditions for further agricultural growth (Sharma, 1998).

The constant use of land for agriculture leads to a loss of its important nutrients such as nitrogen and phosphorous and eventually results in the permanent loss of soil fertility. Soils are silent contributors to the achievement of agricultural production. One of the key functions of soils

is to serve as a medium from which crops can get water and mineral nutrients that are essential for their growth. These nutrients are Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Calcium (Ca), Magnesium (Mg), Zinc (Zn), Iron (Fe), Manganese (Mn), Copper (Cu), Boron (B), Molybdenum (Mo) and Chlorine (Cl) (Dash and Senapati, 1986). Though all the above nutrients are present in soils, yet many soils, may be deficient in one, two or several nutrients from the point of view of practical crop production. This happens because either the soil does not contain adequate amount of nutrients or they cannot replenish the pool of available nutrients. Fast enough as the nutrients are removed by plant roots and other competing processes such as leaching the soil is easily exhausted. Though all the above quoted nutrients are important for crop production, for North East Indian agriculture today, at least five nutrients (N, P, K, S and Zn) are of considerable practical importance (Sharma, 1998).

To feed the rapidly increasing population, the land is taxed heavily to increase the food production. For this purpose in most parts of the world chemicals are used in agricultural fields to raise the productivity of land. The fertilisers, pesticides, herbicides, fungicides, insecticides made from different types of chemicals when applied to land act as poison for it, though they enhance the productivity. However, in recent times the heavy use of chemicals in agricultural fields has come under sever criticism, especially by the environmentalists, because many of the chemicals have not only poisoned the soil and water but they have also reached in the food chain of men and animals. Alternative means and ways to maintain sustainable productivity of land have been discovered to get rid of such poisonous chemicals. These are, in fact, organic manure and pesticides, herbicides, etc. made from plants, which do not have detrimental effects on men and environment. In integrated nutrients approach, the chemical fertilisers are substituted by compost, the well decomposed organic manure prepared from crop residues, weeds, lawn

mowing, tree leaves, kitchen refuges, animal excreta, and city garbage. Application of compost prepared from biodegradable waste naturally increases the proportions of Nitrogen, Phosphorus and Potassium in the soil. It also leads to sustainable land productivity. Therefore, this paper tries to emphasise the use of organic manure to maintain sustainable productivity of the land in Northeast India.

Problems of Chemical Farming

Though with the introduction of high yielding varieties the demand for chemical fertilisers has increased many fold, but indiscriminate use of commercial fertilisers has created following problems (Pathak, 1998).

i) Soil and Water Pollution

Use of high dose of fertilisers increases leaching losses which in turn pollutes both soil and ground water. The nitrates in drinking water cause methimoglobinomia diseases. Nitrates are also toxic to men and animals.

ii) Nutrients Imbalance in Soil

Commercial fertilisers cannot provide all types of essential plant nutrients. Therefore, application of one or two fertilisers creates nutrients imbalance.

iii) Diseases and Pests Attack in Plants

High yielding varieties fed with nitrogenous fertilisers are found susceptible to many diseases. Pests attack also increases considerably. Harmful pathogens are multiplied with addition of fertilisers.

Importance of Organic Farming

Organic farming is a technique for growing plants in which fewer chemicals are used, whether it is chemical fertilisers

or chemical pesticides. Application of organic manure has the following benefits:

i) Reduction use of chemical fertilisers.
ii) Reduction use of chemical pesticides.
iii) Clean agricultural practices for growing crops.

Benefits of Organic Manure Application

Application of organic manure, prepared from any techniques, in the soil improves soil quality by increasing soil fertility and productivity. Soil pH is neutralized by the buffering action of organic manure or compost. Addition of organic manure increases soil porosity, aeration, temperature and water holding capacity. It also controls soil micro flora by reducing pathogens and nematodes. It acts as a storehouse of plant nutrients in soil due to buffering action, minerals and trace elements become available more easily to crops. Nutrient leaching from chemical fertilisers in the soil is also reduced considerably when applied alone with compost or organic manure. It arrests soil erosion and prevents soil degradation also (Gaur, Neelakantan and Sargan, 1995).

Preparation of Organic Manure

Organic manure or in other words compost is prepared from all biodegradable waste such as weeds, grasses, crop residues, animal dung etc. All these organic waste if composted will undergo physical and chemical changes. The pathogenic bacteria that feed and grow in them get destroyed. Three techniques are used to prepare compost.

i) Anaerobic or Pit Compost

It is prepared by conventional pit method. The waste materials and cow dung (1:2 w/w) are dumped in 2m × 1 m × 0.6 m pits either after mixing or putting in layers. After complete filling the pits are covered with mud and

cow dung paste. Under anaerobic conditions decomposition is slower and foul gases are produced by anaerobic organisms. The materials inside the pits must be moistened at weekly interval by pouring water through the pipes inserted from the top. After three months it should be mixed thoroughly. Covering with black polythene makes easy to remove cover during mixing. Generally the waste material decomposes completely in six to eight month and produces good compost.

ii) Aerobic or Heap Compost

In this method a chamber of 2 m × 1 m × 0.6 m (smaller) or 10 m × 2 m × 1 m (bigger) size is made over the ground with bricks and bamboo sticks having sufficient aeration facility. The chamber is filled with wastes materials and cow dung layers. Surface is covered with cow dung paste or black polythene. During decomposition both the release of carbon dioxide and availability of oxygen increase, which help in decomposition. Materials should be mixed thoroughly at monthly intervals. Watering should be done weekly to maintain moisture. Good compost is prepared in 4 to 5 months. Quality of heap compost is better than pit compost.

iii) Vermicompost

This compost is prepared with the help of two varieties of earthworms namely *"prionyx excavatus"* and *"eisenia foetida"*. The vermicompost beds are prepared in a row by mixing wastes with cow dung (1:2) and sufficient water under the shades and covered with black polythene. Shade is necessary to protect earthworms from sunlight and rain during vermicomposting. Initially temperature of the beds will increase which hastens the decomposition. The materials should be overturned twice at 15 days intervals and moistened by regular watering. Earthworm (500 nos. sq. m. bed) is released after one month and beds are covered

with moist gunny bags, which facilitates in maintaining aeration. The earthworms eat decomposed materials and deposit excreta on the top. The excreta are then separated out from the top layer in weekly interval and that is one of the best organic manure.

Results and Findings

Table 1 shows that vermicomposting is quicker (only three months time) followed by aerobic composting (4.5 month), while anaerobic composting is slower (5.6 months). Earthworm is responsible for quick composting as it fed continuously the decomposed wastes. Compost preparation is over ground or heap (aerobic process) and its periodical turning causes higher temperature rise and faster decomposition as compared to that of pits (anaerobic processes). Vermicompost is neutral in reaction while other two are slightly alkaline. The Nitrogen, Phosphorus and Potassium contents of vermicompost are relatively higher than aerobic and anaerobic compost, hence they are most suitable to be applied in agricultural fields of the region for sustainable land productivity so that we get sustainable food production as well.

Table 2 shows that microbial population in the different compost varies greatly which influence effectiveness of the respective compost in sustainable land productivity. The vermicompost is definitely most beneficial for the land as well as the agricultural production, for it has got the

Table 1: Composting time and nutritive value of the compost prepared by different techniques

Compost	Composting time (in months)	pH (1:2)	N (%)	P (%)	K (%)
Aerobic	4.5	7.8	1.4	0.11	0.82
Anaerobic	5.6	7.9	1.0	0.08	0.58
Vermicomposting	3	7.1	1.6	0.14	1.04

Source: D.R.L., Tezpur, 2001.

Table 2: Microbial population in compost

Compost	Bacteria (10^5/g compost)	Fungi (10^5/Compost)
Aerobic	152	35.5
Anaerobic	177	29.0
Vermicompost	1875	2.0

Source: D.R.L., Tezpur, 2001.

highest bacteria and the lowest fungi. Therefore, the increased use of vermicompost is advisable for sustainable land productivity and food production too.

Conclusion

In Northeast India due to the traditional method of cultivation and extensive shifting cultivation the soil is gradually loosing its nutrient status and crops are starving due to lack of balanced nutrients. To avoid further deterioration of soil fertilisers are applied to the soil. Whereas to control diseases and pests infestation in the cultivated crops chemical pesticides are used. But excesses of both these chemicals have brought lot of problems to the environment and human being of the region.

Nowadays, the integrated cropping technique is developed in Northeast India to reduced use of costly and poisonous chemical fertilisers and pesticides. To fulfill these needs application of organic manure creates a new dimension towards agricultural productivity avoiding the use of chemicals. Organic manure, prepared by aerobic, anaerobic and vermicomposting methods, are very effective in not only providing sustainable land productivity and food production but also in controlling number of diseases in the crops and nematodes in the soil. Organic manure supplies all types of nutrients and act as balanced fertilisers. For sustainable land productivity in Northeast India application of organic manure creates a new dimension.

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