

MODEL ANSWER

Class : B.Sc. Forestry Vth Semester

Paper : Plantation Forestry

Department of Forestry, Wildlife & Environmental Sciences

Question 1 (A) choose the correct answer:

- a) Why the teak is no considered fit in bund plantation:
- 1) Long rotation
 - 2) Big size leaves
 - 3) High pest and disease
 - 4) **All above**
- b) Mycorrhizal symbiosis helps plant to provide :
- 1) Nitrogen
 - 2) **Phosphorus**
 - 3) Potash
 - 4) Silica
- c) Which is a known as a very good soil for the all type of plants :
- 1) Clay soil
 - 2) Sandy soil
 - 3) Clay soil
 - 4) **Sandy loam**
- d) *Populous deltoides* is introduced in India. the origin of this species from which country
- 1) **United kingdom**
 - 2) Australia
 - 3) North America
 - 4) None of these
- e) Mean annual temperature of tropical zone is about:
- 1) **Over 24 °C**
 - 2) 17-24 °C
 - 3) 7-17 °C
 - 4) All of these

(B) Write brief on the followings:

a. **Cover crops**

Cover crops are subsidiary species usually low shrubs sometimes small trees, intentionally introduced into a plantation with a primary object of restoring a cover to the soil as early as possible and minimizing any risk of soil erosion due to exposure . Cover crop also raised for the addition of the organic matter in the soil .

In a **West Bengal** *tephrosia Candida* has been used as a cover crop. *Indigofera tinctoria*, *crotolaria juncia* also use as a cover crop.

b. Wind break

To raise a plant in such a manner where these raised plant protect our desired crop there are two main porpoise of making wind break firstly to prevent the desired crop (in agriculture and forest plantation site)secondary to prevent the soil erosion and hot air transportation from desert area to territorial range.(it means checking a denudation)Exa. Prosopis, Azadirachta, Eucalyptus

c. Dibbling

Dibbling is a method of seed sowing in which seeds are sown after digging of the soil another word we can say the a method of seed sowing in which seeds are sown in the land after hole making on the ground. Main profit of the dibbling is to reduce extra use of the seeds and proper care of the newly germinated plant

d. Seed treatment.

There are several types are seed treatments given to the seed for different porpoise 1) treatment for breaking of dormancy. As example hard coat seeds require like Terminalia, Adina, albizia, cassia fistula etc. 2) giving protection against pest-Paddy, wheat

e. Mechanical thinning.

It is a tending operation through which we cut or remove the tree in any thumb rule basis. E.g. the tree of any plantation site removes alternate line. Diagonal, row, or may be entire column remove. Mechanical thinning is done in young age of the plantation.

Question 2. Define lay out. Give the detail of different planting and lay out pattern for the establishment of plantation.

Answer . Lay out means geo graphical allocation/ arrangement of the different types of resources through which manipulates the production of plant. The pattern of the plantation lay out may be

- 1) Rectangular,
- 2) Square,
- 3) Pentagonal,
- 4) Hexagonal etc.

Mostly square / rectangular (Tetragonal) plantation recommended but land availability is a big factor.

Mostly in our plantation site should be fulfill with

- 1) path
 - a) vehicle path
 - b) bridle path
 - c) inspection path
- 2) Store room (office room)
- 3) Labour shed
- 4) fencing
- 5) Pump house.

Planting pattern: - Following are some general rules are applied in the plantation site for the plantation.

- a) Rectangle planting
 - b) Square planting
 - c) Triangular planting
 - d) Quincunx plantation
- a) **Rectangle planting:** - in line planting plants are planted at the same spacing in line which are same distance apart thus the planted plant form rectangles.
Formula for calculating the plant: - no of hectare / distance (p x plant x row x row)
- b) **Square planting:** - planting in square pattern i.e. with plants occupying the four corner of each successive square. This is achieved by planting plants in the lines at the same spacing as that of the lines themselves.
Formula for calculating the plant: - no of hectare / distance (p x plant x row x row)
- c) **Triangular planting:** - planting in the pattern of equilateral triangle i.e. the plant occupy tree corner of each adjacent equilateral triangle.
Formula for calculating the plant: - no of hectare x 1.15/ distance (p x plant x row x row)
- d) **Quincunx plantation:** - in which an extra plants is placed in the center of each square of four plants.
Formula for calculating the plant: - no of hectare x 2 / distance (p x plant x row x row)

Question 3.) Give a brief account of the history of plantation in India. Give the objectives of taking up large scale plantation?

Answer. There is enough evidence to show that dense forests once covered India. The changing forest composition and cover can be closely linked to the growth and change of civilizations. Over the years, as man progressed the forest began gradually depleting. The growing population and man's dependence on the forest have been mainly responsible for this.

All ancient texts have some mention of the forest and the activities that were performed in these areas. Forests were revered by the people and a large number of religious ceremonies centre on trees and plants. The Agni Purana, written about 4000 years ago, stated that man should protect trees to have material gains and religious blessings. Around 2500 years ago, Gautama Buddha preached that man should plant a tree every five years. Sacred groves were marked around the temples where certain rules and regulations applied.

Maurya regimes: - When Chandra Gupta Maurya came to power around 300 BC, he realized the importance of the forests and appointed a high officer to look after the forests.

Ashoka regimes: - Ashoka stated that wild animals and forests should be preserved and protected. He launched a programme to plant trees on a large scale. These rules continued even during the Gupta period.

Mughal regimes: - During the Muslim invasions a large number of people had to flee from the attacks and take refuge in the forests. This was the beginning of a phase of migration to the forest. They cleared vast areas of forests to make way for settlements.

The Muslim invaders were all keen hunters and therefore had to have patches of forests where they could go hunting. This ensured that the trees in these areas were not felled, and the forest ecology was not tampered with. The Mughals showed more interest in gardens and their development. Akbar ordered the planting of trees in various parts of his kingdom. Jahangir was well known for laying out beautiful gardens and planting trees.

British regimes: - During the early part of the British rule, trees were felled without any thought. Large numbers of trees such as the sal, teak, and sandalwood were cut for export. The history of modern Indian forestry was a process by which the British gradually appropriated forest resources for revenue generation. Trees could not be felled without prior permission and knowledge of the authority. This step was taken to ensure that they were the sole users of the forest trees.

But after some time, the British began to regulate and conserve. In 1800, a commissioner was appointed to look into the availability of teak in the Malabar forests. In 1806, the Madras government appointed Capt. Watson as the commissioner of forests for organizing the production of teak and other timber suitable for the building of ships.

In 1855, Lord Dalhousie framed regulations for conservation of forest in the entire country. Teak plantations were raised in the Malabar hills and acacia and eucalyptus in the Nilgiri Hills.

In Bombay, the conservator of forest, Gibson, tried to introduce rules prohibiting shifting cultivation and plantation of teak forests. From 1865 to 1894, forest reserves were established to secure material for imperial needs. From the 18th century, scientific forest management systems were employed to regenerate and harvest the forest to make it sustainable. Between 1926 and 1947 afforestation was carried out on a large scale in the Punjab and Uttar Pradesh. In the early 1930s, people began showing interest in the conservation of wild life.

During World War I forest resources were severely depleted as large quantities of timber were removed to build ships and railway sleepers and to pay for Britain's war efforts. Between the two wars, great advancements in scientific management of the forests were

made, with many areas undergoing regeneration and sustained harvest plans being drawn up. Sadly, emphasis was still not on protection and regeneration but on gaining maximum revenue from the forests. World War II made even greater demand on the forest than World War I had done.

After independence: - With the independence of India in 1947, a great upheaval in forestry organization occurred. The princely states were managed variably, giving more concessions to the local populations. The transfer of these states to the government led to deforestation in these areas. But some forest officials claim that the maharajas cut down a lot of their forests and sold them. This may have been the case in some instances, but a lot of forest had existed and has been lost since the government took over these states.

The new Forest Policy of 1952 recognized the protective functions of the forest and aimed at maintaining one-third of India's land area under forest. Certain activities were banned and grazing restricted. Much of the original British policy was kept in place, such as the classification of forest land into two types.

The next 50 years saw development and change in people's thinking regarding the forest. A constructive attitude was brought about through a number of five-year plans. Until 1976, the forest resource was seen as a source of earning money for the state and therefore little was spent in protecting it or looking after it.

In 1976, the governance of the forest came under the concurrent list. 'Development without destruction' and 'forests for survival' were the themes of the next two five-year plans, aiming at increasing wildlife reserves and at linking forest development with the tribal economy. But a large gap between aim and achievement exists still.

Objectives of large scale plantation: -

- 1) To generate the revenue
- 2) To regulate the life air (O₂) cycle
- 3) To fulfill demand of local people : -
 - a) Fuel wood
 - b) Fodder
 - c) Grazing
 - d) Fruit production
 - e) Flower production
 - f) Small wood production
- 4) Environmental aspect :-
 - a) Rehabilitation of land
 - b) To protect from environmental condition
 - 1) Extreme hot condition
 - 2) Frost
 - c) Wind break
 - d) To stop desertification

- e) To control the soil erosion
- 5) Recreational purpose / esthetic purpose
- 6) To fulfill the industrial demand

Question 4.A) Write in detail the factor which decide the choice of species of plantation.

Answer: In artificial regeneration, one of the most important decisions is the selection of the species. Choice of the species deserves thoughtful consideration as it controls the success of artificial regeneration. A minor error of the in the selection of the species may result in the failure of the plantation which will lead to huge loss of money, time, & energy.

Following are some important factor which one affects the artificial plantation.....

- 1) Site factor
 - a) **Climate:** - in the our country climatic condition vary place to place due to following reason and vary for the plantation.
 - 1) **Rainfall:** - rainfall is very important factor for the choice of species because may be rain fall less or more.
 - A) **Less:** - desert region less rain fall found there require less water demanding species. *Acacia juliflora*
 - B) **High:** - here require to plant high water demander species. *Terminalia arjuna*
 - 2) **Temperature:** - temperature also a very big important factor for the choice of species.
 - A) **Less Temperate:** - generally less temperature frost chilling of the air may cause serious damage to the plant example
 - B) **high temperature :** - Transpiration loss by the tree.
 - b) **Soil:** - sandy loam and clay affect the choice of species. Sandy has less amount of the mineral but clay has more amount of the mineral material but less aeration in the soil.
 - c) **Physiographic:-** A) hilly area : - soil binder & deep rooted.
B) plain area
- 2) **Purpose of plantation:** - on the basis of our demand we can plant plantation in our field.
 - a) **Industrial need:** - on the basis of our industrial need we raise plant. For example:
 - for bat industries you can plant straight grain and had wood.
 - For the paper wood industries require more cellulosic fiber earned plant.
 - b) **Social need:** - for which purpose you want to raise plant plantation.
 - A) **Grazing**
 - B) **Browsing**
 - C) **Fuel wood**
 - D) **Esthetic value etc.**
- 3) **Biotic:** - grazing browsing fire also affect.

- c) **environmental protection:** -
- d) **land use needs**
- 3) **Silvicultural factors:** - what are the requirements of your plant.
 - a) **Ecological requirement:** - every species have their own ecological requirement and the site must be able to fulfill them
 - b) **Silviculture system:-** which type of the silvicultural system applied in the area.
 - 1) Shelter wood.
 - 2) Clear felling.
 - 3) Strip line system etc
 - c) **Effect of species on site:** - which type of effect given by the tree in the site.
 - 1) **Allelopathy effect** –eucalyptus, bamboo.
 - 2) **Shade effect** - Banyan tree
 - d) **Rate of growth:** -
 - 1) Fast growth of the tree (early)
 - 2) Slow growth of the tree (late)
 - e) **Resistance to insect pest and disease**
 - f) **Ease of establishment**
- 4) **Economic factor**
 - a) **Relative cost of return.**
 - b) **Demand and supply:-** higher demand means high return and less demand means less cost return
These all factors are either directly or indirectly affect the choice of species for the different types of the plantation.

Question 4. B) give the botanical name of five tree species suitable for the given site.

- a) Mountain temperate region.
- b) Ravines land.

Answer : - A) MOUNTAIN TEMPERATE REGION:-

- 1) *Pinus roxiburghii.*
- 2) *Salix alba*
- 3) *Pinus valluchaiana*
- 4) *Cedrus deodara*
- 5) *Picia smithiana*

B) REVINE LANDS :-

- 1) *Albizia lebbek,*
- 2) *Dalbergia sissoo,*
- 3) *Dendrocalamus strictus,*
- 4) *Pongamia glabra,*
- 5) *Acacia nilotica.*

Question 5. Define permanent nursery? Give advantages of raising nursery.

Ans. : - Nursery is an area where plants are raised for the eventual planting out. Has ordinarily both seedling and transplants obtained from seed sowing.

Seedling is the young plant obtained from the seed sowing.

This plant can be one meter in height.

Permanent Nursery: It is a nursery that is maintained for supplying nursery plants for a long time on a permanent basis. It is intended to meet the requirements of one or more ranges and it is relatively larger in extent.

- Main features
 - Fit for large and intensive work and intensively managed
 - Established where as all the facilities are available, i.e., easy supervision, communication facilities, labours, etc.
 - Intensive Manuring and soil working are done in perpetuity
 - Used for large scale a forestation works, or distribution to the villagers
 -
 - under community and private forestry programme.
 - A large labour forces, tools and equipments are available
 - Original cost of formation is high but is cheaper in the long run
 - Regular skilled supervision is done
- Advantages
 - Varieties of planting stocks supply; such as root- shoot cuttings, grafted plants, layering, budding, polypot seedlings, etc.
 - Duration of service life is long and production cost is reasonable.
 - Meet the requirement of more ranges.
 - Supervision cost is low and can be easily supervised.
 - Easy transport of nursery stocks due to nearness of roads.
 - Plants are raised year after year for a long time on same site.
- Disadvantage
 - Transportation of seedlings is difficult and costlier.
 - Establishment cost is high.
 - Mannuring of beds annually & intensive soil working is essential.
 - Requires large labour forces throughout the year which is difficult to available in agricultural seasons.

Advantages of raising nursery: -

- 1) To produce healthy / vigorous plant for plantation : -
- 2) To produce disease free plant for plantation
- 3) To introduce exotic species
- 4) To produce desired plant for industries, or home manufacturing
- 5) To provide a suitable habitat for newly expose(germinated) seedling
- 6) Every year each plant don't produce seed
- 7) Some seed never germinate without gating favourable condition.

Question 6. Calculate the quantity of seed required to be sown in nursery bed?

- 1) The weight of *dandrocalamus strictus* seed per kg is 35000 with 15 % plant percent.

ANS. Formula for calculation of seed requirement

$$\text{Seed requirement (W)} = \frac{A \times D}{P \times N}$$

HERE,

A = Area of the bed in square meter

D= no. of the plant require in per square meter

P = plant %

N = no. of seed in per gram

$$A = 10 \text{ M}^2$$

$$D = 10 \times 10 = 100. \text{ seedling}$$

$$P = 15 \%$$

$$N = 35000/1000 = 35 \text{ seed / gram}$$

$$W = \frac{10 \times 100}{15 \times 35} = 1.90 \text{ gram seeds require}$$

- 2) The weight of *gmelina arborea* seed per kg is 9800 with 40 % plant percent.

ANs. 2) . Formula for calculation of seed requirement

$$\text{Seed requirement (W)} = \frac{A \times D}{P \times N}$$

HERE,

A = Area of the bed in square meter

D= no. of the plant require in per square meter

P = plant %

N = no. of seed in per gram

$$A = 10 M^2$$

$$D = 10 \times 10 = 100. \text{ seedlings}$$

$$P = 40 \%$$

$$N = 9800/1000 = 9.8 \text{ seed / gram}$$

$$W = \underline{\underline{10 \times 100 / 40 \times 9.8 = 10000 / 392 = 25.51 \text{ gram seeds require}}}$$

Question 7. What are the different methods of planting? Discuss the general rule of planting?

Answer: Planting is an operation through which plants are set in the ground or land surface.

There are following methods of planting applied in plantation operation

A) Entire planting:

- 1) Naked root
- 2) With root covered (soil)
 - a) Ball planting
 - b) Brick planting
 - c) Container planting
 - 1) Dona
 - 2) Mosses
 - 3) Basket
 - 4) Tubes
 - 5) Earthen pots
 - 6) Polythene begs

B) Stump planting

C) Branch planting

A) ENTIRE PLANTING: - in this type of planting entire plants are set in the ground or land surface.

- 1) **Necked root planting:** - seedling plants are taken out when monsoon has set in well.

Plants are kept in shade.

To reduce the transpiration loss leaves few leading shoot rest of all leaves remove from sample.

Technique: - in a pit seedling plant should be in center the color should be kept about 10 cm above the ground level/surface.

Condition: - if you need more amount of the seedling for plantation you can start removal of seedling from the bed after afternoon. And if you need less amount seedling for the plantation you can start as you want/desire.

B) **With root cover:** - in this type of planting entire plants are set in the ground or land surface. But their roots are covered with the some media like Polly begs, soil, or with some container.

a) **Ball planting:** - ball planting require for those species which one cannot tolerate sudden impact of the of root expose.

Condition: - roots are always covered with the soil. And plants are planted in ground with this soil covered ball.

b) **Brick planting:** - in the planting bricks seeds are germinated and seedling plants are raised in the ground with the this bricks generally the size of bricks 10x20x25, 10x15x20, 10x15x15 are recommended. Here 2 cm hole are made on surface for seed germination.

Condition: - bricks may be break during transportation. It should be transport carefully.

c) **Container planting:** - there is some container use for the planting of the seedling.

1) **Dona:** - in this type of the plantation plants are grow in the leaves and plant in the plantation site mostly in forest *bauhia vahlii* leaves use for plantation

2) **Basket:** - generally baskets are made with the bamboo stick where plants are grown.

3) **Tubes:** - generally the bark of tree use for the plant grown and plantation purpose.

4) **Polly begs:** - 10x10 cm, 10x15 cm, 10x20 cm etc found in the market as you want you can take for the plantation purpose. All of above this type of the method is cheapest and mostly recommended for the plantation.

2) **Stump planting:** - generally this is called root shoot planting. Where some part of the root and some part of the shoot taken and plant in the field.

Condition: - there are some limitations in root shoot plantation.

Shoot should be 5-7 cm & root should be 10 -15 cm or more may be

This stump should be leafless. And covered with the gunny begs before planting otherwise the sprouting may be affected by environmental condition.

3) **Brach planting** :- there are some plants find in the nature those who can make the entire plant by the branch and some artificial method also recommended for the branch planting in a artificial method of branch planting we can use some hormone like IAA,IBA,AG3 etc,

Following are some general rules / patterns are applied in the plantation site for the plantation.

1) Rectangle planting

- 2) Square planting
- 3) Triangular planting
- 4) Quincunx plantation

1) Rectangle planting: - in line planting plants are planted at the same spacing in line which are same distance apart thus the planted plant form rectangles.

Formula for calculating the plant: - no of hectare / distance (p x plant x row x row)

2) Square planting: - planting in square pattern i.e. with plants occupying the four corner of each successive square. This is achieved by planting plants in the lines at the same spacing as that of the lines themselves.

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3) Triangular planting: - planting in the pattern of equilateral triangle i.e. the plant occupy tree corner of each adjacent equilateral triangle.

Formula for calculating the plant: - no of hectare x 1.15/ distance (p x plant x row x row)

4) Quincunx plantation: - in which an extra plants is placed in the center of each square of four plants.

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