CHALLENGE 7. STRATEGIES AND TOOLS FOR SUSTAINABLE SOIL AND SUBSTRATE MANAGEMENT

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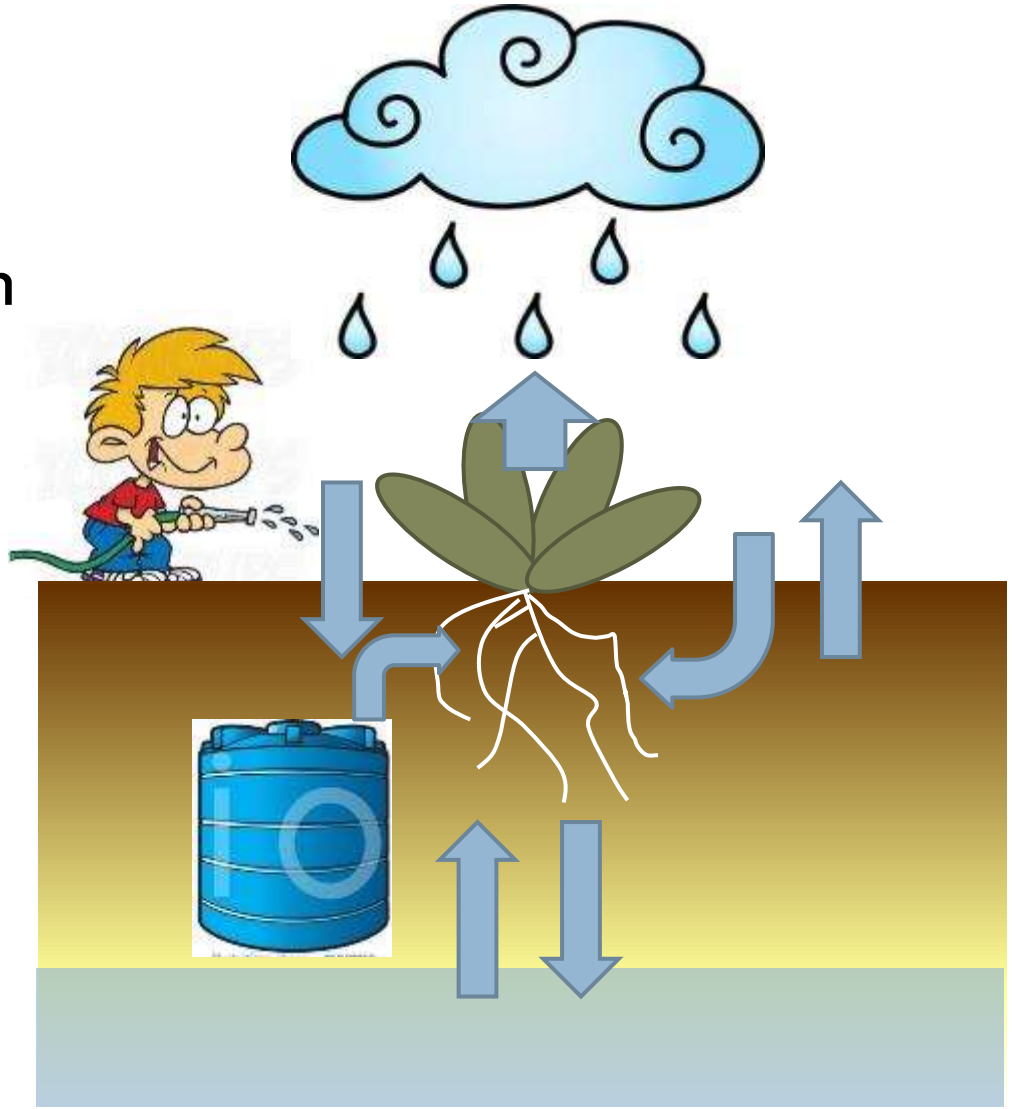
Soil and substrate crucial role in crop growth and water management

- Fixation of plants with roots
- Buffer of water, oxygen & nutrients
- Resilience against pests & diseases

Unhampered crop growth

Efficient water use



Common soil problems

- Shallow rooting depth
- Compaction
- Low CEC/organic matter content
- Erosion
- Crusting
- Salinization
- Soil born pests and diseases

→ No optimal water & oxygen flow and root growth

- ***Awareness of changes in soil properties***

Fertile soils

Integrated Systems Approach

Ecosystem Services

Soil

Operations

WAGENINGEN UR
For quality of life

Action 1 Conservation horticulture

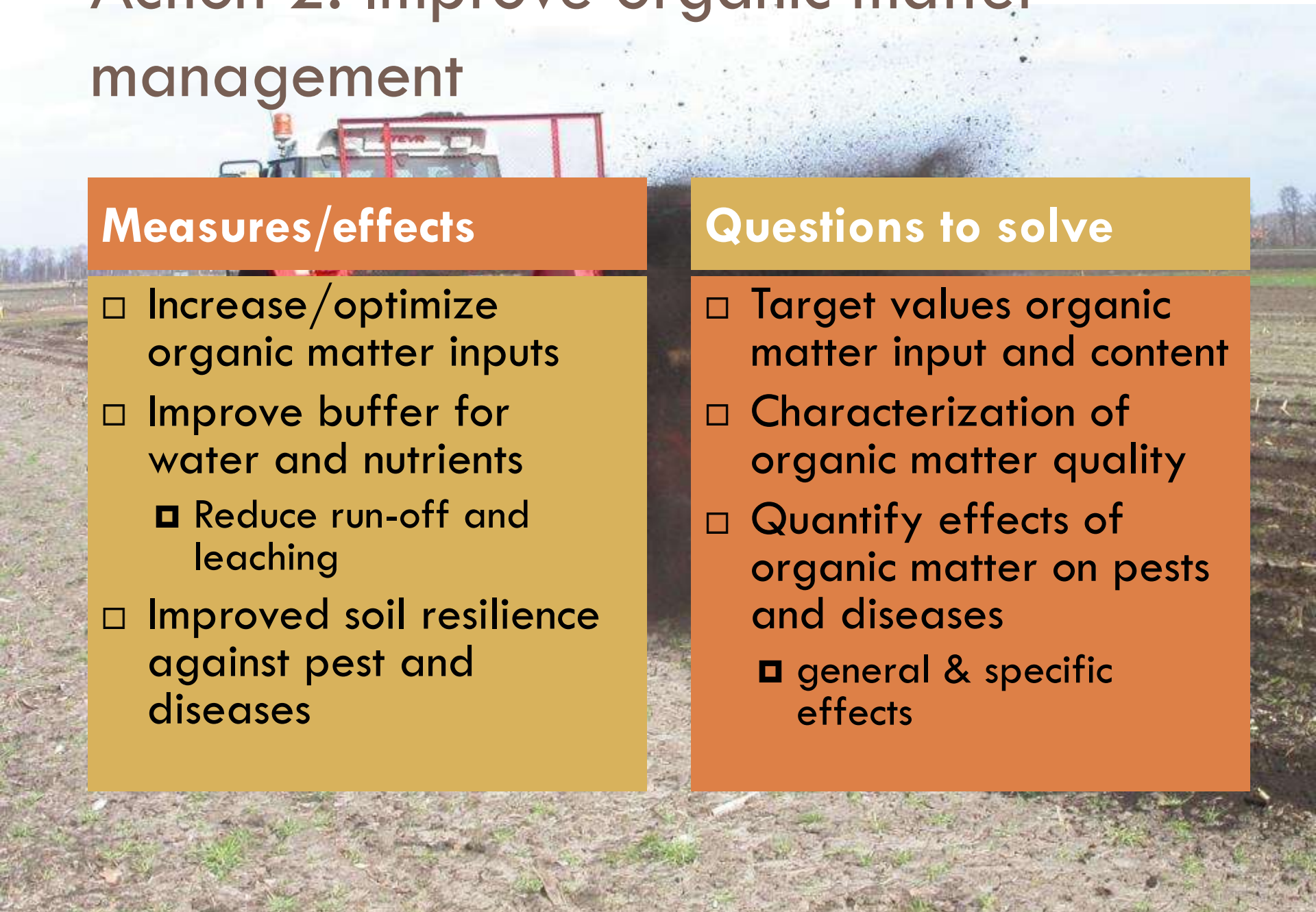
Measures

- Reduced soil tillage
- Keep soil covered: green manure crops
- Crop rotations with arable crops and grassland
- Soil organic matter management

Questions to solve

- How far can tillage be reduced?
- How to fit in green manure crops?
- How to cooperate with other sectors to increase o.m.?

Action 2: Improve organic matter management



Measures/effects

- Increase/optimize organic matter inputs
- Improve buffer for water and nutrients
  - Reduce run-off and leaching
- Improved soil resilience against pest and diseases

Questions to solve

- Target values organic matter input and content
- Characterization of organic matter quality
- Quantify effects of organic matter on pests and diseases
  - general & specific effects

Action 3 Improve crop rooting

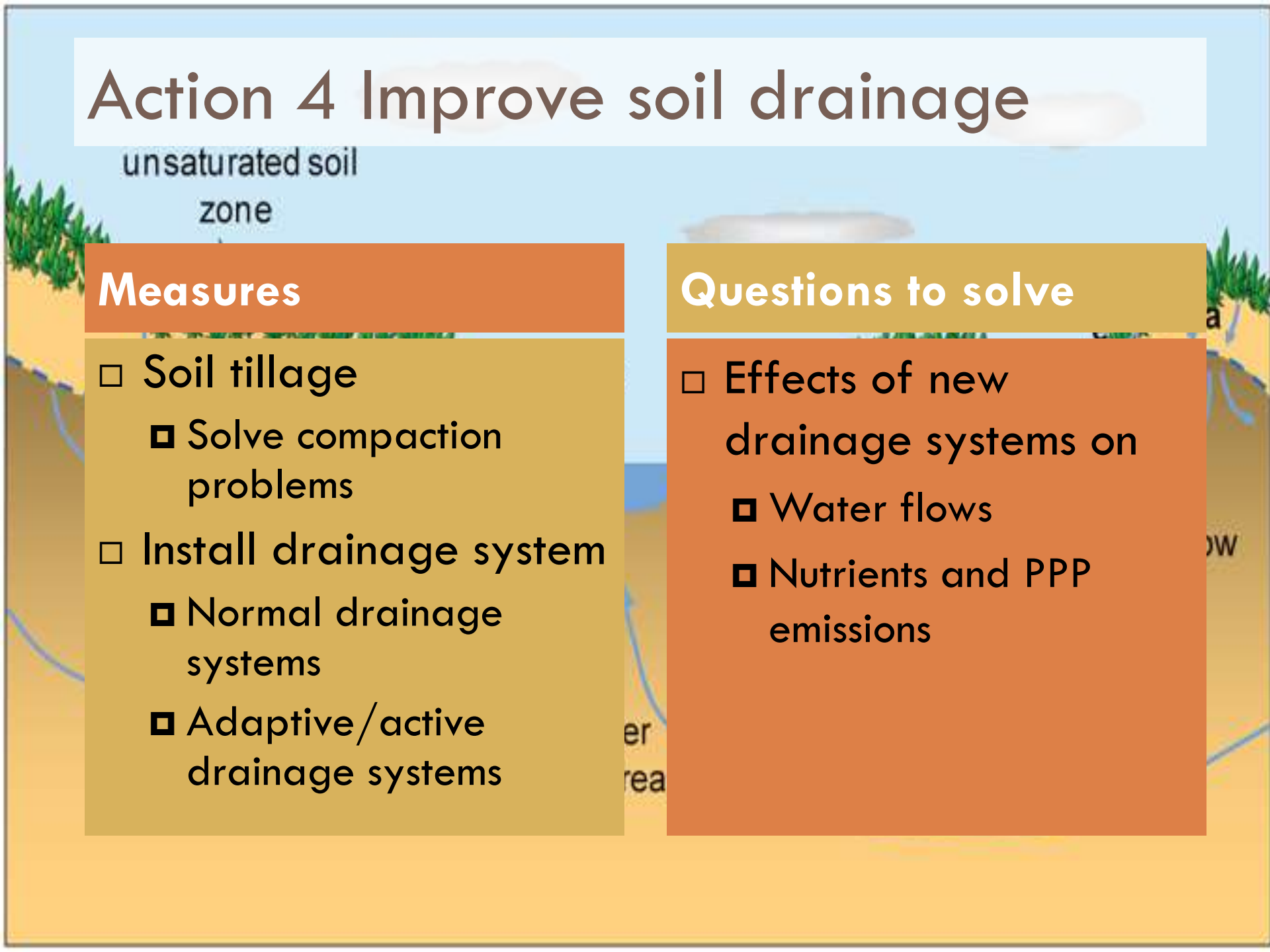
Measures

- Prevention of compaction
  - Strong rooting crops
  - Use light machinery
  - Right timing of operations
- Breaking compacted soil layers
  - Soil tillage
  - Green manure crops

Questions to solve

- Quantify root growth of crops and cultivars
- Efficient light machinery
- To break compacted layers
  - Effective machinery
  - Effective crops

Action 4 Improve soil drainage



Measures

- Soil tillage
  - Solve compaction problems
- Install drainage system
  - Normal drainage systems
  - Adaptive/active drainage systems

Questions to solve

- Effects of new drainage systems on
  - Water flows
  - Nutrients and PPP emissions

Action 5: Soil improving crop rotations

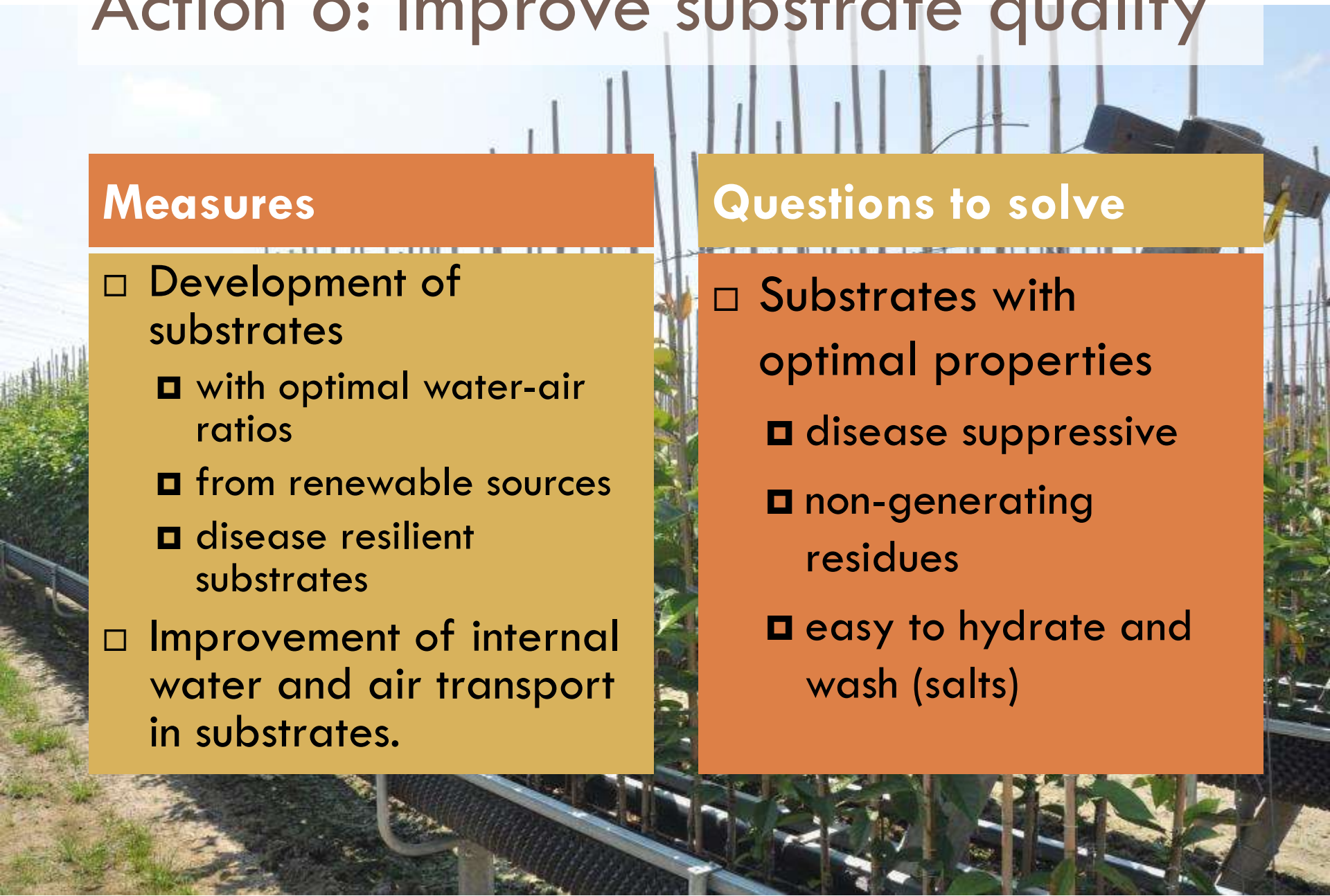
Measures

- Use of
  - Green manure crops
  - deep rooting crops
  - crops with high amount of C-rich crop residues
- Combine horticulture with arable farming and/or grassland

Questions to solve

- Design of multifunctional crop rotations
- Modes for cooperation with other agricultural sectors

Action 6: Improve substrate quality



Measures

- Development of substrates
  - with optimal water-air ratios
  - from renewable sources
  - disease resilient substrates
- Improvement of internal water and air transport in substrates.

Questions to solve

- Substrates with optimal properties
  - disease suppressive
  - non-generating residues
  - easy to hydrate and wash (salts)

Action 7. Improve substrate management

Measures

- Development of control systems for plant water status and oxygen and nutrient availability
- Strategies and systems to mitigate salt accumulation and facilitate washing

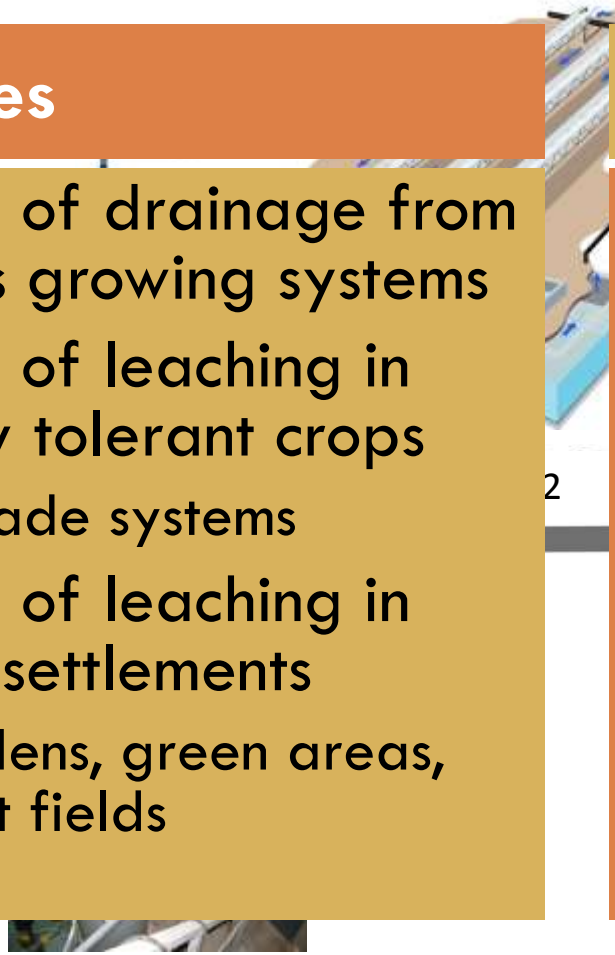
Questions to solve

- Optimization of water supply and oxygen availability
- Management in saline conditions

Action 8. Improve drainage re-use

Measures

- Re-use of drainage from soilless growing systems
- Re-use of leaching in salinity tolerant crops
  - cascade systems
- Re-use of leaching in urban settlements
  - gardens, green areas, sport fields



Storage tanks

Questions to solve

- Availability of good quality irrigation water
- Optimal nutrient control in re-circulating systems
- Develop efficient and affordable disinfection systems.

Overview actions challenge 7

- 1 Conservation horticulture
- 2 Improve organic matter management
- 3 Improve crop rooting
- 4 Improve soil drainage
- 5 Soil improving crop rotations
- 6 Improve substrate quality
- 7 Improve substrate management
- 8 Improve drainage re-use