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Swedish University of Agricultural Sciences

 **BioGreenhouse**


 **COST**  
EUROPEAN COOPERATION  
IN SCIENCE AND TECHNOLOGY

 COST is supported by  
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Horizon 2020

## Food safety in organic vegetable chains

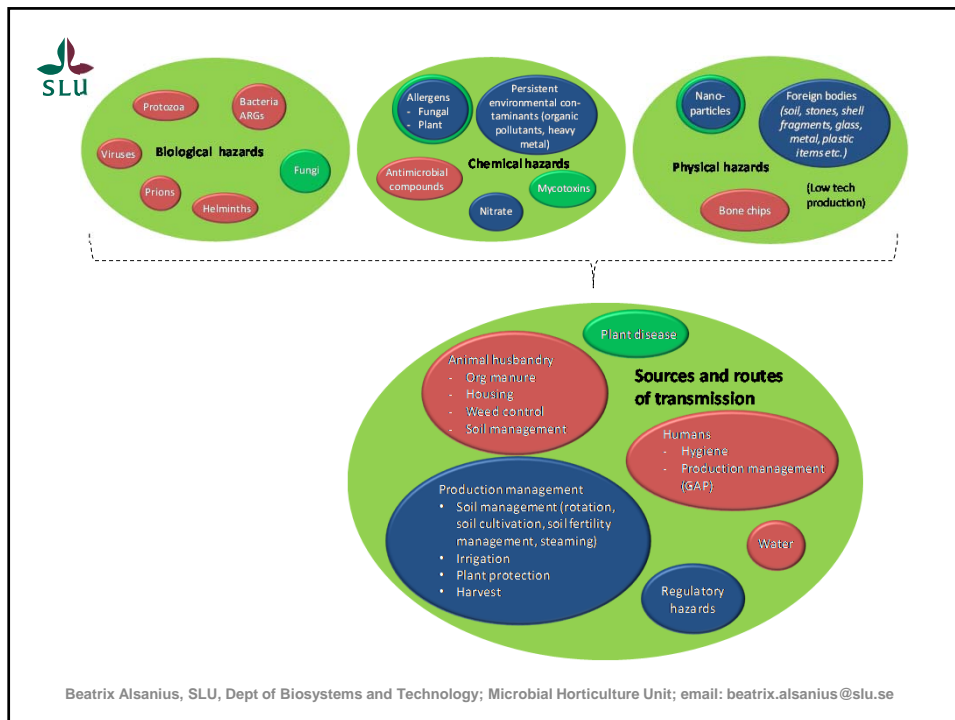


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"...organic vegetables are perceived as containing less contaminants and more nutrients, and as such, being healthier and safer compared to conventional vegetables"

Hoefkens et al. 2009



...however

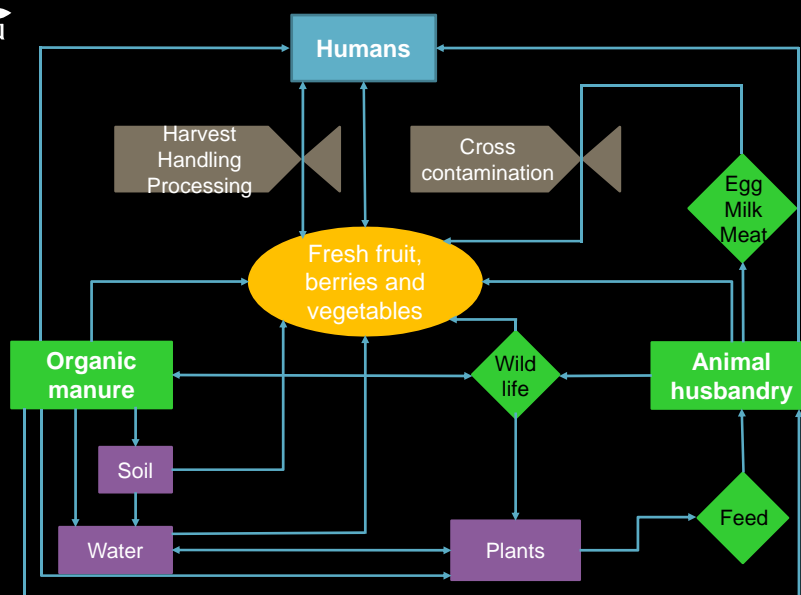
The distance between animal husbandry and crop production is much closer than in conventional/integrated cropping systems adventuring microbial food safety.

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## Biological hazards





- 1995: verocytotoxigenic *Citrobacter freundii* associated with organically grown parsley
- 2011: *Escherichia coli* O104:H4 associated to fenugreek, Germany/France, number of registered cases: 3842, of these 855 with HUS, 53 deaths
- 2012: *E. coli* O157:H7 associated with spinach and spring seeds, USA, number of registered cases: 33



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## Microbial hazards related to animal husbandry

			
<i>Salmonella</i> S/TEC <i>Listeria monocytogenes</i> <i>Campylobacter</i>	<i>Salmonella</i> <i>Campylobacter</i> <i>Yersinia enterocolitica</i> <i>Listeria monocytogenes</i> ESBL	<i>Campylobacter</i> <i>Salmonella</i> ESBL	S/VTEC

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...and

- Organic horticulture guidelines permit the use of certain chemicals that adventure chemical food safety (e.g. the use of copper to fight certain fungal plant pathogens)

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SLU The review paper considers

Physical, microbial and chemical hazards related to OGH and highlights approaches for mitigating them.

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SLU Horticultural waters

- Ground water well
- Municipal water (potable water)
- Collected rain water
- Surface water
  - ▶ Water course (creek, river)
  - ▶ Irrigation pond
- Treated and non-treated sewage water

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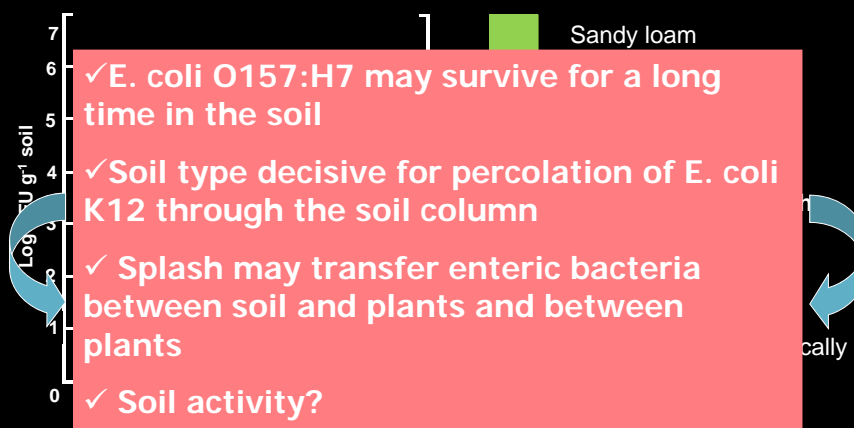
## Organic manure

- *E. coli* O157:H7 and *Salmonella* can persist during long time in manure (up to 2 years)
- Factors counteracting survival
  - High pH, high fibre content, high temperature, large temperature fluctuations, high native level of coliforms, good aeration (different studies)
- Impact of animal diet
  - Low energy high fibre diet reduces the survival of *E. coli* and *Salmonella* Typhimurium in contrast to high energy low fibre diet (grass-maize silage) (Franz et al. 2005)

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## Soil



Source: Monaghan & Hutchinson, 2012

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## Growing media for organic production

- Growing media for transplants
- Growing media for "soilless" organic production
- Constituents closely related to animal husbandry
  - Animal waste products
  - Composts?
  - Storage?

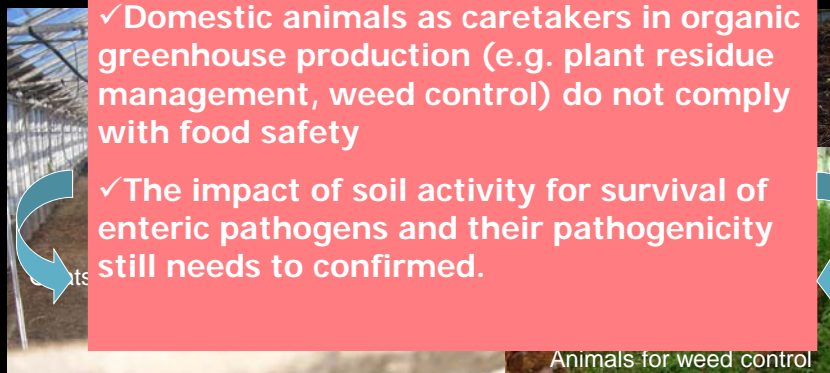


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## Crop residue management


- ✓ Domestic animals as caretakers in organic greenhouse production (e.g. plant residue management, weed control) do not comply with food safety
- ✓ The impact of soil activity for survival of enteric pathogens and their pathogenicity still needs to be confirmed.



Animals for weed control

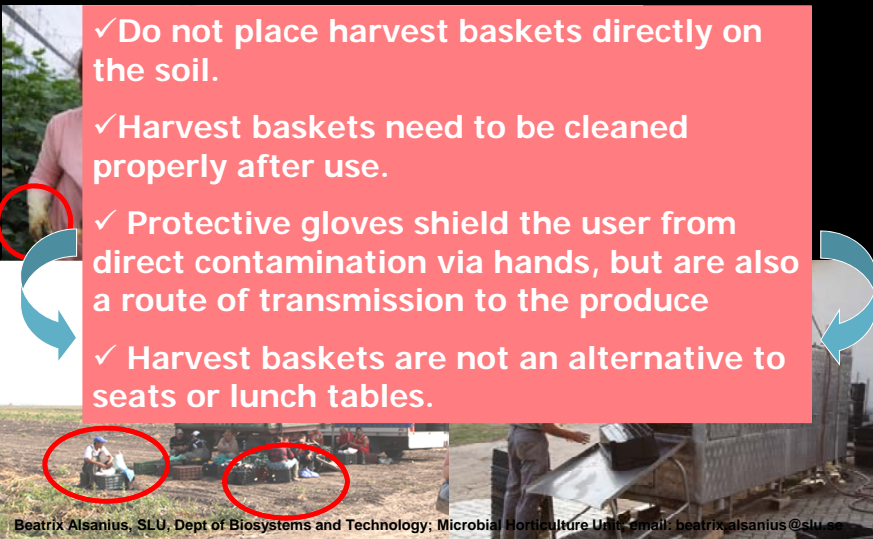
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## Crop handling and harvest

- ✓ Do not place harvest baskets directly on the soil.
- ✓ Harvest baskets need to be cleaned properly after use.
- ✓ Protective gloves shield the user from direct contamination via hands, but are also a route of transmission to the produce
- ✓ Harvest baskets are not an alternative to seats or lunch tables.

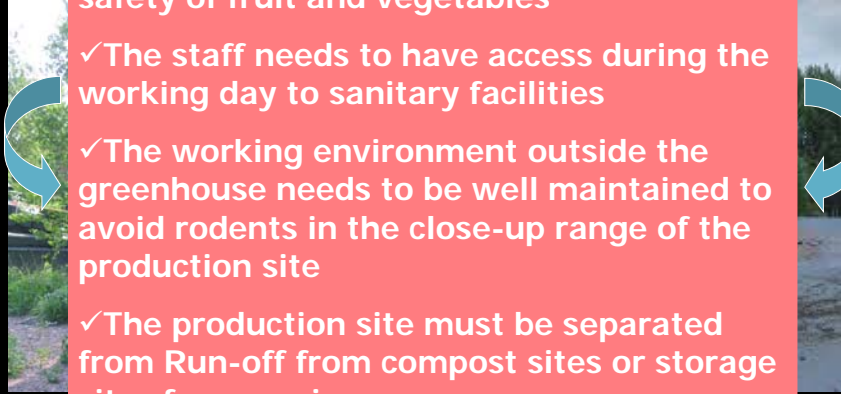


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## Wo

- ✓ Workers' health is crucial to maintain food safety of fruit and vegetables
- ✓ The staff needs to have access during the working day to sanitary facilities
- ✓ The working environment outside the greenhouse needs to be well maintained to avoid rodents in the close-up range of the production site
- ✓ The production site must be separated from Run-off from compost sites or storage sites for organic manure



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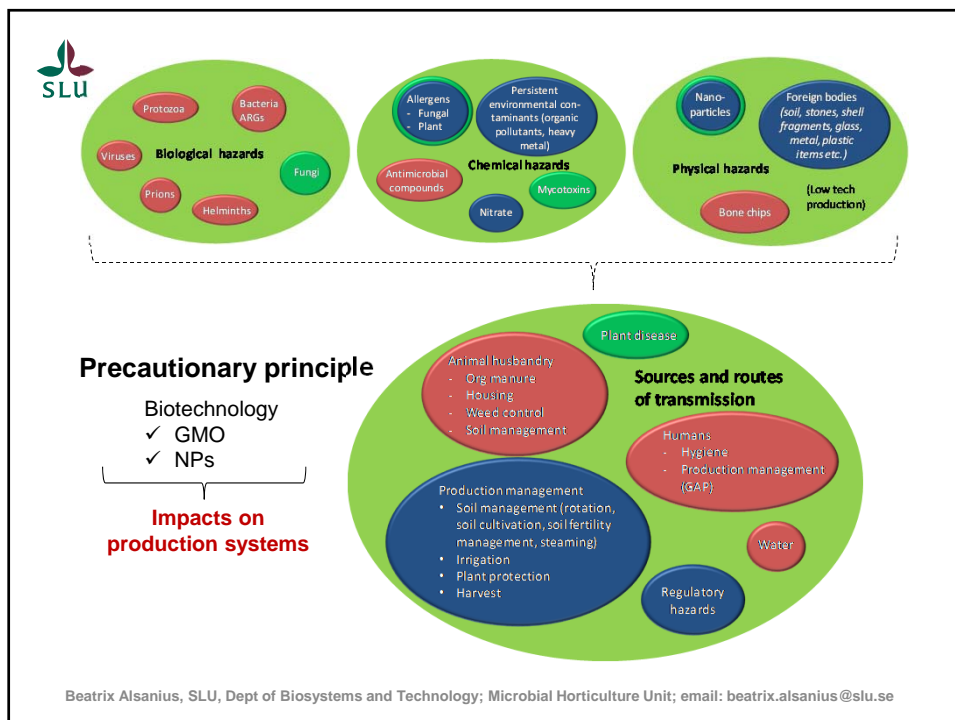


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## Chemical hazards

- Nitrate
- Synthetic chemical compounds from waste material
- Heavy metals
- Mycotoxins

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## Strategic research lines

- Hygiene awareness and strategies in primary organic greenhouse production
- Interactions between crop physiological properties and food safety in OGH, esp. survival of human pathogens
- Impact of biological activity on prevalence, survival and proliferation of human pathogens in OGH
- Risk assessment for human pathogens under diverse scenarios in OGH
- Hazard analysis critical control points in OGH
- Reduced use of copper to control foliar diseases through climate control measures
- Occurrence of mycotoxins in organically grown greenhouse commodities

