



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



## Acknowledgement

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CZ.1.07/2.2.00/28.0302**

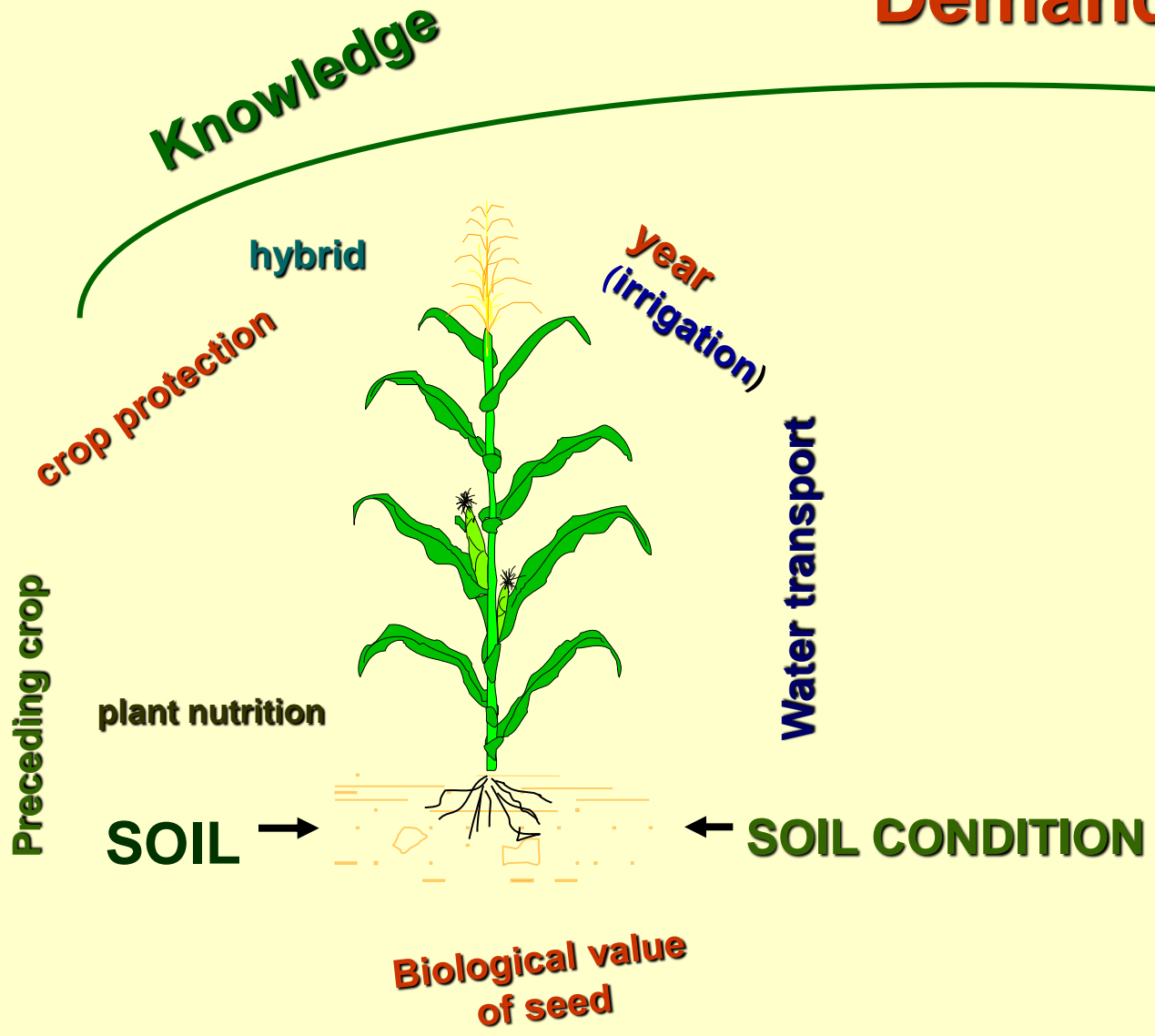
# Importance of soil quality for plant growth

Mendel  
University  
in Brno



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# Demand of crop



# **Improvement of biological impacts of soil tillage in a crop production system**

- 1. Structure + C + water conservation tillage**
- 2. Conservation of beneficial living creatures in soils**
- 3. Altering soil load and regeneration periods – different growing / sowing / harvesting time**
- 4. Surface cover – preventing climate damages**
- 5. Managing stubble residues**
- 6. Producing soil loosened state maintaining and structure improving plants**
- 7. Sensible plant nutrition**
- 8. Skilful crop protection**

# Adaptable tillage =

- water conservation
- carbon conservation
- structure conservation
- habitat conservation
- cost saving (rationally)
- climate stress mitigating

# Improved soil tillage system

## STUBBLE TILLAGE / MANAGEMENT

conserving soil moisture, promoting biological mellowing and decreasing heat and rain stress



## STUBBLE TREATMENT

weed, volunteer control



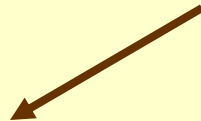
## PRIMARY TILLAGE + SURFACE MANAGEMENT

soil condition improvement to the required depth by different tools (plough, cultivator, subsoiler, disk)



## SECONDARY TILLAGE (if needed)

clod breaking, surface levelling and pressing



**SEEDBED PREPARATION**  
(best condition for sowing)



**SOWING**  
surface press



**SEEDBED PREPARATION + PLANT + SURFACE PRESS** in one pass

# Adaptable soil tillage

## Steps

- ❑ stalk chopping and spreading,
- ❑ stubble management,
- ❑ stubble treatment,
- ❑ soil condition assessment (spade probe, stick-probe),
- ❑ adaptable primary tillage and surface preparation,
- ❑ surface cover,
- ❑ minimising the surface,
- ❑ rationalisation of seedbed preparation and sowing

**Beginning of the new tillage season is the day of harvest**

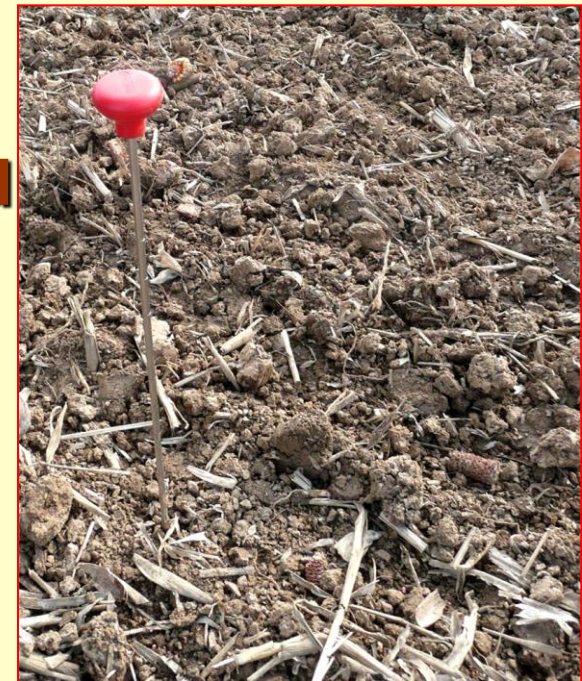


## Root assessment

## Spade probe



## Stick sound







**wet**

# Finger/ palm-test



**Humid**



**Dry**

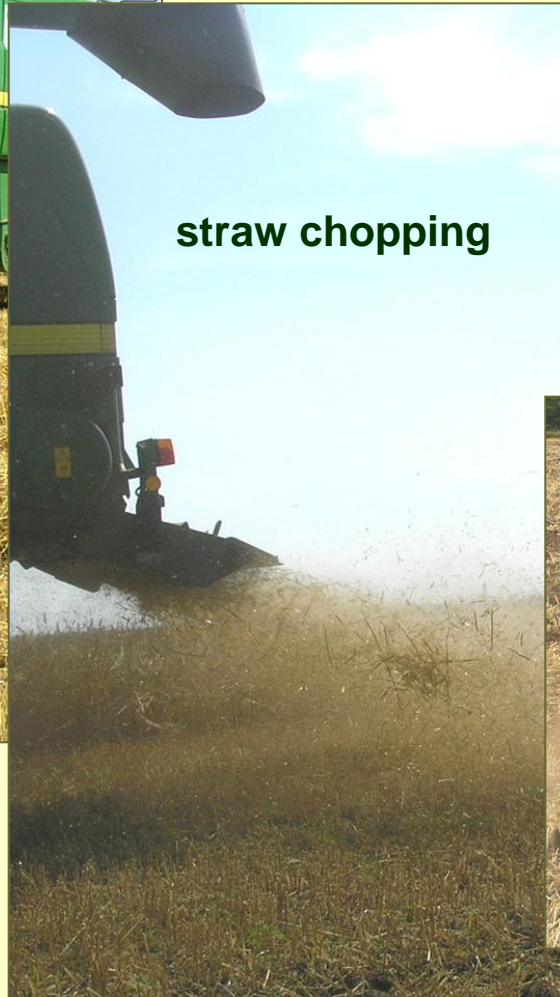
# Stubble residues are important



straw chopping



chopped straw



stubble  
stripping

# Stubble residues are important



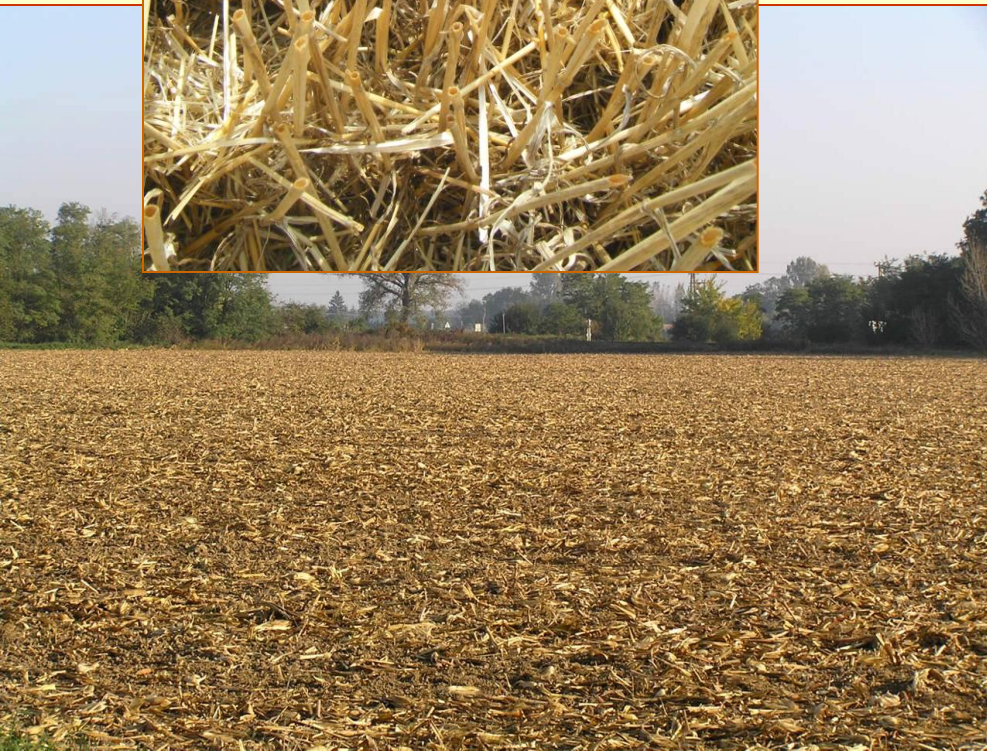
## Nutrition for plants

**3 t/ha wheat straw contains**  
(ingredient, kg/ha):

**N: 11-18, P: 2-3, K: 24-27**

**10 t/ha maize stalks contain**  
(ingredient kg/ha):

**N: 28-36, P: 8-12, K: 80-100**



**Stubble  
treatment**

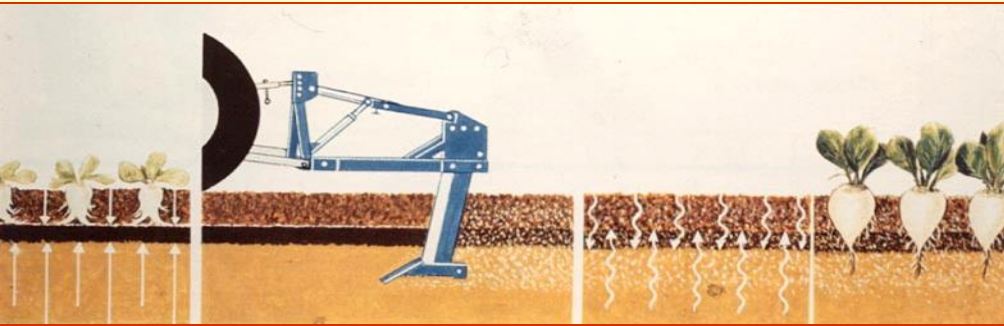
**spraying**

**Inverting or mixing**

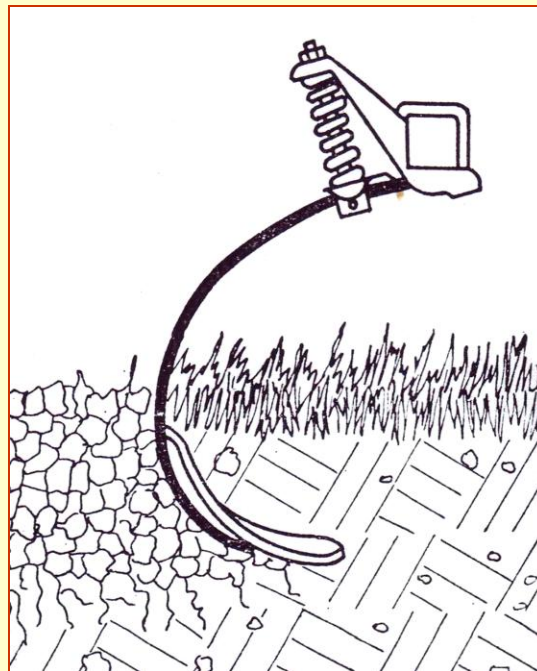


**volunteer  
crop**

# Soil state improvement



# Soil state maintenance



# Soil conditioning primary tillage



## Loosening

- 1. Soil condition test**
- 2. Use in tilled/  
undisturbed  
stubble soil**
- 3. In dry – no over-  
dried – soil**
- 4. Surface  
preparation by  
cultivator**
- 5. No recompaction!**

# SOIL LOOSENING



## Advantages

1. Alleviation of compacted status
2. Favourable biological impacts
3. Alleviation of harmful climatic effects
4. Use on dry soil
5. Less moisture loss
6. Less energy
7. Production guarantee = economical benefits
8. Climate stress mitigating

## Considerations

1. no use on wet soils
2. ploughless operation
3. cloddiness on dry soils
4. higher energy demand on dry soils
5. no control weeds, but disturb life of perennial weeds
6. learn it well!
7. possible defect at surface preparation

# Ploughing, loosening and tine till systems in *dry soils*

Ploughing system	Loosening system	Tine system
<p>Stubble tillage: conv. disk (+)</p> <p>↓</p> <p>Ploughing: rev. plough + combined roll (0)</p> <p>↓</p> <p>Surface prep: conv. disk (+)</p> <p>↓</p> <p>Seedbed preparation: Compactor (-)</p> <p>↓</p> <p>Sowing</p>	<p>Stubble tillage: mulch cultivator (-)</p> <p>↓</p> <p><b>LOOSENING + comb. roll (0)</b></p> <p>↓</p> <p>Surface prep: flat disk(-)</p> <p>↓</p> <p>Seedbed preparation and sowing</p>	<p>Stubble tillage: mulch cultiv. or no disturbance(-)</p> <p>↓</p> <p>Chemical treatment (if) (-)</p> <p>↓</p> <p>Primary tillage: tine (-)</p> <p>↓</p> <p>Seedbed preparation and sowing</p>
<p>Soil state improvement: moderate</p>	<p>Soil state improvement: good</p>	<p>Soil state improvement: very good</p>
<p>Legend: possible damage (+); minimised damage (-), neutral (0)</p>		



# Improvement of soil state deteriorated severe pan compaction

**Gradual deepening = better (than one bad) + less cost**

**1<sup>st</sup> step: shallow stubble tillage + surface press and cover.**

**2<sup>nd</sup> step: loosen to the pan (2 – 3 weeks for regeneration)**

= deepening of the biological active layer

- 2 – 3 weeks prior to 3rd step

**3<sup>rd</sup> step: ripping the pan layer (to ~ 40-45 cm)**

❖ **Level / press the surface**

❖ **Alternate the direction of soil ripping in the years!**

**More efficiency, less energy  
in soils having good OM balance**



# Soil conditioning primary tillage

## Cultivator (tine) use



**1. Soil conservation = benefit/profit**

**2. In dry, humid and wet (workable) soil!**

**4. No pan-compaction (!)**

**5. Crumbling, loosening, mixing, surface forming.**

**6. Adaptability to soil state**

**7. Stubble- and primary tillage, surface preparation after subsoiling**

**3. Mulching = water conservation**