

# Safe ECOSAN fertilizers: methods and recommendation for safe reuse of human excreta

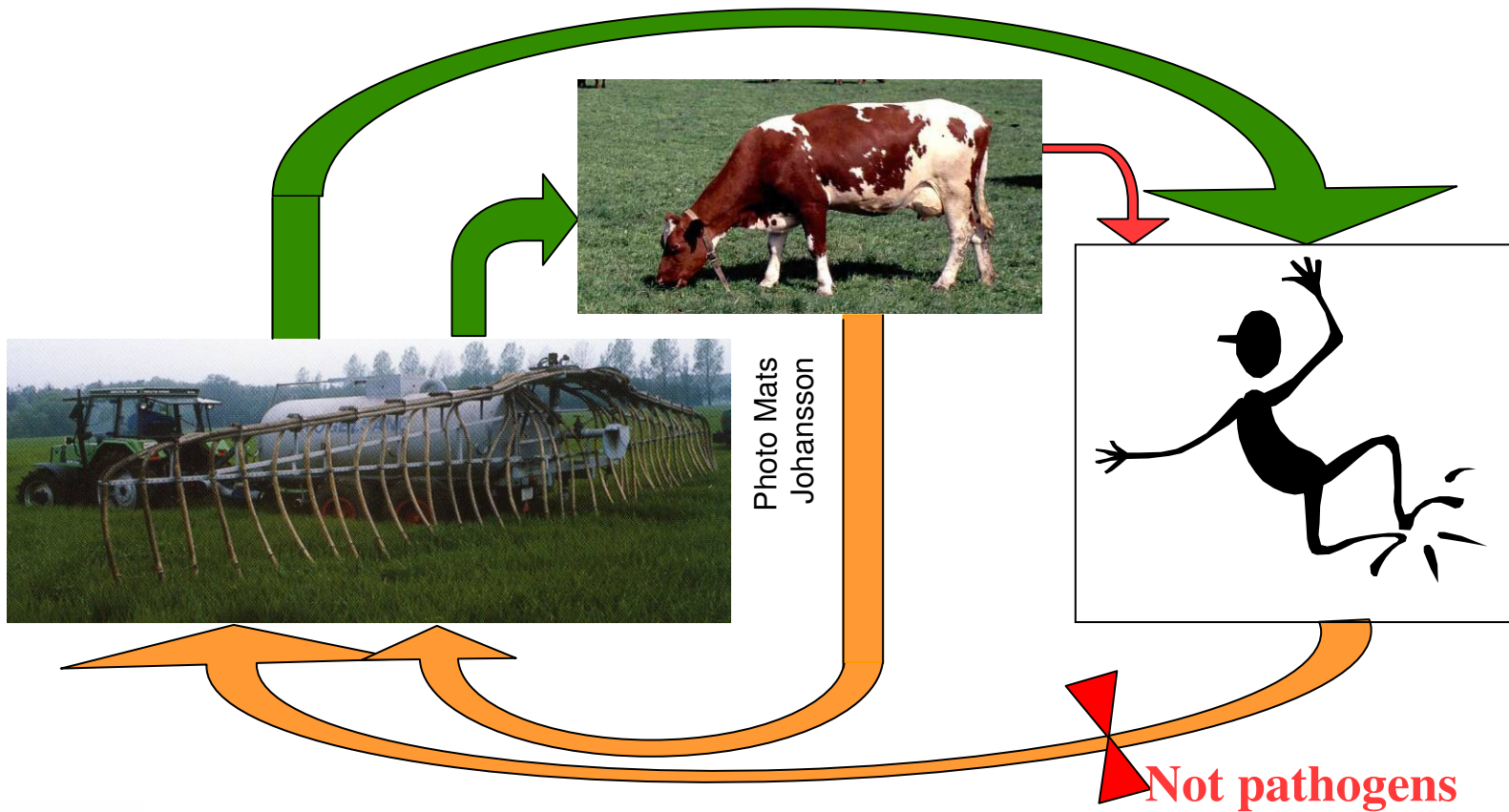


Håkan Jönsson  
*Associate professor*  
[Hakan.Jonsson@et.slu.se](mailto:Hakan.Jonsson@et.slu.se)

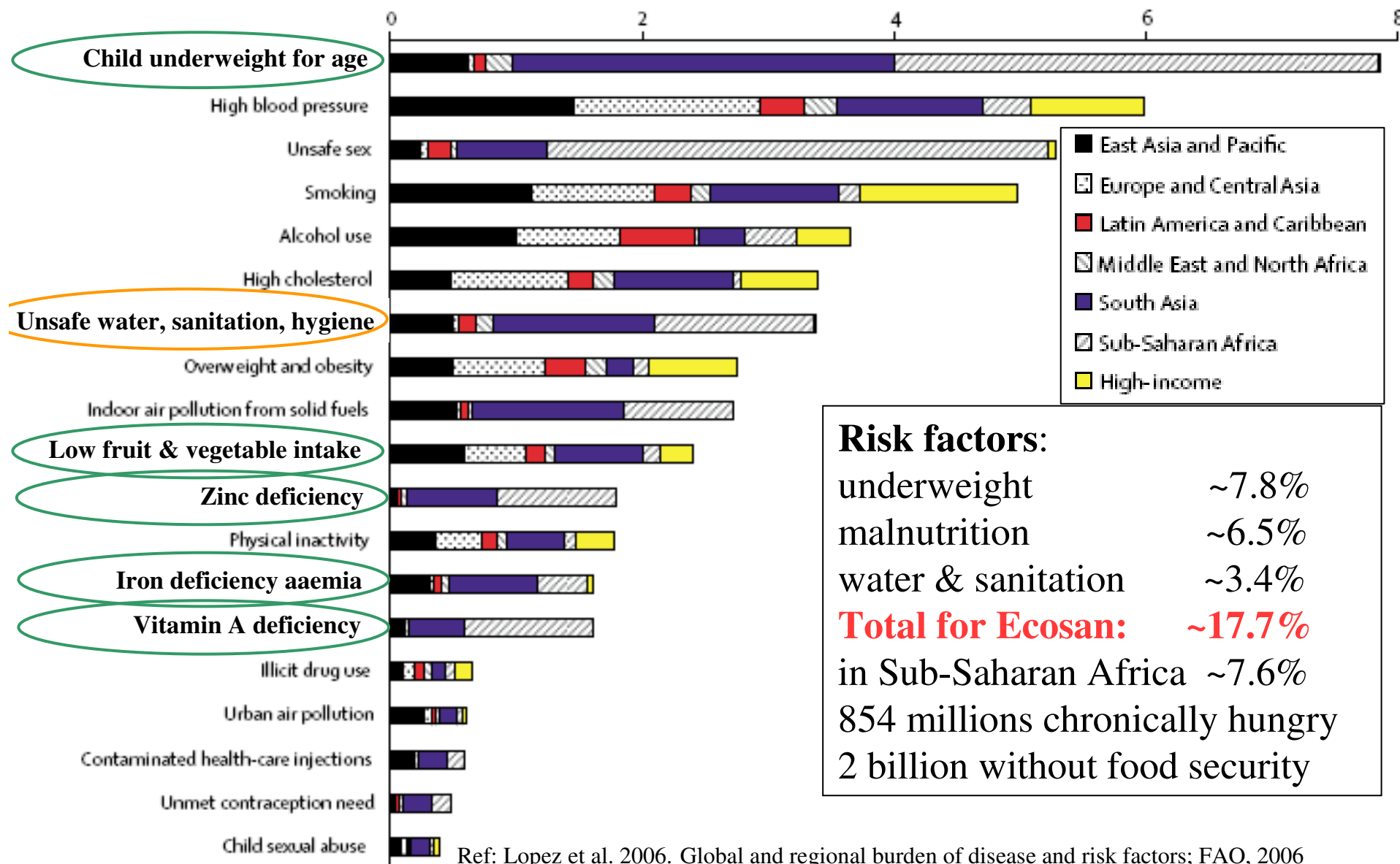


# Vision: Closed loop for nutrients, NOT pathogens

Carbohydrates, proteins, fats, etc



# Global risk factors for disease and premature deaths (% of DALYs)



# Recommendations urine treatment – main barrier

- **Leave sludge, do not rinse the container**
  - Contains urease -> increases degradation of urea, ammonia and pH concentrations
- **Household use (small system)**
  - Unrestricted use
    - 1 month fertilization – harvest (WHO)
    - Storage 1 week (Schistosoma)



Photo H. Jönsson



# Recommendations urine treatment – main barrier

- **Large system (> 1 household)**
  - $>2.5\text{g N L}^{-1}$ ,  $\text{pH}>8.8$  - Leave some sludge in tank
  - **Restricted use (not raw for human consumption)**
    - $4^{\circ}\text{C} - 20^{\circ}\text{C}$  - 1 month storage (WHO)
    - $20^{\circ}\text{C} - 30^{\circ}\text{C}$  - 2 weeks (Nordin, 2007; Vinnerås et al., 2008)
    - $>30^{\circ}\text{C}$  - 1 week (Nordin, 2007; Vinnerås et al., 2008)
  - **Unrestricted use (including human consumption raw)**
    - $<20^{\circ}\text{C}$  - never (Nordin, 2007; Vinnerås et al., 2008),  $> 1$  yr (WHO)
    - $20^{\circ}\text{C} - 30^{\circ}\text{C}$  - 6 months (WHO), 2 months (Nordin, 2007; Vinnerås et al., 2008)
    - $>30^{\circ}\text{C}$  - 1 months  $20-30^{\circ}\text{C}$  (Nordin, 2007; Vinnerås et al., 2008)
    - 1-1.5 months (CREPA, Dagerskog)

# Recommendations for faeces with ash – storage

- **Ash + storage**

- >6 months

- pH >9, temp >35°C or moisture <25%, (WHO)
- Niger, Mali, Burkina Faso, Senegal (CREPA, Dagerskog)

- >8 months

- Congo, Togo, Côte d'Ivoire, Guinea Bissau (CREPA, Dagerskog)

- >8 months + composting

- Benin, Guinea (CREPA, Dagerskog)

- Additional barrier advisable

# Recommendations for thermal composting

- > 1 week at >50°C (WHO)
  - Easiest with 1:1 mix with kitchen waste (Niwagaba et al., 2008)
  - Moisture and organic contents and insulation critical (Niwagaba, 2007)
  - Additional barrier advisable



Photo C. Niwagaba

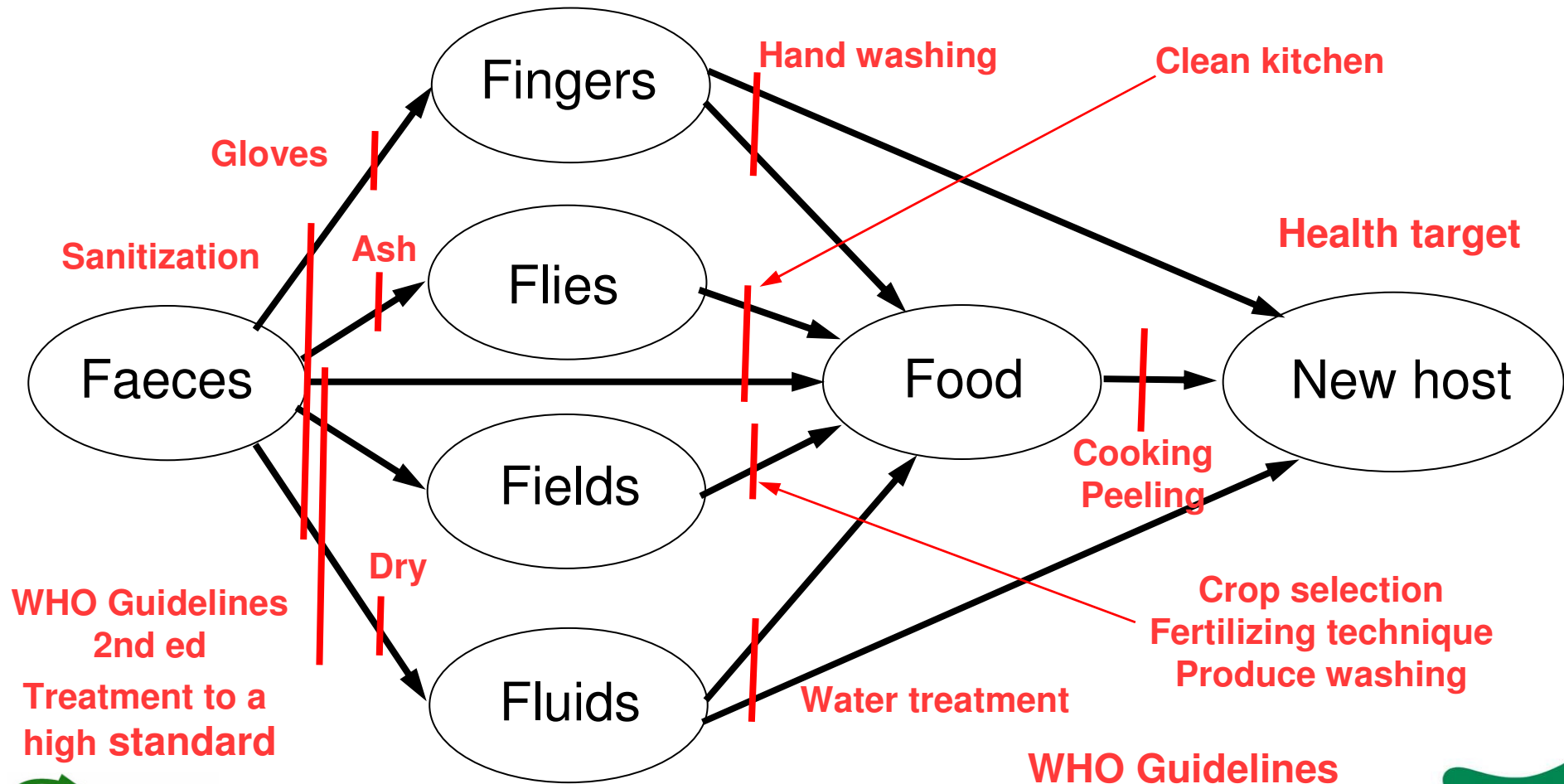
# Recommendations for ammonia treatment

- Addition of urea or water solution of ammonia
  - 2% urea (based on wet weight)
    - $<20^{\circ}\text{C}$ , restricted use (not raw for human consumption)
    - $>20^{\circ}\text{C}$ 
      - 2 months restricted use (not for human consumption raw)
      - 6 months unrestricted use
    - $>30^{\circ}\text{C}$ 
      - 1 month unrestricted use (raw for human consumption)
    - Ref: Vinnerås and Nordin (pers. comm.)





# Exposure – transmission routes



WHO Guidelines  
2nd ed  
Treatment to a  
high standard



WHO Guidelines  
3rd ed  
Systems perspective



# Effect of barriers (IWMI, 2006)

Control measure	Reduction (logs)	Notes
Wastewater treatment	1-6	
<b>Localized irrigation (low crops)</b>	<b>2</b>	<b>Root crops, crops grown above, partially in contact with the soil</b>
<b>Localized irrigation (high crops)</b>	<b>4</b>	<b>Crops where harvested part is not in contact with the soil</b>
Pathogen die-off	0,5-2 per day	Die Die-off on crop surfaces; between last irrigation and consumption. Depends on climate (temperature, sunlight), crop type, etc.
Produce washing in water	1	Washing salad crops, vegetables and fruit with clean water.
Produce peeling	2	Fruit, root crops
Produce cooking	6-7	Immersion in boiling or close-to to-boiling water until ensures destruction.destruction.

# THANK YOU FOR YOUR ATTENTION

