

Paths to a sustainable food sector

Ulf Sonesson

SIK – the Swedish Institute for Food and Biotechnology

Göteborg



Background

- We know a lot about food production and sustainability
 - Potential environmental improvement (LCA-based)
 - Possible technical/management solutions (Expert based)
- Changed systems might lead to consequences of various kind
 - Product quality, food safety, animal welfare, consumer reactions and costs



The Project

Combine "all known knowledge" on improvements in environmental impacts in food supply chains for the main foods^a produced in Sweden, and:

- Design systems that performs "better"
- Evaluate supply chains by LCA
- Assess costs (primary production)
- Assess potential consequences of proposed changes

By involving experts on all subjects

The time horizon is short term – 5-10 years

The project is jointly funded by Vinnova (Swedish Innovation Agency), federations of farmers, food industry and retail and the Region of Västra Götaland

^a Dairy (milk and cheese), Beef, pork, Poultry and Bread



Goal Scenarios

Few (any?) solutions are the best for all impact categories

- There will be conflicting goals

Three “goal scenarios” were created, where impact categories were grouped.

- Based on societal goals and LCA experience combined with literature on what impact categories most often are “functionally connected”

1. “Strengthening agricultural ecosystems” (reduced pesticide use, increased biodiversity, reduced local nutrient leachate)
2. “Plant nutrient efficiency” (reduced eutrophication, efficient phosphorous use)
3. “Climate- end energy efficiency” (GWP, Energy use)



How we went about it

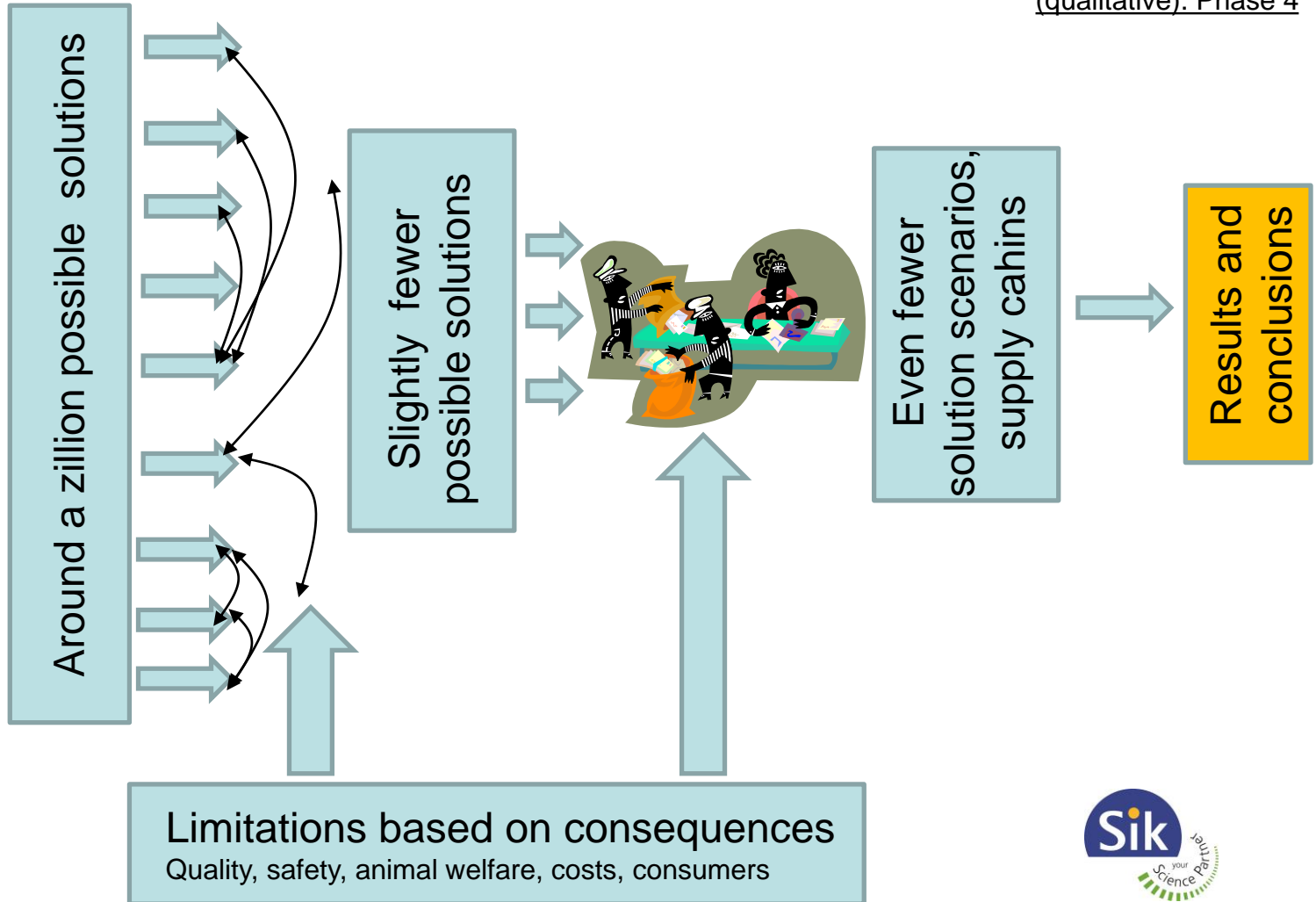
Production experts identify promising solutions (phase 1)

Coordination between system parts (phase 2)

Design improved supply chains, one per product and goal scenario. Phase 3

Evaluation of solution scenarios. LCA, Costs (quantitative) and other consequences (qualitative). Phase 4

- Beef, primary production.
- Pork, primary production
- Poultry, primary production
- Dairy, primary production.
- Crop production
- Manure and by-product treatment
- Industrial processing
- Packaging
- Logistics, distribution, supply chain



Solution Scenarios

For each supply chain, improved production systems were designed in order to meet the goal scenarios – Solution scenarios.

- Detailed descriptions of each step in the chain
- Quantified on production data
- Basis for:
 - assessment of consequences
 - LCA
 - Cost calculations



Solution scenarios - examples from the pork supply chain

Feed production: Higher yields, reduced pesticide use (crop rotations, precision farming, breeding), reduced energy use (eco-driving, cooling of grain, BAT fertilizers), spring ploughing, accurate plant nutrient supply

Animal production: Faster growth, more piglets per sow, lower recruitment of sows, less feed per weight gain, other feeds, lower mortality, higher meat percentage in carcasses, reduced energy use in houses

Manure management: Covered lagoons, spreading in spring (growing crop), digestion, more accurate machinery, using larger area for spreading

Processing: Reduced energy use, less wastage (“green lean” concept), use of by-products (digestion, incineration)

Packaging: Space-efficient packaging, MA (increased shelf life), material choice.

Logistics and Distribution: Optimized transports, efficient supply chain management in distribution

General: Biofuels and fossil-free electricity where possible.

Types of results generated:

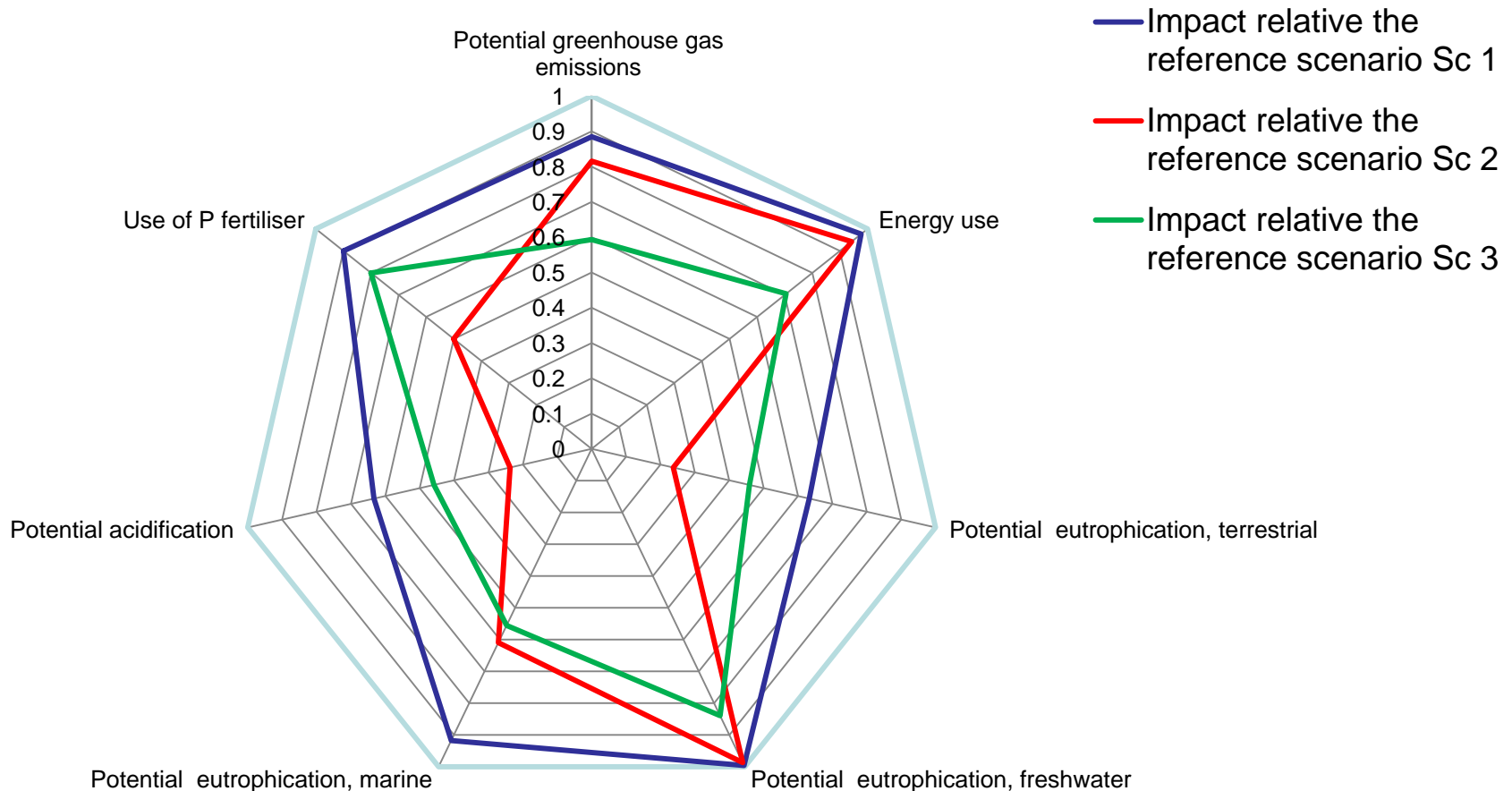
1. LCA's for fresh pork, frozen chicken breast, wheat bread, beef, milk and cheese produced in the Västra Götaland province, Sweden. (FU = 1 kg of product)
2. LCA results for agricultural production in the province (FU = same amount of pork, beef, chicken, milk and baking wheat as produced in the province in 2012)

For the three goal scenarios and reference scenario

Very important for the results: Increased production efficiency lead to less use of land  alternative production

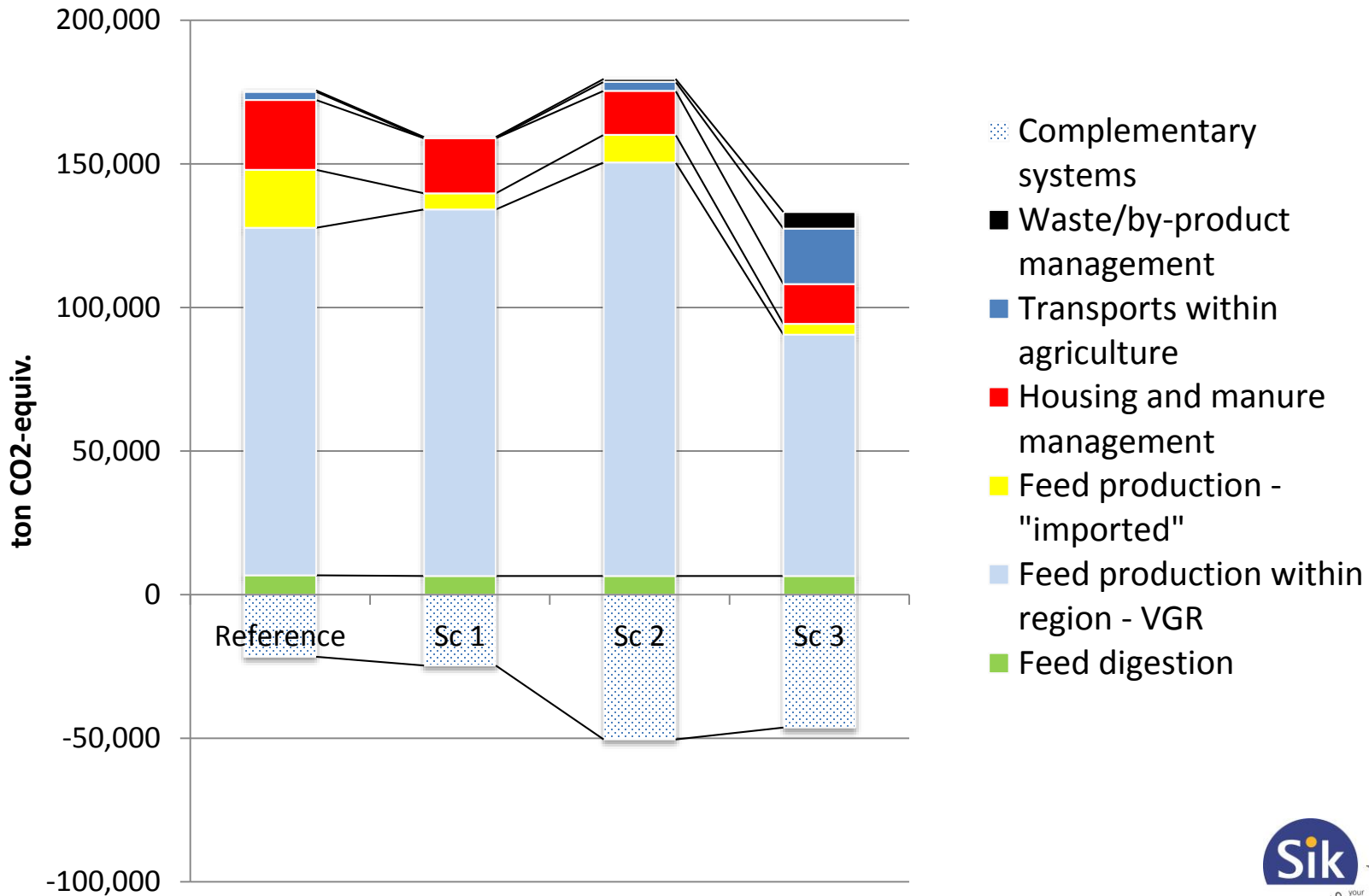


Results – examples, impacts per kg of pork delivered at retail



Results – examples.

GHG Emissions from entire region for primary production, pork



Questions that can be addressed

part of the SP Group



Product level:

- How far can we get by implementing available knowledge, and what are the costs?
- Is there a risk of negative consequences, what are the “price” of avoiding these?
- What measures are positive for many impacts and consequences?
- Where are the severe conflicts? Can they be resolved?

Region level (additionally):

- How far can we approach a more sustainable food system within the present context?
- How can the agricultural policy be designed in order to achieve most improvements? Possible to evaluate present policies.
- How are the production systems interconnected (dairy-beef, grain-animal production- manure management)+ what are the sensitive aspects?



Conclusions from the project:

Working methods:

- Important to give a clear frame for production experts – motivation
- Involving production experts and also non-academic knowledge gives credibility among users and is needed for completeness
- Including consequences throughout the project very useful – gives credibility among users and increase quality of conclusions
- Takes a lot of effort.....

Results:

- We can get quite far by doing what we know – without risking severe consequences
- Clarification of costs vs environmental benefits is critical
- Evaluation of policies is possible and important

Future perspectives:

- How would drastically changes in consumption patterns affect the overall environmental impact and costs in a region?



Thank you for your attention!

Sonesson, U^{1*}, Lorentzon, K¹, Andersson, A², Barr, U-K¹, Bertilsson, J³, Brunius, C², Emanuelsson, M³, Borch, E¹, Göransson, L³, Gunnarsson, S⁴, Hamberg, L¹, Hessle, A⁴, Kumm, K-I⁴, Lundh, Å², Nielsen, T¹, Salomon, E⁶, Sindhøj, E⁶, Stenberg, B⁵, Stenberg, M⁵, Sundberg, M⁶ & Wall, H³

¹ SIK – The Swedish Institute for Food and Biotechnology, P.O Box 5401, 40229 Göteborg

² SLU – The Swedish University of Agricultural Sciences, Dept. of Food Science, Uppsala

³ SLU - Dept. of Animal Nutrition and Management, Uppsala

⁴ SLU - Dept. of Animal Environment and Health, Skara

⁵ SLU - Dept. of Soil and Environment, Skara

⁶ JTI – Swedish Institute of Agricultural and Environmental Engineering, Uppsala

And additional colleagues

