Soil erosion and assessment
Knowledge of the soil types in the field is critical for determining whether conservation agriculture is feasible in a specific field.
Factors influencing field variability and yield potential

- soil drainage
- texture
- organic matter
- erosion spots
- compaction

While some factors can't be changed, many can be addressed through management
Internal drainage

- Both natural and man-made drainage can make a difference.
- Better-drained soils usually have a yield advantage when crops are grown in high residue systems.
- In CA channels formed by crop roots and soil biota are no longer destroyed by tillage implements and water can drain out on gravity forces.
Organic matter

- often leads to more uniform plant stands
- definite link between amount of tillage performed and the soil's ability to hold carbon. Carbon accounts for about half of a soil's organic matter, which is critical to long-term productivity
Soil erosion is often mentioned as the cause of soil fertility decline and consequent land degradation. However, a better explanation and understanding is provided by regarding soil erosion as an effect of fertility decline and degradation processes.
Factors which affect soil erosion caused by water

- rainfall pattern,
- slope steepness (gradient),
- slope length,
- soil type,
- existing erosion control structures,
- cropping practices, especially soil cover,
- time
Erosion caused by wind

– on level land
– depends on the strength of the occurring winds
Human-induced erosion

- can happen fast with large amounts of removed soil.
- it can be a serious threat to agricultural production and the environment
Erosion

• On-site effects:
  • Loss of water, fertilizers and pesticides (Immediate production loss)
  • Loss of soil (Long-term productivity loss)

• Off-site effects:
  • Deterioration in water quality (e.g. pollution of rivers, death of fish, higher costs of drinking water, etc.)
  • Sedimentation of transported soil (e.g. silting up of reservoirs, covering of crops, etc.) Flooding of inhabited areas (mud flows, sanded up ditches)
  • Rise in peak flows of rivers (destruction of structural works, bridges, etc.)
Soil compaction

- occurs on almost all agricultural soils
- is rather "invisible" as it occurs below the soil surface
- is reversible and its occurrence preventable or at least controllable
Degraded land

- land that due to natural processes or human activity is no longer able to properly sustain an economic function and/or the original natural ecological function.
- Soil degradation is therefore a decline in the soil's productive capacity and ability to fulfil ecological functions.
Reasons for soil inspection

- a crop or pasture is growing below expectation
- presence of rough seedbeds or large, cloddy material being brought to the soil surface
Assessments of soil condition are comparative

- an uncultivated area (a treeline) versus a cultivated or grazed field
- an obvious wheeled area (where a tractor or harvester has gone) and the non-trafficked area beside it
- two areas on the one soil type that have had different types of management history, e.g. conventionally managed versus zero tillage
- in one soil profile to compare topsoil with upper subsoil and subsoil
Soil quality indicators

Usually, measurement-based indicators provide quantitative assessments, but are:

- relatively time consuming
- expensive
- the interpretation is often poorly understood by a layman and need a professional to explain the obtained data
Simple, quick and easily understood methods of assessing soil quality

Most indicators used are linked to physical properties of the soil, because they

• are easily seen,
• have a profound influence on biological and chemical soil properties,
• have a significant impact on the productivity,
• their loss can take decades to recover,
• are costly to remedy.
Indicators of visual soil assessment

- soil structure and consistence
- soil porosity
- soil colour
- number and colour of soil mottles
- earthworm counts
- the presence of a tillage pan
- degree of clod development on the soil surface
- degree of soil erosion
Plant indicators

- crop emergence/area of bare ground
- crop height at maturity / pasture growth and regrowth
- size and development of the root system
- crop yield/stock carrying capacity
- root diseases
- weed infestation/pasture composition
- surface ponding/drought stress
- production costs
Erosion assessment

- Splash erosion
- Sheet erosion
- Rill erosion
- Gully erosion
- Wind erosion
- Mass earth movements
- Waterlogging and sedimentation
Catchment or watershed

- the area that supplies water by surface and subsurface flow from rain to a given point in the drainage
Catchment or watershed management

• deals with all area within the boundaries of a drainage basin.

• It is not only concerned with the agricultural lands under cultivation but also with forests, range lands, areas destroyed by erosion, and others that can serve as protection areas only.