21. Food production: soil and water management

Exercises

1 A. Question

Rhizobium bacteria are associated with the fixation of

A. oxygen

B. carbon dioxide

C. nitrogen

D. water vapour.

Answer

Plants cannot take nitrogen directly from soil but require it for the production of protein. Rhizobium bacteria help in the mobilization of nitrogen. It is thus used as a bio-fertilizer. They form a symbiotic association with the nodules of legumes. The legumes provide food and shelter to the bacteria and it, in turn, helps in fixation of nitrogen.

1 B. Question

Green plants, normally do not suffer from the deficiency of

A. phosphorus

B. sulphur

C. iron

D. Carbon

Answer

Carbon is taken by the green plants from carbon dioxide and it is readily available in the air. But phosphorus, sulphur, and iron although required in small quantities are not readily available and as such the plant can develop a deficiency.

1 C. Question

One of the arguments against too much use of chemical fertilizers is that, they

A. decrease the taste of the food

B. reduce the nutrients in food

C. affect soil bacteria

D. consume too much water

Answer

Chemical fertilizers are synthetic nutrients such as potassium, phosphorus etc. They add salts to the soil which changes its composition. This change in composition renders the soil inhabitable to the existing bacteria resulting in depletion of the soil fauna.

1 D. Question

One of the advantages of growing chili plants between two rows of green gram plants is that

A. chili plants are protected by the shade of dhal plants

B. nitrogenous fertilizer prepared by green gram plants can be utilized by chili plants

C. chili plants get water from green gram plants

D. dhal plants are protected from pests in the presence of chili plants

Answer

Gram plants are leguminous plants which have nitrogen-fixing bacteria Rhizobium in its root nodules. Plants cannot take in nitrogen present in the air directly. They are to be mobilized from the soil. In this case, it is done by Rhizobium bacteria to provide to the chili plant.

2 A. Question

Fill in the blanks with suitable words:

Father of green revolution in India is _____.

Answer

Father of the green revolution in India is Dr. M.S. Swaminathan.

Explanation: Dr. M.S. Swaminathan is an Indian agricultural scientist. He is known as the father of green revolution in India. He developed sustainable methods for the production of food. It involved the production of high yielding varieties of cereal grains, expanding irrigation facilities, distribution of synthetic fertilizers and pesticides to farmers.

2 B. Question

Fill in the blanks with suitable words:

NPK fertiliser has the elements nitrogen, phosphorus and _____.

Answer

NPK fertilizer has the elements nitrogen, phosphorus and potassium

Explanation: N in NPK denotes nitrogen; P denotes Phosphorus and K denotes Potassium. These are macronutrients that are required by plants for their proper growth. Nitrogen is required in higher quantity as compared to phosphorus and potassium which are required in trace amount.

2 C. Question

Fill in the blanks with suitable words:

Urea which is a chemical fertiliser is a rich source of _____.

Answer

Urea which is a chemical fertilizer is a rich source of nitrogen.

Explanation: Green plants require nitrogen for the production of protein. But plants cannot take in nitrogen from the air, it can only be absorbed when mobilized by Rhizobium bacteria or from the synthetic fertilizers which add nitrogen to soils

2 D. Question

Fill in the blanks with suitable words:

By using animal dung and organic waste we can make organic manure called _____.

Answer

By using animal dung and organic waste we can make organic manure called compost.

Explanation: Compost is produced by the decomposition of complex organic matter into simple form. The organic materials are collected in a heap and put in a pit and allowed to decompose naturally. These well decayed organic matters can be used to fertilize the soil.

3. Question

Match the following :

A	B
1. deep-rooted plants	a. do not need nitrogenous fertilizer
2. plants that are not deep-rooted	b. always need rain water
3. plant roots containing rhizobium	c. need chemical fertilisers
4. loss of water	d. occasional watering
	e. frequent watering
	f. furrow irrigation
	g. need nitrogenous fertiliser

Answer

1. Deep rooted plants: occasional watering

Explanation: Deep rooted plants require occasional watering as they can access ground water for their activities. This quality can be used by agricultural scientist for devising irrigation.

2. plants that are not deep rooted: always need rain water

Explanation: Plants that are not deep rooted depends on the rain water for their development. Thus, they require a regular supply of rain.

3. plant roots containing rhizobium-do not need nitrogenous fertiliser

Explanation: Rhizobium is a nitrogen fixing bacteria and as such leguminous plants which have rhizobium in their roots do not require nitrogeneous fertiliser.

4. loss of water- frequent watering

Explaination: Frequent watering causes loss of water as it can't be absorbed by the soil. The water as such is wasted and can't be of any use.

4 A. Question

Answer the following:

List any two advantages and two disadvantages of using chemical fertilizers.

Answer

Advantages:

1. They are available in a usable form containing nutrients in a fixed ratio. The ratio required for a particular area of land is determined by testing the composition of the soil.

2. They are cost effective and can provide plants the nutrients as required having a balance of nitrogen, phosphorus, and potash.

Disadvantages:

1. They change the composition of the soil and as such make the soil inhabitable to the soil flora that naturally flourish.

2. They change the inherent characteristic of the soil an cause land pollution.

4 B. Question

Answer the following:

Why should farmers enhance the amount of humus in their farmland? How do they do that?

Answer

Humus is organic manure that is formed by the decomposition of organic matter present in the soil. It has the ability to bind the loose soil, enhance the water retention capacity of the soil, prevent soil erosion and assist in aeration and penetration of roots.

Farmers can enhance the amount of humus in the soil by preparation of compost pit. Some farmers keep the land unused for a season or two.

4 C. Question

Answer the following:

Distinguish between organic manures and chemical fertilizers.

Answer

Organic manures	Chemical fertilizers
1. They are formed by the natural process of decomposition of organic matter.	1. They are synthesized by humans in the laboratory.
2. They do not contain nutrients in a fixed ratio.	2. They are available in a usable form containing nutrients in a fixed ratio.
3. Organic manures need to be added in large quantities.	3. They are to be added in a calculated amount which is relatively low than that of organic manures.
Examples of organic manures include compost	Examples of chemical fertilizers include Urea, NPK etc.

4 D. Question

Answer the following:

List some agricultural practices that help to maintain the fertility of the soil.

Answer

Agricultural practices that help in maintaining the fertility of soil includes:

a) Crop rotation: Crop rotation is one of the best methods for maintaining the productivity of the soil. It involves growing different types of crops, belonging to different families in a sequence (monocot and dicot). It helps in keeping the insect population under check. Since the insects are host specific the pest of one species will not affect the other. Thus, if paddy which is infected by rice borer is rotated with legume plant, the rice borer will die of food unavailability in the subsequent year.

It also helps in the prevention of soil erosion.

b) Mixed cropping: In mixed cropping one or two subsidiary crops along with one main crop is cultivated. Utilization of soil nutrients is more efficient. Moreover, it provides security against crop failure.

c) Multiple cropping: In this type of cropping more than one crop is cultivated in a year.

Good irrigation facilities and short duration breeds are crucial for multiple cropping.

4 E. Question

Answer the following:

How do you prepare compost manure?

Answer

Preparation of compost involves the following steps:

(a) A small pit is dug in the compound or a plastic bin or bucket is taken

(b) Organic waste such as Put any organic waste such as vegetable peels, cow dung, fallen leaves from trees, crop residues or even weeds into the pit. They are cut into small pieces to make the process of decomposition faster.

(c) A layer of soil is added. This soil provides the required microorganisms for the decomposition of the organic matter.

(d) Water is sprinkled on top to keep the organic matter moist.

(e) The process is repeated until the pit/ bucket is full.

(f) Earthworms can also be added which enhances decomposition (vermicompost).

(g) It is then left undisturbed for 8-10 weeks and then can be used for fertilization of soil.

4 F. Question

Answer the following:

List any three ways by which soil erosion occurs. State any two measures to reduce the loss of top soil.

Answer

Soil erosion occurs mainly by:

1. The top layer of the soil is removed by natural agencies like wind and water

2. Agriculture can lead to erosion of soil and results in depletion of the soil.

3. Surface water runoff can also cause erosion

Measures to reduce erosion:

1. Planting of grass and shrubs.

2. Improve drainage and

4 G. Question

Answer the following:

What are the advantages of organic farming?

Answer

Advantages of organic farming:

(a) Organic farming involves the use of organic manure, bio fertilizers such as Rhizobium, crop rotation method for the proper utilization of nutrients of soil etc and as such limits the use of chemical fertilizers. Thus, they are ecofriendly.

(b) It ensures that the quality of the soil is intact as no synthesized chemicals and fertilizers are added. These measures preserve the soil microbiota.

(c) Since they are ecofriendly they are not associated with soil pollution.

4 H. Question

Answer the following:

Suggest measures to conserve water in agriculture.

Answer

Water is one of the basic need for the production of food ie agriculture. Agricultural practices utilize 70% of the total ground water. It is a constant threat to the environment and as such, it is of utmost importance to conserve the water and use it as efficiently as is feasible.

In order to address the problem one can look into the following:

1. Irrigation system in use. Efficient irrigation involves two factors:

1. Available water must be used as and when required

2. Energy efficient irrigation system also contributes to the proper management of water

3. Knowledge regarding the root system of the plant helps in devising proper irrigation pattern. This will result in saturation of the root zone preventing surface run off and percolation of the root zone.

These factors if taken into account will result in the judicious use of water.

5 A. Question

Think

What is your view on organic farming? If you were to have a piece of agricultural land, do you opt for chemical farming or organic farming? Give reasons for your choice.

Answer

Organic farming involves the use of environment friendly techniques for the cultivation of plants. It relies on techniques such as crop rotation, use of organic green manure, compost, biological pest control techniques.

I would opt for organic farming.

Reasons are sited below:

a) It is eco-friendly and as such limits the use of chemical fertilizers.

b) It maintains the quality of the soil maintaining the flora and the fauna available organic manure, bio fertilizers such as Rhizobium, crop rotation method for the proper utilization of nutrients of soil etc and as such limits the use of chemical fertilizers. Thus, they are ecofriendly.

c) It ensures that the quality of the soil is intact as no synthesized chemicals and fertilizers are added. These measures preserve the soil microbiota.

d) Since they are ecofriendly they are not associated with soil pollution.

5 B. Question

Think

How can we ensure food security for all people of our country?

Answer

Food is the basic right of every human being. Thus it is the duty of every one of us to ensure that proper food is available to our fellow being.

We can ensure food security by adapting the following measures:

1. Educating farmers in recent advances in agricultural practices.

2. Making people aware of the improved high yielding breeds of rice.

3. Adapting measures to tackle climate change.

4. Divesification of crops and crop rotation to ensure proper utilization of soil.

5 C. Question

Think

Why should we find ways for conserving water used in agriculture? What are your suggestions for the conservation of water?

Answer

Agriculture is the mainstay of Indian economy. More than 70% of ground water is used in agriculture and as such poses a constant threat to the environment. So, it is an urgent need to find ways for conserving water used in agriculture.

Suggestion for conservation of water:

Use of water for only when necessary

Improving irrigation facilities

5 D. Question

Think

How can we make agriculture more eco-friendly?

Answer

We can make agriculture eco-friendly by opting for organic farming. It maintains the quality of the soil maintaining the flora and the fauna available organic manure, bio fertilizers such as rhizobium, crop rotation method for the proper utilization of nutrients of soil etc and as such limits the use of chemical fertilizers. Thus, they are eco friendly.