RESOURCE USE (ADAPTATION AND MITIGATION)

Resource efficiency / water and energy / circular economy / fertilization

KEYNOTE SPEAKER

José Vogelezang, *is the scientific director of TKI Horticulture & Starting materials, one of the Dutch Top sectors. As manager of New Business Development of Wageningen Plant Research she is also active in regional steering committees of so-called Greenports (triple helix horticultural clusters). Within Wageningen UR she was programme director of Transition and Innovation research, and Program coordinator of research programmes aimed at "system innovation for agricultural production systems". Mrs Vogelezang holds a PhD in Plant Sciences of Wageningen University.*

CHALLENGES

- Climate resilient production is necessary for production;
- Environmental sustainable production and scarce resources require efficient and circular production methods;
- Society demands the transition from fossil to renewable energy and more self-support in energy supply;
- To remain competitive, labour efficiency and product quality have to be improved;
- Other sources of valuable bio-based ingredients are necessary.

PRESENTATION

Next-level agriculture[1]

In the coming decades, we need a transition to healthy, circular and resource-efficient agricultural production systems. This includes the following challenges:

CHALLENGE: climate-resilient production is necessary for production security (to adapt to changing weather conditions and to prevent soil depletion).

SOLUTION: it is vital to develop systems that optimize the use of soil, water and other critical inputs that are used for production:

[1] Food Transitions 2030, Wageningen UR

- R&I: transition needed to resilient production ecosystems for harvest security. This includes more genetic diversity, stimulating biodiversity in soil and plant environment, better use of symbioses with useful microorganisms ('2nd genome'), and adapting cropping systems (e.g. inter- and multi-cropping).

We know from 10 years of research in Asia, South America and Africa that mixed cropping systems lead to higher yields (ca. 20%), suppression of diseases and better soil quality.

CHALLENGE: environmental sustainable production in the context of resource scarcity, require efficient and circular production methods (so that they do not affect the environment).

SOLUTION: in a controlled environment, a further decrease in inputs is possible, as well as the recovery of unwanted outputs, leading to a circular system:

- R&I is needed for resilient growing systems, with minimal inputs of water, nutrients, energy and chemicals;
- R&I is needed for a transition to 'green chemicals' for biocontrol of plant diseases;
- R&I is needed for optimizing the genetic basics in challenging environments.

Circular production systems are not only feasible in protected cultivation, but also for crops in the open field, like leek on water systems, apple trees in substrate slots and nursery stock in gutters.

CHALLENGE: society demands the transition from fossil to renewable energy and more self-support in energy supply.

SOLUTION: horticulture is frontrunner in the use of renewable energy: solar, geothermal, heat&cold storage and (industrial) waste heat in smart energy grids:

- R&I: energy-efficient production needs new design, plant varieties and materials for protected cultivation and new climate control strategies for (large scale) economically feasible transitions.

CHALLENGE: to remain competitive, labour efficiency and product quality have to be improved

SOLUTION: high value crops make precision farming and robotics economically feasible, provide optimal plant control and challenging work for young highly educated people:

- R&I needed for intelligent sensor applications and Decision Support Systems to detect, monitor and handle individual plants;
- Further development of robotics for logistics and handling procedures in horticultural processes.

CHALLENGE: in a circular economy, other sources of valuable bio-based ingredients are necessary

SOLUTION: a very wide variety of interesting plant genetic resources has the potential to replace (synthetic) ingredients and components to be used for new applications. This also provides new market opportunities for producers and other SMEs in the chain:

- R&I needed for further understanding of genetics and plant physiology of pathways for innovative bio-compounds and development of new cropping systems.

MAIN OUTCOMES FROM THE DISCUSSIONS

Based on a selection of poster presentations and output from discussion groups the following advice on innovations has been formulated:

- Integrative approaches (holistic, circular, in the value chain) are needed in order to use resources efficiently, recycle resources, improve the use of alternative resources and to create new value and business from waste material;
- Digitization can help such integrative approach by integrating information of different data sources for monitoring and to support effective decision making;
- Involvement of different stakeholders (multi-actor approach), possibility of multi-use of data and new market places (for agricultural waste) is essential.

INNOVATION PROJECTS

At this thematic session, each participant assisted to the presentation of 3 of the following posters:

- AgroCycle - Sustainable techno-economic solutions for the agricultural value chain
- Biorg4WasteWaterVal+ - Bioorganic novel approaches for food processing waste water treatment and valorisation: Lupanine case study
- Development of a concentration system to manage the pig slurry in order to obtain two phases: concentrated and diluted.
- ENTOVALOR - Insects as an opportunity in organic residue valorization
- Increase of N-efficiency in arable crop rotations
- ProEnergy - New food products and bioenergy from fruits of low comercial value and agroindustrial wastes

- Profitability of new technology application to enhance irrigation efficiency in a conventional and organic vineyard
- RichWater - Market introduction of combined wastewater treatment and reuse technology in agriculture
- SustentOlive - Improvement of irrigation and fertilization practices at olive farms in Trás-os-Montes for its sustainability

Waste2Value - Valuation of agricultural by-products for animal feed, biodegradable plastics and treatment of animal effluents