BIOGEOGRAPHY – MUDIT JAIN

Soil: ① Not just accumulated dirt
② organic mixture of sediments, airspace, moisture, lifeforms
③ living system of biotic + ablotic factors.

Genesis < Factors / Processes

Factors

① Parent Material → • PH (↑ exchangeable ions → ↑ base capacity)
• Porosity, permiability (clay) by controlling texture [decided by hardness]
coarse (granite rock), fine (sedimentary) • ↑ Permiable → ↓saline (sandy)
• Soil colour (red soil), nutrients (typ + capacity ex limestone → ca rich soil).

② Structure
Rock hardness, cracks, crystal str → control weathering.

③ Relief
Slope, elevation → deposin / erosion → thick/thin soil profile.

④ Climate (Most imp)
Rain, wind, temp → rate of weathering → Type of weathering
[warm humid → chemical → fine soil]
[cold → physical → coarse], [tropics → Laterisan],
[temperates → Podzolisan], [capillary action → saline/Alkaline (Pedocals)]

⑤ Biota ⑥ Time [for horizon, profile]

Processes

① Weathering: In situ, gradual disintegran of rocks.
Chemical (Hydrolysis (Feldspar $\xrightarrow{H_2O}$ Kaolin), (oxidation/decaying $Fe \rightarrow Fe_2O_3$ (red))
, Carbonation (corossion $CO_2 + H_2O \rightarrow$ acid)
Mech (block, frost, exfoliation) → (angular)

② Leaching: (Mechanical)
Translocan of nutrients within soil → do not leave it. insoluble, finer nutrients move in suspen if soil holds water [slow movement]
• Warm condin → Laterites, cold → Podzols.

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Warm → Si > mobile → Al/Fe on surface → reddish soil. (Bauxites)

cold → opp → grey soil. [Podzolization]

Laterites [acidic, fragile, erosion vulnerability]

Podsol formaⁿ [Fe/Al form sesquioxides on moving down. Chelating agents in coniferous leaves fasten acidic podzol formaⁿ. Hard, impervious Si layer formed. ↑ Humus due to ↓ bacterial action.

③ Capillary action:- opp of leaching. in arid areas → H_2O move up. → evaporates → salts left [↑ca → alkaline, ↑Na/K → saline].

④ Gleification :- waterlogged swamps, mangroves → anaerobic oxidaⁿ → ↑K (blue, green (glauconites of china, Japan) or, Kaori (↑ organic due to swampy condⁿ).
↳ arctic/antarctic.

Classificaⁿ ← Genetic (Process/Factor based Marbut)
Morphological (Property based USDA)

To find pattern, fertility, agri potential, ⁿ improving needs etc.

Genetic

① By russians (dokucheiv, glinka, Marbut)
② Imp factor is climatic effectivity in deciding relief, type of process etc.
③ Focus on soil usage r/t content.
④ Orderⁿ → dust focus on problems.
⑤ Arid, semi arid → capillary action → Pedocals.
⑥ Humid → leaching → Pedalfers. [Podzols or Latosols]
⑦ each divided into zonal/Azonal. Reflect LCT.
⑧ Pedocals [chernozem (black earth, ↑humus, ↑ca, ↑fertile → steppes)
chestnut [tropical chernozem → Prairies (lesser ca)
sejrozem [desert soil, ↑arid, salty [sahara, colorado] → ↓agri.
[diff from India's desert soil].
⑨ Zonal/Intrazonal/Azonal [older classificaⁿ. links distribuⁿ of soil types to climate/vegⁿ].
⑩ Zonal [dominant influence of climate → prolonged climatic influence → denudaⁿ process/agent becomes imp ex lithosol, podzol, sejrozem etc]
⑪ Intra [local factors [moisture/parent rock] is dominant factor. develop in poor drainage conditions → Hydromorphic (gleifica ⁿ), Calcimorphic (rendzina, solonchak)
Halomorphic, (solonetz (↑Na)).

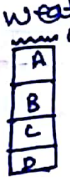
Azonal [youthful due to sedimentation renewal / erosion, Parent material is continuously eroded & deposited (alluvial) → ↓ horizons [↓T, loose sands, slopes]]

Morphological scheme :-

① Entisol [new, ↓ horizon] [flood plains, deltas, slopes] [N. Africa, Iran, Pak etc]
② Inceptisol [some horizon → layers] [top of flood plains, delta] [N. plains, russia, N|E|US]
③ Histosol [↑ organic, ↓ bacteria] [tundra - tropics] [canada, Europe].
④ Aridisol [↓ org, arid, light, ↓ agri, calcification, salinization] [deserts]. / shifting sands
⑤ Andisol [volcanic ash in parent material, ↑ veg] [Ring of fire] [chile, mexico, Japan]
⑥ Vertisol [black soil, ↑ clay, inverted profile] [steppe / wet-dry tropics] [deccan, Ethopian highlands]
⑦ Mollisol [↑ ca, ↑ fertile, ↑ org, ↑ moisture retention] [humid] [c. asia, russia, c. America]
⑧ Spodosol [temperate cool, moist] [canada, scandiniavians].
⑨ Alfisol [sub surface clay argilic layer, humid midLats | conti / sub-tropp, fertile, ↑ agri, in glacial regions]
⑩ Ultisol [red / yellow, humid ST, extra layer wrt oxisols] [S|E|A, wghats, odisha]
⑪ oxisol [evergreen, warm, rainy → chem weathering] [↑ decomposition → ↓ agri] [laterite, sahel]

Soil horizon

1) Study of soil's vertical cross section → it's properties.
2) Depends on soil's age → Thick | Thin, climate, weathering process.
3) Differentiated into layers ∴ is heterogenous.
4) soft rock → thick profile.
5) D & O are not soil but superficial layers.
6) A & B are soil proper & root zone (deeper in B).
7) A leaches → B accumulates (enriched) (illuviated). A (depleted) / (Eluviated)
8) O A E B C D.
9) ex: Laterites O (↓ humus), A (Fe, Al), E (silica poor), B (silica rich / grey).
10) ex: Spodosol O (↑ humus), A (↓ Fe, ↓ Al, ↑ Si / grey), B (Al sesquioxides).



Soil erosion

Reasons :- overgrazing, deforestation, topsoil removal, fallowing, compaction → runoff
CC → ↑ rain intensity → splash / sheet erosion.

Affects :- (imp) 20 mn tonne productivity loss / yr, land loss (7-10 MHa).

Soln :- Engg / str [plugging dam, retention wall / basins, check dams, bunds, tripods, stone pitching, wire nets, groynes (→←)

Preventive [agri modification, organic farming, ↓ grazing, ↑ trees, soil mulching, ↑ land use pattern, ↓ fallow, ↑ modern irrigation, terrace farming, watershed, Relay cropping].

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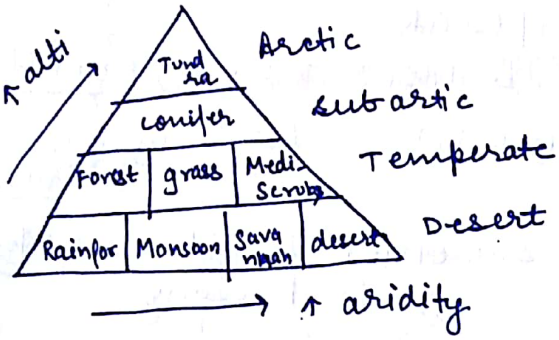
Salinization Reasons [drainage, capillary, canal seepages, ↑ fert].

Sol :- soil washing, ↑ drainage, gypsum use, canal lining. But all this work by salinization.

better sol^n :- preven^n :- agri practice, ↓ hw use, ↓ H_2O intensive, agro-climate planning, lay farming (cynadon), agro-stological solutions.

Resources

Factors affecting distribⁿ of plants



① Trop climate – vertical sunrays.

② Trop rainforest [tall, dense, broad leaf hardwood, teak, Mahogany]

Oxisols → × cultivated plants.

② Savannah parkland, campos, llanos.

ultisols & vertisols.

③ Deserts [sahara, Arabian, Aus, Kalahari], w. coast, aridisols.

④ Mid lats

Medi [winter rain → scrubs oak]

Marine west coast etc etc.

Origin & evolⁿ of animals

(1) fossils of sedimentary rocks are evidences.

(2) Micro scopic org : Pre-cambrian, ≥ 4600 mn yr ago.

(3) Clemmay : outlines that oldest fossils are in zambia.

(4) Invertebrates : 680–580 mn yr old Africa, Eu, N. America

(5) Cambrian T > Pre cambrian T : evolⁿ of protozoa, sponges, molluscs etc.

(6) vertebrates : ordovician, bony animals snails, corals etc.

(7) Silurian T cooler → Algae evolved, 1st land plant CLUBMOSS.

→ land invertebrates [snail, jellyfish etc].

(8) Devonian dev of primitive life. insects, flies, fishes etc.

(9) carboniferers → glaciⁿ → ↑ insects, Amphibians, reptiles

(10) Early Permian → retreat of ice → only robust species survived

→ reptiles were greatly modified.

(11) Triassic → CDT → ↑↑ invertibrates, arthropods

(12) Jurassic → warm, humid → ↑ insects, reptiles, dinosaurs.

(13) Cretaceous → more CDT → inland swamps → flower plants, forests decreased, ↑↑ dino, evolⁿ of mammals, bony fishes.

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(14) Eocene: CDT, SFS → climatic zones developed → mamals evolved, placental animals.

(15) Oligocene: warm, S. American unique animals due to isola.

(16) Miocene: cool → grasses → Elephants.

(17) Pliocene: Polar / temp climate developed → Herbs, Hominids.

(18) Quaternary: extinctn, dispersal, redistribun → fast running animals.

Animal Dispersal [gradual, rapid, seasonal, forced, Anthropo. for breeding.

" " Factors [Phy env, innate ability

Factors of animal distribution

- Physical [LF, climate [T, H_2O, sunlight, P], gravity, salinity, soil]
- Biological [mobility, dispersal, mutual interaction, popn size etc].

world distribun of animals by Wallace into zoo-geographic zones.

① Paleoarctic: Europe, E. asia, w. asia

② Ethiopian: Africa, Arab, madagascar [endemics african flying squirrel, mole rats etc]

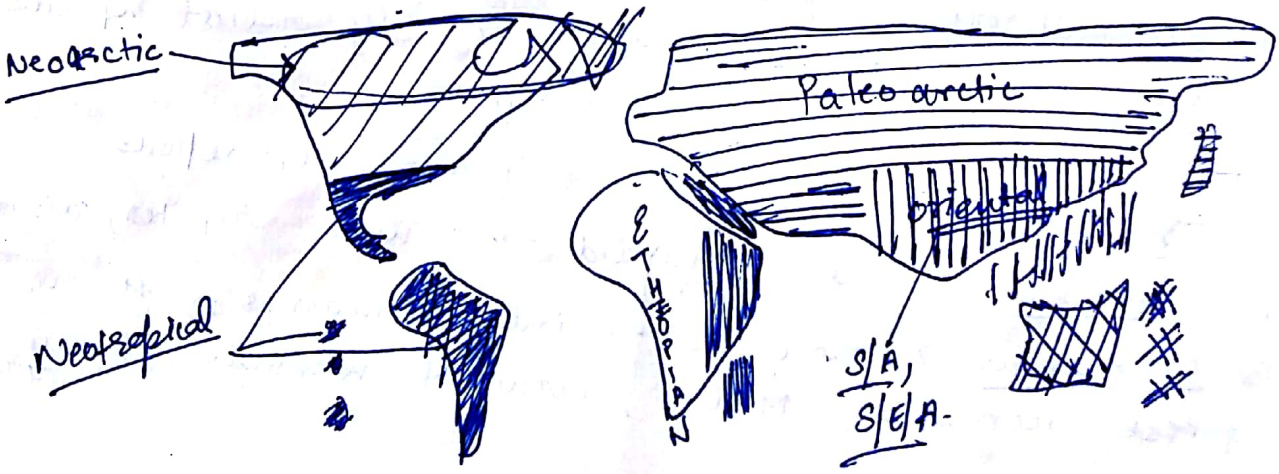
③ Oriental: Tropical asia [Ind SR, SL SR, S. China SR, Indo-Malaysia SR.] SR = sub region

④ Australian: Aus, NZ, PNG, islands

⑤ Neotropical: Mexico, C. America, S. America, W.I, Galapagos. marine,

⑥ Neoarctic: Greenland, N. america.

wallace's zoo-geographic zones.



Gene pool centres

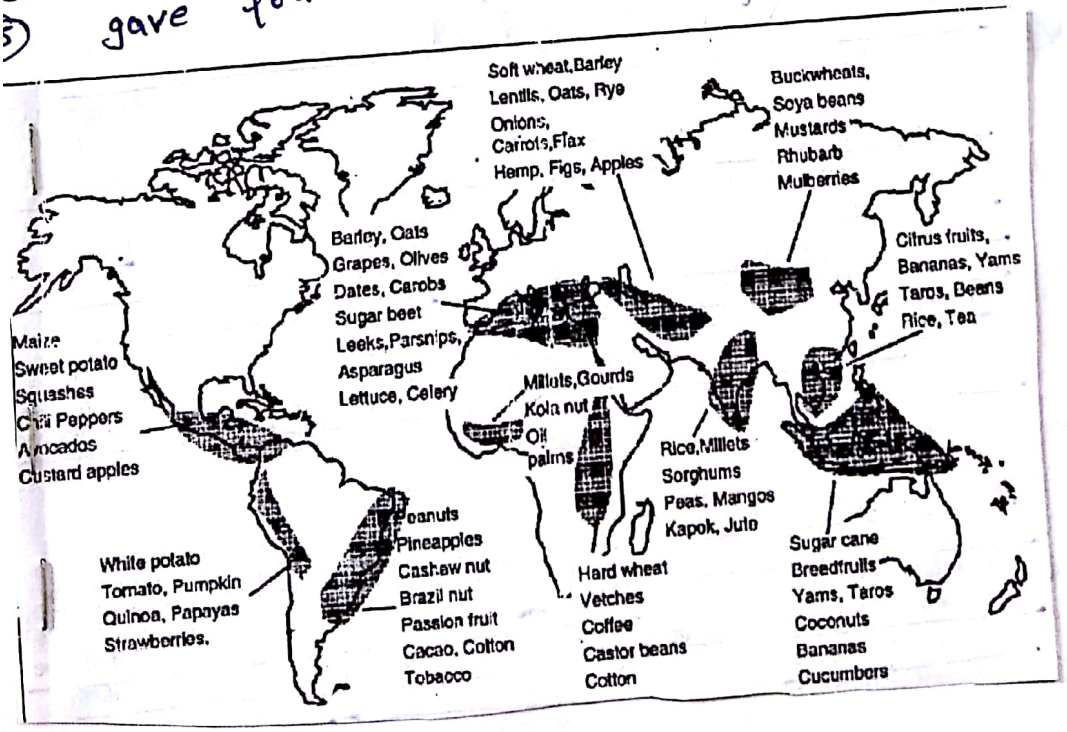
Large gene pool indicates ↑ genetic diversity. → robust pop.
↓ " " " ↓ biological fitness & ↑ chance of extinc

- Centre of origin is a geog area where grup of organisms either domesticated or wild, 1st developed. Acc to scientists, it is very tough to assemble info on origin / evolun as evidences are getting dim with time. candole was 1st to pose ques of geog origin of cultivated plants. Based on Darwin's evolun concepts & candolles observan, N I vavilov gave hypothesis on gene pool centres of plants in 1920s.

Assumpn: ① main species cud b traced back to 1 p/r region called centre of origin.
② These centre cud b common for a range of crops.
③ These are areas of origin or evolun/ genetic diversifican.

Findings: ① distinguished b/w primary n secondary crops.
Primary = basic ancient cultivated plants.
secondary = derived from weeds that infested primary crop fields.
② Region of max varian, usually including endemic species, cud be centre of origin.
③ found foci of type formation / hearts of centres.
④ numbers & borders of CPCs changed continuously.
⑤ gave four CPCs :-

Prim vs sec
Foci
Δ accepted
endmic → coo.



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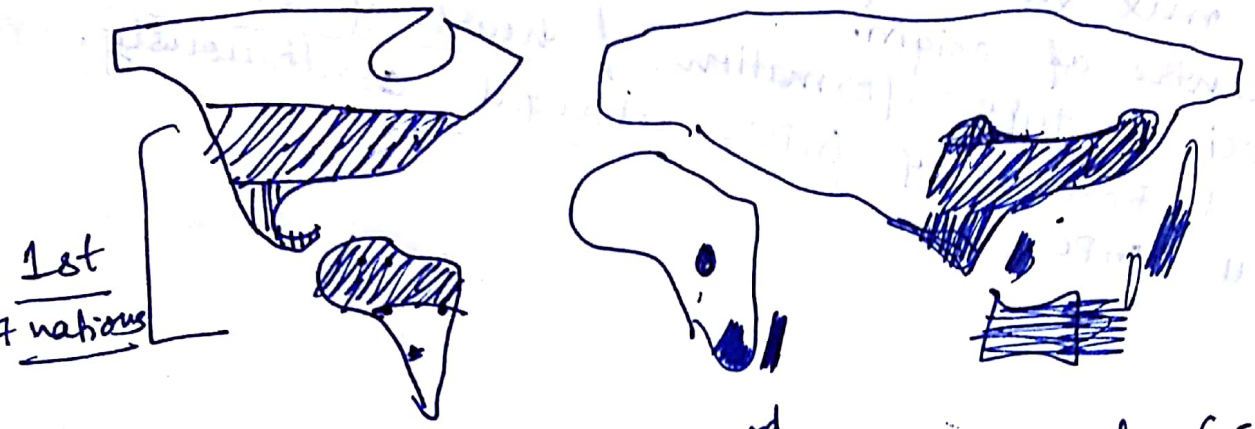
VAVILOV'S CENTRES OF ORIGIN OF CULTIVATED PLANTS

Centres of origin:	Foci of type formation:	Some important crops:
1. **The South-Asiatic tropical centre** (most of South and Southeast Asia)	The Indian focus The Indo-Chinese focus The Island focus, comprising islands in South-east-Asia	Rice, sugar cane, and a large number of tropical fruits and vegetable crops
2. **The East-Asiatic centre** (comprising East China, Taiwan, Korea and Japan)		Soybeans, different species of millet, the majority of vegetable crops and very many fruits
3. **South-western-Asiatic centre** (from Turkey to Kashmir)	The Caucasian focus The Asia Minor focus The North-western-Indian focus	Majority of endemic species of wheat, rye and fruits, pea, chickpea and lentil.
4. **Mediterranean centre** (Mediterranean countries)		Olives, carob tree, a multitude of vegetable and forage plants
5. **Abyssinian centre** (Highlands of Ethiopia, Eritrea, south-western parts of Arabia/Yemen)		Teff, Arabica coffee, sorghum, endemic species of wheat, barley and the enset banana
6. **Central American centre** (the northern parts and islands of Central America)	The mountainous South-Mexican focus The Central American focus The West Indian focus	Maize, several species of cotton, beans, gourds, cocoa, and probably sweet potatoes, yams, peppers and fruits
7. **Andean centre** (surroundings of the three foci in South America)	Andean focus proper Chilean focus (southern parts) Bogotan focus (eastern Colombia)	Potatoes and other tuber-producing species, the quinine tree, the coca bush

Megadiversity countries

① some regions have ↑, sm ↓ biodiversity.
② Tropical RF = ↑ ex Amazon forest.
③ identified by Unep's world conservation monitoring centre
④ 17. [those which highest endemics [>, 5000 endemic plants]



1st 7 nations

USA
mexico
Peru
Brazil
Ecuador
Venezuela
colombia
7

Africa (3rd)
3 { Madagascar, congo, SA.

Asia : 2nd. (5)
Phil, indo, malaysia, India, china
5

oceania 4th
Aus, PNG] 2

= (17).

Principles of Ecology

life bearing sphere of our env is biosphere: the realm or narrow zone of contact of other 3 realms that sustain life.

It is a complicated biotic system where interactive relatn b/w various components generates & sustains life bearing capacity. Thr are 6 hierarchies of interactive relatn, whr every level represents well developed system by itself and also interprets relation with other levels. study of these relatn by ODUM who identified biotic & abiotic constituent's interactions wrd each other. 6 hierarchies are gene system, cell system, organ, organism, popn, ecological.

constituents

- Biotic
  - autotrophs
    - chemo
    - photo.
  - Hetero
    - Primary
    - secondary
    - decomposers
- Abiotic
  - organic
  - soil nutrients
  - Inorganic
    - sunlight
    - water

primary heterotrophs are directly dependent on autotrophs (herbivores) secondary (carni). decomposers decompose dead organic matter or organic excreta

linkages : abiotic - Biotic (Production), biotic - biotic (feeding), biotic - abiotic (decomposition)

biotic producers utilize abiotic constituents n generate food. production amount varies from Locn to Locn & these variatn are determined by 4 factors. Major factors include sunlight & capacity of photosynthesis in converting solar energy → food regulated by water. ∴ productn ↓ with ↑ in latitude. Minor Factors include season cycle, age of vegn

* Productivity is stored amount of energy / time / area. Avg global productivity 323 dry gram / m² / year

biotic - biotic | feeding relation is outlined wrt respirational loss applicable at every level of relatn b/w biotic community. These levels of biotic community are called trophic levels. With ↑ TL → ↑ respirational loss → ↓ feeding / ecological capacity. This justifies food pyramids having 4-5 levels. Primary producers occupy level 1 & have largest abundance & biomass in a given location [wtg living matter / area / time]

*also with ↑ LAT → ↓ productn → ↓ feeding capacity. ∴ biodiversity ↓.

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Biotic – abiotic represents decompositions and related to decomposers which convert biotic into abiotic. Decompositn has 2 phases Humificatn & Mineralization.

Biomes are regional divide of ecosystem that inc both terrestrial & aquatic sub categories.

Terrestrial inc Tundra, Desert, Forest, grassland, savannah.

Tundra terrestrial biome | terrestrial ecosystem

Highest latitudinal biome of world. confined to sub-polar location, Long cold winters wid brief summers. Summer season causes ablation of surface with subsurface permanent frozen → water logging → condin for autotrophs / heterotrophs. plants have floating adaptability due to no soil. common ex r mosses, lichens, few flowering plants. Heterotrophs inc insect, big terristrial animals (caribou), polar bear, water birds Has least productivity

Desert ↓ water. In tropical west margins & subtropical conti interiors. evaporational loss > precipitatn loss. photophs adapted as xerophytes due to prevailing aridity. deep roots (Phreatophytes) & succulents features. cactus, thorny bushes & region specific plants (Aloevera etc). date palms in oasis regions. In subtropics higher tablelands feature Yak, Antelope. heterotrophs adapted to thick coating, nocturnal adaptability (Rodents collectively this biome exhibit less biotic diversity n more habitat diversity → NICHE diversity