

Soil Degradation

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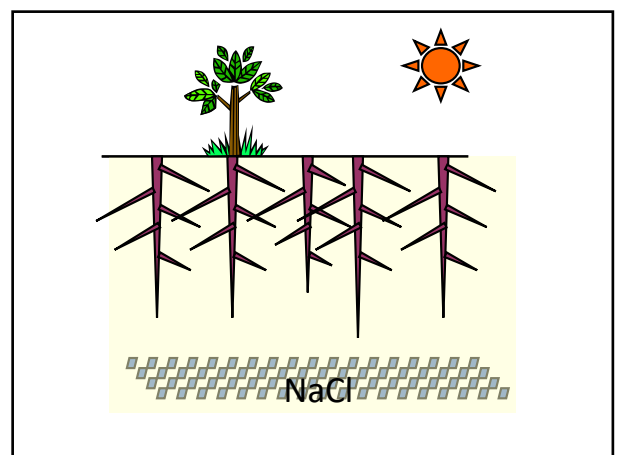
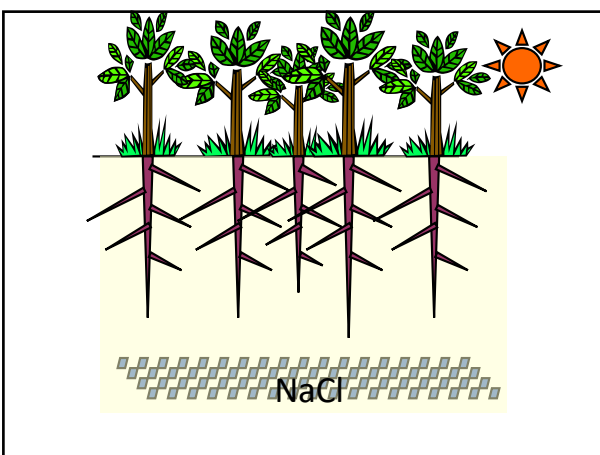
Mechanism of Soil salinization

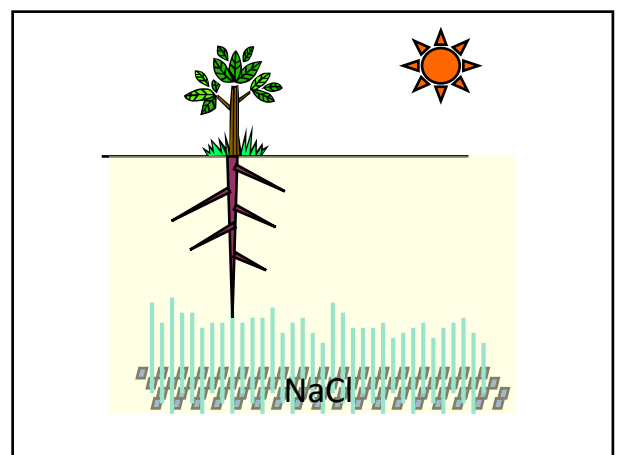
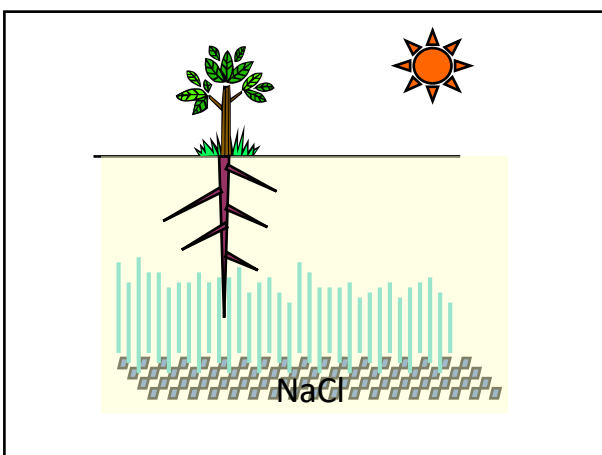
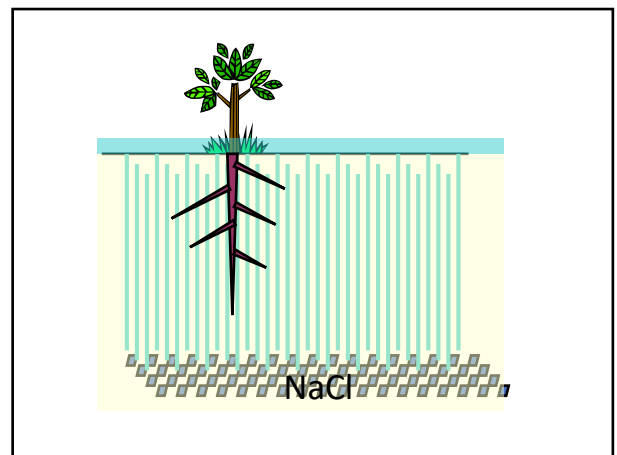
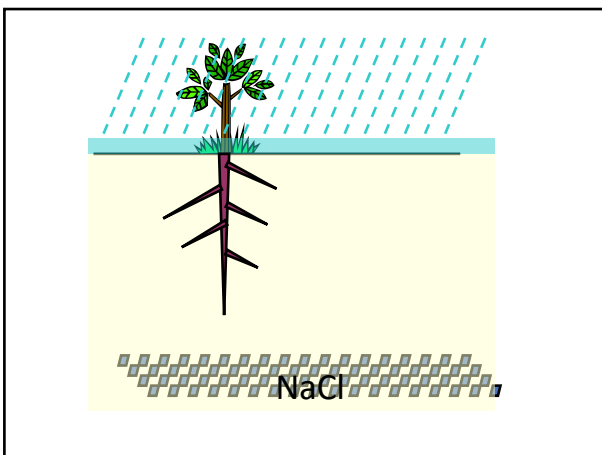
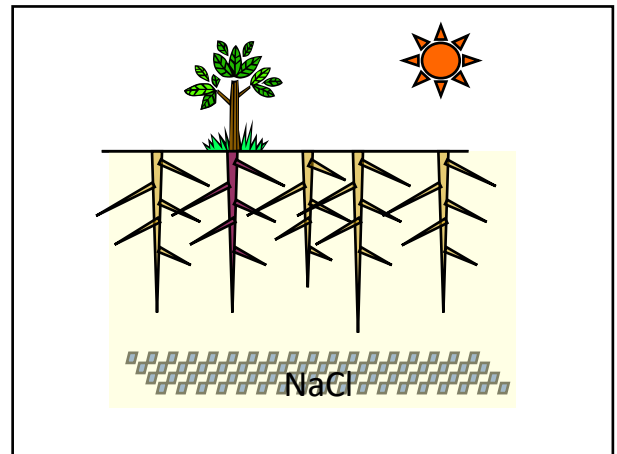
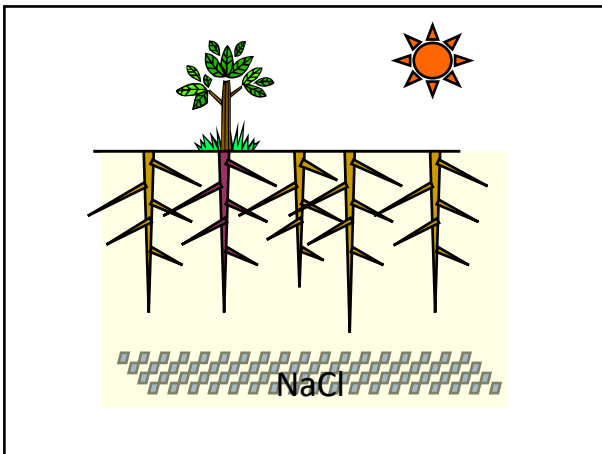


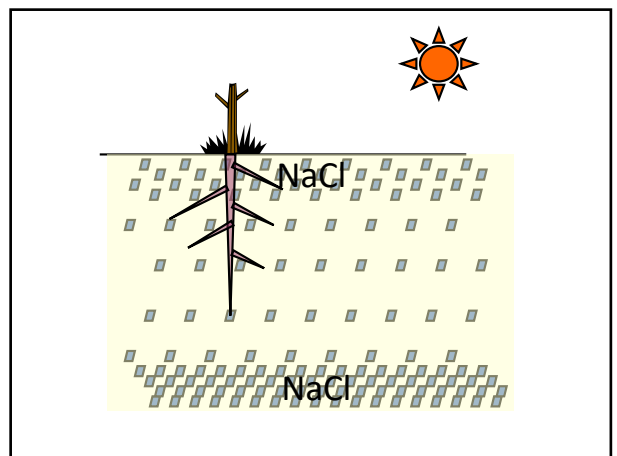
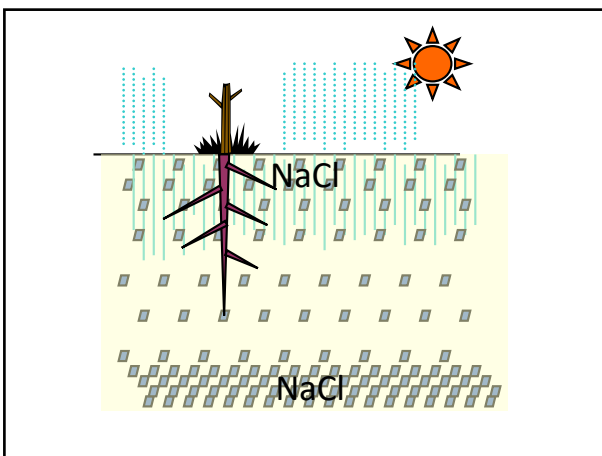
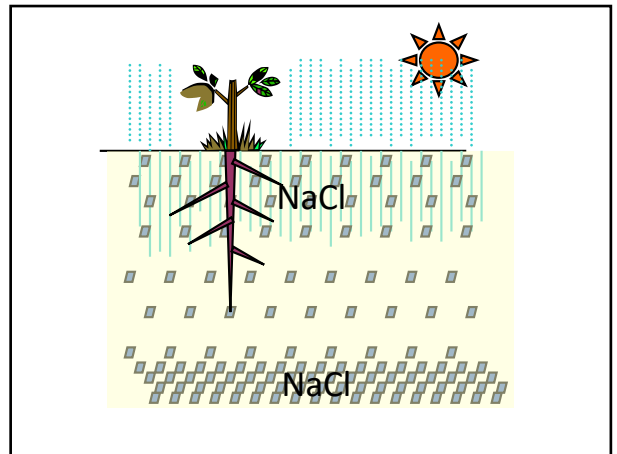
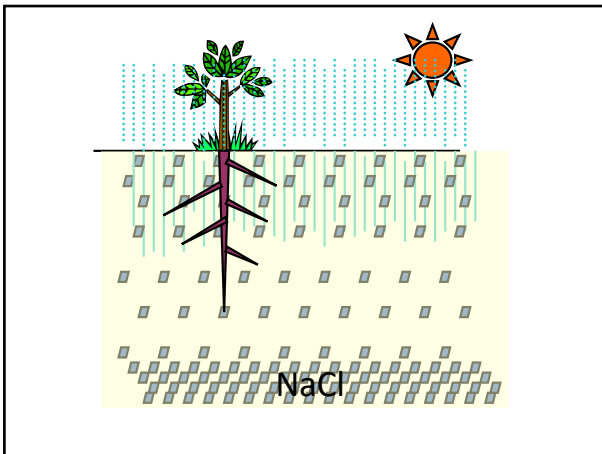
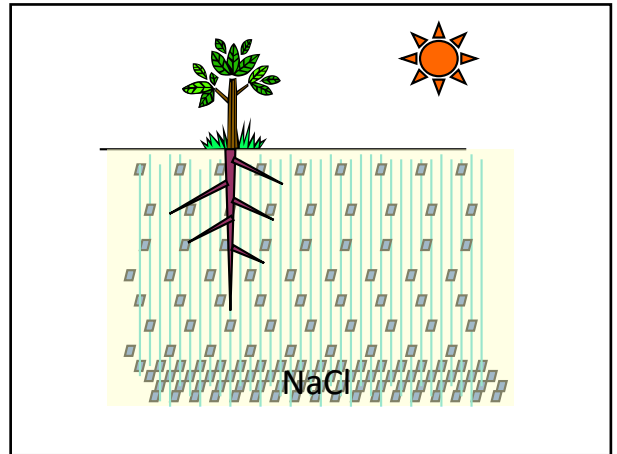
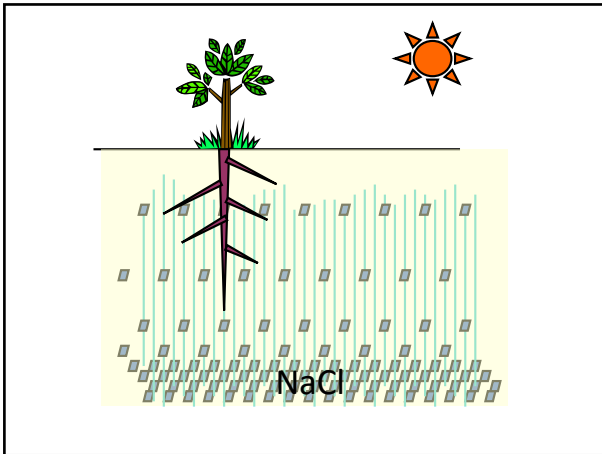
Salinized land in Khon Kaen, Thailand

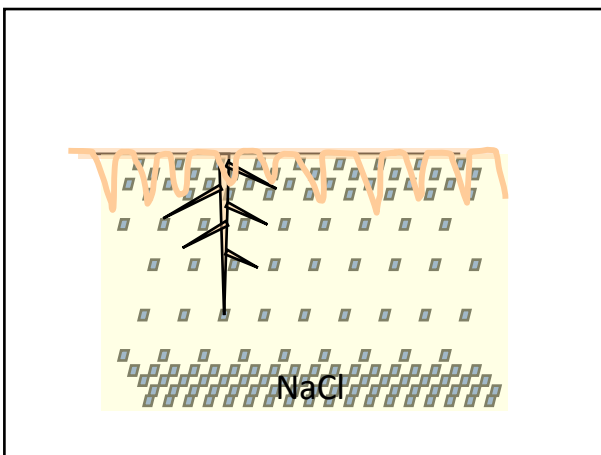
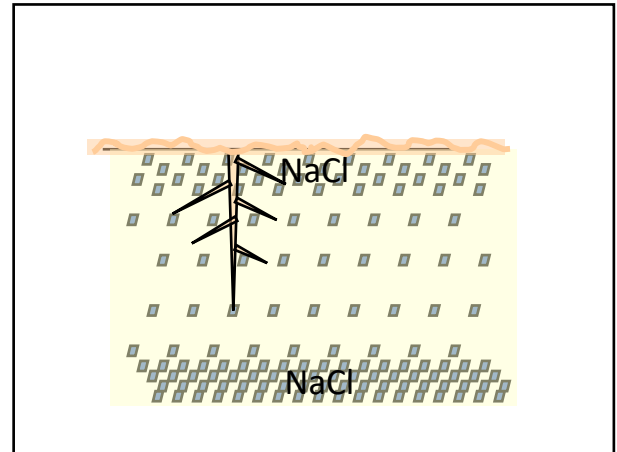
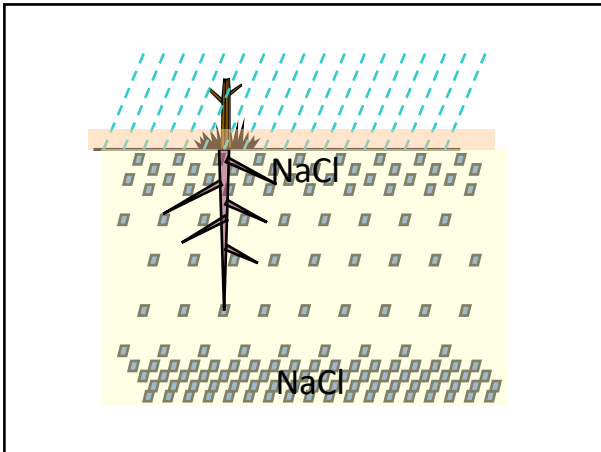


Soil covered with salt film.









Improper irrigation and drainage

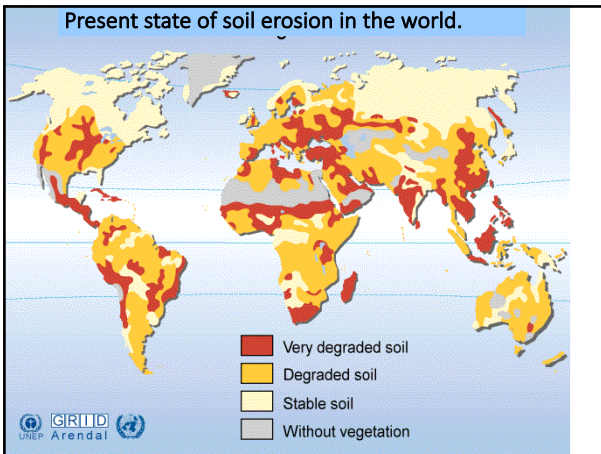
- Irrigation is necessary to conduct agriculture in the dry land with the annual rain fall less than 250 mm.
- However, if the water is not drained properly, salts dissolved in the irrigation come out on the land surface.

Repeated use of drained water from the fields.

- Causes the increase in salt concentration in river water.
- Total area of salinized irrigated lands in the world.
- = 20,000,000~25,000,000 ha
= 200,000~250,000 square kilometer

Soil erosion Gully erosion

Due to the excess forest clearing in Borneo (Kalimantan), Indonesia
According to Nippon University.



Soil erosion (Loss of fertile surface soil)

- Annual soil loss due to erosion
 - USA: 3.1 billion tons
 - Etiopia: 1.0 billion tons
 - India: 6.0 billion tons
 - Russia: 2.3 billion tons
 - China: 5.0 billion tons
- 1.0 billion ton = 1 Giga ton
(= the weight of water in 1 cubic kilometer mass)

Soil loss due to erosion in Japan

- Cultivated land: 0.1~4 t (av. 1.7t) / ha
- Bare land: 0.9~103 t (av. 31.6 t) / ha
- If soil is lost at the rate of 2 t/ha from the upland field (in total 2.4 million ha) in Japan, Sum of the lost soil will be around 5 million t / year.

Amount of soil blown off by wind. (Yokoi, 1986)

	Mg (ton) / ha	Thickness of lost soil (cm)
Non plowed land	0 ~30	0 ~0.30
Autumn plowed (humic soil)	20~50	0.20~0.50
Autumn plowed (subsoil)	40~100	0.40~1.00
Spring plowed	120~200	1.20~2.00

Loss of soil by wind erosion

- Wind erosion in volcanic ash and sand dune area.
- More the 50 % of the land is bare (uncovered) in winter and early spring in Hokkaido.
- 6 – 9 cm of plowed layer soil is lost annually. Equivalent to the loss of around 1,000 tons / ha.

Wind erosion in Australia



Loss of tropical forest and soil destruction

- One third of the total land area on earth is forest.
4.3 billion hectare.
43 million square kilometers.

Cleared forest in Amazon area.



Slash and burn in southern Leyte, Philippines



Growing cassava on a steep slope.



Soil survey in Leyte, Philippines



Forest soil which still keeps soil organic matter.



The land where the forest was cleared in the southern Leyte.



Punta

Soil with degraded soil organic matter.



Loss of tropical forest and soil degradation.

- Area of tropical forest: 20 million square kilometer.
→ 0.17 million square kilometers are lost annually.
- Area of tropical rain forest and seasonal forest: 11 million square kilometers.
→ 0.1 million square kilometers are lost annually.
- Tropical forest will vanish in 100 years.

Reasons for the decrease of forest.

- Expanding cities and residential area.
- Turning to permanent grass land and cultivated land.
- Turning to large scale plantations (oil palm, coffee, sugar cane)
- Total forest clearing for timber, pulp and paper production.
- Opencut mining.

Reasons for the decrease of forest.
(continued)

- Charcoal production
- Typhoon and wild fires.
- Clearing of mangrove forest for shrimp raising.
- Construction of infrastructures.
- Construction of dam for hydroelectric power generation.

Clearing of mangrove forest.



yaccyann.maxs.jp/amamioosima/14.jpg



Shrimp raising pond in Sumatra, Indonesia.



Afforestation of cleared mangrove.

Richness of tropical forest ecosystem and its vulnerability.

- One half of the total biological species are living in the tropical forest.
- The speed of organic matter decomposition and cycling is very fast.
- Very little organic matter and nutrients are stored in their soils.

Tropical trees absorb nutrients from very thin surface soil.



Comparison of plant biomass in the forest and prairie grassland in Wisconsin, USA.

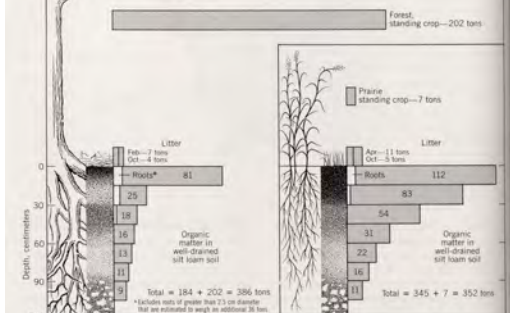


Figure 6-3 Metric tons per hectare distribution of organic matter in forest (white oak, black oak) and prairie (big bluestem, Indian grass) ecosystems in south central Wisconsin. (Adapted from Nielsen and Hole, 1963. Courtesy of F. D. Hole, Soil Survey Division, Wisconsin Geological and Natural History Survey, University Extension, University of Wisconsin.)

Amount of carbon supply and soil carbon storage in various climate zones.

