Model answer

AV-9013

B. Sc. (Hon's) (First Semester) Examination 2015-16

Rural Technology

Paper: RT 102 (Manures and Fertilizers)

Answer 1:

(i) (c) Litter
(ii) (d) 9 inches
(iii) (a) Dung+mud plaster
(iv) (d) All of these
(v) (d) Bio-pesticides
(vi) (d) Bacterial inoculants should be mixed with fertilizers
(vii) (b) $CO(NH_2)_2$
(viii) (b) Not easily soluble in water
(ix) (b) P_2O_5 X 2.29 = P
(x) (b) *Kharif*

Answer 2:

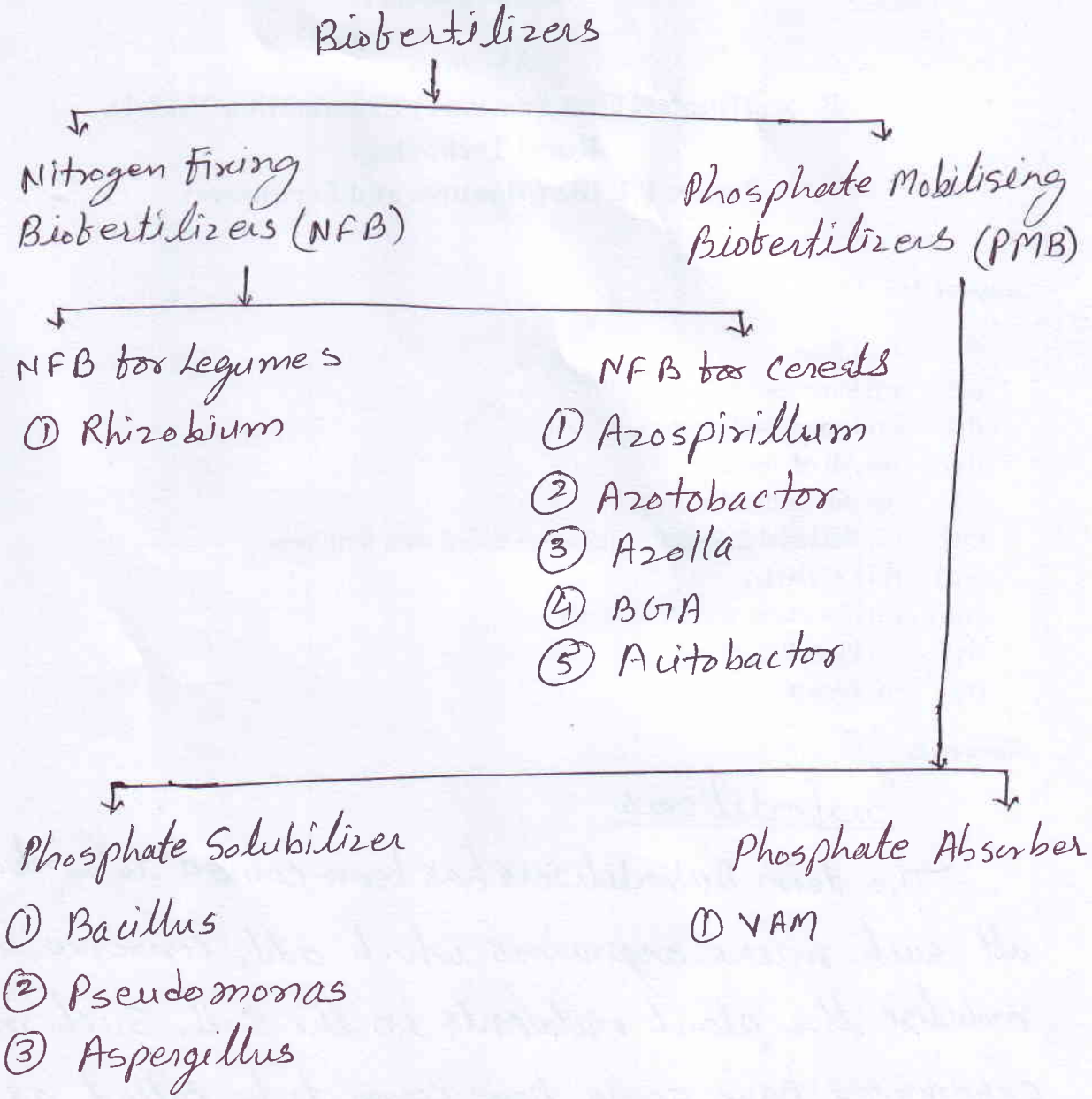
Biofertilizers

The term Biofertilizers has been coined to embody all such micro organisms which add, conserve, and mobilise the plant nutrients in the soil. Such macro-organisms have some how come to be called as "Biofertilizers."

In other words biofertilizers are based renewable energy sources and are ecofriendly as composed to commercial fertilizers.

Classification of Biofertilizers

Depending upon the nutrient provided, Verma & Bhattacharya (1994).



Answer 3:

Advantages of Biopesticides

- Biopesticides usually are inherently less harmful than conventional pesticides.
- Biopesticides generally affect only the target pest and closely related organisms, in contrast to broad-spectrum conventional pesticides that may affect organisms as different as birds, insects, and mammals.
- Biopesticides often are effective in very small quantities and often decompose quickly, thereby resulting in lower exposures and largely avoiding the pollution problems caused by conventional pesticides.

- When used as a component of Integrated Pest Management (IPM) programs, biopesticides can greatly decrease the use of conventional pesticides, while crop yields remain high.
- Harmful residues not detected
- Can be cheaper than chemical pesticides when locally produced.
- Can be more effective than chemical pesticides in the long-term.
- Biodegradable

Limitations

- High specificity: which may require an exact identification of the pest/pathogen and the use of multiple products to be used; although this can also be an advantage in that the biopesticide is less likely to harm species other than the target
- Often slow speed of action (thus making them unsuitable if a pest outbreak is an immediate threat to a crop)
- Often variable efficacy due to the influences of various biotic and abiotic factors (since biopesticides are usually living organisms, which bring about pest/pathogen control by multiplying within the target insect pest/pathogen)
- Living organisms evolve and increase their resistance to biological, chemical, physical or any other form of control.
- If the target population is not exterminated or rendered incapable of reproduction, the surviving population can acquire a tolerance of whatever pressures are brought to bear, resulting in an evolutionary arms race.

Answer (4) There are several resens bor not using the green manuring methods by the barmes, Same imper tant resons one :

1. Lack of irrigation bacility
2. Lack of good quality of seed.
3. Lack of knowledge about sowing time, plowgling time etc.
4. It required proper plowgling
5. farmes den't want to use their field bor growing grasses.
6. It takes longer time bor preparation.
7. Climatic conditeion abbect the manure preparation etc.

Answer ⑤ Similarities between organic & inorganic fertilizers:

Particulars

① Both ~~one~~ provied nutrient to the plant.
② Both essensial for plant growth & development.
③ Both increase the yield of crops.
④ Both reduce the crop loss.
⑤ Both increase the soil fertility etc.

Difference

① Organic manure use in high amount but inorganic fertilizers use in ~~less~~ less amount.
② Organic manure has less concentration but inorganic fertilizers have high concentrate.
③ High does of inorganic fertilizes reduce soil fertility but high does of organic manure improve soil fertility.
④ Inorganic fertilizes used in splite does but organic ~~fer~~ manure used ~~in~~ as basal does.
⑤ We can make organic ~~manure~~ at our field. but inorganic fertilizes always make at industries.
⑥ The production cost of organic manure is less than inorganic manure/fertilizers. etc.

Answer 6:

Advantages:

- Brings higher prices for organically grown crops.
- Composting can offer several potential economic benefits to communities:
- Extends current landfill longevity and delays the construction of a more expensive replacement landfill or incinerator.
- Reduces or avoids landfill or combustor tipping fees, and reduces waste disposal fees and long-distance transportation costs.
- Offers environmental benefits from reduced landfill and combustion use.
- Creates new jobs for citizens.
- Produces marketable products and a less-cost alternative to standard landfill cover, artificial soil amendments, and conventional bioremediation techniques.
- Provides a source of plant nutrients and improves soil fertility; results in significant cost savings by reducing the need for water, pesticides, fungicides, herbicides, and nematodes.
- Used as an alternative to natural topsoil in new construction, landscape renovations, and container gardens. Using composts in these types of applications is not only less expensive than purchasing topsoil, but it can also often produce better results when establishing a healthy vegetative cover.
- Used as mulch for trees, orchards, landscapes, lawns, gardens, and makes an excellent potting mix. Placed over the roots of plants, compost mulch conserves water and stabilizes soil temperatures. In addition, it keeps plants healthy by controlling weeds, providing a slow release of nutrients, and preventing soil loss through erosion.

Limitations:

- Take more time
- Slow response
- Not availability of quality raw materials
- Less nutrient contents
- Need high amount etc.

Answer 7: there are different methods of recycling the organic materials like Vermicompost, NADEP, Indore method etc. Indore method of recycling is discussing here:

Start building the heaps by laying a lattice of old branches at the bottom. Divide the base area of the heap into a 6 (roughly equal) transverse (across) sections, five of which are filled and one left vacant. Make each section of 7 layers (figure 1) of 9 inch thickness. In a 9 inch layer,

have 4 inches of dry waste, 3 inches of green weeds and leaves, 2 inches of manure and a sprinkling of urine-earth-wood ash. (The layering process is illustrated in figure-2).

Make ventilation holes after completing two layers of a section. Take a 6-8 ft long pole with a 2 inch diameter and probe vertically through the working, gradually increasing the size of the hole to 4 inches by waggling (movement from side to side or up and down) the pole. See that the pole remains in its position and ensure that the air- vent continues to the top of the completed section. The first pole should be at a distance of not more than 2 feet from the heap, with a maximum distance of 4 feet between two successive holes.

Continue building of the section up to a height of 5 feet, after establishing the air vents. Build five sections in the similar manner, leaving the sixth one vacant (The sixth one is utilized while turning the heap). Water the heap, lightly, just after completion and again the next morning.

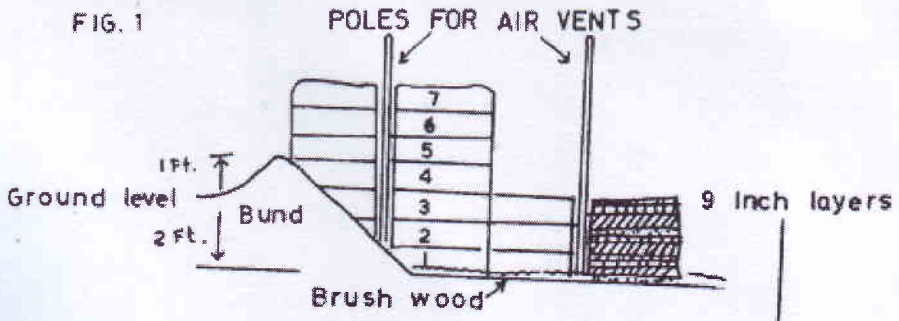
The central portion of the compost heap gets heated to its maximum temperature, within one week of its completion. The material in the cooler region composts slowly and the weeds, seeds and diseased material may not be completely decomposed. Hence, it is vital to turn the heap so that the cooler top, bottom and sides get mixed back into the middle of the new heap, once the temperature at the centre begins to drop. Turning also facilitates thorough mixing of the ingredients and their aeration.

Carry out the first turning two weeks after construction of the heap. Put the top 9 inches from section 5 into the floor of section 6, mixing it in the process. Cover it with the next 9 inch layer and water it. Re-establish the air vents before proceeding further. Switch section 4 to Section 5, once Section 5 is completely turned over into Section 6. Keep turning over each section into the next one, leaving Section - I blank (figure -4).

Carry out the second turning after 3 weeks. A third turning is realized only if the original materials are recognizable, after 9 weeks. It takes around 12 weeks for final composting, though a little longer during monsoons. The final product has a pliable texture, an earthy smell and is dark brown or grey in colour. This matured compost is half of its original volume as it simply shrinks due to the cooling process.

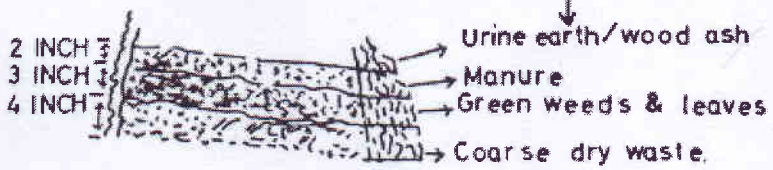
Finished section of 7 layers

FIG. 1



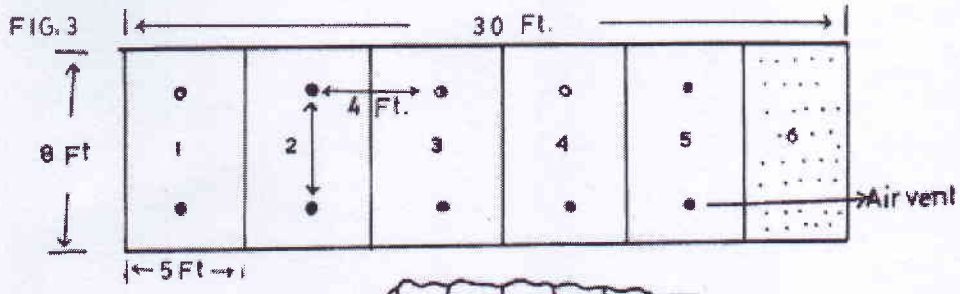
Compost heap showing layers of Ingredients.

FIG. 2



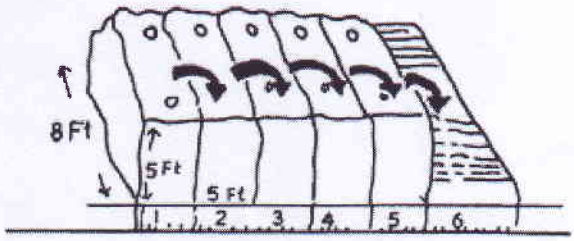
PLAN VIEW SHOWING COMPLETED COMPOST HEAP

FIG. 3



Turning the heap

FIG. 4



Answer 8:

The urgency of using organic manure has been gaining ground in the wake of increasing cost of fertilizer with every passing year and certain other inherent limitations with the use of chemical fertilizers. Farmyard manure is the oldest organic manure used by man ever since he involved in farming. It has stood the test of time and is still very popular among the poor and marginal farmers. It consists of litter, waste products of crops mixed with animal dung and urine. Therefore, it contains all the nutrient elements present in the plant itself and returns these nutrients to the soil when it is applied to the field for the benefit of succeeding crop.

1. Solid excreta: Solid excreta mainly consists of dung which is only partially digested by the animal. It also contains living and dead bacterial cells which have nearly half the nitrogen of the dung. The manurial value of solid excreta depends upon the quantity of nitrogen, phosphorus and

potash, while the quantity of these nutrients in dung depends upon several factors such as type, age, breed and condition of the animal and nature of the food animals take.

2. Liquid excreta: The urine is richer than dung in respect of nutrient contents but its phosphorus content is low. The composition of urine also depends on the type of animal, age, condition and the nature and digestibility of food. Sheep urine, like its dung, is the richest in manurial ingredients. Horse urine comes next At the same time it is very rich in total mineral matter. Pig and cattle urine are the poorest. but the heavy quantity of cattle urine compensates for its low nutrient value.

3. Litter: The term litter is given to all those materials which are used in the cattle shed under the animal at night as a bedding. Besides providing a dry bed and keeping the animal clean, it absorbs urine.

1. Selection of site: To avoid flooding in the rainy season, pit should be dug on a projected and elevated site. It should not be near the canals and other water reservoir where high water table is suspected. Pit should be dug, as far as possible, near the source of manurial materials i.e. a little away from cattle shed. Place should be protected from cattle and accessible by bullock -cart

2. Size of the pit

3. Collection of ingredients

4. Laying in the pit

5. Watering and turning

Answer 9:

Plants, like animals and human being, require food for their liveliness, growth and development. This food is composed of certain elements and compounds often referred to as plant nutrients. The essential nutrients are the key components of the soil fertility. The chemical compounds required by the organism are termed as nutrients and their supply and absorption for growth is defined as nutrition. Plant nutrients are available in the form of organic and inorganic substances. Plants require 16 essential elements for their normal growth and completion of life cycle. On the basis of their relative concentration in plant tissues these are divided in to macro-nutrients and micro-nutrients.

Macronutrients

Out of the 16 essential plant nutrients six elements are used by plants in large quantities. These are N, P, K, Ca, Mg and S. Since these elements are used in relatively large amount they

are designated as "Macronutrients". The first three nutrients namely NPK are utilized by plants in considerable quantities. Majority of soils of the world are consequently found deficient in these nutrients, hence N, P, and K are often called as Primary Nutrients. Ca, Mg and S are called secondary nutrients due to their secondary importance to the manufacturers of NPK fertilizers.

Micronutrients

The other seven nutrients namely Fe, Mn, B, Zn, Ca, Mo, Cl and Ni are used by field crops in very small quantity hence these are called Micronutrients. These nutrients are also called Trace, Minor or Rare elements. They are however essential to plant growth.

The nutrients should fulfill the conditions for proper growth and development of plants. They must be present in the soil in available form. The nutrient must be present in optimum concentration for plant growth. Deficiency or excess of any nutrient limits plant growth. There must be a proper balance among the concentrations of the various soluble nutrients in the soil solution.

Role and Functions of Essential Nutrients

1. Nitrogen

1) Nitrogen is an essential constituent of proteins and chlorophyll and is present in many other compounds in plant metabolism, such as nucleotides phosphatides, alkaloids, enzymes, hormones, vitamins etc. It is thus a very basic constituent of plant life.
2) Imparts dark green colour to plants. It promotes vegetative growth in leaves, stem and produces rapid early growth.
3) It improves the succulence of leafy vegetables and fodder crops and increases the protein content in it.
4) Governs considerably the utilization of phosphorous, potassium and other elements

2. Phosphorous

1) Phosphorous is a constituent of nucleic acid, phytin and phospholipids. An adequate supply of Phosphorous early in plant life is important for the development of the reproductive parts of the plant
2) Phosphorous is also an essential constituent of majority of enzymes which are of great importance in the transformation of energy, in carbohydrate metabolism, fat metabolism and also in respiration (catabolism of carbohydrates) in plants. It is closely related to cell division and development.
3) Stimulates early root development and growth, their by helping to establish seedling quickly.

4) Brings about early maturity of crops particularly cereals and counter acts the effects of excessive nitrogen.
5) Stimulates flowering, aids in seed formation, increases grain to stalk ratio. It also improves the quality of food grains and other crops.
6) When applied to legumes it enhances the activity of Rhizobium and increases the formation of root nodules. Thus it helps in fixing more atmospheric nitrogen in root nodules. With Phosphorous deficiency, legumes plants may simultaneously suffer from nitrogen as well as potassium deficiency.
7) Excess of Phosphorous in soil may cause deficiencies of some nutrients particularly iron and zinc. It may also reduce the detrimental effects of over liming.

3. Potassium

Unlike all major nutrients potassium does not enter in to the composition of any of the important plant constituent, such as proteins, chlorophyll, fats and carbohydrates concerned in plant metabolism. It occurs in as state of solution in the cell sap. Being soluble it can be removed with solution in water from the plant tissue.

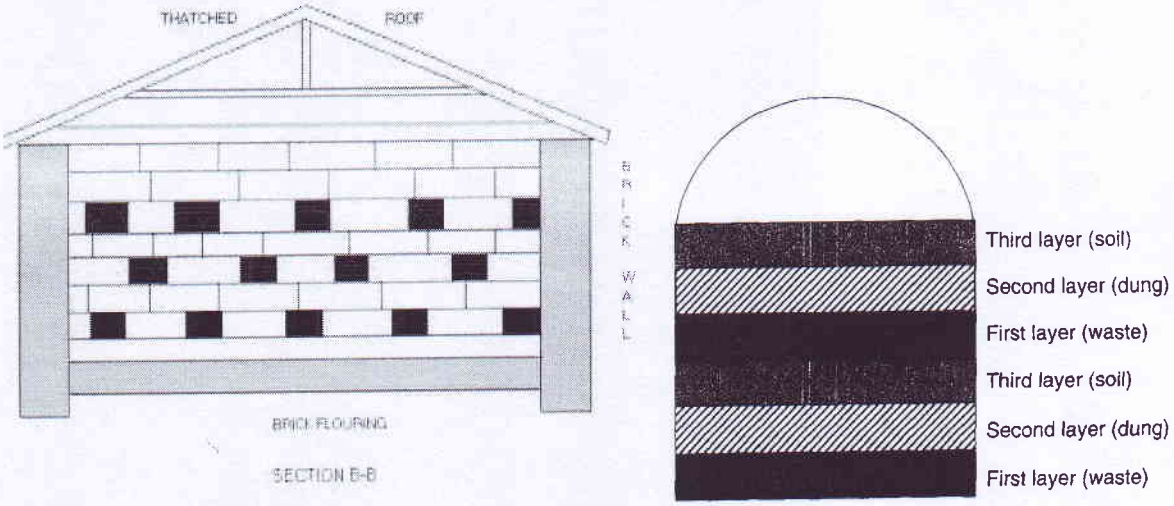
1) Imparts increased vigor and disease resistance to plants and produce strong, stiff straw in cereals, specially paddy and wheat. It also imparts winter hardiness to legumes and other crops.
2) It regulates water conditions within the plant cell and water loss from the plant by maintaining the balance between anabolism, respiration and transpiration. It reduces tendency to wilt and helps in better utilizations of available water.
3) Essential in the formation and transfer of starches and sugar. Thus potassium is required in large quantities for potato, sweet potato, turnip, Banana, suran and Tapioca.
4) Helps in formation of proteins and chlorophyll, it increases plumpness of grains and seeds and acts as an accelerator of enzyme action.
5) Counteracts the injurious effects of excess nitrogen in plants. Hence, a balanced ratio of N and K is important in plant nutrition.
6) Improves the quality of final products such as improvement in quality of tobacco leaf, quality of fiber in fiber crops, taste size and keeping quality of fruits. With citrus fruits however, an excess of potash has a bad effect on quality.

Answer 10:

The NADEP method of organic composting was developed by aGandhian worker called Narayan DeotaoPandharipande of Maharastra (Pusad).Compost can be prepared from a wide range of organic materials including dead plant materialsuch as crop residues, weeds, forest litter andkitchen waste. Compost making is an efficient way of converting all kinds biomass into high value fertilizer that serves as a good alternative tofarmyard manure, especially for crop-growinghouseholds without livestock.

Design

This method of making compost involves the construction of a simple, rectangular bricktank with enough spaces maintained between the bricks for necessary aeration. Therecommended size of the tank is 10 ft (length) x 5 ft (breadth) x 3 ft (height). All the fourwalls of NADEP tank are provided with 6// vents by removing every alternate brick after theheight of 1ft. from bottom for aeration. Tank can be constructed in mud mortar or cementmortar.



- Raw materials required for filling NADEP tank:
- Agricultural waste (Dry & green) – 1350-1400 kgs.
- Cattledung or biogas slurry – 98 – 100 kgs.
- fine sieved soil – 1675 kgs.
- Water – 1350-1400 litres.
- The important technique in the manufacture of Nadepcompost is that the entire tank should be filled in one go, within 24 hours and should not go beyond 48 hours, as this would affect the quality of the compost.

- Before filling, the tank is plastered by dilute cattle dung slurry to facilitate bacterial activity from all four sides. It is also filled in definite layers each layer consisting of the following sub layers.

Sub-layer-1 4 to 6// thick layer of fine sticks, stems, (To facilitate aeration) followed by 4 to 6// layer ofdry and green biomass.

Sub-layer-2 4 kgs. Cow dung is mixed with 100 litres of water andsprinkled thoroughly on the agricultural waste to facilitate microbial activity.

Sub-layer-3 60 kgs. Of fine dry soil is spread uniformly over the soakedbiomass for moisture retention and acts as a buffer duringbiodegradation.

Thus the proportion of organic materials for each layer is 100 kgs. organic biomass: 4kgs. cow dung + 100 litres water +60 kgs soil. In this way, approximately 10 -12 layers are filled in each tank. After filling the tank, biomass is covered with 3// thick layer of soil and sealed with cow dung + mud plaster.

MAINTENANCE

After 15-30 days of filling the organic biomass in the tank gets automatically pressed down to 2 ft. The tank is refilled by giving 2-3 layers over it and is resealed. After this filling thetank is not disturbed for 3 months except that it is moistened at intervals of every 6-15 days.The entire tank is covered with a thatched roof to preventexcessive evaporation of moisture. Under no circumstancesshould any cracks are allowed to develop. If they do, they should be promptly filled up withslurry.

BENEFITS

- Reduced cash expenses on chemical fertilizer, improved soil fertility, increased cropyield
- Supports organic crop production, reduced dependence on outside inputs_ From each NADEP tank approximately 2.5 tons of compost is prepared within 90-120 days.
- The use of compost reduced the need for mineral fertilizer thus reducing productioncosts and outside dependence.