

Erosion

✦ **6.4 billion tons** of soils are eroded from the U.S. each year; this would fill 320 million average-sized dump trucks that, if parked end-to-end, would extend to the moon and $\frac{3}{4}$ of the way back!

Definition

✦ Erosion is the movement of soil components, especially surface litter and topsoil, from one place to another.

Importance

- ✦ In undisturbed ecosystems, the roots of plants help anchor the soil, and usually soil is not lost faster than it forms.
- ✦ But, farming, logging, construction, overgrazing by livestock, off-road vehicles, deliberate burning of vegetation etc. destroy plant cover and leave soil vulnerable to erosion. This destroys in a few decades what nature took hundreds to thousands of years to produce.

Water Erosion

✦ **Splash** – water hits the soil at a severe angle
(based on slope)

➤ This can erode soil.

✦ **Sheet** – when surface water moves down a slope or across a field in a wide flow and **peels off fairly uniform sheets** of soil.

➤ Because the topsoil disappears evenly, sheet erosion may not be noticeable until too much damage has been done.

Water Erosion (Cont.)

- ✦ Mass Slippage – (like in California) where it is very wet and large amounts of soil slip away in large chunks (**mud slides**).
- ✦ Rill – concentrated flow across the surface of soil. Leaves **rivulets** (micro channels).



❖ Gully – rivulets of fast-flowing water join together and, with each succeeding rain, cut the channels wider and deeper until they become ditches or gullies. Gully erosion usually happens on steep slopes where all or most vegetation has been removed.


Wind Erosion

✦ **Saltation** – one particle hitting another and being blown across the surface of the soil.



✦ **Suspension** – airborne soil. Ex.
soil from Lubbock is found in
Temple, Texas.

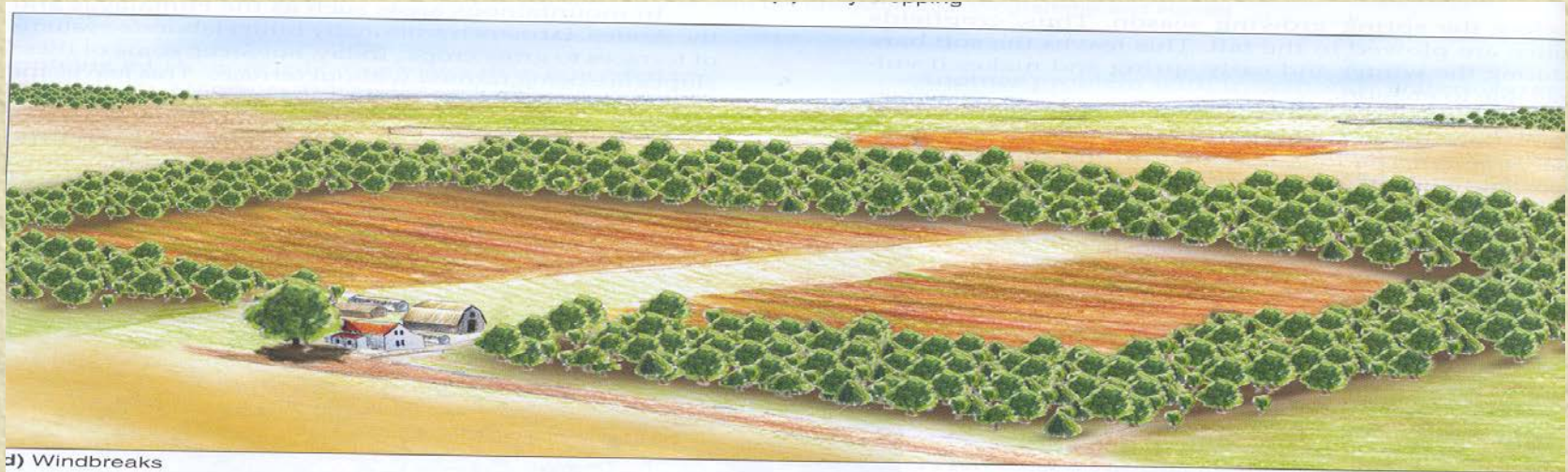




✦ Surface Creep – mountains/sand dunes; surface creeping slowly across. **Landslides** are an example of a very fast surface creep.

Erosion Control (see Wright pg. 222)

✦ **Shelterbelts** – can reduce wind erosion.
Long rows of trees are planted to partially block the wind. They can also help retain soil moisture, supply some wood for fuel, and provide habitats for birds.



d) Windbreaks

✦ **Minimum Tillage** – (conservation tillage) to disturb the soil as little as possible while planting crops.

✦ (Tilling is the act of turning or agitating the soil.)

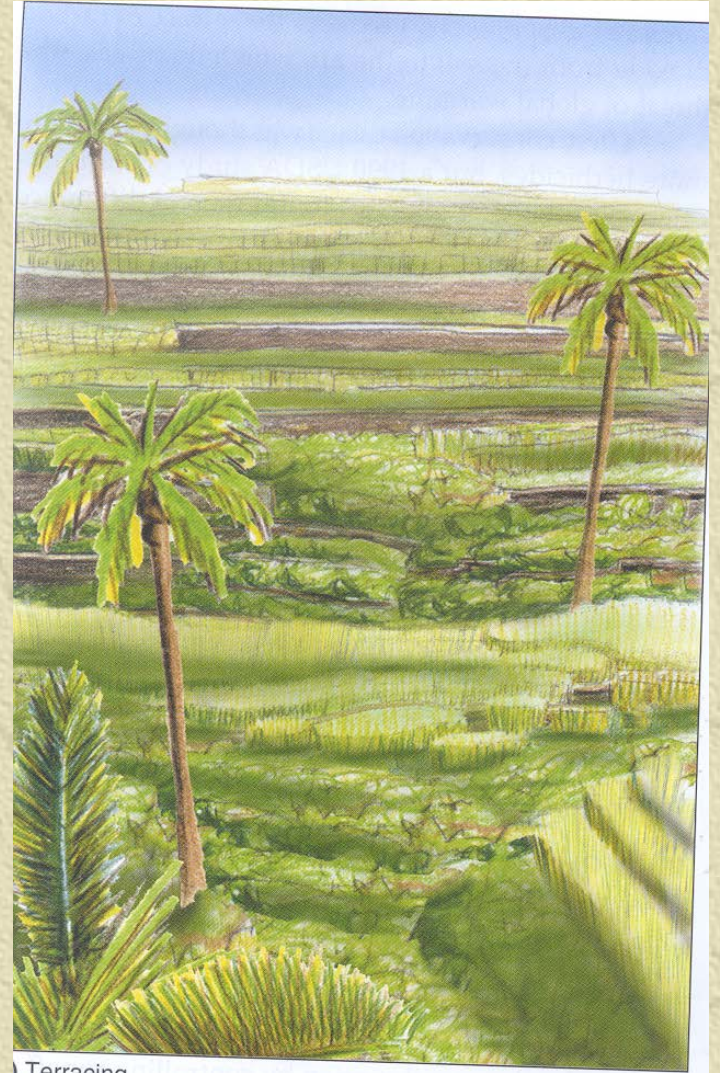
✦ Special tillers break up and loosen the subsurface soil without turning over the topsoil, previous crop residues, and any cover vegetation.



✦ **Contour Farming** –sloping your growing crops, etc.

✦ You run terraces parallel to the ground to stop soil from running down a steep slope. Plowing and planting crops in rows across, rather than up and down, the sloped contour of the land.

✦ **Terracing** – (what you use for contour farming.)
A broad, staircase-like effect **slows water runoff and erosion**, helping to retain water at each level.



Terracing

✦ Strip Cropping – a row crop such as corn alternates in strips with another crop that completely covers the soil, reducing erosion. It catches and reduces water runoff and helps prevent the spread of pests and plant diseases.



✦ **Cover Cropping (alley cropping)** – several crops are planted together in strips or alleys **between trees and shrubs** that can provide shade (which **reduces water loss** by evaporation) and helps to retain and slowly release soil moisture.



Alley cropping

Irrigation Techniques

- ✦ Conventional center-pivot irrigation- allows **80%** of the water input to reach crops



- ✦ Gravity-flow irrigation- Valves that send water down irrigation ditches.



✦ Drip irrigation- Can raise water efficiency to **90-95%** and reduce water use by 37-70%.

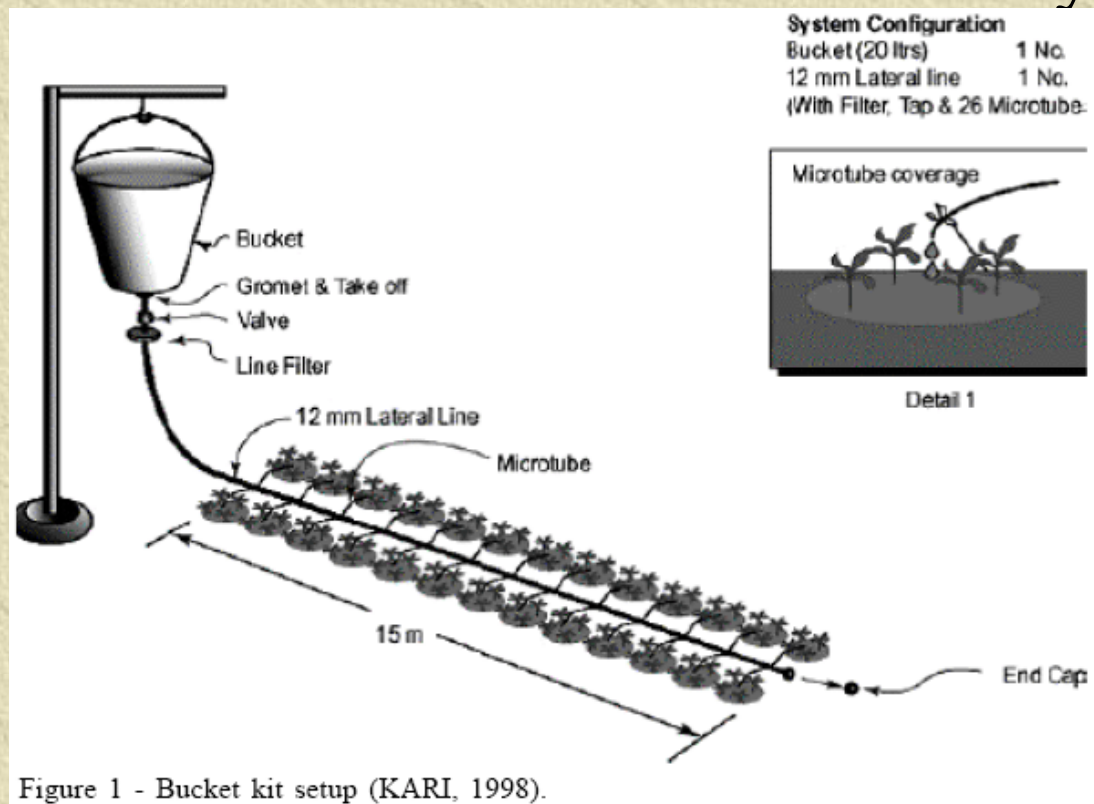


Figure 1 - Bucket kit setup (KARI, 1998).

✦ Floodplain irrigation- allowing the natural floods to irrigate the crops. Soils in flood zones tend to be nutrient rich and fertile.



Soil Nutrients

Macronutrients

-
- ✦ Macronutrients are larger in atomic structure. Ex. **Nitrogen, Phosphorus & Potassium**. Can be added to nutrient-poor soils with **fertilizers**.

Micronutrients

- ✦ These are smaller in atomic structure. Plants need them in small amounts.
- Ex. **Selenium, Zinc & Iron**.

Fertilizers and Labels

- ✦ Organic Fertilizers – animal manure, crop residues, bone meal, and compost
- ✦ Inorganic Fertilizers – man-made from chemical compounds
 - ✦ Benefits – exact compositions are known; they are soluble & thus immediately available to the plant
 - ✦ Costs – quickly leach away; this pollutes the water; doesn't help the water holding capacity of the soil like organic fertilizers do.

Hydroponics:

Definition

✦ Hydroponics are growing plants in fertilized water.

✦ Method of suspending plants in water and the solutions involved.

Ex. cranberries are grown this way.



Costs of Hydroponics:

- ✦ It is labor-intensive and expensive.

Benefits:

- ✦ You can control the environment & grow plants where there is no soil; NASA is looking into trying to find a way for astronauts to grow their own food using this method in space!