

(Please do not write anything except the question number in this space)
कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

UPSC

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SHASHANK BHARDWAJ

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1. a

Allelopathy: It is a mechanism of interaction of frus' body parts like leaves, bark etc with the associated or nearby species.

↗ @.g Eucalyptus releases acids in soils from its leaves.

Types

- 1) Autogenic allelopathy - It involves impact of leaves or bark of a tree species on their own growth or development.
- 2) Allogenic allelopathy - It involves impact on other trees or crops species.

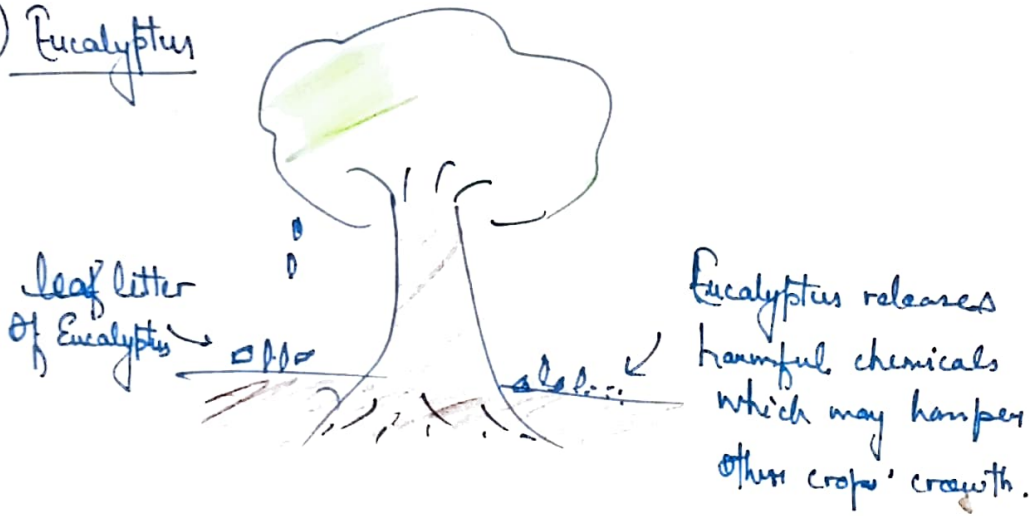
Also, it can be categorised based on whether leaf litter influences or interacts ^{directly} with soil composition or its metabolites (decomposition.)

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Examples

① Eucalyptus



② Neem - Neem's medicinal properties can be used as biopesticide.
(Azadirachta indica)

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(b) Shifting cultivation: It is a process of cultivation where trees are felled and burnt in an area followed by cultivation of agricultural crops. When soil loses its fertility, cultivators move to next place.

◦ It is known by different local names. In North-Eastern India, it is also known as 'Jhum cultivation'

Shifting cultivation Supporting Naga people

↳ Supporting food security:

1) It enables Naga people to cultivate arable crops on hilly or undulating terrain.

2) Burning of slash increases humus content of the soil.

3) It increases soil productivity in the short term.



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4) Enables them to grow local palatable crops which are nutritious, addressing malnutrition.

↳ Supporting Community livelihood

1) Due to increase in production and productivity of agricultural crops, they can utilise market channels through self-help groups.

2) further, repeated felling and burning has enabled Bamboo species to flourish in Naga people's habitations.

3) Bamboo production provides opportunity to facilitate local networks and handicrafts through Tribal e-haat festivals.

4) further, shifting cultivation can give them opportunity to explore more commercial species to grow.

Thus, shifting cultivation ensures fulfillment of SDG 1 (No poverty) and SDG 2 (Zero hunger) at the same time.



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(c) Agroforestry is a sustainable land-use systems where agricultural crops and tree crops are grown in the same area at the same time.

△ e.g. Poplar-wheat-soyabean agroforestry system in Terai region.

D & D

o D & D stands for design and diagnosis.

It is a methodology of diagnosis of agroforestry problems and design of solutions to address

the given problems.

o It involves different stages:-

↓
Macro level D & D

Here, we study and examine constraints, needs & objectives at large scale.

↓
Micro level D & D

Here, we try to find out the issues at local level.

Role of D&D in Agroforestry

- It enables a forester to find out the challenges in execution of agroforestry programmes according to prescribed procedure.
- It involves design creation, field testing and analysis of tests, enabling real-time problem solving approach.
- It provides alternative solutions to be adopted to enhance sustainability and productivity of the soil.
- A good D & D is flexible, easy to apply and adoptable in agroforestry system.

National agroforestry Policy 2014 also highlights the importance of research and development in Agroforestry.

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(d) Tribals are considered as 'cornerstone' of forest conservation programme.

Conservation of forest wealth is not just important for its tangible and intangible benefits, but also for international obligations like India's Nationally determined contributions.

Role of tribals in the conservation of forest wealth

(1) Preservation - Tribal community acts as 'first line of defence' against poachers and mafia. eg Jamuna Tudu's role in conservation in Jharkhand.

(2) Cultural aspect - Conservation of forest wealth is imbibed in culture of tribals.
eg Values like minimalism, need-based approach etc.

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(3) Religious factor - Sacred groves promotes trees' growth and biodiversity of the forest ecosystem. e.g. Kavu near Malabar Coast.

(4) Provisioning aspect - Tribals collect firewood, fodder etc from forest. Thus, they prevent forest fire vulnerability.

5) Also, in event of forest fire, they often act as 'first responder' to address the disaster.

Overall, tribals play key role in conservation of forest, directive principle enshrined in Article 48A of the Indian Constitution

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(e) Tribals' population constitutes around 8.6% of India's population. Though different tribal community has adopted mainstream developmental living, ~~for~~ many tribal community still lives ~~in~~ near forest areas.

Factors responsible for restricting Tribal population in the forest area

1) Some areas are considered inviolable and restricted for human interventions.

⚡ e.g. Critical tiger habitat (Core area of Tiger Reserve)

2) For protecting biodiversity and wildlife, some are ~~for~~ declared protected areas.

⚡ e.g. 'National Parks' declared under Wildlife Protection Act 1972.

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3) Also ~~in~~ during regeneration period, some forest areas are fenced to avoid conflict with respect to grazing, logging etc.

4) During land reclamation event, human interventions are restricted.

eg land reclamation effort in Chambal Ravines.

5) Some miscreants may exploit tribal youth to facilitate them poaching or illegal felling of timber.

Thus, for the purpose of conservation, preservation and protection of ~~the~~ forest

Wealth, tribal population are restricted in the forest area.

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3.(a)

Agro-forestry system is a sustainable land-use system that encourages simultaneous production of agricultural as well as tree crops.

△ e.g. Poplar-wheat system in Terai region.

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

- 1) low crown to bole diameter ratio so that lesser shade impact on growing crops.
- 2) Minimum branching and self-pruning capacity, to enhance timber quality and quantity.
- 3) Positive impact on soil, increasing its

texture and structure.

4) No negative allelopathic effects on growing crops.

5) Phenology of tree species should support sowing of agricultural crops.

△ eg Poplar shed their leaves in November, which is sowing time for wheat.

And new leaves of Poplar appear ~~at~~ in April, which is cultivating period of wheat.

6) Tree species should have more clean, ~~long~~ long bole to support paper and pulp industry. △ Trees growing near Jammu (Haryana).

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7) Bamboo culms should be solid inside.

e.g. Dendrocalamus strictus supporting BILT

Paper mill.

8) Growth rate should be faster and lesser

rotation period is preferred for Agroforestry

System linked with paper and pulp industry.



(b)

Multi-Purpose Trees - These trees are raised and grown for more than one purposes. Purposes can be tangible like ^{commercial} growing timber, as well as intangible like increasing soil aggregate structure.

E.g. Tamarindus indica (9mb) is ~~at~~ utilised for riverine afforestation as well as getting fruits for medicinal purposes.

Benefits

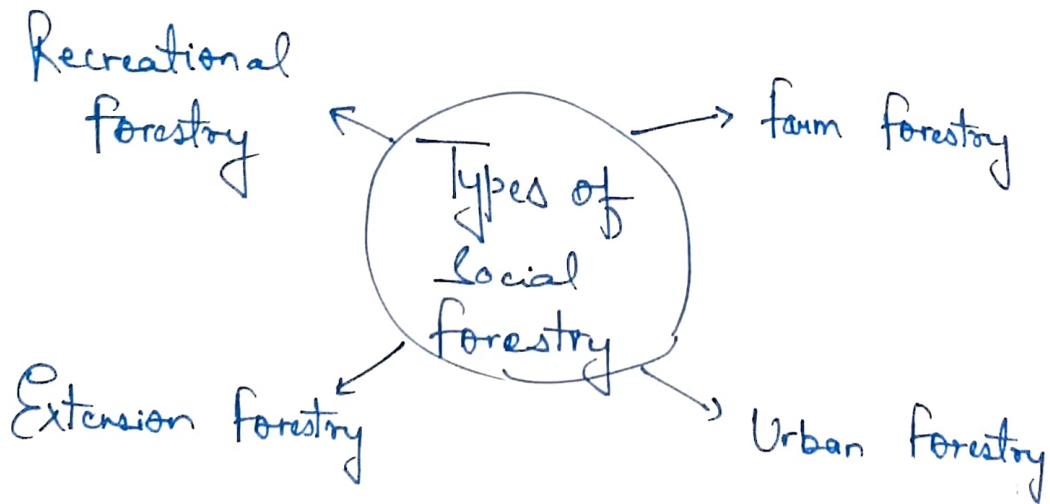
1) Protective role - E.g. Azadirachta indica (Neem) provides neem seed oil for neem coated urea production as well as for its medicinal properties.

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- 2) Improving soil structure - eg Mangifera indica (Mango) helps in breaking in hard pan through its root development.
- 3) Providing livelihood to locals through employment generation.
- 4) Provides regulating services. eg micro-climate regulation.
- 5) May act as cultural support to tribals.
eg Sacred groves like Jarnas.
- 6) Provides provisioning services like fuelwood, fodder, leaves for utilisation.
eg bidi leaves - Diospyros melanoxylon.

(c) Social forestry is the application of forestry practiced outside the conventional forest area.

- It may be described as forestry 'of the people, by the people and for the people'.



Objectives of Urban forestry

- Social forestry supports plantation in habitable regions. e.g. Home gardens in Kerala
- It helps in combating air pollution in urban areas. e.g. in Delhi NCR region.

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- It improves Standard of living and promotes quality lifestyle. eg urban parks.
- It provides shelter to wild flora and fauna outside traditional forests.
- It helps in fulfilling wood needs of the Country, thus decreasing pressure on forest area.
- It helps in fulfilling international obligations like REDD+ mechanism, UNCCD commitments of restoring 26 million hectare by 2030.

Management difficulties of urban forestry

- 1) High biotic pressure on urban land due to migration and alien flora establishment.

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- 2) less soil fertility and low land availability
- 3) High air pollutants presence settles on tree leaves.
- 4) Vulnerability of young saplings from roadside cattles.
- 5) less responsibility taken by locals. This can be substantiated by 'Tragedy of Commons' concept.

Way forward

- ✓ fencing of urban forest areas, especially at young stage.
- ✓ Motivating people and bringing behavioural change through organising 'Van Mahotsav'.

4(a)

Characteristics of the Tribal Economy

- 1) based on subsistence where need-based economic transaction is followed.
- 2) Somewhere, barter system of transaction can still be observed.
- 3) dependent on forest produce - eg lac, honey production.
- 4) Traditional Knowledge digital library facilitating ~~knowledge~~ knowledge of tribal community to disseminate further.
- 5) After absence of well-developed market channels are observed. However, TRIFED has promoted tribal products on different platforms.

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6) based on handicrafts and local artworks

e.g. Dhokra handicrafts; Bamboo based
baskets etc.

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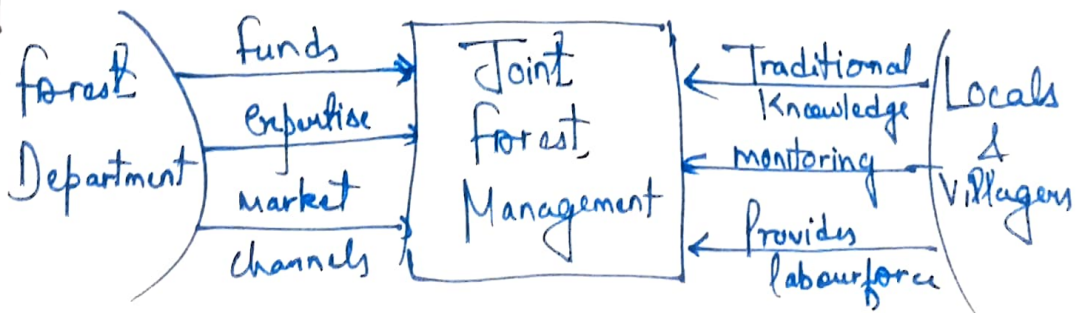
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(b) Joint Forest Management (JFM) is a management technique where forest department and locals together manages the forest stands.

Formation of Joint Forest Committees

JFM is formed by Government resolution where village level committee expresses its interest to work together with governmental efforts to manage forests.

Role in forest management

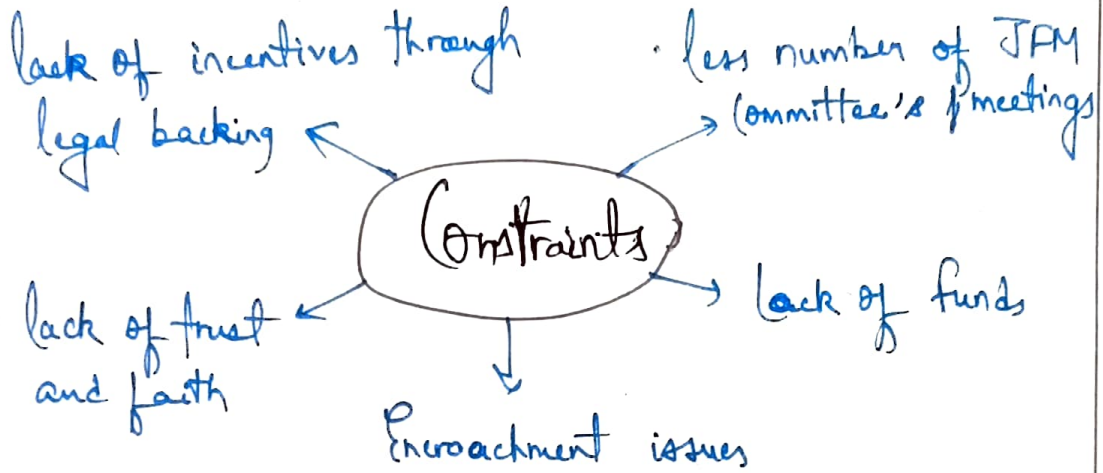


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- JFM improves management through constant local support in monitoring and surveillance in forest regeneration.
- locals act as 'first responder' in the event of 'forest fire' or illegal felling reporting.
- forest department provides market channels for local produce. eg Borplool Honey in Sundarban forest.
- Provides synergy between the Government and locals, tackling issues of poaching or illegal felling of trees.





Way forward

- Confidence building and trust establishment through Government's efforts to promote Tribal welfare.
- Access to funds to improve market channels of local's minor forest produce.

(C)

NGOs - Non-governmental organisations are organisation of people with similar objectives and similar processes to achieve them.

Role in wildlife conservation

1) Bringing awareness regarding wildlife conservation

eg International union of conservation of species (IUCN)

2) Bridge building between ~~Govt~~ Government and locals.

eg WWF-India

3) Consensus orientation of people to conserve and adopt sustainable practices.

eg Birdlife international

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4) Developmental aid to promote sustainable and innovative practices.

E.g. M.S. Swaminathan Research Institute's role in promoting fish bone technique in Pitchavaram mangroves.

5) Evaluating and assessing the status of flora and fauna

E.g. World Wide fund for nature's Living planet report 2023 highlights that nearly 69% species have gone extinct in last 30 years.

6) Opportunity to enhance urban wildlife through wetland management.

E.g. Wetland International's conservation efforts.

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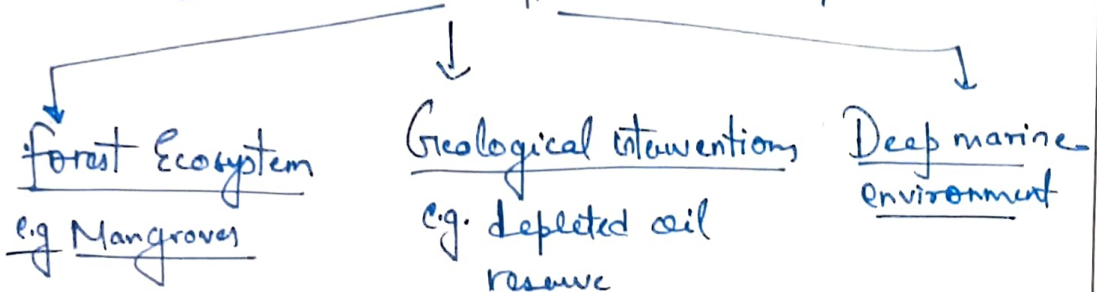
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S(a)

Carbon sequestration is a process of capturing and storing atmospheric carbon into potential areas.

• Potential areas of carbon sequestration



Role of forests in Carbon sequestration

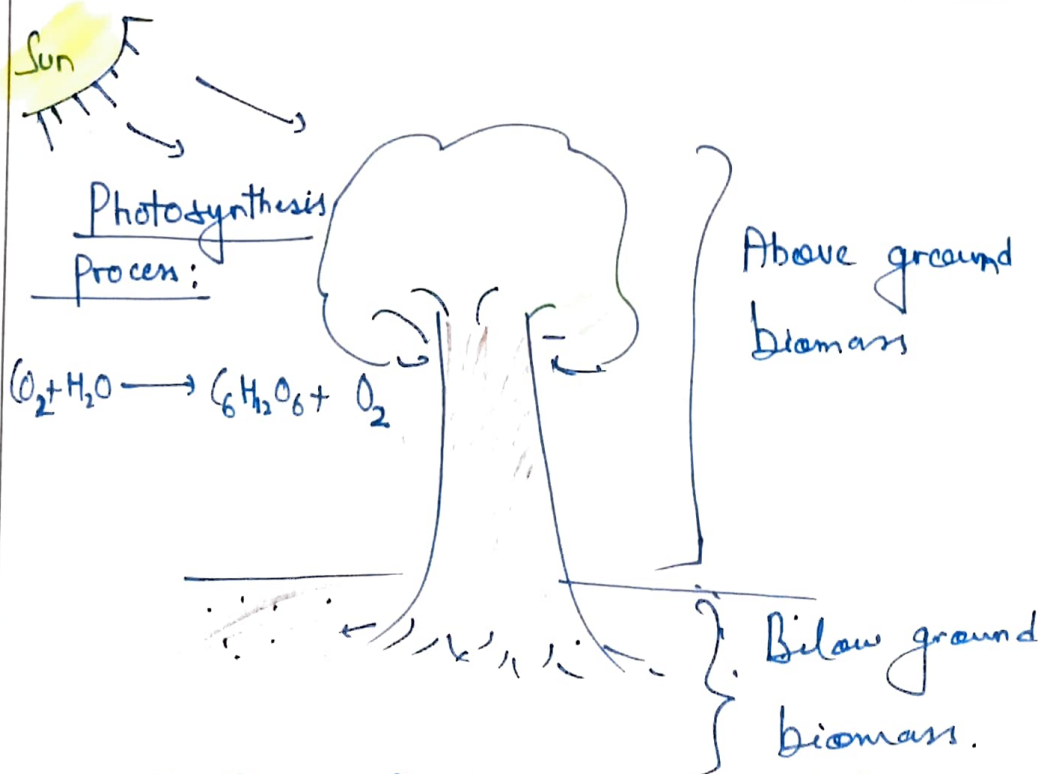


Fig. Role of forests in Carbon sequestration

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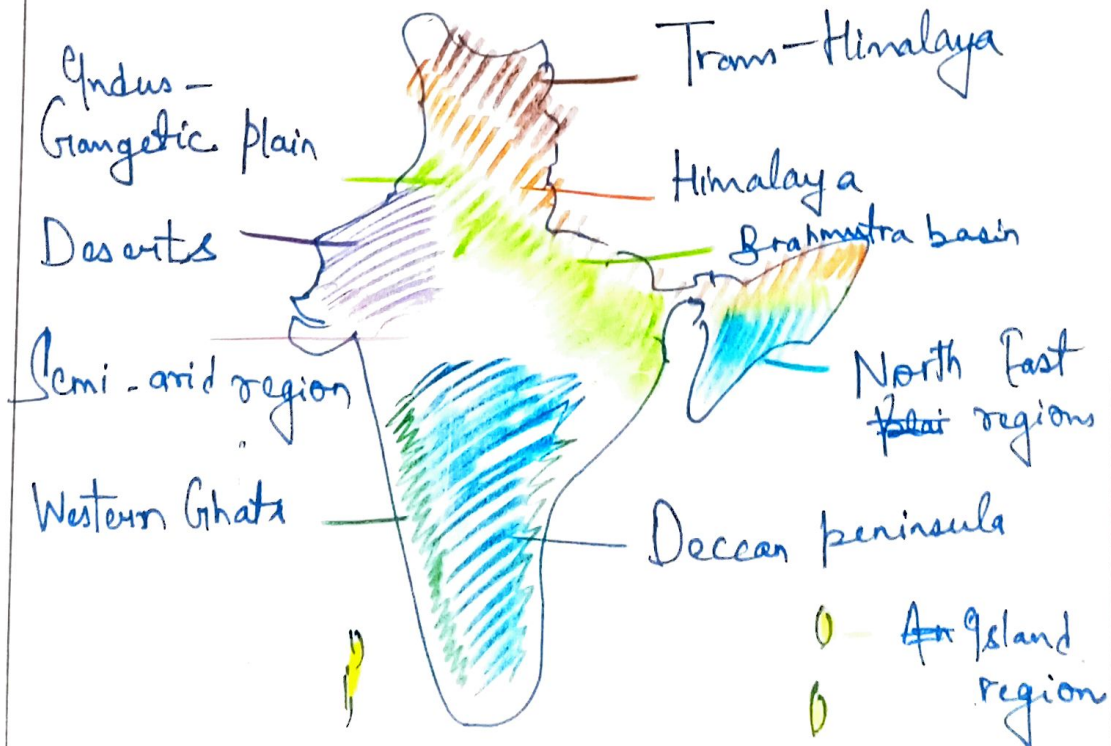
- 1) forest takes CO_2 (Carbon dioxide) during photosynthesis process.
- 2) Biomass storage in trees: bole, bark and other body parts of trees.
- 3) Below ground carbon storage in the form of roots and soil organic matter.
- 4) facilitates nutrient cycling process.
- 5) forest ecosystem is considered as 'closed system' for nutrients cycling. It prevents leaching of carbon nutrients.

Thus, forests play an important role in carbon sequestration, facilitating our efforts to combat climate change under Sustainable Development Goal 13.

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(b) Biogeographical zones are areas with similar geographical conditions like temperature, pressure, humidity, edaphic factors etc where which promotes habitation of almost similar flora, fauna and fauna.

Biogeographical zones of India



- 1) Trans-Himalayan region - e.g. Ladakh
↳ Cold desert condition
- 2) Himalayan region - undulating and sloping region.
- 3) Granitic plains - fertile alluvial zones.
- 4) Brahmaputra basins - drained by Brahmaputra river.
- 5) North Eastern regions like Manipur, Mizoram etc
- 6) Deccan peninsula characterised by basaltic rock.
- 7) Western and Eastern Ghats
- 8) Coastal regions - features like of deltas, Estuaries.
- 9) Semi-arid regions and deserts
- 10) Island regions . e.g. Andaman and Nicobar Islands

(c) Progeny testing is a process of testing of progeny to evaluate the potential of parent species.

Here, performance of progeny is tested on various parameters. eg diameter, height, phenology etc.

Importance of Progeny testing for tree breeders

- 1) Progeny testing helps tree breeders to examine and evaluate the genetic potential of ^{selected} parents.
- 2) It provides more accurate result as we, here directly evaluating the performance of offspring.

3) It helps in decision making with respect to phenotypic variance and genetic factors contributing to it.

4) It helps tree breeders to regulate external environment and minimise impact of environmental factors on the progeny's growth mechanism.

5) Progeny testing provides actual result of tree improvement programmes, enabling more concrete study of free selection.

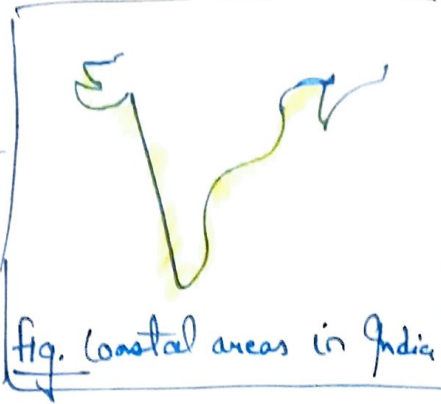
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(d) Afforestation is a process of raising trees
in an area.

Afforestation in different
sites require locality factors.
Examination - edaphic factor,
biotic factor, topographic factor and climatic factor.

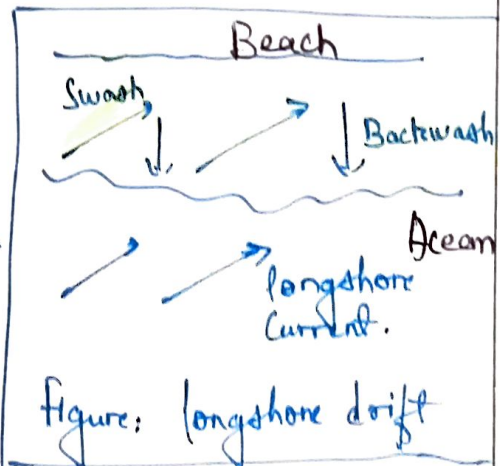


Specific problems that we face during
afforestation works in coastal areas

1) Coastal erosion:

Longshore drift causes

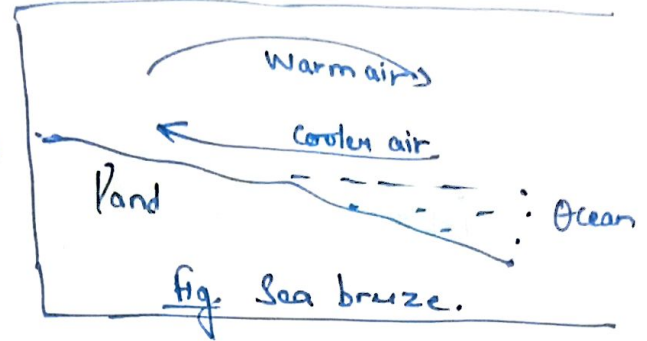
Soil erosion faster near
beaches.



2) High salinity due to coastal water erosion
intrusion.

3) Strong winds and intense storms like

Cyclones (eg) Sea breeze during daytime



4) Salt spray event during cyclone storms.

5) Anthropogenic pressure like coastal reclamation, aquaculture etc.

Way forward

↳ Choice of species eg Casuarina equisetifolia

↳ fish bone technique for Mangrove afforestation.

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(c) India has got varied natural landscape as intangible heritage by nature. Various soil types are one of its aspect.

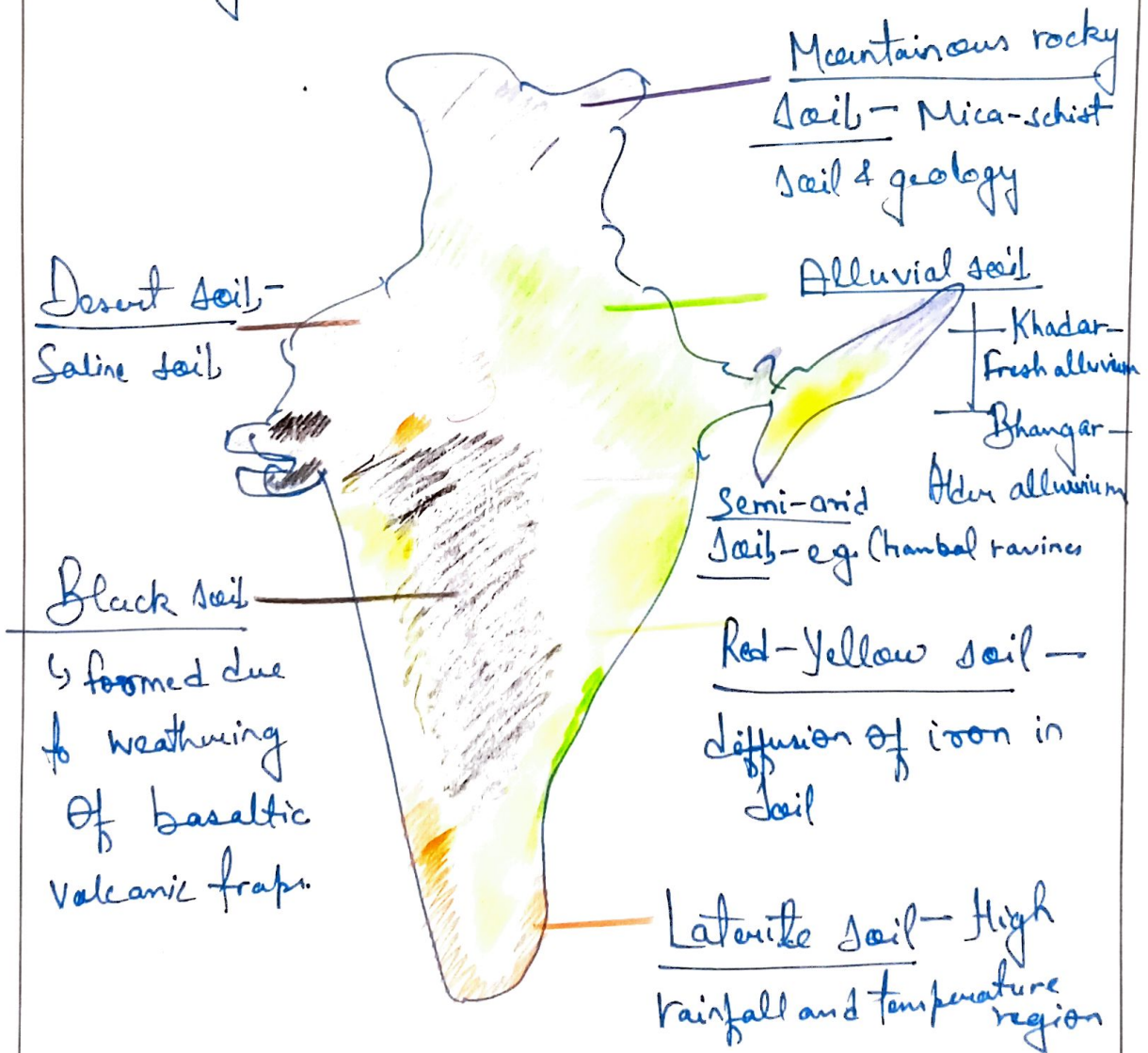


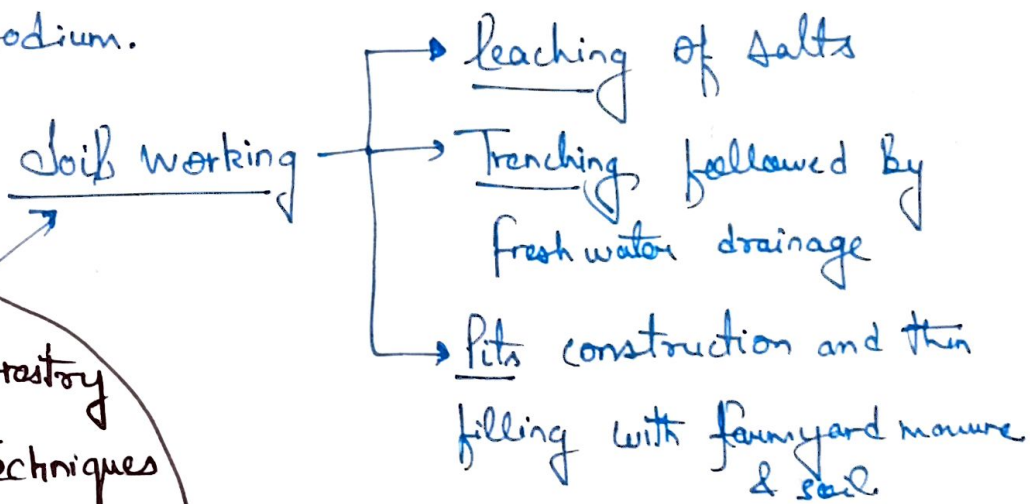
Figure: Various soil types in India

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8.(a) Salt-affected soils are generally characterised by presence of sulphates, chlorides and Carbonates of Magnesium, Calcium and Sodium.



Forestry Techniques for the reclamation of salt-affected soils

Soil Stabilisation

- Focus on locally growing shrubwood
- Mulching
- fencing to protect local herbs and shrubs

Choice of species

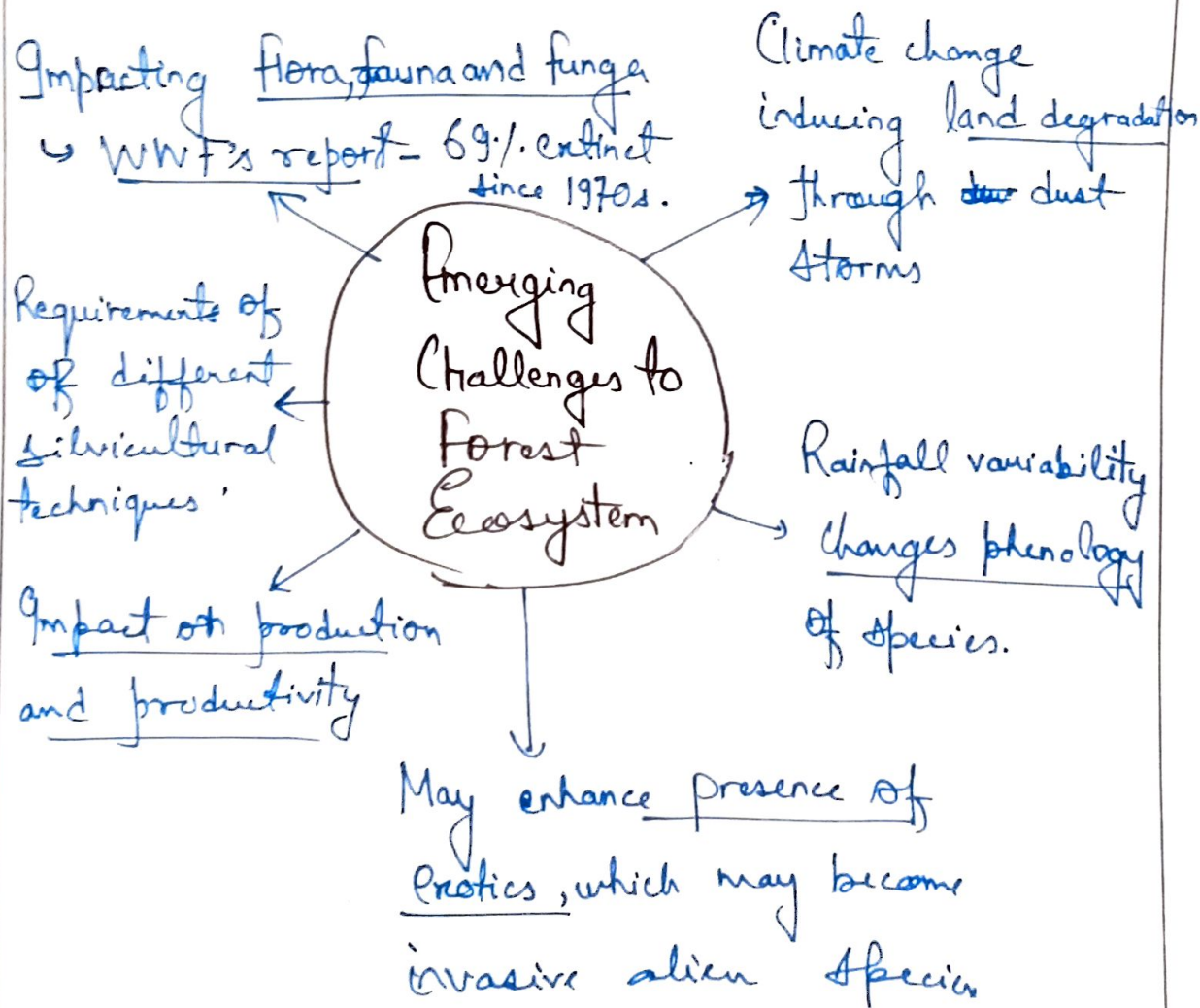
- Nursery raised seedlings are planted for bigger trees
- Acacia nilotica, Albizzia lebbek etc. are selected.

Irrigation and tending operations

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(b) According to IPCC's 6th assessment report,
impact of climate change induced disasters
is going to be more intense, frequent
and variable.



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Addressing the challenges

① Afforestation and Reforestation - to enhance soil structure and enhance its fertility to support other species.

↳ eg leguminous species such as Acacia catechu (Khair), Albizia procera etc.

② Climate change mitigation measures -

↳ eg Enhancing carbon sequestration potential through Mangrove plantation.

③ Adaptation techniques

↳ Climate smart forestry techniques -
eg choice of ~~agro~~ climate suitable species
↳ building green corridor. ↳ Project

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Green belt near Aravalli region.

④ Enhancing soil productivity and stabilisation

near riverine areas, semi-arid areas etc.

eg Raising plantations under Ganga Gram
Yojana.

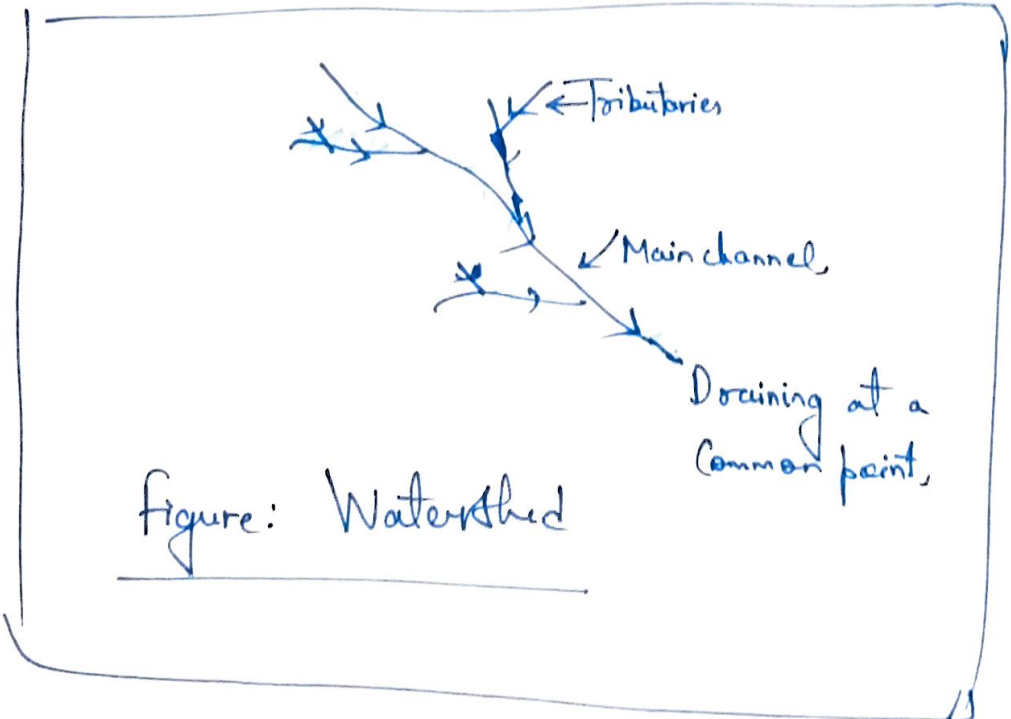
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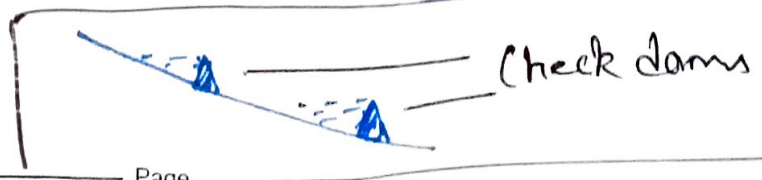
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(c) Watershed is a hydrological unit that collects water and drains at a common point.



Different types of watershed

1) Contour bunds and check dams

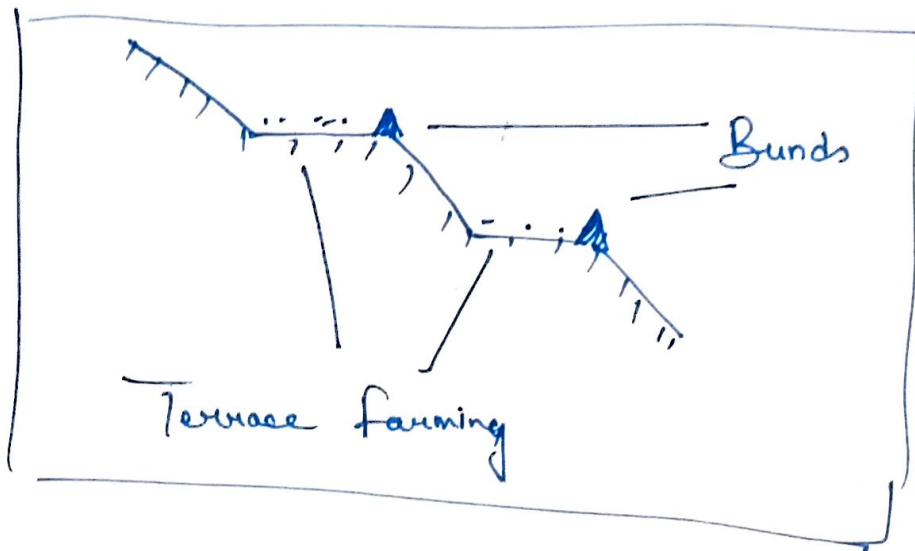


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2) Traditional water channels-e.g. Apatani
technique in Arunachal Pradesh.

3) Terrace farming technique in Himachal
Pradesh.



4) River catchment area where tributaries
join the main river.

e.g. Yamuna river joining Ganga river
in Prayagraj.