



AN INCREDIBLE STORY OF ORGANIC FARMING – THE ULTIMATE NEED OF THE ERA

Dr. Kathakali Bandopadhyay, *Assistant Professor, Department of Geography,
Subarnarekha Mahavidyalaya, Jhargram*

Dr. Ratan Kumar Samanta, *Principal, Swarnamoyee Jogendranath Mahavidyalaya*

INTRODUCTION

Concept of Bio Farming/ Organic farming

The concept of bio-farming is not clear to many concerns. Many people think that traditional agriculture, sustainable agriculture etc. are bio-farming. Some people are of the idea that the use of organic manures and natural methods of plant protection instead of using synthetic fertilizers/pesticides are bio-farming. But this is not true. The bio-farming/organic farming in real sense envisages a comprehensive management approach to improve the health of underlying productivity of the soil. Earlier Lampkin mentioned that organic agriculture is a production system which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. It relies on crop rotation, crop residues, animal manure, legumes, green manures, off farming organic waste and aspects of biological pest control.

Bio-farming is being practiced in 100 countries of the world. The ill effects of chemicals used in agriculture have changed the mindset of some consumers of different countries who are now buying organic with high premium for health. Policy makers are also promoting bio-farming for restoration of soil health and generation of rural economy apart from making efforts for creating better environment. In India the National Centre of Organic Farming under Ministry of Agriculture is promoting organic farming as facilitator across the country and providing various organic assistance to organic entrepreneurs and farmers.

Historical Perspective of Organic Farming

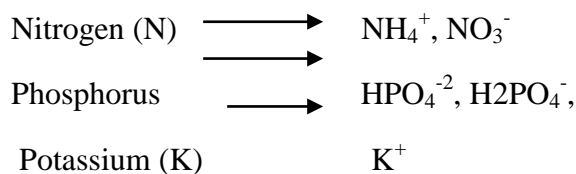
Although the term ‘organic farming’ is being popularized in recent times, but it was initiated in 10000 years back when ancient farmers started cultivation depending on natural sources only. In fact, organic agriculture has its roots in traditional agricultural practices that evolved



in countless villages and farming communities over the millennium. Major milestones in the area of organic farming are shown in table (Table: 3.1) below.

The logic behind the mineral fertilizer use:

- a) Plants require 17 essential nutrients;
- b) Regardless of sources, including organic, plant absorbs nutrient in an inorganic form e.g.



So, attempting to separate organic and inorganic in difficult and fertilizers are essential.

- c) There is scientific evidence that plant uptake inorganic nutrient and crop has its demand. The nutrient uptake by crops per ton of yield production is tabulated (Table: 3.2) below.
- d) Organic farming implies large scale requirement of organic fertilizer which is difficult to obtain.
- e) Organic fertilizer may also contain heavy metal if it is purchased from outside.
- f) Intensive farming to meet food demand of huge population exhausted native soil fertility, so fertilizer use can not be ignored.
- g) Dr. Norman Borlaug, the father of Green Revolution is of the opinion that organic agriculture cannot increase agricultural productivity.
- h) In the green revolution era throughout the world, the use of plant protection chemicals including all pesticides like fungicides, insecticides, weedicide, were used extensively to protect plant from pest and diseases. The use of pesticides (kg/ha) in USA, Japan, Korea, China, India are 1.50, 10.80, 16.60, 2.25, and 0.38 respectively. The argument behind using pesticide is that with the intensive agriculture, the problems of insect pests and diseases taking complex shape and posing serious challenges. So the use of pesticides during last three decades has emerged as one of the essential agro-inputs to increase and sustain crop yields.



Harmful effects of pesticides

Scientific surveys and evidences indicate that particles of pesticides, sprayed or used over crops leave un-dissolved and harmful elements which are transferred to human and other living bodies through grains, vegetables, fruits and grasses, causing number of diseases, ailments and harmful effects on our health. The indiscriminate use of pesticide concerns the presence of pesticide residues in our foods. According to WHO (2005), 14000 people die every year in the third world countries due to pesticide poisoning. Its immediate effect has appeared on environment and ecosystem also. Pesticides hinder the microbial activity in the soil, so that the organic matter synthesis is hampered. The humus formation in soil, as a result, becomes impossible. Consequently, soil suffers from prolonged nutrient deficiency (De and Jana, 1997). Thus, indiscriminate use of pesticides leads to the problem of soil and water contamination and ultimately degrades the land and water quality. Persistence of various pesticides in soil is shown in the table: 3.3.

Necessity of Organic Manure

Before dealing this sensitive issue, we can extend our look on the following facts:

- a) Creation of earth - 5 billion years back
- b) First life started - 3.8 billion years back
- c) Initiation of plants- 0.5 billion years back
- d) Appearance of man- 2 million years back
- e) Prehistoric man started cultivation- 10000 years back
- f) Development of fertilizer concept-
 - i) J.B.Boussingault(French Chemist, 1840)
 - ii) Justus Von Liebig, 1840 (German Chemist)
- g) First Global Fertilizer Industry- Single super Phosphate (SSP), 1842, Rothamsted Expt. Station, London
- h) First Fertilizer Industry in India- SSP Factory, Ranipet(1906), Tamil Nadu
- i) History of Fertilizer- (100-160) years only
- j) Why Fertilizer Needed- For cell growth, protein synthesis, root development, good biomass etc.

The organic activators are not happy with fertilizer input which is the out put of 100-160 years only. They are also not convinced with the logic that the use of fertilizer is essential for cell growth, protein formation etc. as lot of plants on road side or on hill side or on desert or



forest are surviving with huge biomass years after years without use of any fertilizer. The organic groups are also of the view that:

- a) Promotion of mineral fertilizer is the brain of industry only.
- b) Crop produced with chemicals not good for health, contains heavy metals, causes several diseases due to excess NO_3 , NO_2 and it pollutes environment. Table: 3.4 shows the concentration of selected heavy metals in the fertilizers.
- c) Indiscriminate use of inorganic fertilizer has deteriorated soil badly with deficiency of macro and micro nutrient.
- d) Organic produce contains more vitamins, minerals, enzymes, trace elements. In a two years study as made in western suburbs of Chicago, it has been observed that the average levels of minerals were much higher in the originally grown than in the conventionally grown food. Calcium is 63% higher, Iron 73%, Magnesium 118%, Molybdenum 178%, Phosphorus 91%, Potassium 125%, and Zinc 60%.
- e) The productivity of organic farming may be less in initial years, but the yields increased progressively under organic farming equating the yields under inorganic farming by sixth years
- f) Regular addition of organic fertilizer improves the soil quality. The loss of nutrient in organic manure is less due to its slow release. Further, organic standard restricts the use of off-farm organic fertilizer as it may contain pollutants. It is always better to use on farm inputs.
- g) Several bio-pesticides (Trichoderma viridi, Bacillus thurengiensis BT, NPV, GV etc.) botanical pesticides (Neem), bio-control agents (Trichogramma, Cryptolaemus, Chrysoperla etc.) are capable of controlling pests and diseases.

Main Principles of Organic farming

The main principles of organic farming are the following:

- i) To maintain the long term fertility of the soils.
- ii) To avoid all forms of pollution that may result from agricultural techniques.
- iii) To produce foodstuffs of high nutritional quality and sufficient quantity.
- iv) To reduce the use of fossil energy in agricultural practice to a minimum.
- v) To give livestock conditions of life that confirm to their physiological need.
- vi) To make it possible for agricultural producers to earn a living through their work and develop their potentialities as human beings.



Organic manures

Organic manures may be defined as materials which are organic in nature, bulky and concentrated in nature and capable of supplying plant nutrients and improving soil physical environment having no definite chemical composition with low analytical value produced from animal, plant and other organic wastes and byproducts (Das, 1999).

Classifications of Organic Manure

Organic Manure: i) Bulky Organic Manures

 ii) Concentrated Organic Manures

Bulky Organic Manure: i) Farm Yard Manure

 ii) Green Manure

Concentrated Organic Manure: i) Oil Cakes

- i) Non-edible to cattle
- ii) Edible to cattle

ii) Blood Cake

iii) Meat Meal

iii) Others

Table: 1.1 Persistence of Various Pesticides in Soil

Name of Pesticides	Approximate Persistence in Soils
Heptachlor	9 years
Aldrin, Dieldrin	9 years
DDT	10 years
BHC(Benzene Hexachloride)	11 years
Chlorodane	12 years
Diuron	19 years
Slimarine	17 years
Antrazine	18 years
Monuron	36 years
2, 4-D	14-30 days

(Bhattacharya & Chakraborty, 2005)



Table1.2 Comparison between Traditional Farming and Bio-farming

Year	Production (Qunt./ha.)	Total Income in Rs. (‘000)	Excess Income (20%)	Total Income in Rs. (‘000)	Actual Income In Rs. (‘000)	More/Less compared to Traditional Farming
Traditional Farming	10	20	0	20	9	0
Ist Year, Bio-farming	5	10	0	10	0.75	-8.25
2 nd Year, Bio-farming	5.75	11.25	0	11.25	3.75	-5.25
3 rd Year, Bio-farming	6.25	12.50	2.50	15.00	7.00	-1.50
4 th Year, Bio-farming	7.50	15.00	3.00	18.00	10,50	1.50
5 th Year, Bio-farming	8.75	17.50	3.50	21.00	13.50	4.50
6 th Year, Bio-farming	10.00	20.00	4.00	24.00	16.50	7.50

Source: Organic Cotton Farming Tech. bull. No.1/2000, (ICR, Nagpur 37(1999))

Characteristics of organic manures:

- i) Organic manures supply organic matter to the degraded soil and hence improve the physical condition of soil like soil structure, aeration, water holding capacity etc.
- ii) It also stimulates the activity of different soil micro-organisms through the supply of energy.



- iii) It improves the buffering and exchange capacity of soil and also influences the solubility of soil minerals as well as mineral nutrients in the soil.
- iv) It also forms chelates which helps for the nutrition of plants.
- v) It also regulates the thermal regimes of the soil.

Farm Yard Manure (FYM):

It refers to the well decomposed mixture of dung, urine, farm litter (bedding material) and left over or used-up materials from roughages or fodder fed to the cattle. An average nutrient and moisture content in the dung and urine of different kinds of animals is given in the table (Table: 1.3) below. Urine of all animals contains much amount of Nitrogen and Phosphate as compared to dung. The urine of cows, bullocks and horses contain partially nil or traces of Phosphate. Similarly, the dung of all animals except pig is low in Phosphate.

Table: 1.3 Average amounts of moisture and nutrient content in the dung and urine of different animals

Animals	Dung: Urine Ratio	Moisture (%)	Nutrients(kg/t)		
			Nitrogen	Phosphorus	Potassium
Dairy Cattle	80:20	85	4.53	1.22	3.40
Feeder Cattle	80:20	85	5.40	2.13	3.22
Poultry	100:0	62	13.54	6.48	3.17
Swine	60:40	85	5.84	3.22	4.94
Sheep	67:33	66	10.42	3.17	9.83
Horse	80:20	66	6.75	2.03	5.98

Source: Das, 1999

Concentrated Organic Manures:

Concentrated Organic manure may be defined as a material of organic origin derived from raw materials of animal or plant, without bulky in nature having no defined composition of plant nutrients. Some most common such organic manures are oil cakes—edible to cattle (e.g.



mustered oil cake, ground nut oil cake, til oil cake etc.) and non-edible to cattle (e.g. neem oil cake, mahua oil cake etc.), blood meal, fish manure, bone meal etc.

Advantages of concentrated organic manures:

Since the sources of availability of concentrated organic manures are different and hence they do not contain definite amount of nutrient elements. However, concentrated organic manures are easy to handle and have relatively higher plant nutritive value as compared to bulky organic manures. Besides, it is quick acting organic manure when incorporated into the soil.

Methods of Composting:

A good quality compost free from weeds, pathogens and rich in nutrients is a prerequisite for adopting organic farming practice. Different methods have been developed for the preparation of quality compost from farm wastes. Depending upon the nature and quantity of raw material available with farmer any one or combination of following methods may be adopted for the production of compost. Different methods of composting as mentioned by the Department of Agriculture, Madhya Pradesh (2009) is discussed herewith.

- a) **Indore Method:** This is an old method of compost preparation in the pit having size of 9'x5'x3'. A portion of pit is filled with farm wastes layer by layer. Each layer is around 3" thick and over it a layer 2" of cow dung slurry mixed with urine is spread. Pit is filled with farm wastes and plastered with 2"-4" thick layer of soil and dung. This prevents moisture loss and allows the temperature to rise up to 60-65°C within 3-4 days. Material inside the pit is turned after 15-30 days and moisture is maintained by adding water. Another turning is given after an interval of 30 days. Good quality compost becomes ready within 3-4 months.
- b) **Nadep Compost:** This method was developed by Naryan Devrao Pandri Pandey. A brick structure measuring 10'x6'x3' is prepared with holes in the side walls to ensure adequate supply of air during composting. The brick tank is filled with farm wastes, soil and cow dung and water is added to maintain moisture between 60-75%. A tank is filled with soil 16-18qtls, farm wastes 14-16qtls, dung 1-1.2qtls. Water is added to moisten the material and upper layer is plastered with soil and dung mixture. After 75-90 days of composting, microbial culture of Azotobacter, Rhizobium and phosphate solubilizing bacteria are added into the mixture. Compost becomes ready for use within 110-120 days. One tank provides about 2.5-2.7 t of compost sufficient for one



hectare land. Another kind of nadep is known as BHU-NADEP .In this, construction of tank by bricks are not required. Method of filling is same as above.

- c) **Nadep Phospho Compost:** This is a method to prepare phosphorus enriched compost using farm wastes, rock phosphate and phosphate solubilizing bacteria. Insoluble phosphorus present in rock phosphate is transformed into soluble form through the action of certain specific micro organisms during the process of composting. Compost is prepared using farm wastes, cow dung and soil as the quantity given for preparation of nadep compost .Rock phosphate is added to this mixture @ 12.5% w/w. This mixture is filled either in pit, NADEP tank or BHU-NADEP. This material is plastered with a mixture of dung and soil after adding sufficient water to moisten the decomposing mixture. The material is turned after 15 days and thereafter at an interval of 30 days. At each turning, water is added to maintain sufficient moisture. Compost becomes ready within 3-4 months and contains N (1%), P_2O_5 (2-4%) and K_2O (1-2%).
- d) **Vermi Compost:** Earthworms are used to prepare compost from farm and livestock wastes. Earthworms continuously feed upon the organic residues and produce casts. This casts is generally termed as vermi compost, Casts of earthworms are usually rich in nutrients and organic matter and therefore serves as a good source of manure for growing crops. Certain earthworms like *Eisenia foetida*, *Perionyx excavatus* and *Eudrilus eugeniae* are specifically suited for the preparation of vermicompost. Vermicompost contains N(1.0-1.5%), P_2O_5 (0.2-1.0%) and K_2O (1-2%) depending upon the raw materials used (Plate: 19).
- e) **Bhabhut Amrit Pani:** This is a preparation made by mixing cow dung 10Kg with desi ghee 250gms and honey 500gms. This material is mixed with 200 liter of water and spread in the field after sowing a crop.
- f) **Amrit Sanjeevani:** This is fermented preparation made up of cow dung 60kg, urea 3kg, single super phosphate 3 kg. Murate of potash 1.0 kg., ground nut cake 2 kg and water 200 liter. The mixture is fermented for two days in a container. This material is sprayed over the crop two-three times in one acre area.
- g) **Pitcher khad:** This is a fermented preparation made from cow dung 15kg, cow urine 15 liter, water 15 liter and Gurd 250gms. Mixture is mixed in a container and covered with a cloth or gunny bag. The material is fermented for 4-5 days. The fermented



mixture is mixed with water of 200litre and sprayed over the crop in one acre area. Two -three sprays are sufficient for short duration crops.

- h) **Bio Gas Slurry:** Biogas slurry is a good manure. Slurry is dried in solar drier. Dried slurry is directly applied in fields.

Green Manures

Several green manure crops provide sufficient organic matter and nitrogen for growing crops. Dhaincha and sunhamp are two most common green manure crops normally used as a source of nutrients and organic matter. They have potential to supply 60-90 kg nitrogen within a period ranging between 45-60 days. Green manuring also help in providing large amount of easily decomposable organic matter to the soil which accelerates the nutrient cycling processes and make available nutrients to the crops. One tones Dhaincha dry matter adds N 26,2Kg, P 7.3Kg, K 17.8Kg, S 1.9 Kg, Ca 1.4 Kg, Mg 1.6 Kg, Zn 25ppm, Fe105 ppm, Mn 39 ppm, & Cu 7ppm per hectare in soil.

Advantages of green manuring

- i) It increases the organic matter regime of the soil and thereby modifies soil physical, chemical and biological environments. In fact, this stimulates the activity of soil micro-organisms.
- ii) It improves the soil structure, aeration status permeability and infiltration capacity of soil.
- iii) It reduces the soil loss caused by run off and erosion.

Microorganisms like Azotobacter, Azospirillum, Rhizobium, Blue green algae and Phosphate solubilizing bacteria are being used as biofertiliser in different crops. These microorganism promote plant growth through different process like nitrogen fixation, phosphate solubilizing and production of plant growth substances. Blue green algae and Azola are been successfully used as biofertilizer in paddy.

Bio-farming/Organic-farming in India

Background: The Indian agriculture is traditionally organic in nature and farmers were following organic cultivation till the middle of the last century (1950). The green revolution was ushered in India during sixty and it has been the cornerstone of India's agricultural achievement, transforming the country from the stage of food deficiency to self-sufficiency.



During the period, the production of food grains has increased four folds, from 50.82 m. in 1950-51 to 212.05 m. on 2003-04. But indiscriminate and excessive use of chemicals during this period has put forth a question mark on sustainability of agriculture in the long run calling attention for sustainable production which will address soil health, human health and environmental health and eco-friendly agriculture. Organic farming appears to be one of the options for sustainability. Organic agriculture was started in India in 1900 by Sir Albert Howard, a British agronomist.

The year 2000 is very important year for India from organic point of view. The four major happenings were made during the year 2000. These are:

- The Planning Commission constituted (2000) a steering group on agriculture who identified organic farming as National challenge and suggested it should be taken in the form of a project as thrust area for 10th plan. The group recommended organic farming in NE Region, rain fed areas and in the areas where the consumption of agro chemicals is low or negligible.
- The National Agricultural Policy (2000) recommended promotion of traditional knowledge of agriculture relating to organic farming and its scientific upgradation.
- The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture constituted (2000) a Task force on organic farming under the chairmanship of Shri Kunwar Ji Bhai Yadab and this task force recommended promotion of organic farming.

The Ministry of Commerce launched the National Organic Programme in April, 2000 and Agricultural and Processed Food Products Export Development Authority (APEDA) implementing the Nation Programme for Organic production (NPOP). Under the NPOP, documents like National standard accreditation certificate for accrediting inspection and certification agencies, Accreditation procedure, inspection and certification procedures have been prepared and approved by National Steering Committee (NSC) (Bhattacharya & Chakraborty, 2005).

Conclusion

National strategies for sustainable use of land resource should be taken into account. Pesticides, insecticides, chemical fertilizers are to be used with utmost caution to avoid the possibility of land and water pollution. Special emphasis on organic farming on the part of



the farmers, with that of the use of organic manure, green manure, different composts and organic chemical, eco friendly pesticides and insecticides . Domestic , municipal and industrial wastes are to be treated before disposal to keep the environment free from degradation.

References:

- Bojue,D. J. (1956), Metropolitan Growth and the conversion of land to non agricultural use :, Studies in Population Distribution , no.11, Scripps Foundation Oxford, OH
- National Committee on the Development of Backward Area (NCDBA), (1981): Report on Development of Tribal areas, Planning commission of India, New Delhi.
- Parikh Jyoti (2001): Sustainable regeneration of Degraded lands , Tata Mac Graw Hill Publishing , New Delhi, pp 295-297.
- Siddaraju GV and Rajendran S, (2006), Organic Farming System : Issues and Concerns , Kurukhetra – A Journal of Rural Development, vol 54, no.9, July 2006, Publication Division, Ministry of I&B, Patiala House, New Delhi – 110001,pp 20-23.