



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution Coimbatore – 35

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and Affiliated to Anna University , Chennai.

DEPARTMENT OF AGRICULTURAL ENGINEERING

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WATERSHED PLANNING AND MANAGEMENT





Wind Erosion

- Wind erosion is the process of detachment, transportation and deposition of soil particles by the action of wind.
- High velocity winds strike the bare lands (having no cover), with increasing force. Fine, loose and light soil particles blown from the land surface are taken miles and miles away and thereby, causing a great damage to the crop productivity.
- It is a common phenomenon occurring mostly in flat, bare areas; dry, sandy soils; or anywhere the soil is loose, dry and finely granulated and where high velocity wind blows.
- Wind erosion, in India, is commonly observed in arid and semi-arid areas where the precipitation is inadequate, e.g. Rajasthan and some parts of Gujarat, Punjab and Haryana.
- **Rajasthan has severe wind erosion problem.**
- **Wind erosion is predominant in arid and semi-arid regions.**





Effects of Wind Erosion



- Wind erosion damages land and natural vegetation by removing soil from one place and depositing it at another location.
- It causes soil loss, dryness and deterioration of soil structure.
- Most serious damage caused by wind erosion is the change in soil texture.
- **Productivity losses:** Smaller particles of soil are more subject to movement by wind as silt, clay and organic matter are removed from the surface soil by strong wind, leaving the coarse, lesser productive material behind.
- Sediment transport and deposition are significant factors in the geological changes which occur on the land around us and over long periods of time are important in the soil formation process.
- Human health as airborne dust can cause asthma and other health problems.
- Property as built structures can be sandblasted by wind-blown dust and buried in blown sand.



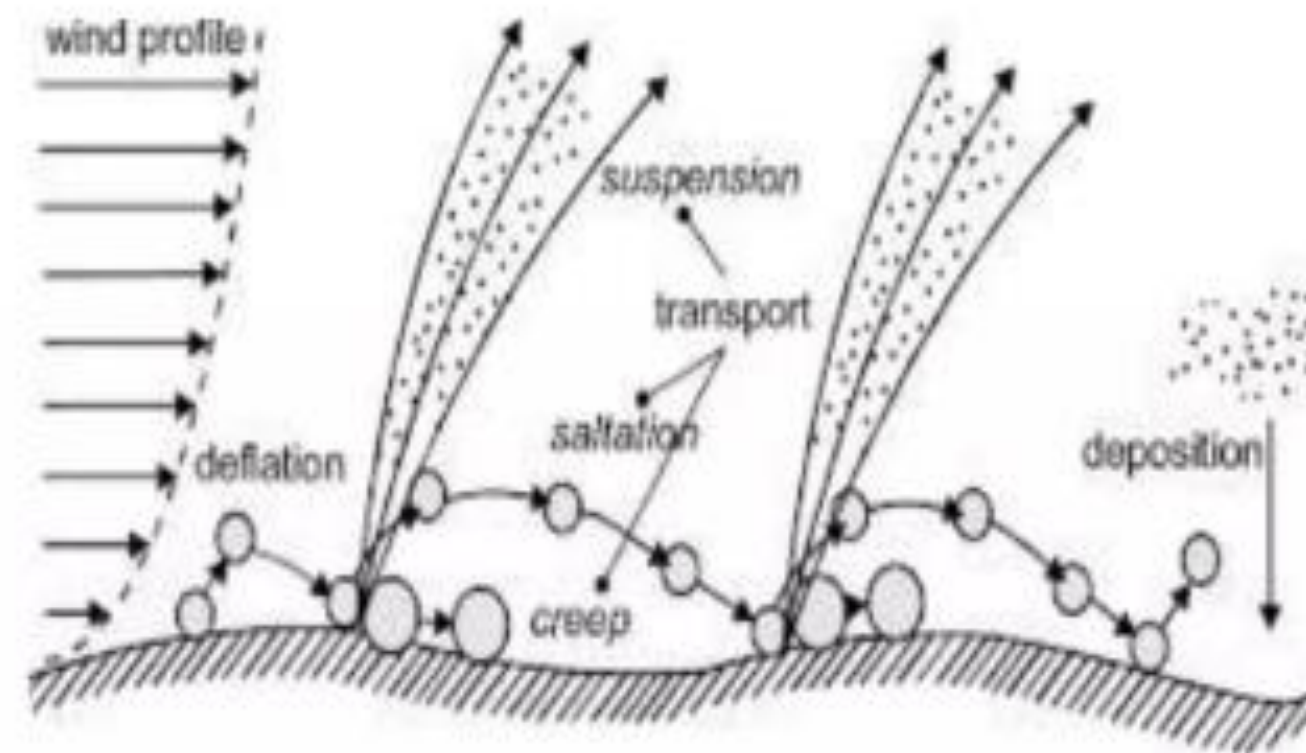
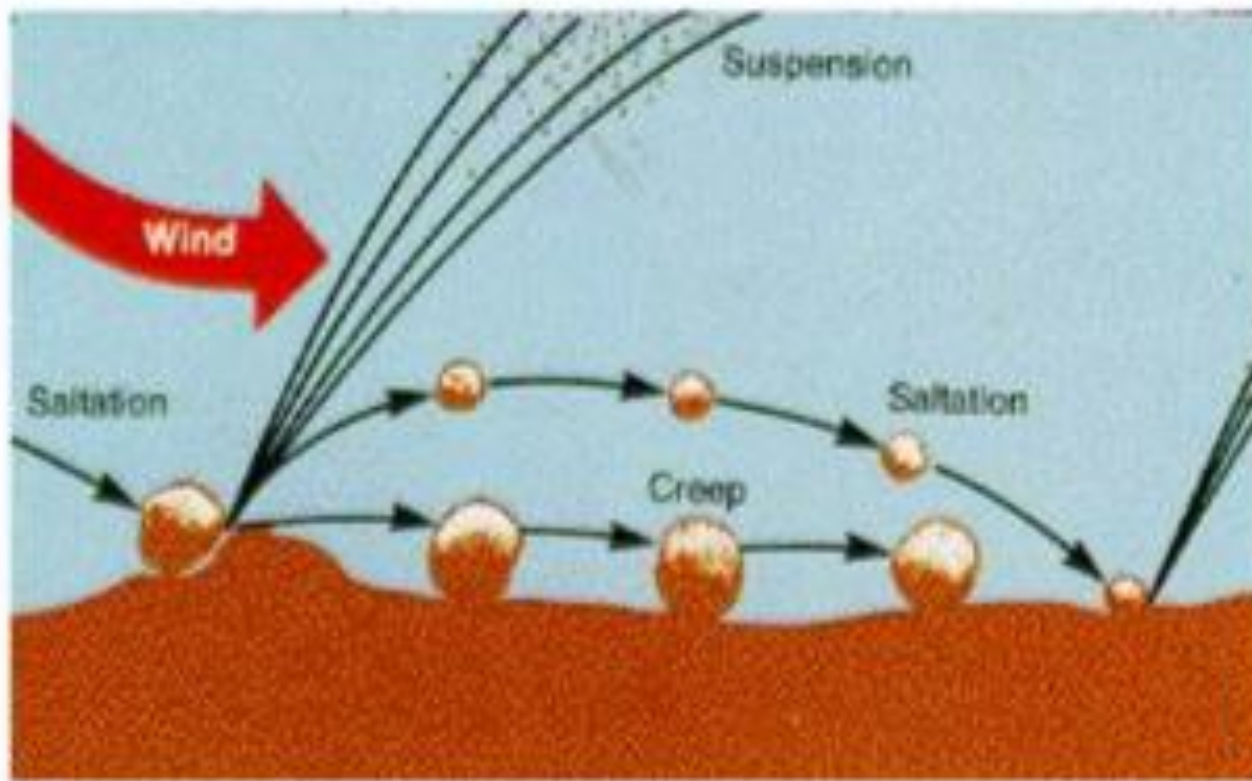
Factors Affecting Wind Erosion

- Climate, soil and vegetation are the major factors affecting wind erosion at any particular location.
- **The climatic** factors that affect the wind erosion are the characteristics of wind itself (velocity and direction) in addition to the precipitation, humidity and temperature.
- **Soil** moisture conditions, texture, structure, density of particles, organic matter content are the soil characteristics that influence erosion by wind. Soil movement is initiated as a result of wind forces exerted against the surface of the ground. The quantity of soil moved is dependent upon the particle size, the cloddiness of particles, and wind velocity itself.
- **Surface features like vegetation** or other artificial cover (mulching etc) have the protective effect on wind erosion problem as surface cover increases the roughness over the land surface and thus reduces the erosive wind force on the land surface.



MECHANICS OF WIND EROSION

- Wind erosion occurs where soil is exposed to the dislodging force of wind.
- These are initiation of movement, transportation and deposition.





- **Initiation of Movement:** The initiation of the movement of soil particles is caused by several factors acting separately in combination. In the course of collision of grains rolling and bumping on the surface, some particles may be bounced up. It occurs when the wind force or the impact of moving particles is strong enough to dislodge stationary soil particles.

- **Transportation:** The transportation of the particles once they are dislodged take place in three ways:
 - i) **Suspension** – The soil particles of less than 0.1 mm size are subjected to suspension and around 3 to 40 % of soil weights are carried by the suspension method of soil transport under the wind erosion. Finer suspended particles are moved parallel to the ground surface and upward.





ii) Saltation – In saltation soil particles of medium size (0.10-0.5 mm diameter) are carried by wind in a series of short bounces. These bounces are caused by the direct pressure of the wind on soil particles. Depending on soil type, about 50 to 75% of the total weight of soil is carried in saltation.

iii) Surface Creep – The large particles which are too heavy to be lifted into the air are moved through a process called surface creep. In this process, the particles are rolled across the surface after coming into contact with the soil particles in saltation. In this process the largest of the erosive particles having diameters between 0.5 to 2 mm are transported and around 5 to 25% of the total soil weights are carried in this fashion.

➤ **Deposition:** Deposition of the particles occurs when the gravitational force is greater than the forces holding the particles in air. Deposition could occur when the wind velocity is decreased due to surface obstructions or other natural causes.



- **Wind Erosion Control**

Three basic methods can be used to control wind erosion:

- Maintain Vegetative Cover (Vegetative Measures)
- Roughen the Soil Surface by Tillage Practices (Tillage Practices or may be called Tillage Measures)
- Mechanical or Structural Measures (Mechanical Measures)



Vegetative Measures



- **Vegetative measures can be of two types:**
 - **1. Temporary Measures**
 - **2. Permanent Measures**
- **The use of these measures depends upon the severity of erosion.**



Tillage Practices



The common tillage practices used for wind erosion control are as under:

Primary and Secondary Tillage

Use of Crop Residues

Strip Cropping

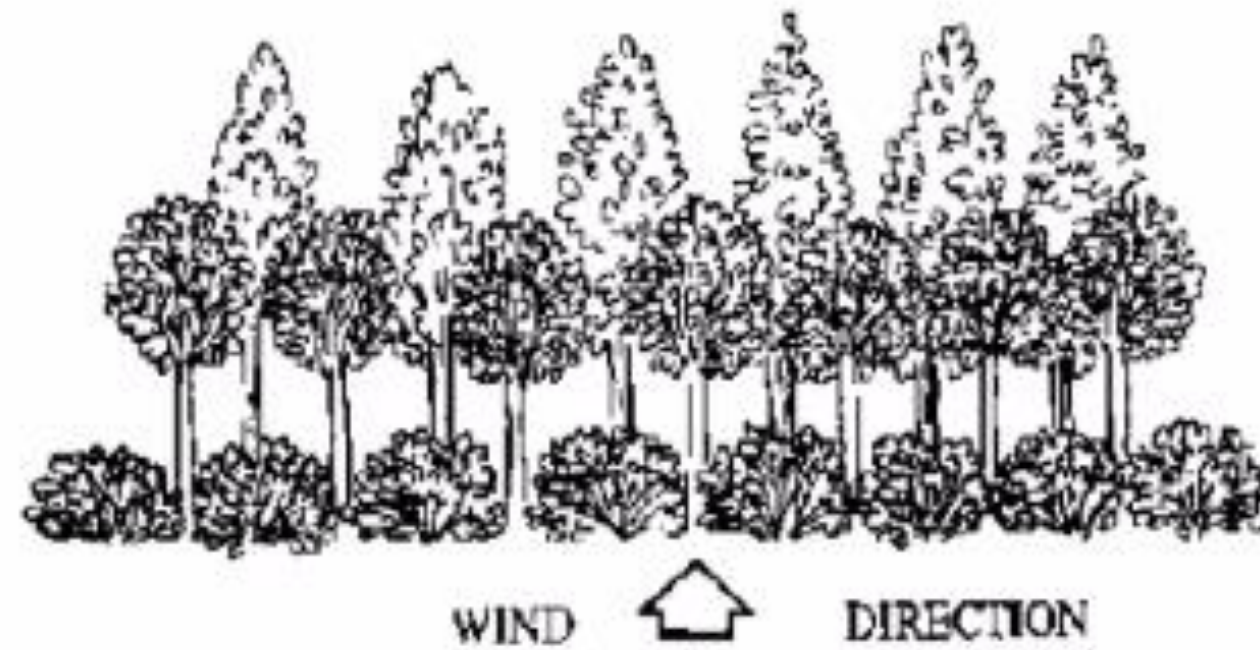


- This method consists of some mechanical obstacles, constructed across the prevailing wind, to reduce the impact of blowing wind on the soil surface
- These obstacles may be fences, walls, stone packing etc., either in the nature of semi-permeable or permeable barriers.
- The semi-permeable barriers are most effective, because they create diffusion and eddying effects on their downstream face.
- Terraces and bunds also obstruct the wind velocity and control the wind erosion to some extent.
- Generally, in practice two types of mechanical measures are adopted to control the wind erosion; i) wind breaks and ii) shelter belts.



shelterbelts

These are belts/blocks consisting of several rows of trees established at right angles to the prevailing wind.





The purposes are:

- to deflect air currents,
- to reduce the velocity of prevailing winds,
- to provide general protection to the leeward areas against the effects of wind erosion,
- to protect the leeward areas from the desiccating effects of hot wind,
- to provide food, fodder, timber etc
- Carbon sequestration
- Increases biodiversity.



windbreak

Wind-breaks are strips of trees and/or shrubs planted to protect fields, homes, canals or other areas from wind and blowing soil or sand.





They are rows of trees and shrubs designed to shield agriculture plots from the wind

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