Hornbill Classes

HORNBILL CLASSES

Forestry Optional

IFoS | 2023 | Main Test Series | Test Paper 2

Name of candidate	PATOLIYA RAJ BHIKHUBHAI
Date	17/10/23
Contact NO	7203956166

Index Table		
QN	Maximum Marks	Obtain marks
1 (a)	8	5.5
1 (b)	8	5
1 (c)	8	4
1 (d)	8	4.5
1 (e)	8	4
2 (a)	~~15~~ 10	5.5
2 (b)	~~15~~ 10	5
2 (c)	~~10~~ 20	11.5
3 (a)	~~20~~ 15	8.5
3 (b)	10	5
3 (c)	~~10~~ 15	9.5
4 (a)	15	
4 (b)	10	
4 (c)	10	
5 (a)	8	5
5 (b)	8	5
5 (c)	8	5
5 (d)	8	5
5 (e)	8	4
6 (a)	15	
6 (b)	15	
6 (c)	10	
7 (a)	15	8
7 (b)	15	8.5
7 (c)	10	6
8 (a)	15	
8 (b)	15	
8 (c)	10	

114
200

EVALUATION INDICATORS

HORNBILL CLASSES

1. Answer the following [8 × 5 = 40]

(a) Explain Allelopathy and its type with suitable examples (8 Marks)

Release of certain chemical or secondary nutrient (i.e Mimosine) which hampers the growth of other vegetation.

G, Mg, S, etc.

it's "secondary metabolites" and not Nutrients

good !!

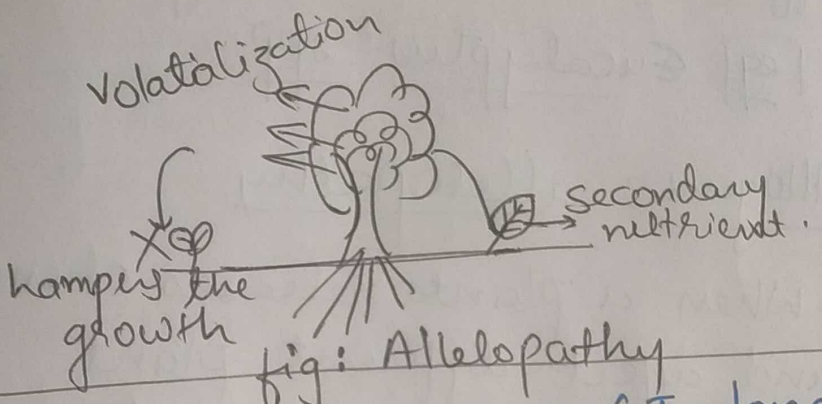


fig: Allelopathy

5.5

eg Juglance regia (Juglone chemical)

Eucalyptus spp.

Benefits → check weed growth

→ Reduce the competition of nutrient, light, moisture.

→ check the invasion of other species.

Types of Allelopathy

1. **Autogenic allelopathy**
   → When growth of own species is hamper or hinders, then such effect is called autogenic
   eg Eucalyptus spp.

2. **Allogenic allelopathy**
   → When a plants releases chemical and affect different plant species, then it is called allogenic allelopathy.
   eg Juglance regia

3. **True allelopathy**
   → Directly release of chemical affect the growth.

4. **Secondary allelopathy**
   → Decomposition of leaf releases chemical which affect growth of plant.

(b) How does Shifting cultivation support food security and community livelihood of the Naga tribe (8 Marks)

In india, total 8400 km^2 area is under shifting cultivation. Naga tribe depends on shifting cultivation for livelihood and food security. It is also called as "Jhum cultivation"

= Food.

Shifting cultivation supports food security

(i) Burning of area will increse the productivity of site, due to nutrient (plant burning), hence more food production *

(ii) provide space for growing crops for 3-5 years.

(iii) Also support Animal husbandry as pastoral and grazing field is available.

5

(iv) Wide range of growth of species, due to good soil fertility.

[Animal husbandry + Minor forest produce + food crop]

Shifting cultivation and community livelihood

(1) Naga tribe collect minor forest produce developed in that area.

(2) NO input cost in the production of the forest crop

(3) Subsestance based farming

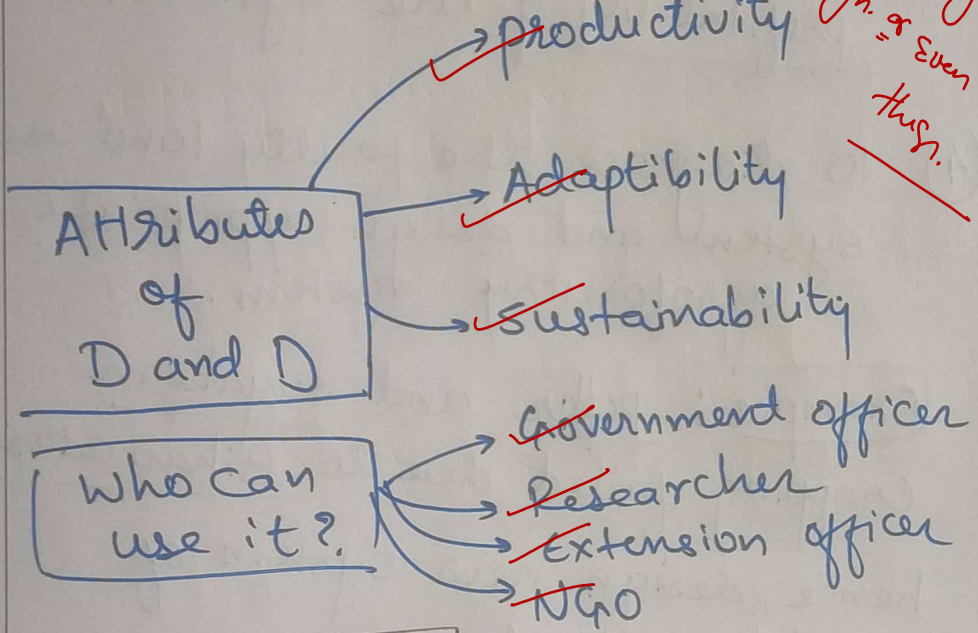
(4) periodic market for selling the produce of forest → hence increse in community livelihood.

(c) Explain D & D and its role in Agroforestry (8 Marks)

Diagnostic and design is a technique in which diagnostic of faulty land management system and design of agroforestry system.

4

Diagnose the problems & challenges in the current ongoing agroforestry system and improve it's design. or even changed it to overcome them.



Steps

prediagnostic
↓
diagnostic
↓
design → Implementation

Repetation.

Role in agroforestry

1. Increse the productivity of the agroforestry.
2. Increse the Adaptibility of the agroforestry system.
3. Increse the sustainability and profitability of the system.
4. To diagnose the faulty land use system and design appropriate agroforestry system.

Example: Poplar (Close spacing band (1m x 3m)) and soyabean cropping failed due to Bihari catterpillar hence, design new system of poplar - wheat (3m x 4m)

5. Help to increse the income and livelihood for the farmer.

(d) Explain the role of tribals in the conservation of forest wealth (8 Marks)

In india, according to 2011 census 10.4 crore tribal people reside i.e 8.6% of total population.

4.5

Role of tribal in Conservation of forest wealth

(1) Tribals have "TOTEM", hence they are sacred to them, therefore Protection of it.

Munda	Tamarind tree
Oraon	Monkey

(2) Tribal considered trees and forest as the "sacred grooves".

(eg) Khasi tribe.

(3) participation of tribal in joint forest Management for conservation of forest wealth.

(iv) Tribals have certain kind of taboo, hence protection of tree species.
(eg) Urination under Mango tree is bad ⇒ hence protection of mango tree.

(v) Tribals livelihood depends on the forest wealth hence they conserve it sustainably.

(vi) Tribal plays an important role to provide information to forest department regarding illegal timber cutting.

(vii) plays important role in forest management.
(eg) Taungya system – village taungya.
– Forest fire Management.
– Control of shifting cultivation.

(e) Enumerate and discuss the factors responsible for restricting tribal population in the forest areas (8 Marks)

One of the common feature of tribal population is that they are living in inaccessible forest area.

(4)

Factors responsible for restricting tribal population

① Social factor → Strong kinship and endogamous marraige system.

→ Belief in 'Totem' system and 'taboo' linked with forest & wild life.

② Economic factor → livelihood opportunity in the forest area.

→ Availability of Minor forest produce.

→ shifting cultivation and Taungya system.

Excellent but not in the spelling Nature

Political factor
- Implementation of forest rights Act, 2006
- Joint forest management.
- Political representation by reservation.

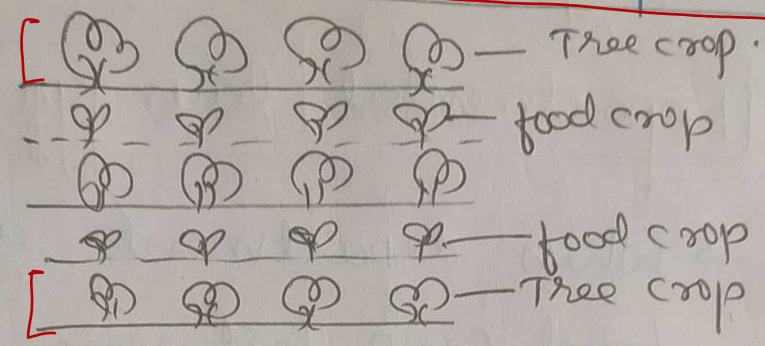
Other factor affecting them

1. Outside forest area prefer specialization of jobs.
2. Illiteracy affect them to travel outside.
3. Technological progression outside the forest area hinders their movement.

Hence, these are the factor for restricting tribal population in the forest area.

2 (a) : Taungya cultivation is a type of traditional agroforestry system. Explain with suitable diagrams and examples. (10 Marks)

Taungya Cultivation is defined as growing food crops in between the tree crops.



use different Color pen.

Food.

fig: Taungya

How Taungya is traditional agroforestry system?

(i) Alternate row of food crop is grown between Tree crop.

(ii) Dual crop on the same unit of land.

(iii) Check the weed growth.

(iv) Incresed in the productivity and income of the farmer.

Taungya is a more systematic, organized, and environmentally sound alternative to the traditional practice of shifting cultivation that has been followed for generations. Its design shares similarities with the shifting cultivation system in several aspects.

Now start writing its properties comparing with Shifting cultivation

(v) Help in the fertilizer and pesticide to the tree crop when given to plant crop.

Types of Taungya

(1) Departmental Taungya

→ When department grow the food crop between the Tree crop, then departmental taungya.

(2) leased taungya

→ When department give on lease to tribal people for food crop growth, then it is called leased taungya.

(3) Village taungya

→ Each individual of village is given around 0.8 hectare to 1.7 hectare for 3-5 year. for cultivation of forest crop. then it is called village taungya.

2 (b) How does social forestry promote sustainable livelihood to the village community? (10 Marks)

5

Cultivating tree crops outside traditional forest area by the people is called social forestry.

Social forestry promote sustainable livelihood to village community

sustainable livelihood means a more diverse production system with ensures long-term well-being and economic stability for individuals and communities. This approach involves incorporating various income-generating endeavours, such as agriculture, livestock rearing, cottage industries, and other forms of enterprise, to create a resilient and balanced economic foundation.

Here Social Forestry -

(i) It provides fuel, fodder, fiber from the forest. (Green manure)
(eg) Gliricidia sepium (Multipurpose tree species) at the farm forestry.

(ii) Helps in collecting 'minor forest produce'.
(eg) Caeselpinea sapan (dye)
Butea monosperma (Bengal Kino)
Diaspyrous melanoxylon (Tendu Bidi)

(iii) Help in finding the employment opportunity around 300-500 days under MGNREGA.

(i.e) MISHTI scheme → Coastal plantation.
Recreation forestry

(iv) production of honey in the sundarban region.
(eg) Bonphool honey through social forestry.

(v) Restoration of the degraded land and help in incrse the soil fertility and incrse in ground water table.
(eg) "Sukhomajiri" in Uttarakhand through watershed ⇒ social forestry as keypillar.

Haryana. Chandigarh. Shivalik foothills

(vi) Help to increse economic status by incresing income.

(eg) Arabari village

⇓

10 lakh investment for 15 years yielded ⇒ 1.02 crore in teak plantation.

Hence, social forestry plays an important role in promoting sustainable livelihood to the village community.

2 (c) Define Agroforestry. Describe the role of Agroforestry in relation to nutrient availability and soil water conservation (20 Marks)

Agroforestry is defined as sustainable land use system of growing food crop, tree crop and animal rearing on same unit of land either on same time or different time.

Excellent

According to the Nair, 1987 it is classified based on following factor,

(i) Structural
(ii) functional
(iii) Socio-~~ecological~~ economic
(iv) ~~Economic~~ Ecological.

Some agroforestry system

- Alley cropping
- Agua forestry
- Taungya.
- Silvi-apiary culture
- Wind break
- shelter break
- protein bank

Role of agroforestry in nutrient availability

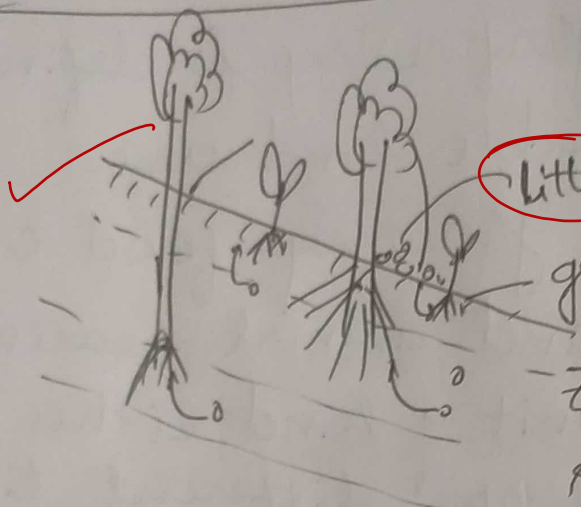


fig: Nutrient recycling

(i) Fixing the nitrogen, when leguminoceae family species is planted. (eg) protein bank

(ii) Mycorhizza provides phosphorus to the plant. (80-90% phosphorous in mycorhizza).

(iii) Closed and leaky system of nutrient recycling.

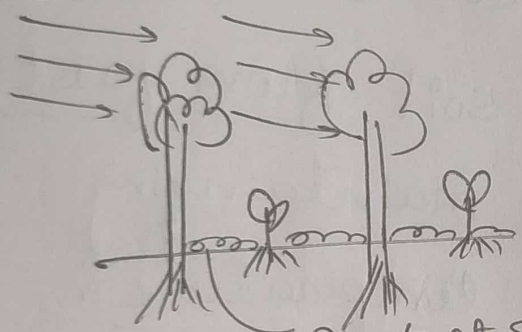
(iv) providing fertilizer or green manure to lower plants.

(eg) Gliricidia sepium

(v) Helps food crops for proper availability of micro and macro nutrient.

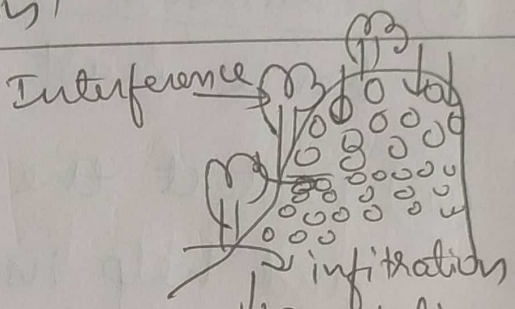
(vi) decomposition of leaf litter act as the source of fertilizer.

Role of agroforestry in water-soil conservation



protect soil

fig: soil conservation.



water

fig: conservation

(i) Agro forestry conserve soil from splash or water erosion at extreme rainfall.

(ii) protect soil by conserving the macro and micro nutrient by covering with litter..
(soil organic carbon)

(iii) Agroforestry helps in increasing the infiltration rate of water and helps in ground water recharge.

(iv) Reduce the evaporation of water and increase the interception of water by the tree crop.

(v) Reduction in the runoff and hence least soil erosion.

(vii) protect the soil from forest and help in maintaining ambient soil temperature.

(viii) Soil fertility will increase due to leaf litter content from tree crop.

Therefore above are the impact of agroforestry in nutrient availability and water-soil conservation.

3 (a) What is the basis for the choice of species in the Agro-forestry system linked with the Paper and pulp industry (15 Marks)

Choice of species in agroforestry system is done based on the usage such as timber, fodder, paper and pulp etc.

Basis for the choice of species in agro-forestry system linked with paper and pulp system

(i) High cellulosic content.
(eg) Poplar

(ii) Straight bole with no forking.

(iii) Natural pruning ability.

(iv) Good coppicer ability.

(v) low rotation period for faster growth.

(vi) Availability of Research and development of advanced countries. (eg) Eucalyptus, poplar

G.S

(vii) Resistance to insect-pest attack.

(viii) Should not affect growth of food crop.
(eg) poplar + wheat
Alley cropping.

(ix) Medium crown and height of 10-12 m.

(x) Multipurpose tree species

(xi) Nitrogen fixing quality

(xii) low density timber

(xiii) Softwood rather than hardwood.

(xiv) Availability of cutting and grafting

(xv) High quality timber

(xvi) Tap root system.

(xvii) Should survive the locality factor acting on it.

Hence, above are the basis on which agro-forestry system linked with paper and pulp industry should be selected.

3 (b) What are MPTs and Enumerate their benefits with suitable examples — 10 Marks

5.

Multipurpose tree species is defined as providing multiple production and ecosystem services at same time or different time.

- One species provide multiple service.
  - (eg) Gliricidia sepium
- When one species is maintained differently provide different service.
  - (eg) Leucaena leucocephala

Benefits of MPTs

(1) Increse the productivity of the farm and hence income of the farmer.

(eg) Ailanthus excelsa → fuelwood, fodder, Timber.

② provide livelihood services to the farmer and help in the growth of the forest crop.

eg Acacia nilotica } → Nitrogen fixing
Prosopis cineraria } → fuel, fodder
→ protein bank.

③ Ecosystem services

eg Avicennia marina } → Minor forest produce
Sonneratia alba } → protect against Tsunami

Avicennia → coastal stabilization
Sonneratia → carbon sequestration (Blue carbon)

④ Production services

→ Production services such as food, fodder, fuel, paper & pulp, fiber etc

eg Populus deltoids
Eucalyptus spp.

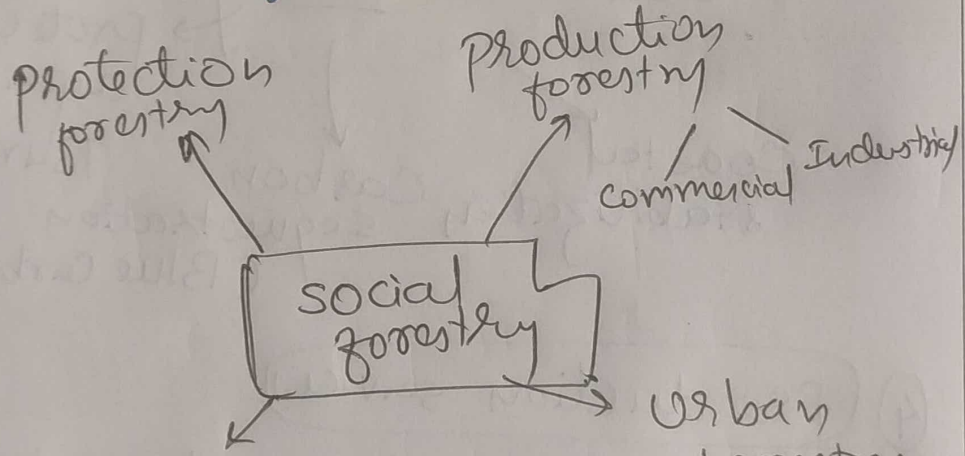
3 (c) What is social forestry? Write about the objectives and management difficulties of urban forestry

15 Marks

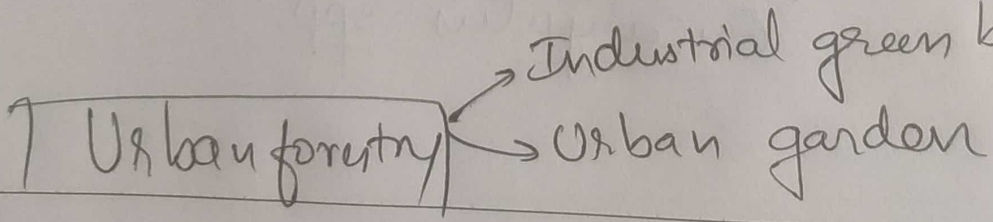
Q.5

Social forestry is defined as growing trees outside the traditional forest area by the people, for the people, on the common land

According to, National Commission on agriculture 1976, it is classifed as,



→ Farm forestry
→ Aesthetic forestry
→ forestry on degraded land.



Objectives of Urban forestry

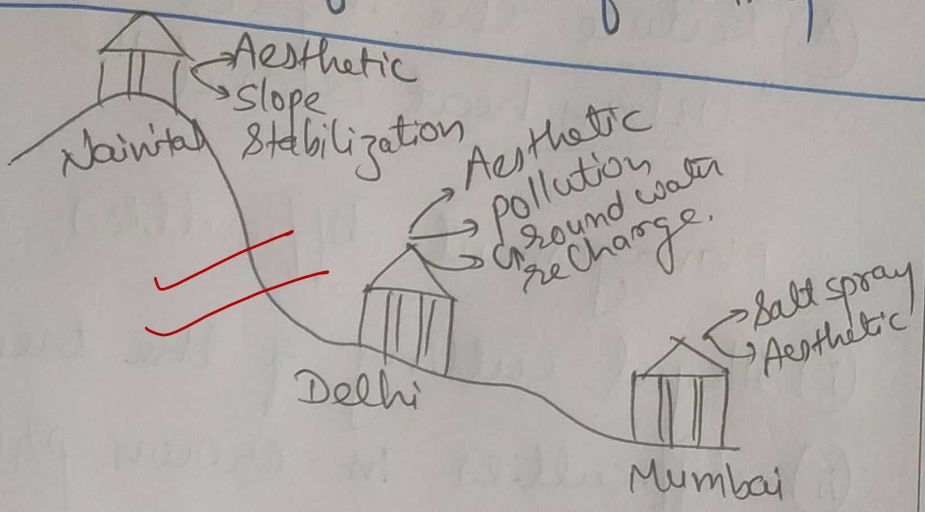


fig: objectives of urban forestry.

(i) Ground water recharge
(ii) Reduce the effect of air and noise pollution.
(iii) Carbon sequestration.
(iv) Reduce the impact of wind and frost and create microclimate.
(v) Aesthetic purpose
(vi) provide support to biodiversity
(vii) provide food, fodder and fuel.
(viii) Stabilization of slope.
(ix) ~~Aesthetic~~ Against Salt spray.

(x) Reduce the impact of "Urban heat island" 11.

Management difficulties

(i) Illegal culling of the trees.

(ii) difficulties in crown pruning

(iii) lack of citizen participation

(iv) Very less or no maintanence of plantation

(i·2) water availability or cage plantation (due to biotic factor)

(vi) Insect and pest attack

(vii) Invasive allien species

(eg) prosopic juliflora in Banglore.

5. Answer the following [8 × 5 = 40]

(a) Discuss the role of forests in carbon sequestration

8 Marks

Capturing and storing of carbon either in geological site or natural forest is called carbon sequestration.

5

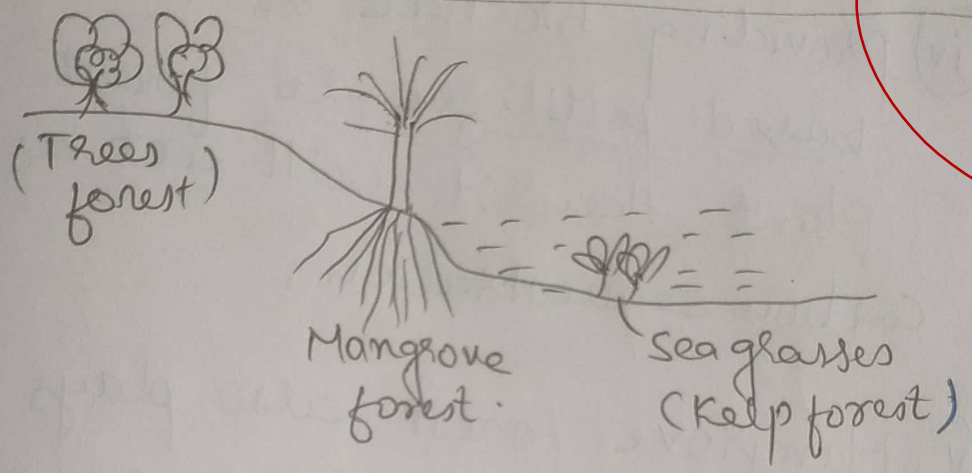


fig: Carbon sequestration by forest.

(i) Kelp forest beneath the ocean surface capture and store carbon. (Blue carbon).

(ii) Carbon dioxide act as the source of fertilization for the growth. hence forest stores Carbon dioxide in terms of Carbon fertilization.

(iii) Forest absorb CO_2 and releases oxygen during photo-synthesis process. Hence carbon sequestration in the wood of the tree.

(iv) providing biochar or Carbon based fertilizer to forest plant, then it will act as carbon sequestration.

(v) Mangrove forest also plays an important role in carbon sequestration.

These forest after million of years will transform into coal and oil. Therefore forest help in carbon sequestration.

5 (b) Discuss the Biogeographical zones of India

8 Marks

Biogeographical zones is defined as an area which uniform climatic, biotic factors. In india total 10 (ten) biogeographical zones are there.

5

good.

use "stencil" for map drawing.

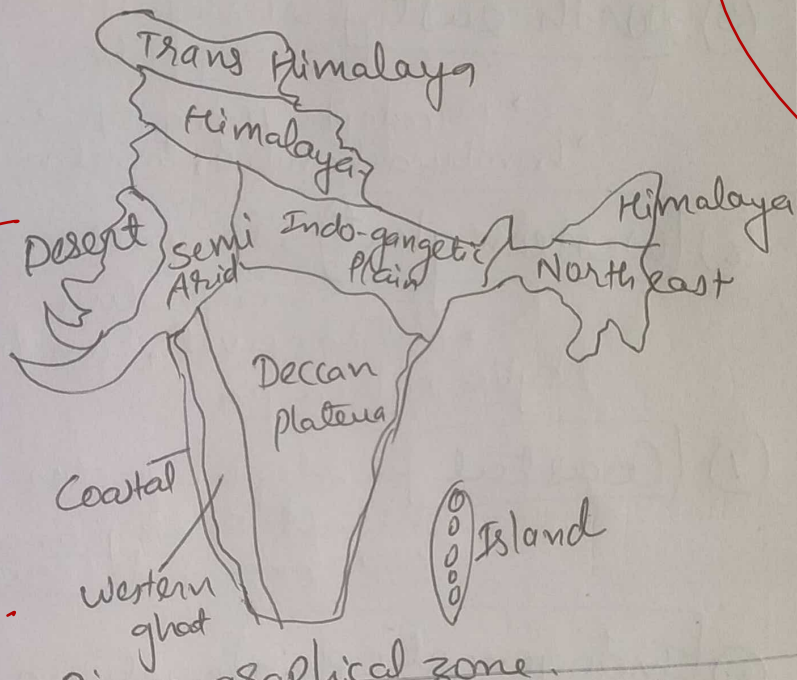


fig: Biogeographical zone.

(i) Trans-himalaya → extreme climatic, edaphic factor
→ Snow leopard.
→ Hippophae Rhamnoids (seabuck thorn)
(Cold desert) 'ladakh'

(ii) Himalaya: → lahaul-spiti, Kinnaur
→ climatic → low rainfall
→ Extreme temperature
→ Salix alba
→ pinus gerardiana
→ Himalayan brown bear, Kashmiri stag.

③ Desert → Temperature - 10°-48°C
→ Rainfall - 30-50 cm.
→ Wild ass, great indian bustard
→ Opuntia, Crassulaceae family.

④ Semi-arid → Area - gujarat, Rajasthan, M.P, Haryana etc.
→ chinkara, black buck, black bear
→ Acacia nilotica, Albizzia lebbeck, prosopis cineraria

⑤ North east → Rainfall - 200-300 cm
→ temperature - 30-40°C
→ Namdapha flying squirrel, Barking deer.
→ bambusa bamboo, tomelina arborea, Teak

⑥ Western ghat → Rainfall - 250-350°C
→ temperature - 30-40°C
→ Malabar civet, Lion tailed Macaque
→ Xylia xylocarpa.

⑦ Coastal → Edaphic factor such as salt spray and Tsunami
→ Casuarina and Cocos nucifera.

⑧ Indogangetic plain → alluvial soil with moderate rainfall
→ Elephant, tiger, Rhino.

⑨ Deccan platera → Black cotton soil.
→ chinkara, hornbill
→ Acacia nilotica, Pterocarpus Santalinum

⑩ Island → Andamaman and nicobar Island
→ Dugong, Crocodile

5 (c) : What is progeny testing? Why is it important for tree breeders — 8 Marks

5

Evaluation of parents based on the performance of the progeny.

→ It is also known as 'vilmorin isolation principle'.

good.

Two types of progeny testing
- → Half sib progeny testing
- → full sib progeny testing.

Half sib

→ When only one parents is known.

procedure → seeds are collected from the plant and evaluation of progeny is done.

→ only GCA (general combining activity)

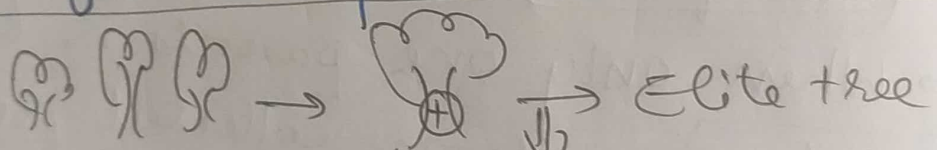
full sib

→ When both the parents is know.

→ help in knowing SCA (specific combining activity).

Importance for tree breeder

1. Help in understanding the genetic gain.
2. Help in calculation of GCA (general combining activity) and SCA (specific combining activity).
3. Genetic superior seed production for breeding purpose.
4. Selection of the Elite tree from the plus tree.



5. Help to study the tree species at individual level.
6. Help in finding genetically supriar tree.

5 (d) : Write down the specific problems that we faced during afforestation works in coastal areas | 8 Marks

India have 7500 km long coastal boundary. During afforestation in coastal area we faced many problem.

Specific problem during afforestation in coastal area.

5

(i) Frequent Salt spray in an area.

(ii) Frequent Cyclone and waves

(iii) Unavailability of nutrient due to waterlogging condition.

(iv) Strong wind around 100 km/hr or more.

(v) Anaerobic condition for the roots.

(vi) Due to tidal effect, chance of failure of plantation.

(vii) Extreme temperature and moisture availability.

(viii) Biotic factor, such as release of perticide and insecticide from "prawn cultivation"

Solution

(1) plantation technique → Sunken bed method
→ Block plantation.

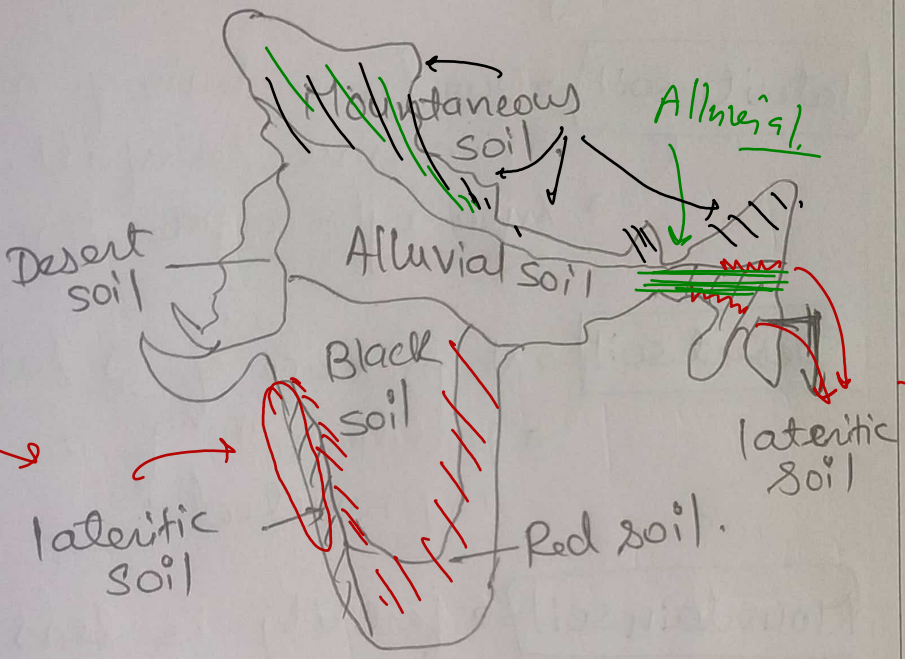
(2) Appropriate choosing of species → Casuarina equisetifolia
→ Avicennia marina

(3) peoples ~~plant~~ participation in the afforestation programe.

Government scheme
(1) MISHTI scheme
(2) Gujarat government scheme of mangrove plantation with peoples participation

5 (e) : Draw a map of various soil types in India — 8 Marks

Various types of soil are found in india.



draw it properly.

use stencil

fig: Types of soil

Alluvial soil
- Khadar, Bangar
- fertile deposite of river.
- Rich in nitrogen.
- 42% of total soil.

Red soil
- Important for food security
- Also used for brick industry.
- Presence of Fe (Iron).

Black soil → Regur soil
→ cotton cultivation
→ Montmorellonite mineral
→ large crack during drying of soil

laterite soil → Due to leaching of mineral
→ Excessive rainfall.
→ Xylia xylocarpa dominant

Desert soil → No presence of O layer
→ fertile soil if irrigation is provided.

Mountain soil → fertility is less
→ high humus content (Acidic).
→ Salix alba, pinus gerardiana.

Dokuchaiv also classified soil such as,

1. Zonal – Mountain soil, lateritic soil.
2. Interzonal – Bog soil.
3. Azonal – Alluvial soil

7 (a) : Define variation, its causes, and types with suitable examples — 15 Marks

Variability between the individual of same species, it is termed as Variation.

eg ⇒ Every individual have different hair colour and shape.

8

Causes of Variation

(i) Variation is caused by change in environmental condition, such type is called phenotypic variation.

(ii) Sometime due to change in genetic structure variation is observed such is called genotypic variation.

Types of Variation

- Phenotypic
- Genotypic
  - Dominance Variance
  - Additive variance
  - Epistasis Variance

Phenotypic variation

→ Variation due to combination of genetic and environmental condition.

→ It does not passes through the generation.

→ It is type of addaptive mechanism by the individual against the environmental condition.

Examples:

Environmental + genetic

Food.

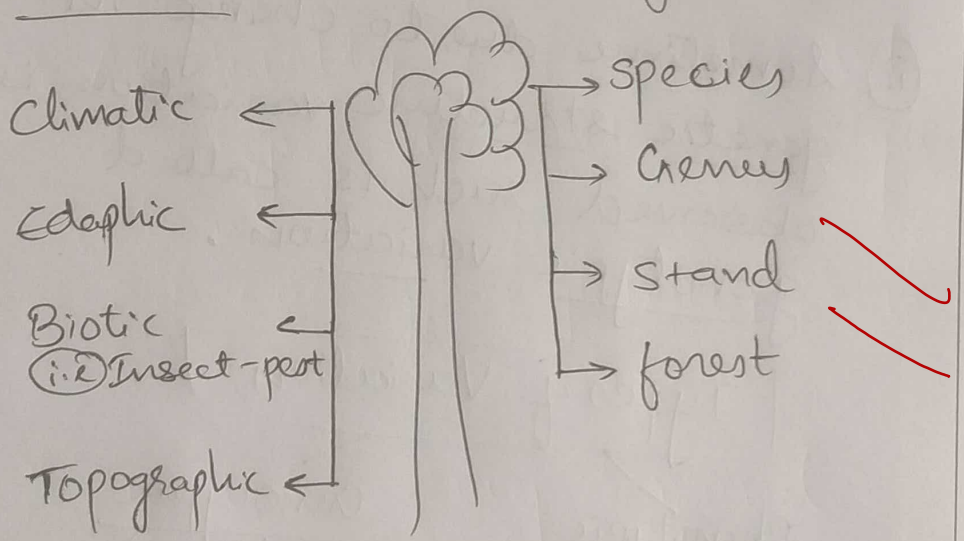


fig: phenotypic

Genotypic Variation

→ Variation due to change in genetic structure of an individual.

→ It ~~changes~~ transfer from one generation to other.

Types → Additive variance

→ Non-additive variance

① Additive variance

→ Difference between AA and aa allele

→ responsible for transgression of gene.

→ Homozygosity.

② Dominance variance

→ Difference between AA aa from Aa.

→ Responsible for Heterosis

→ Heterozygosity.

③ Epistasis

7 (b) : Discuss the reasons for the widespread use of exotics for plantations and the specific advantages of exotics over native species

15 Marks

8.5

Exotics is defined as species of foreign origin when planted in other nation.

Reason for widespread use of exotics for plantations

(1) low rotation period of the species.

(eg) poplar rotation period of 10-15 years.

(2) Availability of Research and development of the foreign nation.

(eg) Eucalyptus globulus from australia

(3) Due to incresing demand at commercial and industrial level.

④ High quality timber with straight bole, natural pruning ability
eg) Populus deltoides

⑤ Resistance to insect-pest attack.

⑥ Wide availability of the choice of species.

⑦ Unique quality of the exotic.
eg) Casuarina equisetifolia
↳ coastal plantation.

Advantage of exotics over native

① Faster growth and hence more income in less time.

② Resistance to the native insect-pest attack.

(iii) Faster production ⇒ reduction in the demand.

(iv) less stress on the existing native species.

(v) No need for various breeding improvement programe.

Some issue

(1) Not completely free from insect pest attack.
(eg) pink disease in Eucalyptus.

(2) Harmfull to human health
(eg) poplar → pollen.
prosopis juliflora – obnoxious.

(3) less ecological importance.

7 (c) : What are the unique requirements for tree improvement for the development of climatically resilient forests | 10 Marks

6

Tree improvement is defined as developing genetically and phenotypically superior tree based on silviculture, tree breading and forest management

Unique requirement for tree improvement for development of climatically resilient forest

fast-growing → more Carbon

(1) provenance of the candidate tree should be climatically resilient.

(2) Seeds should be developed in Tissue culture, which will provide protection against climate change.

(3) Clone should be hardening off in the forest nursery.

④ Tree should bear wide range of climatic and edaphic factor.

eg) climatic → High temperature
→ High rainfall

Edaphic → Anaerobic condition
→ high soil temperature

⑤ The climate should have minimal impact on the phenology of the tree.

eg) flowering
fruiting.

⑥ progeny developed under clonal seed orchard, should also be climatically resilient.

⑦ Availability of tissue culture and soma-clonal and somatic hybridization.