Soil Conservation in Israel

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What is the meaning of soil conservation?

The **protection**, **optimum use** and **reclamation** of soil

<u>Protection from</u>:

1. **Erosion**- soil loss caused by rainwater or wind

2. **Compaction**-poor soil structure and aeration caused by excessive vehicular traffic and/ or improper cultivation practices

3. **Waterlogging**- excessive water content and inadequate aeration caused by poor drainage conditions and/or compaction.

4. **Salt contamination**- soil salinization caused by irrigation and / or high water table conditions

Protection from:
Poor Drainage

Drainage-the removal of excess surface/soil water

Poor Drainage

- **Waterlogging**
- **Soil Compaction**
- **Soil Salinization**

Optimum use of the soil

Attaining the most efficient and economic crop production with minimal damage to the soil and the environment. (Sustainable Agriculture)

Reclamation of salinated or eroded soils

Improving the physical and/or chemical properties of the soil that create a favorable environment for plant growth.

Erosion Control/ Drainage

Determining Factors:

- Soil
- Rainfall
- Slope Gradient
- Hydrological Conditions(water table level)
- Irrigation Methods/Management
- Cultural(cropping/tillage) Practices

Soil

Fixed and Variable Soil Properties:

- Texture(**F**)
- Stoniness(**F**)
- Chaukiness(**F**)
- Organic Matter Content(**V**)
- Salinity/Sodicity(**V**)

Soil Texture

Clay Soils		Sandy Soils
++	Stoniness	+
++	Chaukiness	+
++	Organic Matter	+
++	Salinity/Sodicity	+

+ less ++ more

Soil Properties and Potential For **Erosion/ Poor Drainage**

- Texture
- Stoniness
- Chaukiness
- Organic Matter Content
- Salinity/Sodicity

→

- **Soil Structure Stability**

Soil Structure Stability

Soil Erosivity(erosion potential)
Soil Aeration
Soil water movement

Soil Structure Stability

↓

Soil water movement

Surface
(infiltration rate)

Sub-surface
(percolation rate)

Rainfall

Intensity
Frequency
Amount

→

Soil Erosivity
Soil Aeration

Slope Gradient

Steep → **Erosion**

Flat → **Poor Drainage**

Hydrological Conditions

water table level/quality:

Drainage
Soil salinity

Hydrologic Conditions

Shallow water table

(near the soil surface)

Poor drainage conditions

Hydrologic Conditions

Watertable quality:

more saline

↓

more soil salinization

Irrigation Methods/Management

Methods

- open surface systems(furrow, flood)
- sprinkler systems
- drip

Irrigation Methods

↓

Erosion Control/ Drainage Conditions

Main Principles of Soil Conservation

Main Principles of Soil Conservation

1. Soil conservation is an essential part of an overall approach to

watershed development

<u>In watershed development:</u>

- There is a **hydrological connection** between the **uplands** and the **lowlands:**

- The lowlands will be directly affected by overland and sub-surface flow from the uplands.

2. **Physical planning** should include **soil conservation measures** to treat both the **uplands** as well as the **lowlands**.

Main Principles of Soil Conservation

2. **Good soil management** as part of **physical planning** is the key to effective soil conservation.

Land use suitability is the main criteria in physical planning for determining:

1. Land to be under cultivation
2. Necessary soil conservation measures for all cultivated lands.

Main Principles of Soil Conservation

3. Soil conservation practices should be implemented without regard to land ownership boundaries.

4. Soil conservation requirements for cultivated land are determined by:
Climate -Topography - Soil Type

The Connection between **Climatic Changes (Global Warming) and Soil Conservation**

Less Annual Rainfall → lower soil organic matter

Higher Rainfall Intensity → increased soil erosion

Soil Conservation Practices

According to the climate

Classification: Agro-ecological zones based on:
1. rainfall pattern
2. average yearly rainfall
3. monthly temperatures

Israel is classified as a **mediterranean** climate:
1.**one** winter rainy season
2. 6-8 months **dry**
3. 300-1000 mm rainfall
(Southern Israel-**semi-arid** climate- 100-300mm)

Soil Conservation Practices

Topography Zones	**Major Problems**		**Recommended Approach**
	Shallow soils Erosion	Waterlogging Salinity Soil Compaction	
Uplands	+++	+	Erosion Control
Foothills	+/++	+/++	Erosion Control Drainage
Lowlands	+	+++	Drainage

Frequency: + Low +++ High

Soil Conservation Practices in the Uplands

Main Objective: Preserving shallow soils from erosion

Commonly Used Practices:

1. Bench Terraces
2. Diversion ditches
3. Crop rotation with winter cover crop in row crops
4. Cover crops in tree orchards- vegetative cover(natural or seeded) in winter

Soil Conservation Practices in the Lowlands

Main Objective:Maintain good drainage conditions

Commonly Used Practices:

1. Drainage-surface/sub-surface systems
2. Irrigation management
3. Cover crops in tree orchards- vegetative cover(natural or seeded) in winter

Drainage-the removal of excess surface water and soil water

Natural Systems

Artificial Methods

Surface systems
-field ditches
-drainageways
-row crop beds and tree ridges

Sub-surface Systems

Irrigation Management

Main Objective- Minimize excess water application to prevent waterlogging, minimize surface run-off and soil salinization.

Methods of irrigation with highly regulated water-application- sprinkler /micro-sprinkler /drip

- Water Application Program- based on soil and climate data

Cover crops

A soil conservation method for upland and lowland watershed zones

What are Cover Crops?

Plant Species that can be used in pasture or agricultural field production units(row crops and tree orchards) for the purpose of improving growing conditions while preserving environmental balances and natural resources.
(Covercropping-the systems by which cover crops are integrated in cultural practices)

Potential Benefits

Agricultural

Environmental

Agricultural Benefits

Soil Conservation

1. Reduced soil erosion
2. Improved water infiltration/percolation
3. Increased soil aeration
4. Less soil compaction
5. Reduced waterlogging
6. Addition of legume –fixed nitrogen
7. Cereal extraction of excess nitrates
8. Increased availability of soil nutrients
9. Increased levels of soil organic matter

Weed Control

Plant Protection

1. Attraction of beneficial insects
2. Catchment for insect pests

Environmental Benefits

The reduction in the use of :

+herbicides

+insecticides

+synthetic fertilizers

will result in :

1. Less contamination of groundwater sources
2. Preservation of the soil as a natural resource
3. Less air pollution
4. Preservation of fragile balances of plant and insect communities
5. Minimizing possible human and animal health hazards

Possible negative effects of covercropping

1. Attraction of rodents and insect pests
2. Water and nutrient competition
3. Competition of insect pollinators
4. Lower air temperatures under frost conditions
5. Increased fire hazard
6. Higher costs

Covercropping in Tree Orchards for Soil conservation

Erosion control:
In **non-shaded** young sub-tropical and deciduous orchards with **bare** soil in winter

Drainage
In **shaded** mature sub-tropical and deciduous orchards.

Covercropping Program

Planting-October to December

Growing Season-November to April

The long-term success of a covercropping program will be dependant upon:

1. Adapting the design to local conditions

2. Information sharing and cooperation between extensionists, farmers and researchers

3. Ongoing field research and development

Summary

1. Soil Conservation deals with the protection, optimum use and reclamation of soil.

2. Erosion control and Drainage practices will be determined by the following physical factors:
- soil
- rainfall
- slope gradient
- hydrological conditions(water table level)
- irrigation methods/management
- cultural(cropping/tillage) practices

Summary

3. Soil conservation is an important part of watershed development. Soil conservation practices will be effective when implemented in the entire watershed-uplands and lowlands according to local conditions-climate, soil and topography and without regard to land ownership boundaries.

4. Good soil management (land use and cultural practices) as part of physical planning is the key to effective soil conservation.

5. Covercropping is an effective soil conservation practice for upland and lowland watershed zones.