



## Climate change and sustainability impacts along the agro-food chain

Christian Schader

Summer School Climate Change Impacts

12 September 2019

# FiBL at a glance



Founded in 1973, private foundation

190 permanent staff members

More than 70 interns, B.A./Master/PhD students, apprentices

Sister institutes FiBL-Germany and FiBL-Austria, FiBL-Brussels

# GRI Sustainability Reporting

## **2012 HIGHLIGHTS** Global Sustainability

### Food

In France, McDonald's is the #1 restaurant where children eat fruit.



In the U.S., we anticipate introducing 100 million cups of fruit into children's diets through the Happy Meal®.



95% of McDonald's restaurants offer Happy Meals with a fruit, vegetable or low-fat or fat free dairy option.

### Sourcing

100% of our coffee served in Europe, Australia and New Zealand comes from Rainforest Alliance Certified\* or UTZ Certified farms.



We are founding board members of the **GLOBAL ROUNDTABLE FOR SUSTAINABLE BEEF** and also participate in sustainable beef initiatives in Australia, Brazil and the U.K.



### Planet



We are enabling improved control of heating and cooling systems, lighting and signage through **ENERGY MANAGEMENT** systems.

5.1% decrease in energy used per guest count (estimated restaurant average kWh/GC).

### Community

In 2011, our local economic impacts totaled



40% increase in **LOCAL ECONOMIC INVESTMENTS** in eight of our top nine markets.

### People

We strengthened alignment around the important role of our **EMPLOYEE VALUE PROPOSITION**, which emphasizes friends and family, flexibility and future.



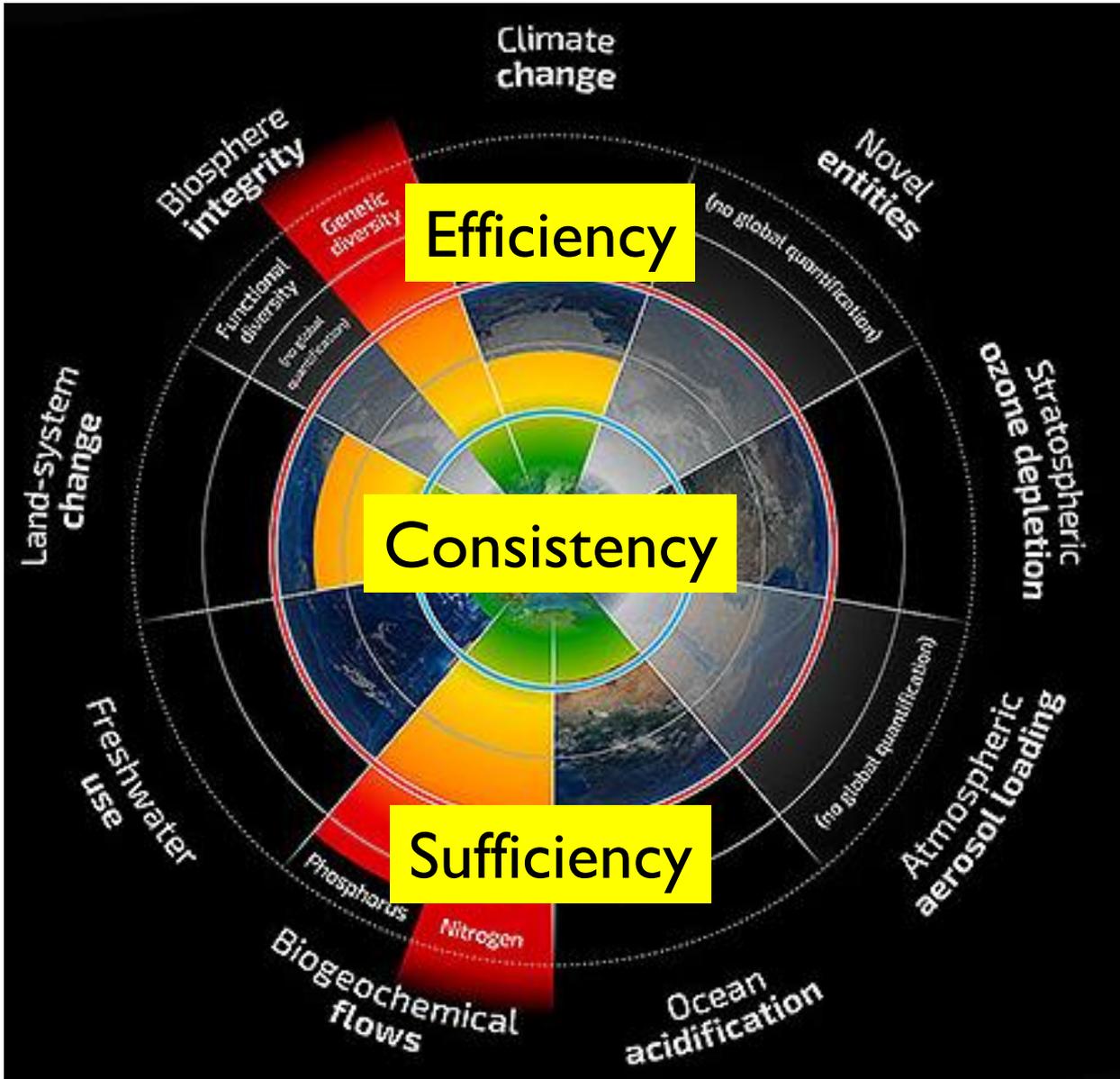
86% of our managers feel the person they report to supports their professional development.

40% increase in number of worldwide top management team who are women.

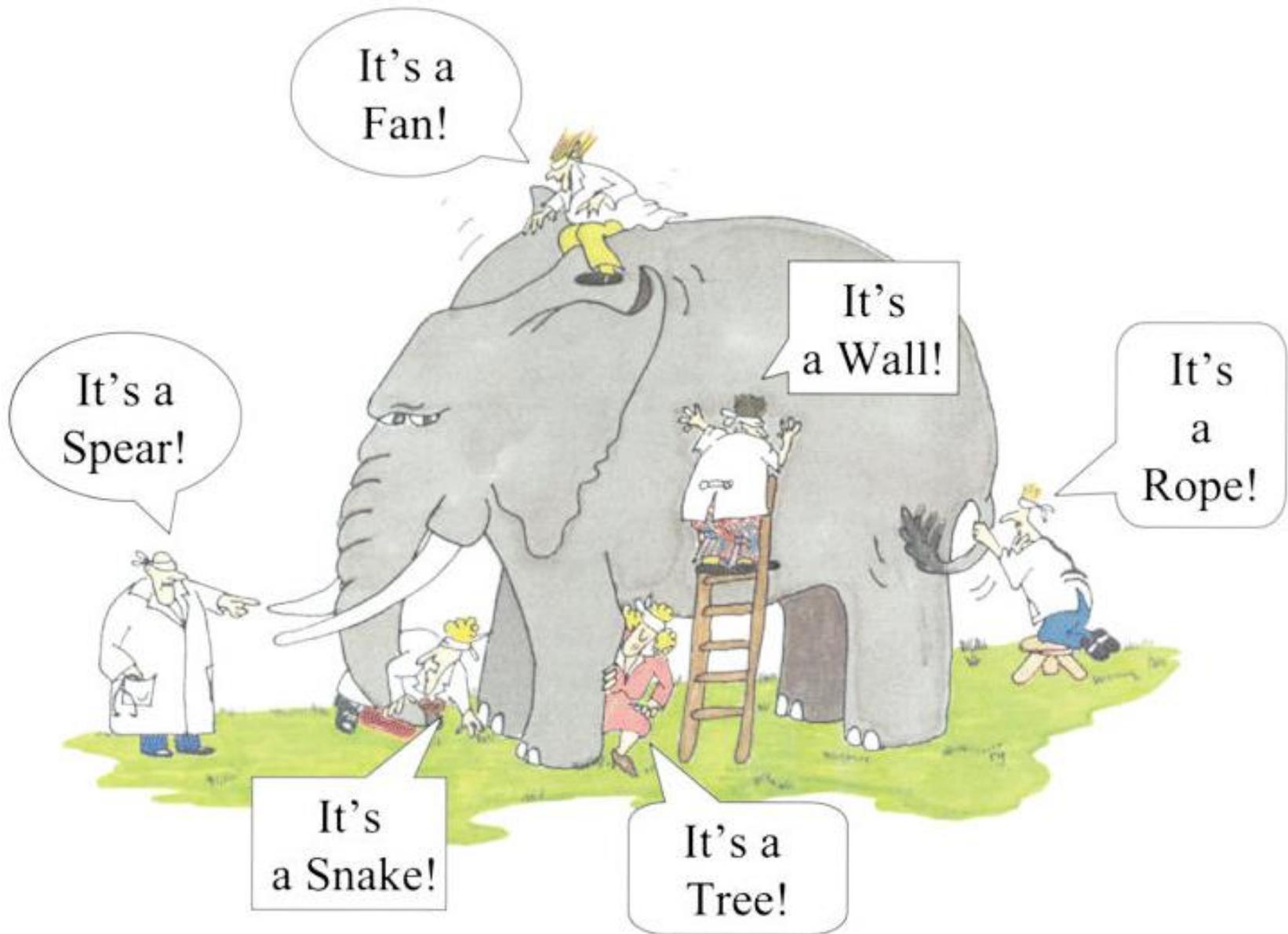
This document includes information from 2012 Sustainability Highlights and unless otherwise noted in the Highlights, figures represent our top nine markets. Percent changes reflect progress from 2010-2011.



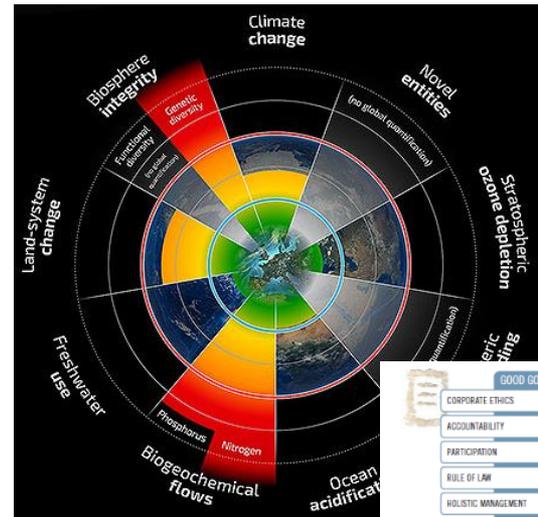
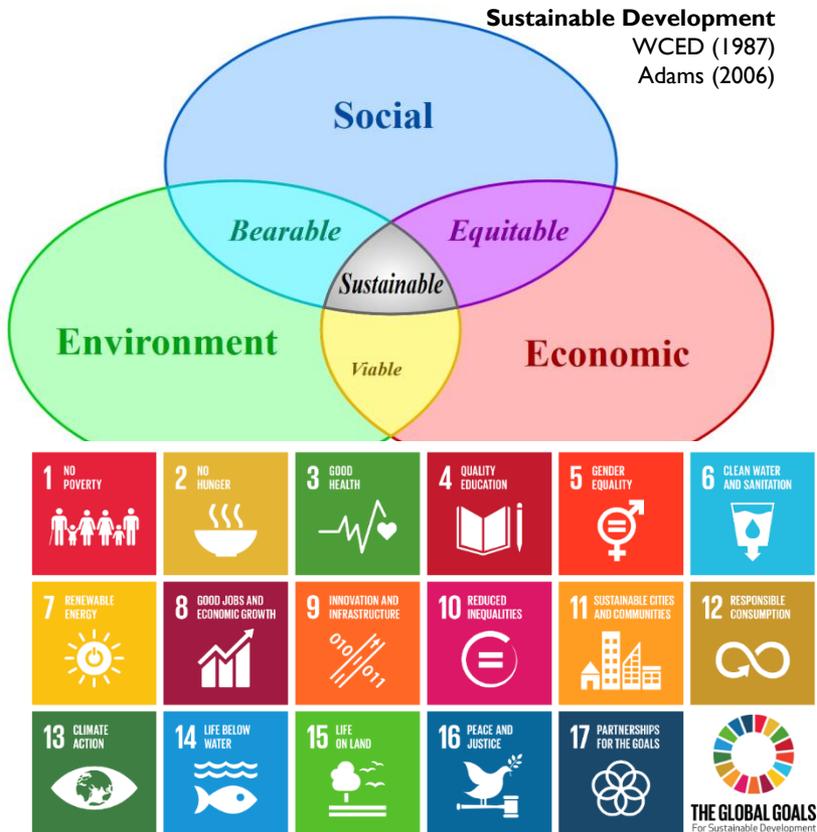
# Planetary boundaries



Steffen et al., (2015),  
Stockholm Resilience  
Center (2015),  
Huber (2000)



# Definitions and sustainability frameworks



**Planetary boundaries**  
Rockström et al. (2009)  
Steffens et al. (2015)

GOOD GOVERNANCE			
CORPORATE ETHICS	Mission Statement	Due Diligence	
ACCOUNTABILITY	Holistic Audits	Responsibility	Transparency
PARTICIPATION	Stakeholder Dialogue	Governance Protocols	Conflict Resolution
ROLE OF LAW	Legitimacy	Remedy, Restoration & Prevention	Civic Responsibility
ROBUST MANAGEMENT	Sustainability Management Plan	Full Cost Accounting	
ENVIRONMENTAL INTEGRITY			
ATMOSPHERE	Greenhouse Gases	Air Quality	
WATER	Water Withdrawal	Water Quality	
LAND	Soil Quality	Land Degradation	
BIODIVERSITY	Ecosystem Diversity	Species Diversity	Genetic Diversity
MATERIALS AND ENERGY	Material Use	Energy Use	Waste Reduction & Disposal
ANIMAL WELFARE	Animal Health	Freedom from Stress	
ECONOMIC RESILIENCE			
INVESTMENT	Internal Investment	Community Investment	Long-Range Investment
VULNERABILITY	Stability of Production	Stability of Supply	Stability of Market
PRODUCT QUALITY & INFORMATION	Food Safety	Food Quality	Product Information
LOCAL ECONOMY	Value Creation	Local Procurement	
SOCIAL WELL-BEING			
DECENT LIVELIHOOD	Quality of Life	Capacity Development	Fair Access to Means of Production
FAIR TRADING PRACTICES	Responsible Slogans	Rights of Suppliers	
LABOUR RIGHTS	Employment Relations	Forced Labour	Child Labour
EQUITY	Non-Discrimination	Gender Equality	Support for Vulnerable People
HUMAN SAFETY & HEALTH	Workplace Safety and Health Provisions	Public Health	
CULTURAL DIVERSITY	Indigenous Knowledge	Food Sovereignty	

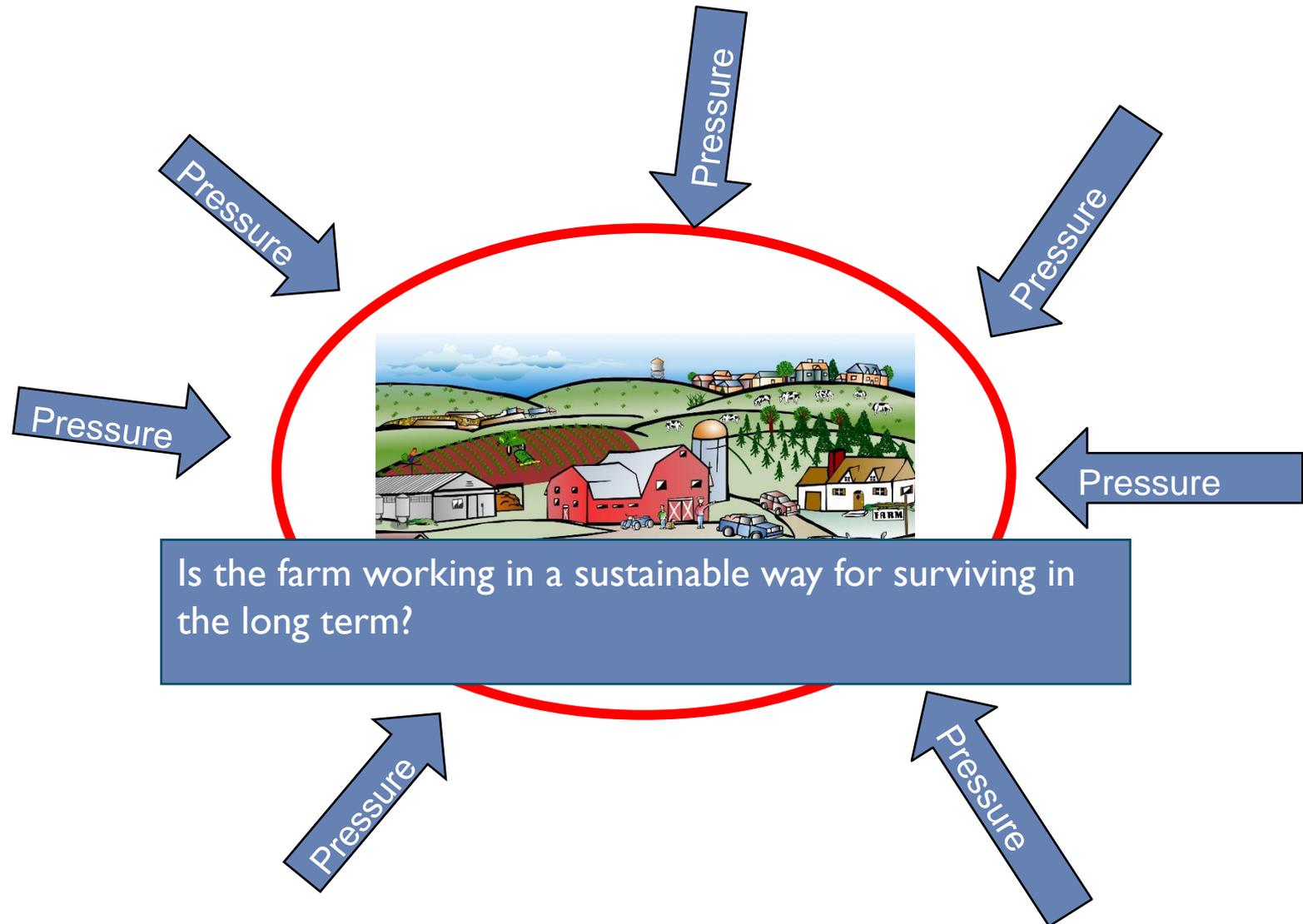
**SAFA Guidelines**  
Food and Agriculture  
Organization of the United  
Nations (FAO) (2013)

**Sustainable  
Development  
Goals**  
Ried et al. (2017)

# Sustainability assessment approaches

Characteristic	Classes
Primary purpose	<ul style="list-style-type: none"> <li>• Research,</li> <li>• Advisory service,</li> <li>• Supplier assessment,</li> <li>• Certification,</li> <li>• Monitoring,</li> <li>• Policy advice</li> </ul>
Level of assessment	<ul style="list-style-type: none"> <li>• Farm level,</li> <li>• Product / supply chain level,</li> <li>• Agricultural sector level</li> </ul>
Dimensions of sustainability covered	<ul style="list-style-type: none"> <li>• Environmental,</li> <li>• Social,</li> <li>• Economic</li> </ul>
Geographical scope	<ul style="list-style-type: none"> <li>• Applicable globally, applicable to a specific country or region</li> </ul>
Sector scope	<ul style="list-style-type: none"> <li>• Applicable to all agricultural/food products or farm types,</li> <li>• Applicable to specific product or farm types</li> </ul>
Perspective on sustainability	<ul style="list-style-type: none"> <li>• Farm/business perspective (is the company economically healthy and developing on a resilient pathway?),</li> <li>• Societal perspective (does the company contribute to sustainable development of society?),</li> <li>• Mixed perspective (farm/business perspective and societal perspective are mixed)</li> </ul>

# Farm-level vs. societal perspective

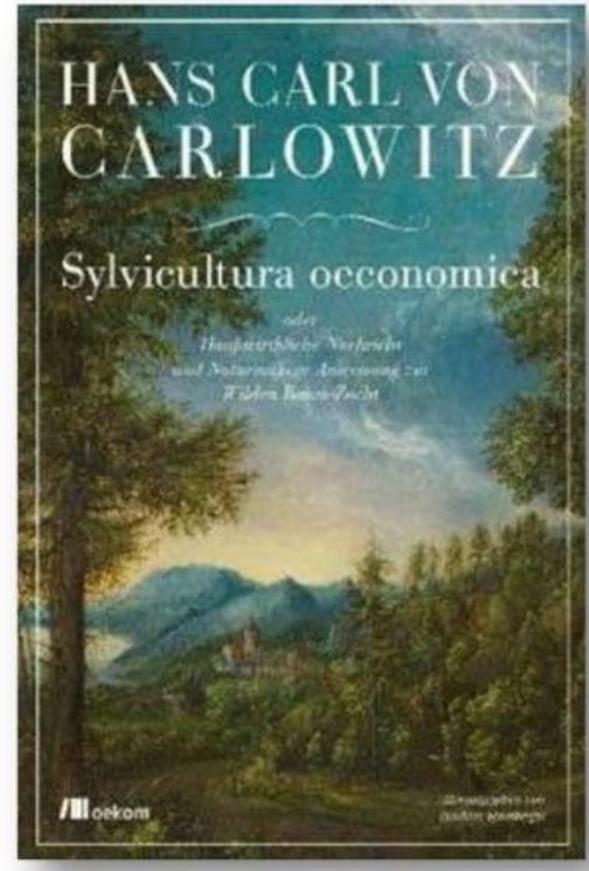


# „Sustainability“ was invented 300 years ago in forestry

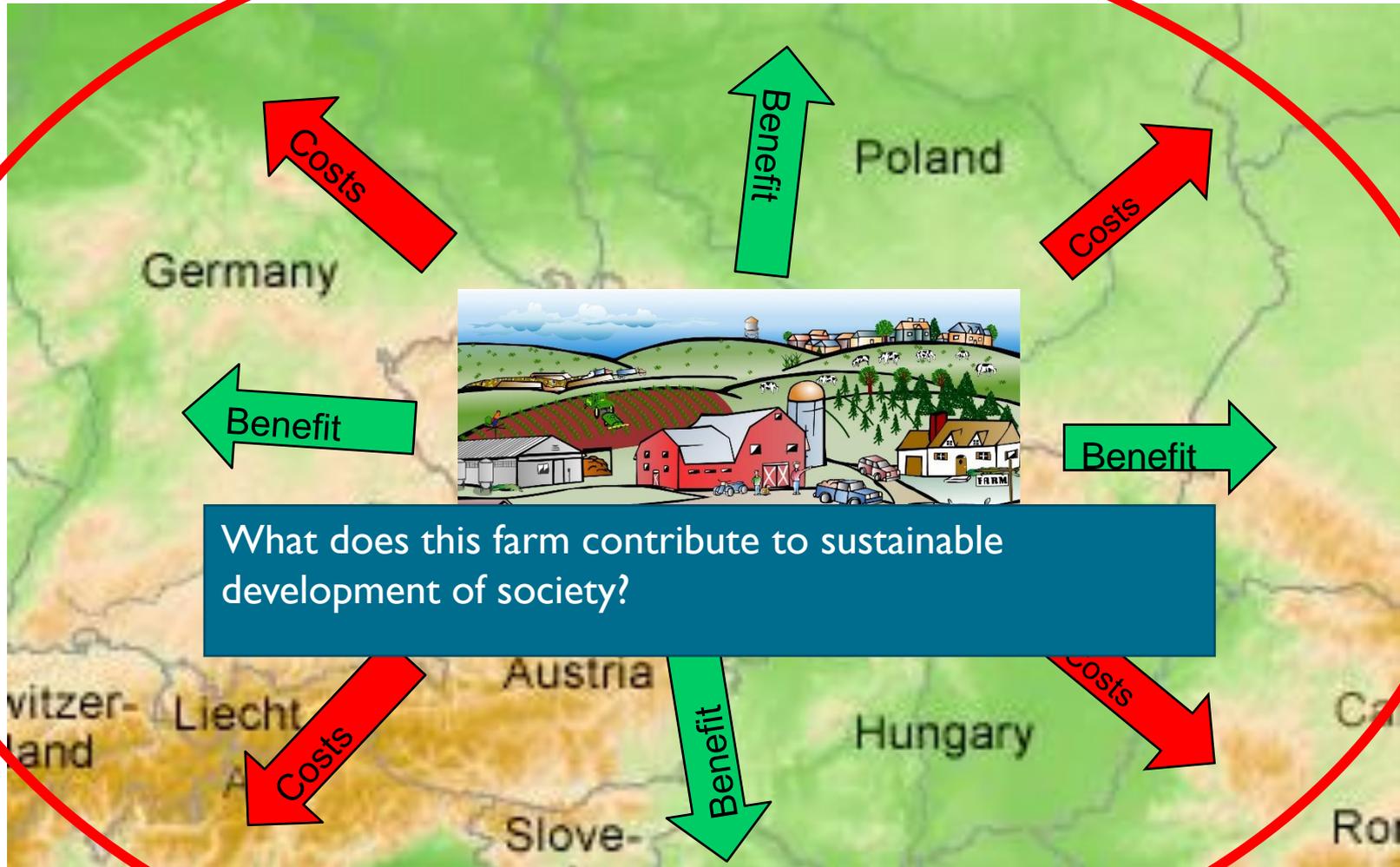
Gefahr zu besorgen und der daraus entstehende Schaden unwiederbringlich/ da muß man keine Zeit versäumen/ und also man das Baum-Säen und Pflanzen eiligt zur Hand nehmen / alldieweil eine lange Zeit erfordert wird/ ehe die wilden Bäume zu gebührender Höhe Stärke und Nutzen können gezogen werden / zumahl da wir bereits erwehnet/ ja außer allen Zweifel ist/ daß die wunder-volle und schöne Gehölze bißher der grösste Schatz vieler Länder gewesen sind / so man vor unerschöpflich gehalten/ ja man hat es unzweifflich vor eine Vorraths-Kammer angesehen/ darinne die meiste Wohlfarth und Aufnehmen dieser Lande bestehen / und so zusagen das Oraculum gewesen / daß es ihnen an Glückseligkeit nicht mangeln könnte/ indem man dadurch so vieler Schätze an allerhand Metallen habhaft werden könnte ; Aber da der unterste Theil der Erden sich an Ersten durch so viel Mühe und Unkosten hat offenbahr machen lassen / da will nun Mangel vorfallen an Holz und Kohlen dieselbe gut zu machen ; Wird derhalben die grösste Kunst/Wissenschaft/ Fleiß/ und Einrichtung hiesiger Forstbarinnen beruhen / wie eine forstbane Conservation und Anhaltung des Holzes anzustellen / daß es eine continuirliche beständige und haltende Nutzung gebe/ weilm es eine unentberliche Sache



Hans Carl von Carlowitz (1713)



# Farm-level vs. societal perspective



# Determining environmental efficiency



Apple A: Germany

- Short transport
- High fertiliser and pesticide input
- High yields
- 7 month storage



Apple B: New Zealand

- Long transport
- Low fertiliser and pesticide input
- Low yields
- 1 month storage

Energy use? GHG emissions? Eutrophication? Toxicity?

# Sustainability assessment

LCA

Product level

RISE

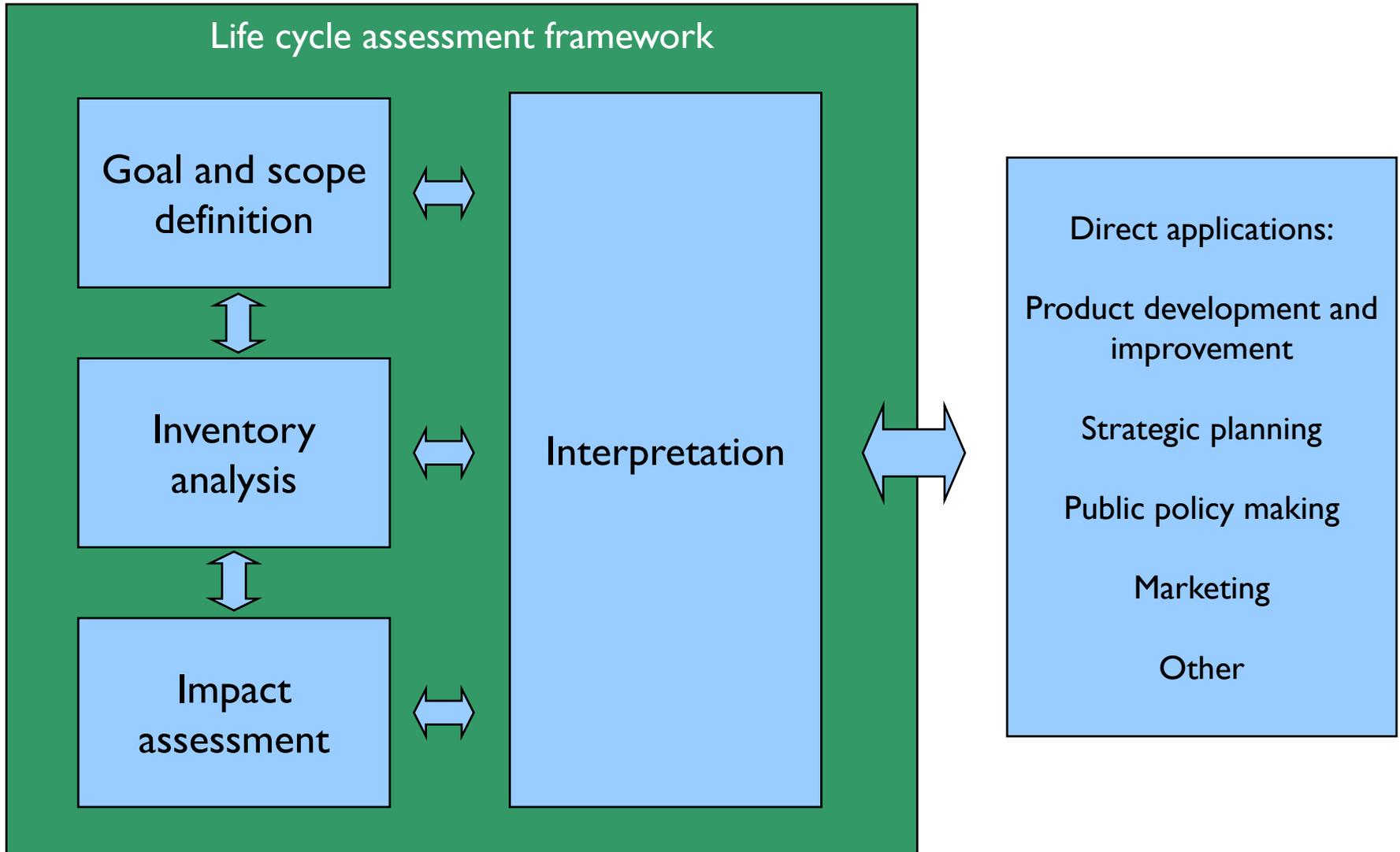
Farm or company level

SMART

Economic and mass-flow models

Sector level

# Steps of a LCA (ISO 14040)



# What is a life cycle assessment?

*Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle (ISO 14040)*

Product system?

Inputs and outputs?

Environmental impacts?

Life cycle?

# Goal and Scope Definition

- The **reason** for executing the LCA, and the questions which need to be answered.
- A **precise definition** of the product, its life cycle and the function it fulfils.
- In case products are to be compared, a comparison basis is defined (**functional unit**).
- A description of the **system boundaries**.
- A description of the way **allocation problems** will be dealt with.
- Data and **data quality requirements**.
- **Assumptions and limitations**.
- The requirements regarding the **LCIA procedure**, and the subsequent interpretation to be used.
- The **intended audiences** and the **way the results will be communicated**.
- If applicable, the way a **peer review** will be made.
- The **type and format of the report** required for the study.

# Functional unit

*Quantified performance of a product system for use as a reference unit  
(ISO 14040)*

Mass of the product

Digestible energy or protein content

Monetary value of production or net value added

(Area, e.g. hectare)

# Life cycle phases

## Cradle-to-grave

- Construction phase
- Use phase
- Disposal phase

## Cradle-to-(farm-)gate

- Construction phase

# Scope Definition

- Functional unit: Quantified performance of a product system for use as a reference unit (ISO 14040).

# Examples of functional units

Product System
Power Plant
Christmas Tree

Figure 4-4: Linkages between Function, Functional Unit, and Example LCI Results for hypothetical LCA studies

# More examples

- What are the functional unit(s) of:
  - A hectare of wheat grown on a farm?
  - A dairy cow?
  - A Porsche car?
  - A hospital?

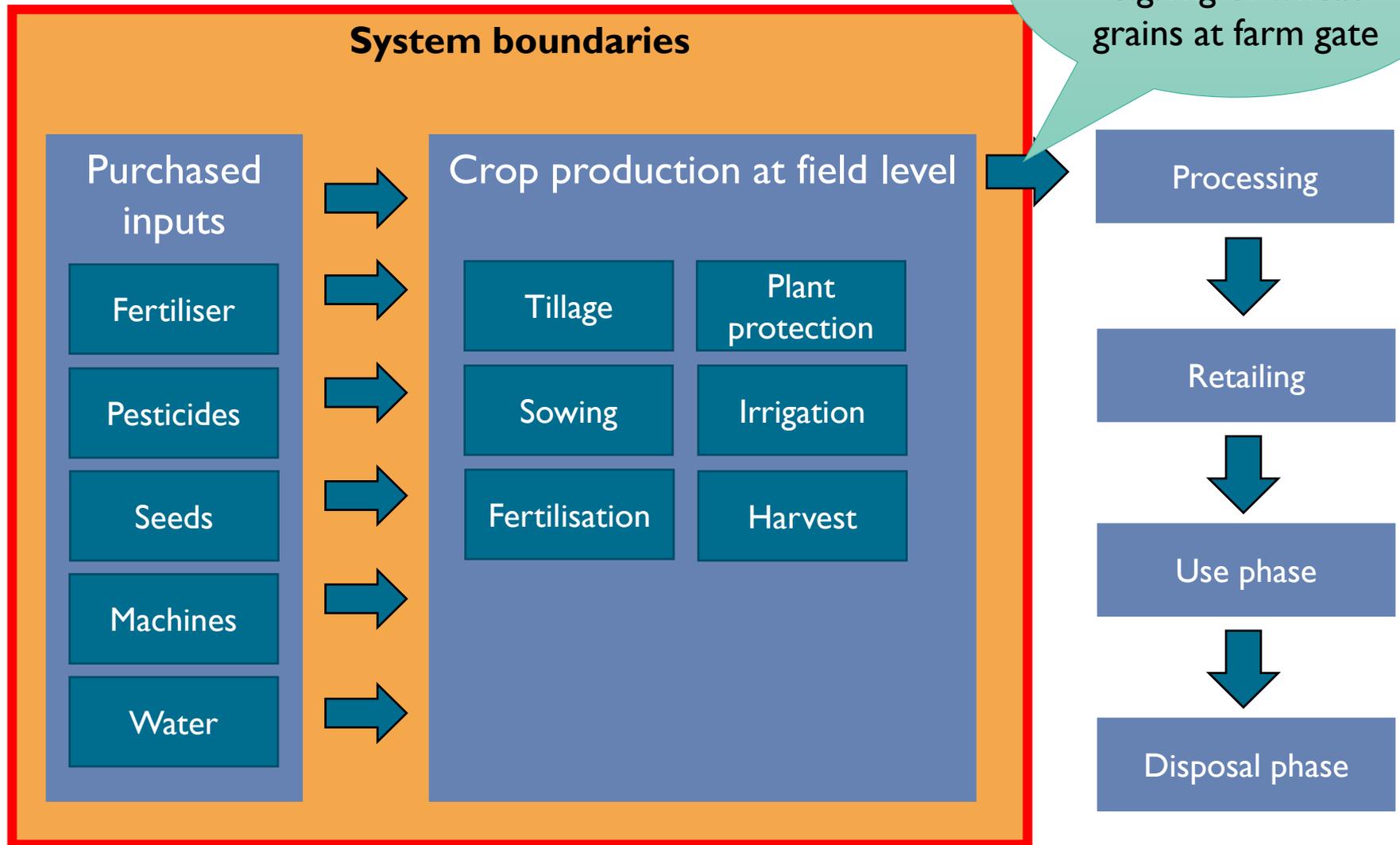
# System boundaries

It is impossible to include everything in your LCA. But where to draw the line? Decision criteria:

- Importance (in mass terms? Energy use terms? Environmental relevance?)
- Data availability (are data present in LCA databases, can they be collected at all?)
- Inclusion of capital goods?

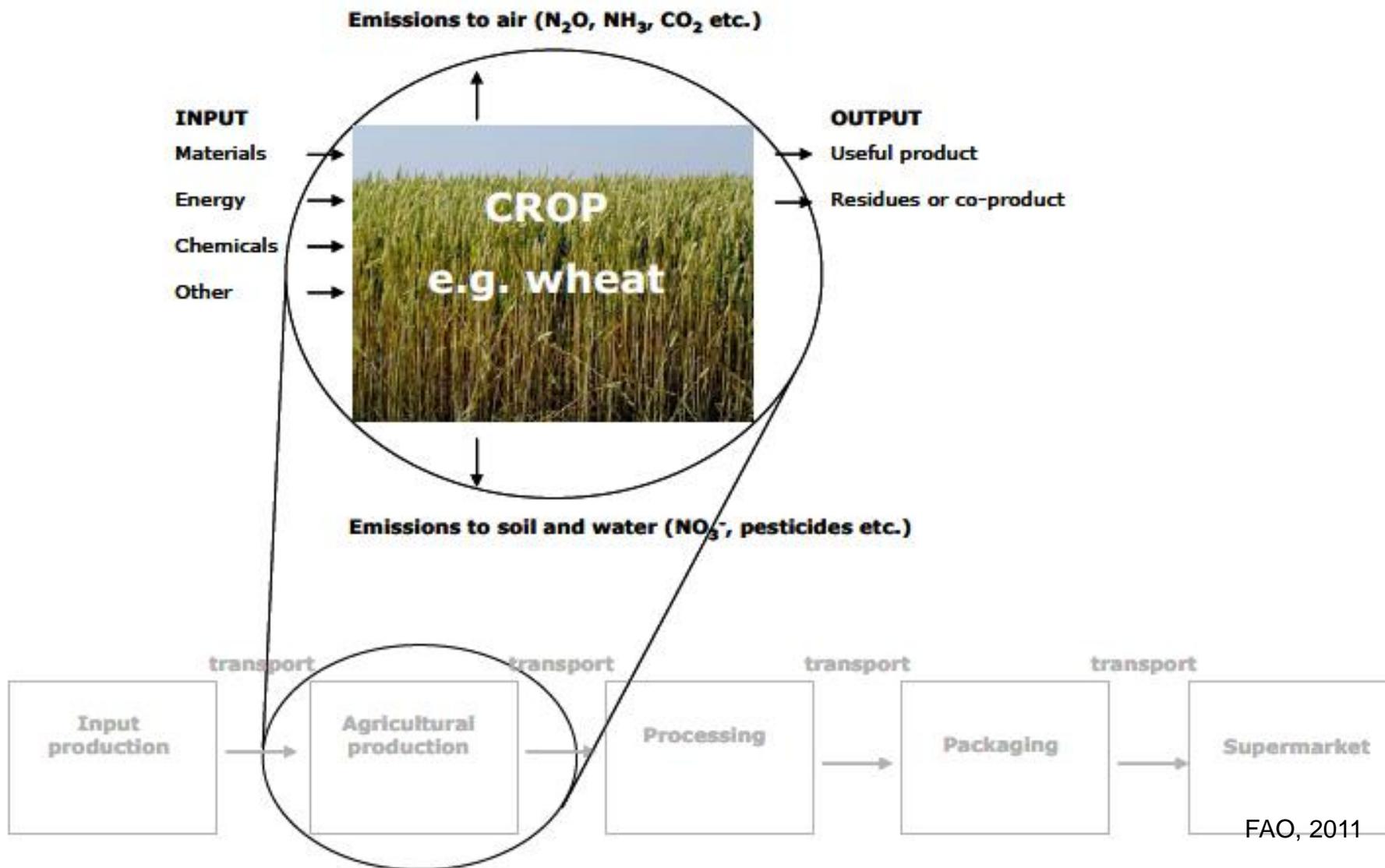
**(Capital goods:** Goods that are a one-off investment, like trucks or machines.)

# System boundaries of an agricultural crop



# Life cycle inventories in agriculture

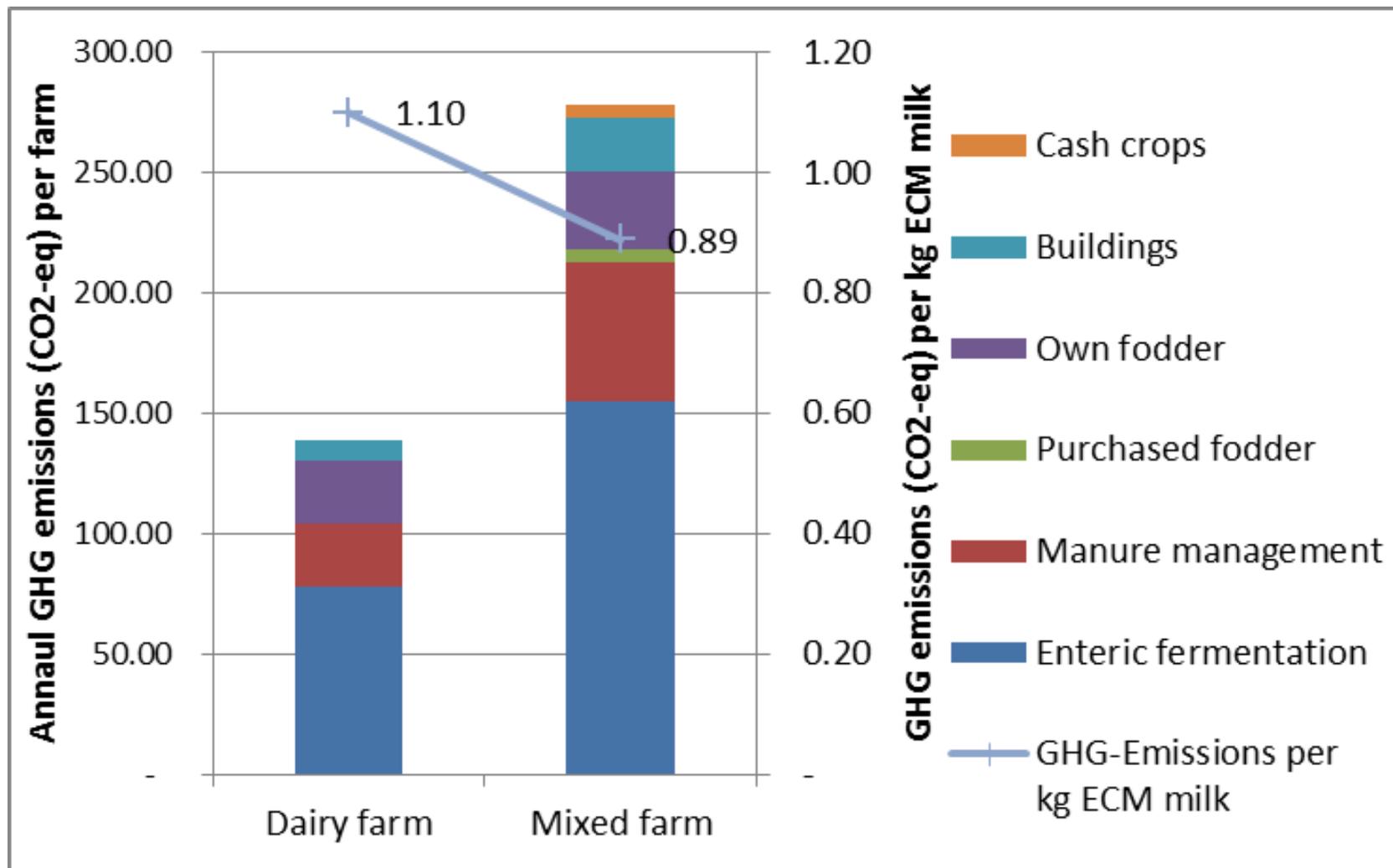
- Foreground vs. Background data



# Impact assessment

LCI Result
1000 g CO <sub>2</sub>
100 g CH <sub>4</sub>
100 g SO <sub>2</sub>
Total result

# GHG emission profile of farms



# Effectiveness of measures (kg CO<sub>2</sub>-eq / per farm and year)

Potential reduction of GHG emissions	Specialised dairy farm		Mixed farm (dairy/arable)	
	Absolute	Relative	Absolute	Relative
<b>Total GHG emissions</b>	<b>139,066</b>	<b>100.00%</b>	<b>277,911</b>	<b>100.00%</b>
Composting livestock manure	-4429	-3.1%	-12,128	-4.4%
Increased number of lactations of dairy cows	-7,788	-5.6%	-8,677	-3.1%
Use of dual-purpose cattle breeds	-3,977	-2.9%	-7,357	-2.7%
Use of photovoltaics (on total roof area)	-4,073	-2.9%	-6,153	-2.2%
Conversion to full-grazing system	-4,672	-3.4%	-6,128	-2.2%
Optimisation of machine life	-2,206	-1.6%	-4,237	-1.5%
Application of Eco drive mode	-728	-0.5%	-2,206	-0.8%
Optimization of machines and tractors	-111	-0.1%	-1,935	-0.7%
Shade trees on pastures	-226	-0.2%	-753	-0.3%
Reduced tillage	-	-	-564	-0.2%
Energy-efficient milk cooling devices	-235	-0.2%	-518	-0.2%
Concentrate-free feeding rations	-371	-0.3%	-343	-0.1%
Use of solar heat (for process water on farm)	-139	-0.1%	-262	-0.1%
<b>GHG savings if all measures are implemented</b>	<b>-28,955</b>	<b>-20.8%</b>	<b>-51,261</b>	<b>-18.5%</b>

# Impact assessment

Most frequently used impact categories:

Land occupation

Energy use (non-renewable energy demand)

Climate change (Global Warming Potential)

Eutrophication (N and P)

Acidification (mainly ammonia)

Toxicity (Ecotoxicity and Humantoxicity)

Anything missing?

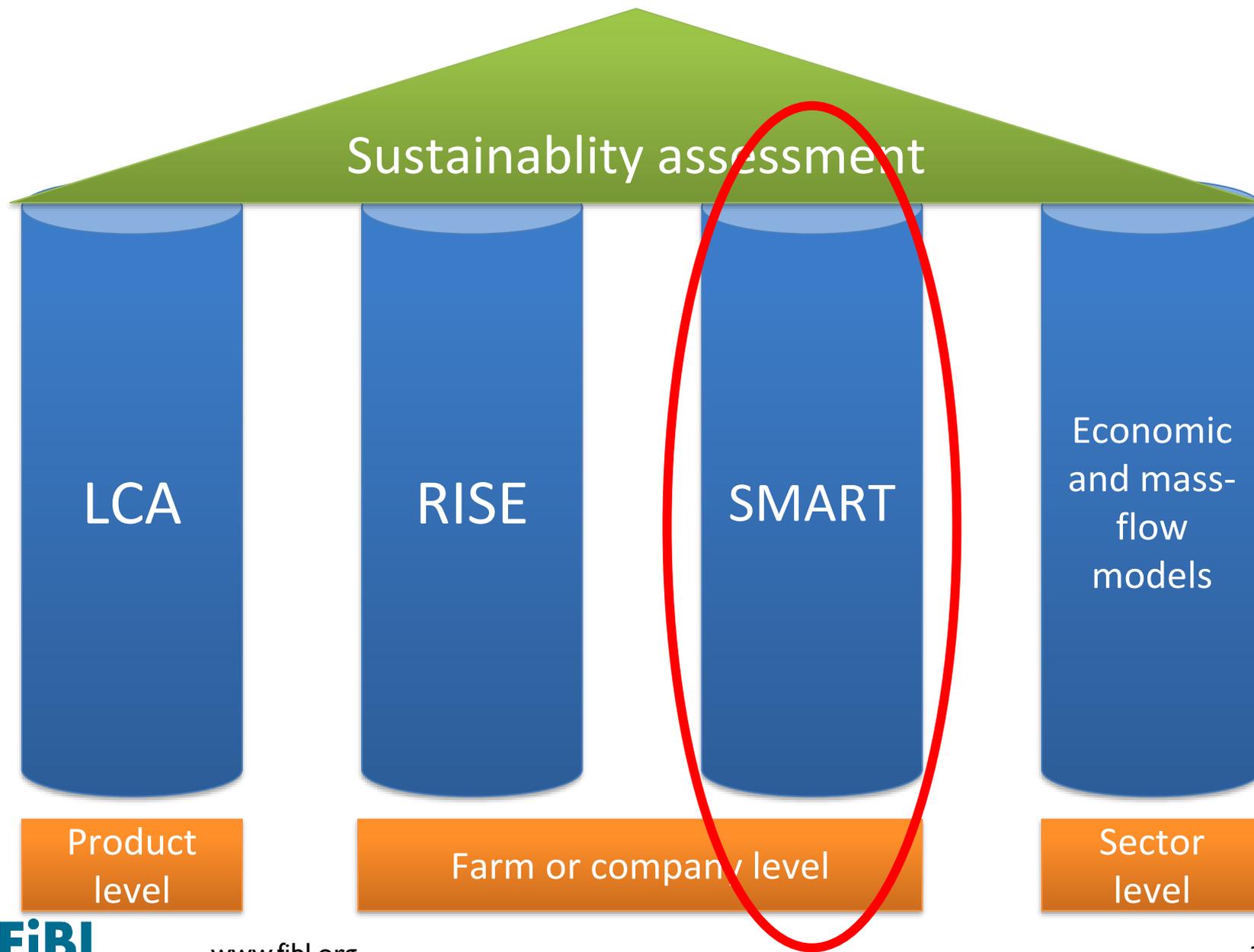
# LCA of food and agriculture – State of the art

Very useful method for comparing resource use efficiency at product level or supply chain level

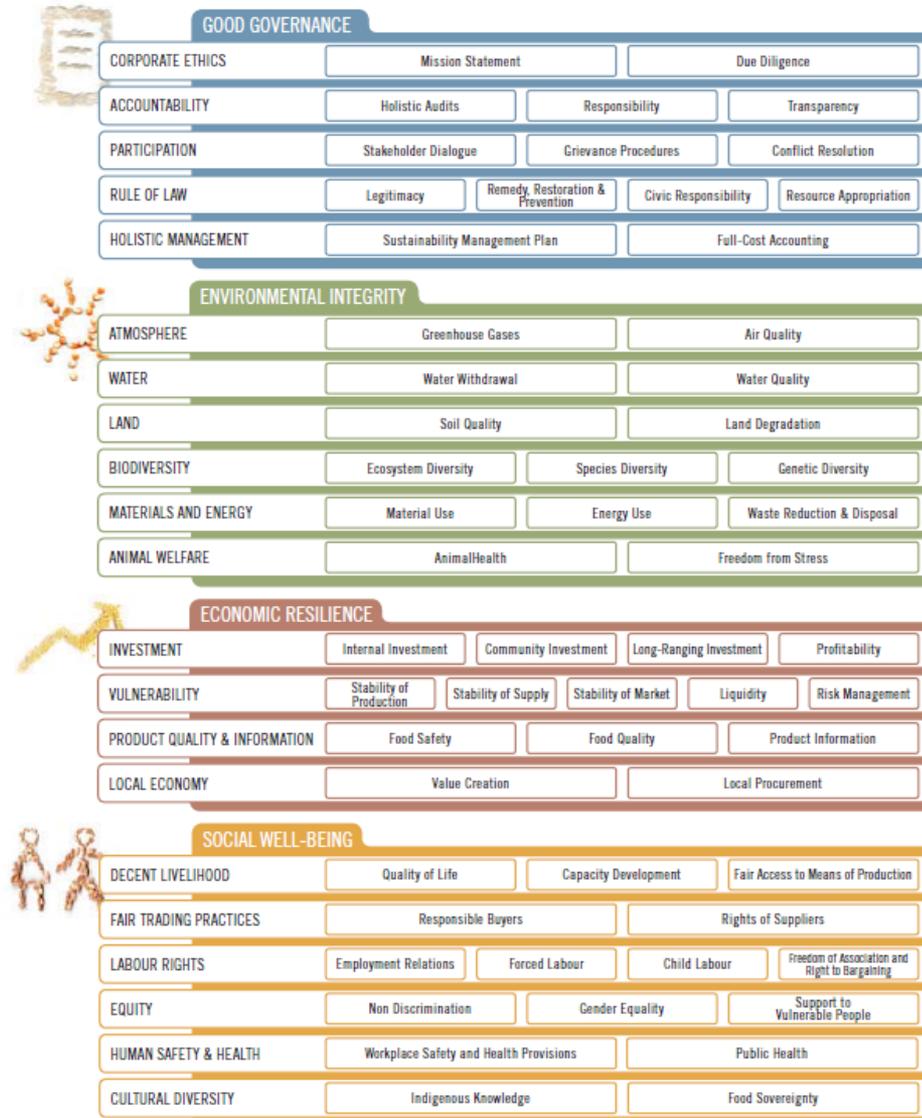
- Relates environmental impacts to a functional unit
- Takes into account also impacts of input production
- Purely quantitative approach

But several drawbacks for food and agriculture

- Only a limited set of environmental impacts can be assessed
- Many hard assumptions
- Social and economic dimensions mostly excluded
- Comparison between production systems with different environmental conditions



# SAFA Guidelines

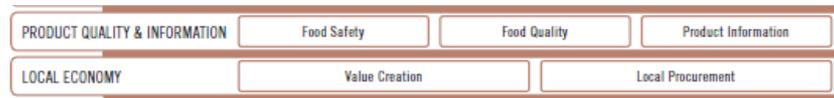
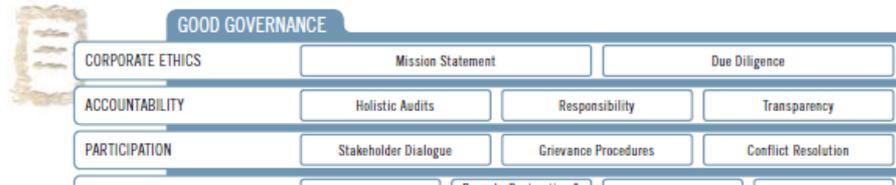


- 4 Dimensions
- 21 Themes
- 58 Sub-themes with sustainability objectives



Food and Agriculture Organization of the United Nations

# SAFA Guidelines



# SAFA Guidelines

GOOD GOVERNANCE			
CORPORATE ETHICS	Mission Statement	Due Diligence	
ACCOUNTABILITY	Holistic Audits	Responsibility	Transparency
PARTICIPATION	Stakeholder Dialogue	Grievance Procedures	Conflict Resolution
RULE OF LAW	Legitimacy	Remedy, Restoration & Prevention	Civic Responsibility, Resource Appropriation
HOLISTIC MANAGEMENT	Sustainability Management Plan	Full-Cost Accounting	

## ENVIRONMENTAL INTEGRITY

ATMOSPHERE	Greenhouse Gases	Air Quality	
WATER	Water Withdrawal	Water Quality	
LAND	Soil Quality	Land Degradation	
BIODIVERSITY	Ecosystem Diversity	Species Diversity	Genetic Diversity
MATERIALS AND ENERGY	Material Use	Energy Use	Waste Reduction & Disposal
ANIMAL WELFARE	Animal Health	Freedom from Stress	

SOCIAL WELL-BEING			
DECENT LIVELIHOOD	Quality of Life	Capacity Development	Fair Access to Means of Production
FAIR TRADING PRACTICES	Responsible Buyers		Rights of Suppliers
LABOUR RIGHTS	Employment Relations	Forced Labour	Child Labour, Freedom of Association and Right to Bargaining
EQUITY	Non Discrimination	Gender Equality	Support to Vulnerable People
HUMAN SAFETY & HEALTH	Workplace Safety and Health Provisions		Public Health
CULTURAL DIVERSITY	Indigenous Knowledge	Food Sovereignty	

SAFA sustainability objective for the “Water Quality” sub-theme:

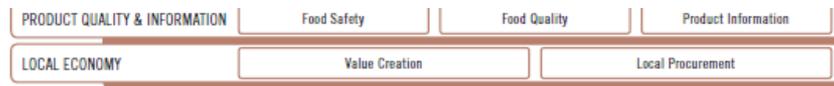
“The release of water pollutants is prevented and water quality is restored”.

# SAFA Guidelines

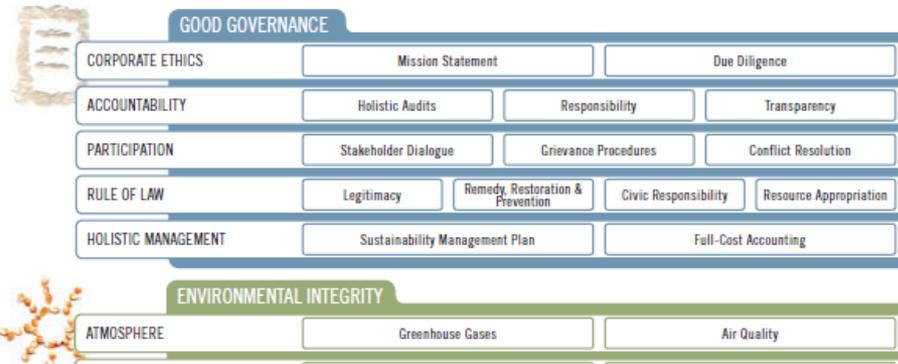


**ENVIRONMENTAL INTEGRITY**

**ECONOMIC RESILIENCE**



# SAFA Guidelines



## SOCIAL WELL-BEING



# Results of a SMART Assessment



SOCIAL WELL-BEING

Human Health & Safety  
Equity  
Labour Rights  
Fair Trading Practices  
Decent Livelihoods  
Local Economy  
Product Quality & Information  
Vulnerability

ECONOMIC RESILIENCE



## SUB-THEME: SPECIES DIVERSITY



### OBJECTIVE:

The diversity of wild species living in natural and semi-natural ecosystems, as well as the diversity of domesticated species living in agricultural, forestry and fisheries ecosystems is conserved and improved.

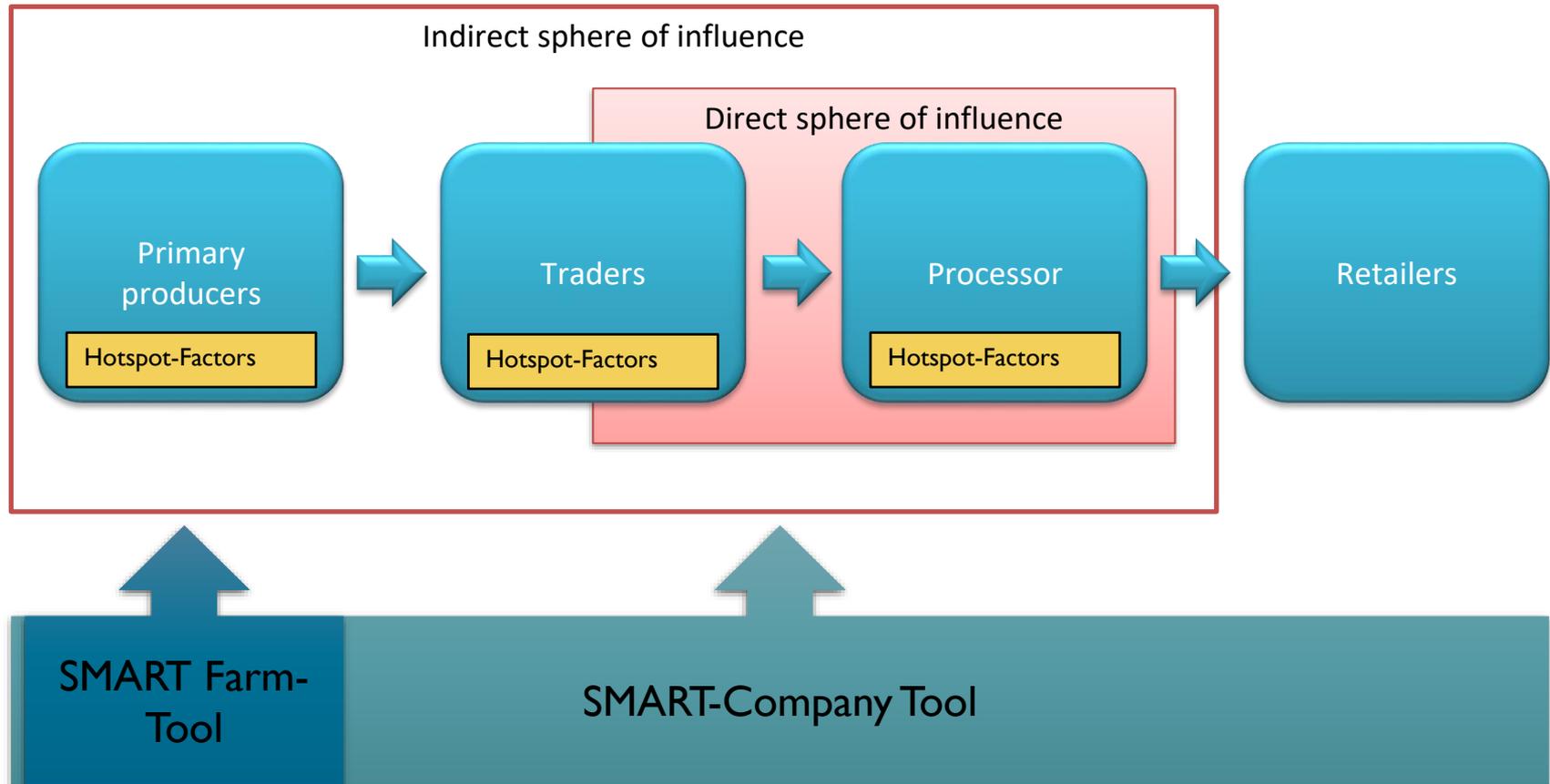
SCORE: 55% of the sustainability objective achieved.

<p>↑ A significant part of the agricultural area is devoted to permanent grassland.</p>	<p>↓ No or only a small part of the farm's agricultural area is devoted to agro-forestry systems.</p>
<p>↑ A large part of the farm's agricultural area consists of ecological compensation areas resp. areas to promote biodiversity.</p>	<p>↓ A small part of the area of permanent grassland is under intensive management.</p>
<p>↑ The whole or a large part of the agricultural area does not receive synthetic chemical herbicide applications.</p>	<p>↓ The pesticides used are considered to be toxic to bees according to the "PAN Pesticide Database".</p>
<p>↑ A large part of the agricultural area does not receive synthetic chemical fungicide applications.</p>	<p>↓ The pesticides used are considered to be toxic to aquatic organisms according to the "PAN Pesticide Database".</p>
<p>↑ The whole or a large part of the agricultural area does not receive synthetic chemical insecticide applications.</p>	<p>↓ Some of the pesticides used are considered to have adverse long term effects on the users according to the "PAN List of HHPs" or "PAN Pesticide Database".</p>
<p>↑ The farm has a high share of scattered fruit trees.</p>	<p>↓ Some of the pesticides used are considered to be</p>

ENVIRONMENTAL INTEGRATION

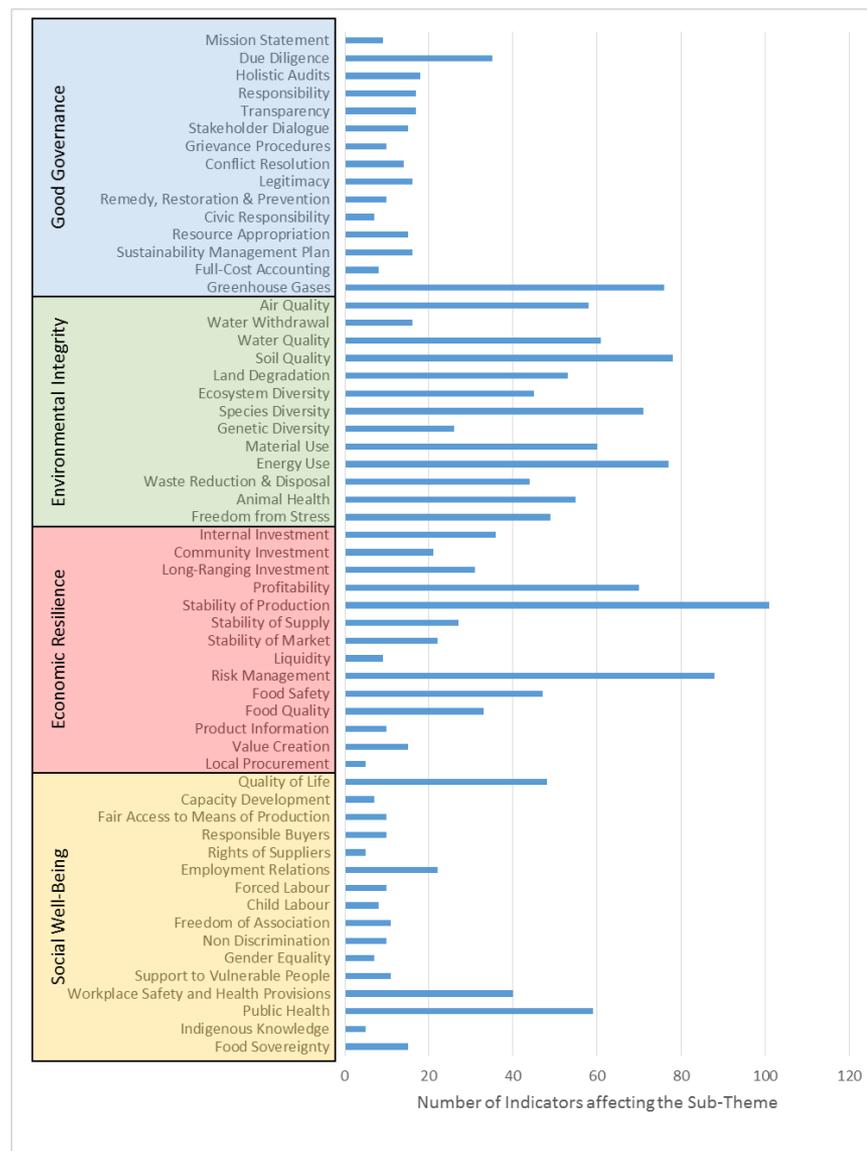


# Sphere of influence



# Number of indicators in the SMART-Farm Tool

- Multi-Criteria Analysis
- 327 Indicators
- Ca. 1700 algorithms specifying the impact of an indicator on a subtheme
- On average 30 Indikators for calculating the degree of goal achievement of a SAFA Sub-Theme



# SMART: Degree of goal achievement (DGA)

$$DGA_{ix} = \sum_{n=1}^N (IM_{ni} \times IS_{nx}) / \sum_{n=1}^N (IM_{ni} \times IS_{maxn}) \forall i \text{ and } x$$

*i* : index of sub-themes

*x* : index of farms

*n* : index of indicators

*DGA* : Degree of goal achievement

*IM* : Impact of an indicator on a sub theme

*IS* : Performance of a farm with respect to indicator *n*

*ISmax* : Best performance possible with respect to indicator *n*

More details: Schader et al. 2016

# Multi-Criteria Assessment in SMART

Sub-theme for which a SAFA objective is defined

Impacts of each indicator in the sub-theme

Capacity Development	Impact Weight	Indicator Rating	Impact weight * score	Sustainability Score at the Sub-theme level
Further training for farm staff	0.93	100%	0.93	44.36%
Apprenticeships	0.71	100%	0.71	
Training on sustainability	0.73	0%	0.00	
Employees: Access to external training	0.85	25%	0.21	
Access to advisory services	0.91	25%	0.23	
Education and training at master level (master crafts men places)	0.56	0%	0.00	
	4.69		2.08	

Relevant indicators impacting on degree of goal achievement

Sum of impacts = maximum achievable points

Sum of impacts \* actual performance = achieved points

# SMART-Farm Tool: Characteristics

Globally applicable, producing comparable results according to the 58 Goals from the FAO-SAFA Guidelines

- Till now about 3000 farms have been evaluated with SMART (Switzerland, Germany, Austria, Hungary, Kenya, Ghana, Uganda, Costa Rica, Dominican Republic, Mexico)
- Applicable to all farm types and sizes: Arable farming, vegetables (including greenhouses), fruits, tree nurseries, viticulture, grasslands/rangelands, cattle, dairy, pigs, goats, sheep, poultry, bees, aquaculture)

Method independent and science-based

- Based on scientific knowledge
- Development financed independently from commercial interests
- Not tailored to a specific context or company

Complementary to RISE

- Not an „advisor“ but an „auditor“ visits the farm
- Harmonisation of standard data for applying as package solution

# SMART-Farm Tool: Characteristics (2)

## Reproducibility, quality assurance

- Training curriculum for SMART-Auditoren 1-2 weeks, incl. theoretical and practical lessons and tests
- Review of a subsample of reports by 2nd auditor

## Useful for a large-scale benchmarking and monitoring

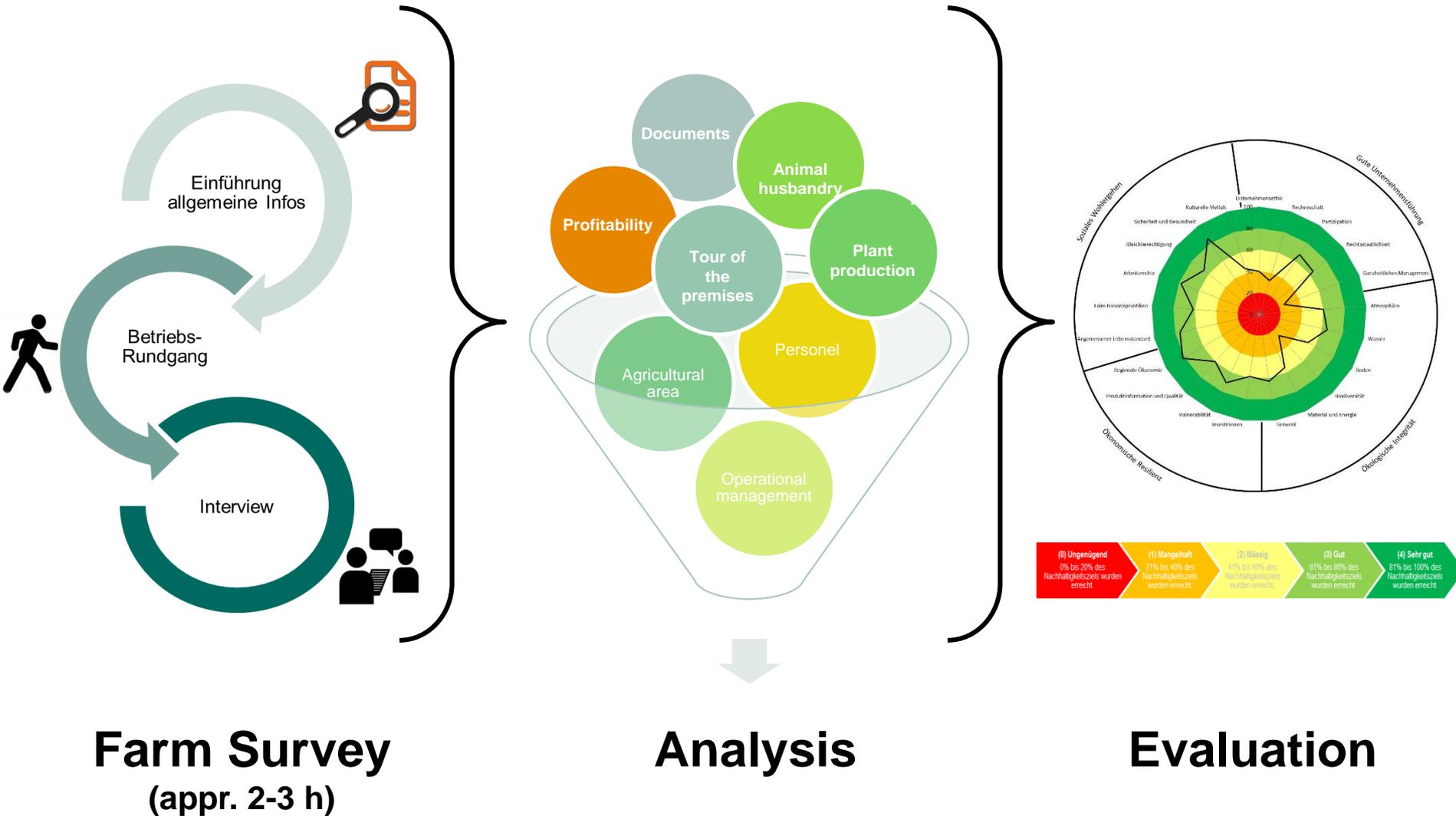
- Comparable low cost per farm
- Automatised as far as possible
- Required data needs to be available

## Coverage of most important drivers for sustainability, drivers being made transparent

## Version 2.1:

- 327 Indicators, partly applicable to only a set of farm types
- Consideration of trade-offs and synergies
- 1769 impact relations between indicators and subthemes

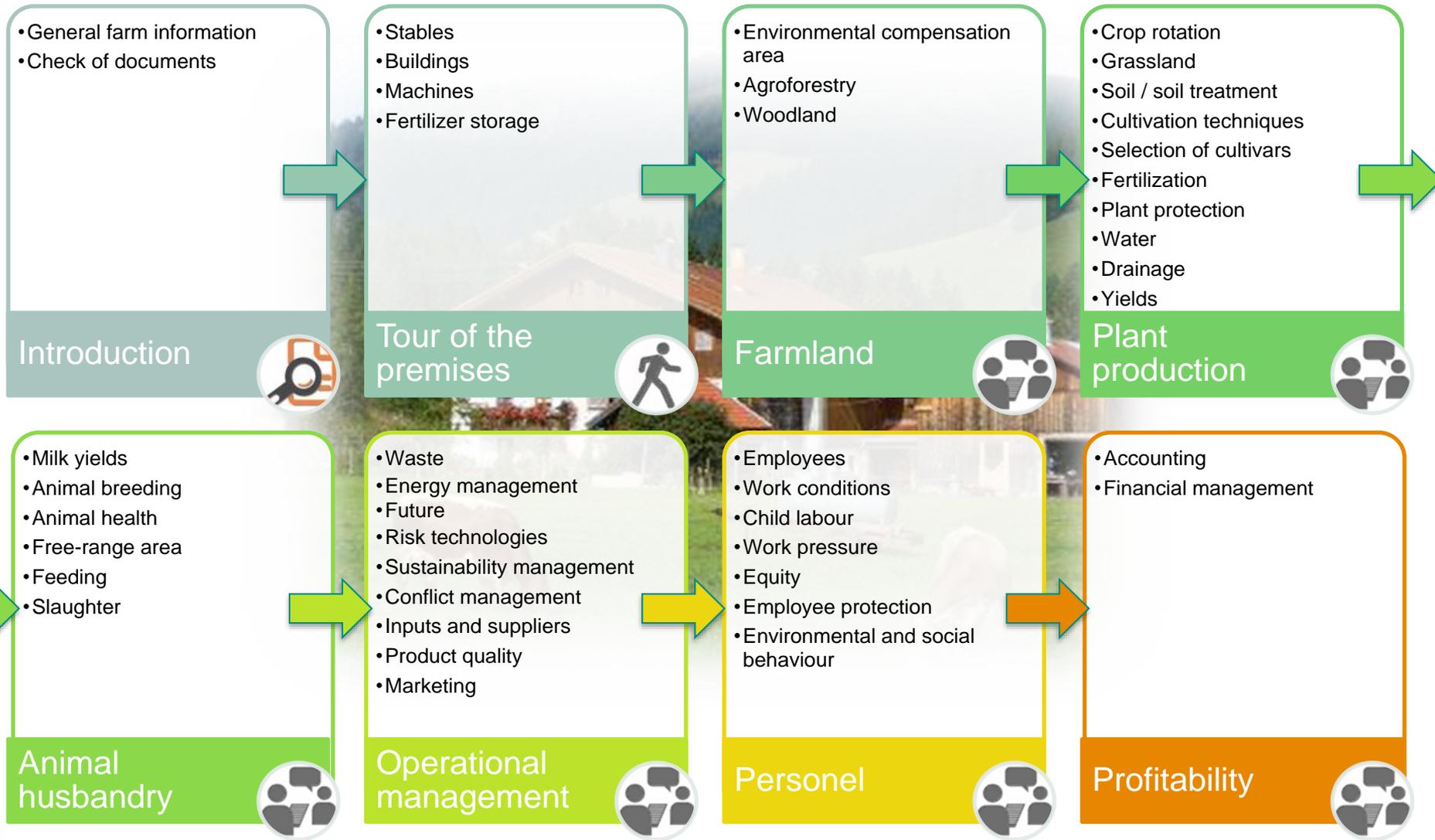
# Process flow SMART Farm-Assessment



# Data collection on farm

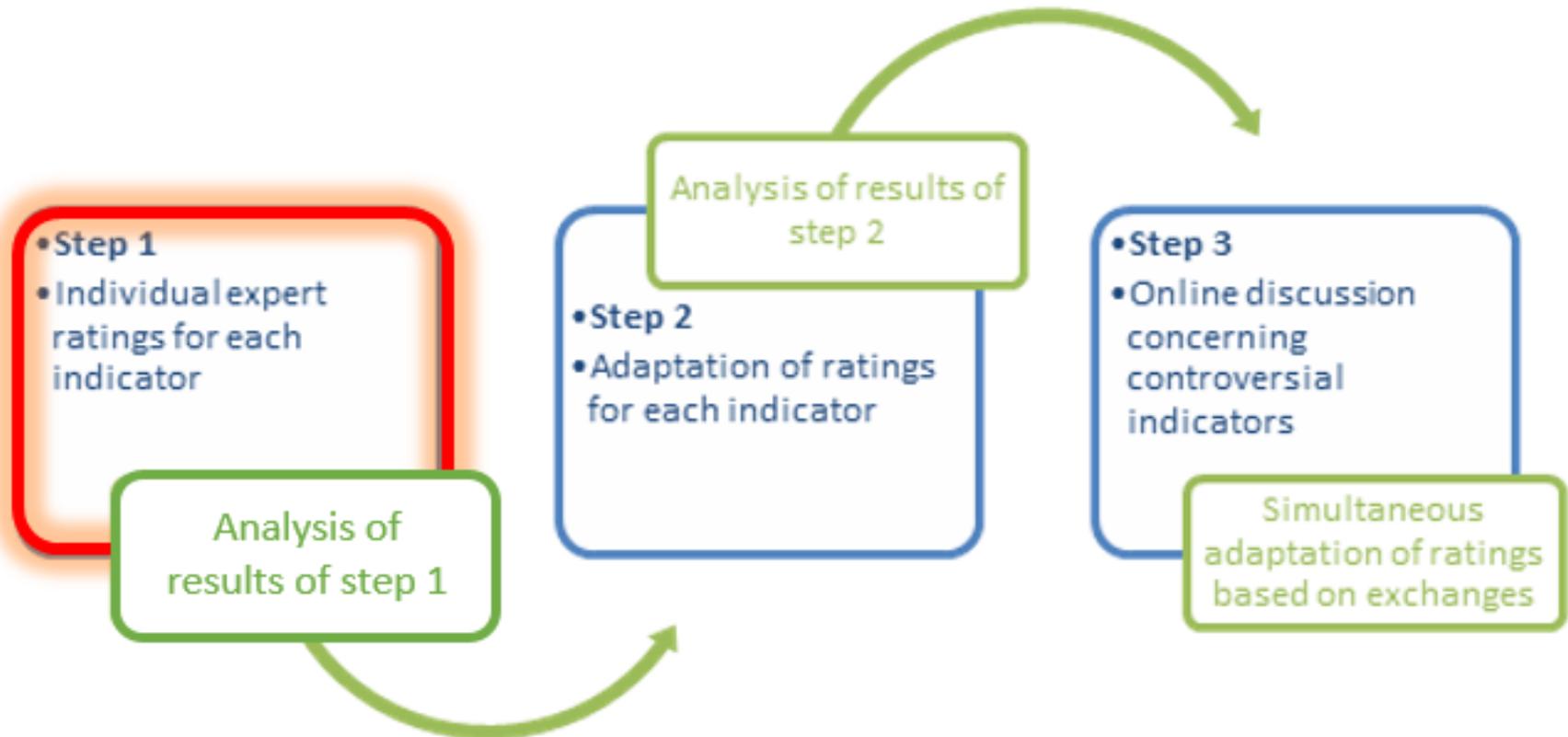


# Data collection on farm



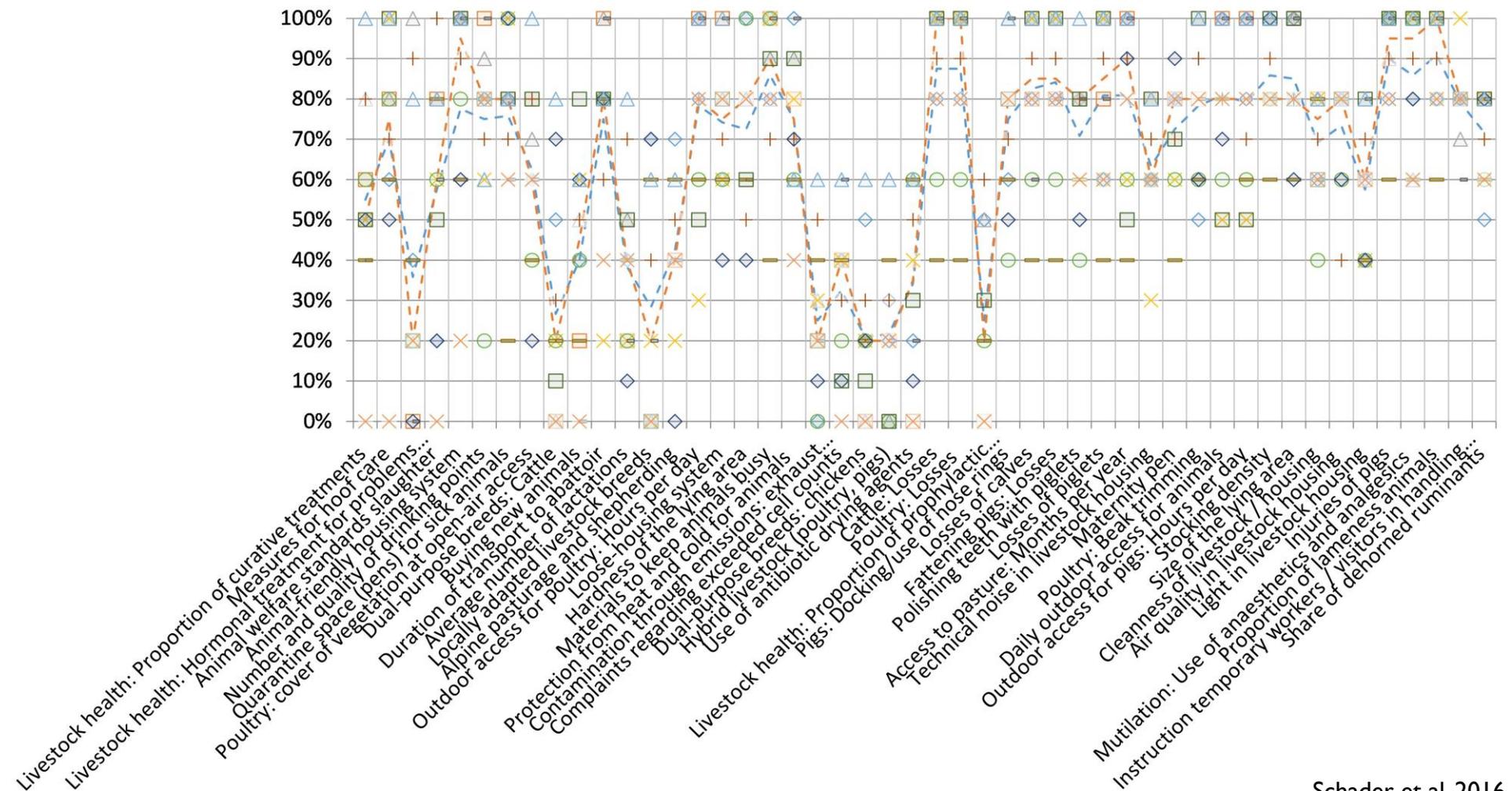
# SMART Indicators: Expert-based weighting

Nominal Group Technique / Delphi

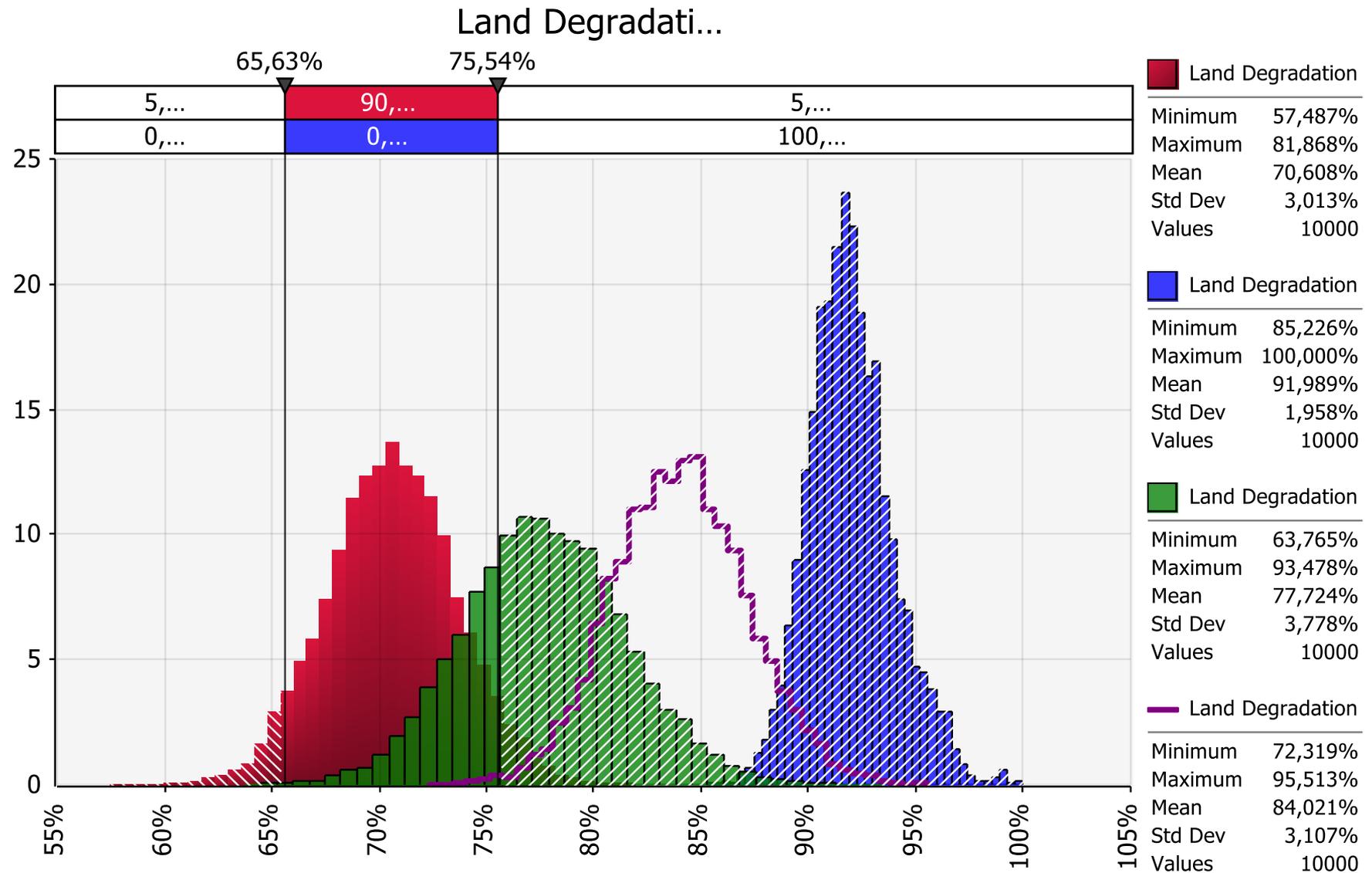


# Example of an expert based scoring: Animal welfare indicators

## Theme: Freedom from Stress



# Example of an uncertainty analysis with the SMART-Farm Tool



# Results: Synergies and trade-offs between sustainability dimensions

Synergies	Governance	Environmental integrity	Economic resilience	Social Well-Being
Governance	86%	59%	73%	78%
Environmental integrity	59%	52%	54%	56%
Economic resilience	73%	54%	69%	69%
Social Well-Being	78%	56%	69%	78%

Trade-offs	Governance	Environmental integrity	Economic resilience	Social Well-Being
Governance	-	540	276	68
Environmental integrity	-	540	276	68
Economic resilience	540	276	144	115
Social Well-Being	68	115	144	115

Animal welfare ≠ Other environmental themes

Stability of production ≠ Environmental themes

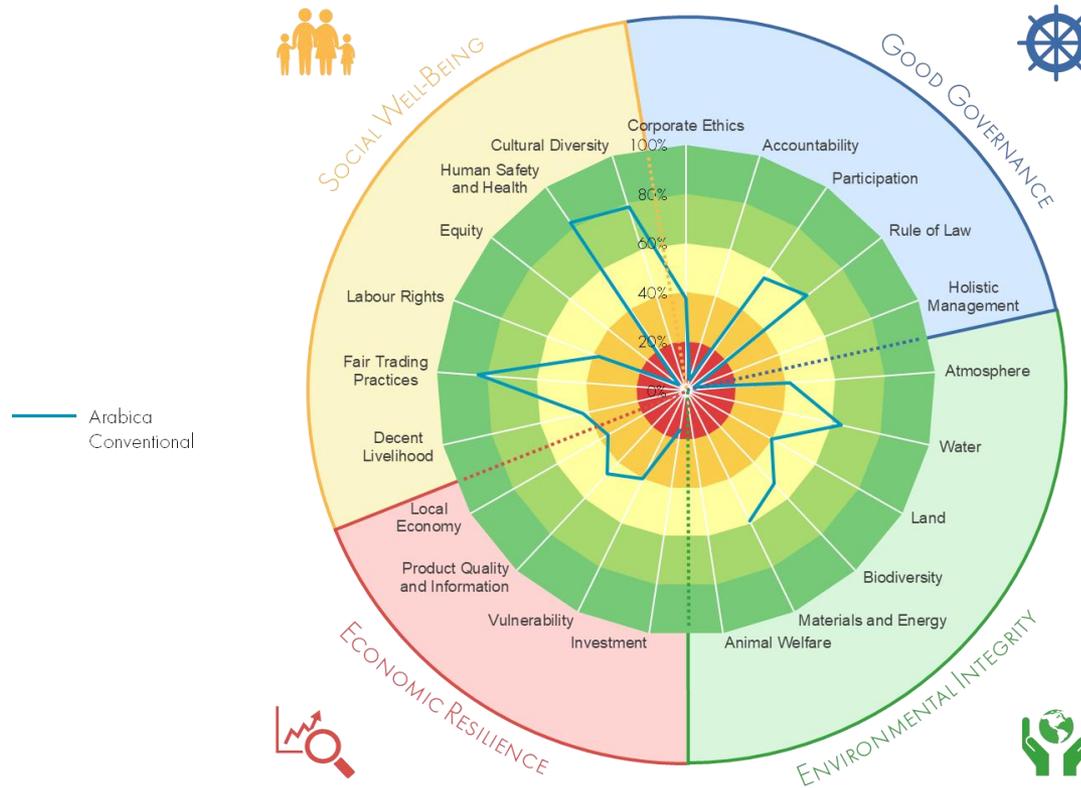
Stability of production and Profitability ≠ Public health and workplace safety

Resilience ≠ productivity

Legitimacy/responsibility ≠ profitability

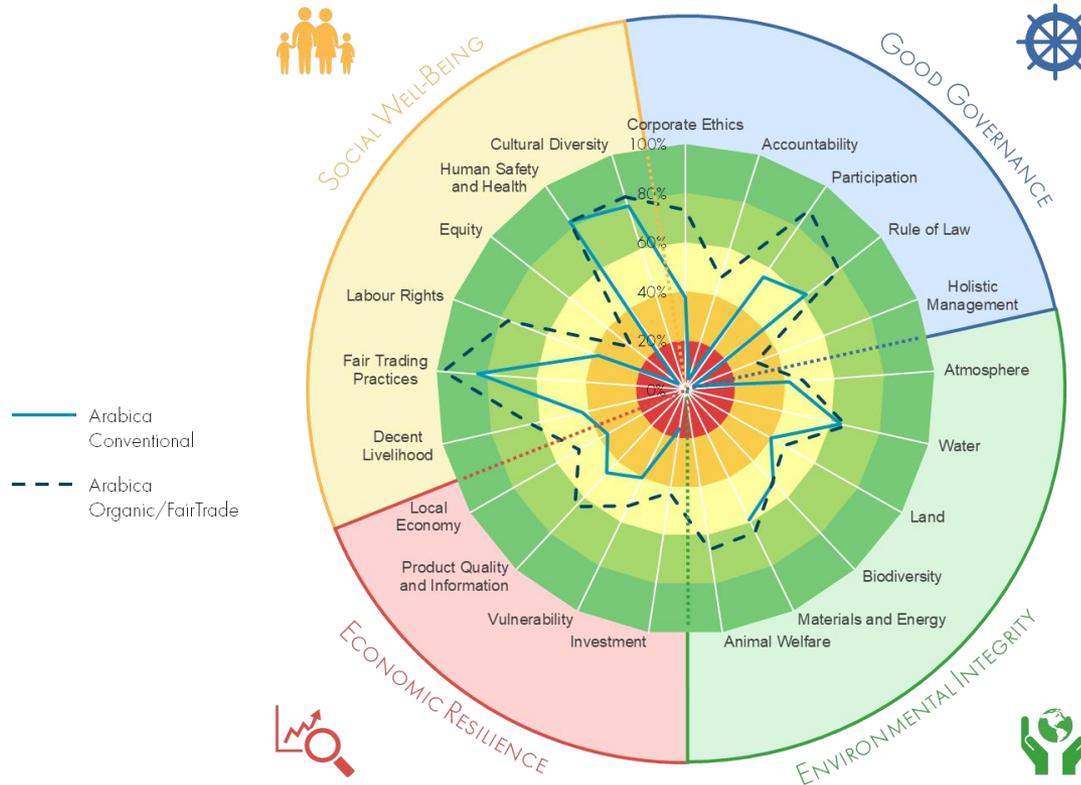


# Comparing Production Systems & Labels (conventional, Fair Trade, Organic) in Uganda



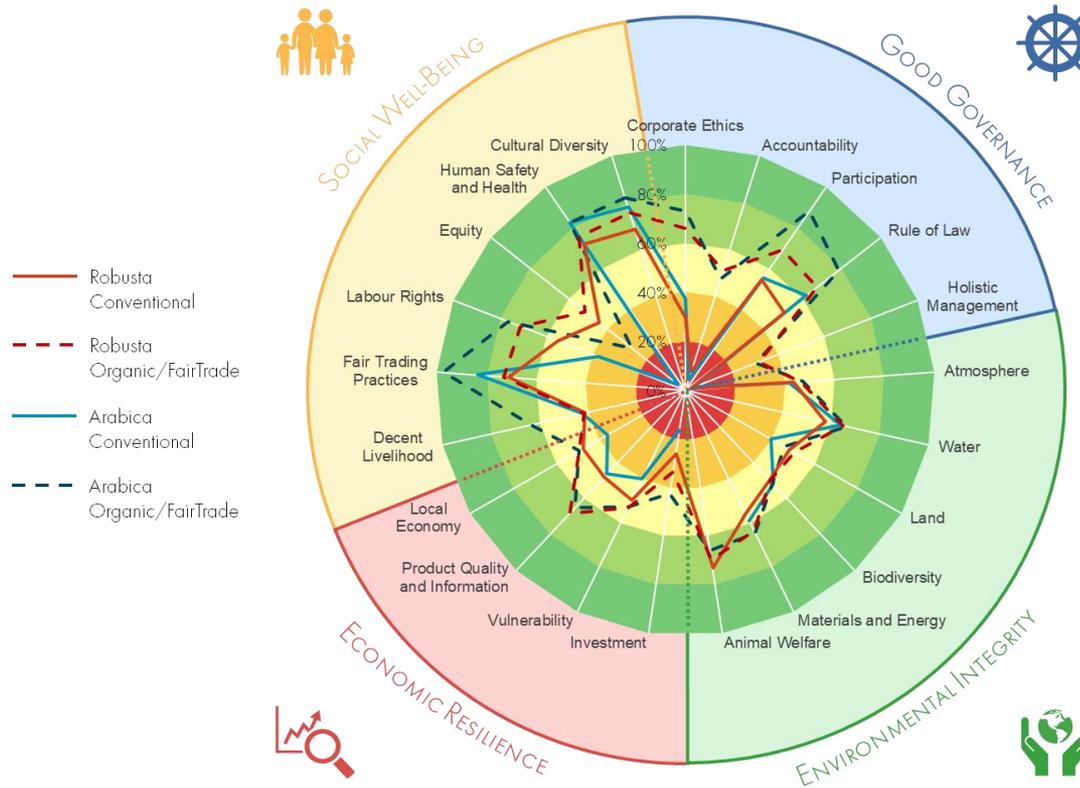
Source: Ssebunya et al 2019

# Comparing Production Systems & Labels (conventional, Fair Trade, Organic) in Uganda



Source: Ssebunya et al 2019

# Comparing Production Systems & Labels (conventional, Fair Trade, Organic) in Uganda



Source: Ssebunya et al 2019

# Comparison of standards



**Practice-oriented policy rationale:**

Monitoring/Payment based on implementation of practices

Farm

**Practices**

Implementation of practices deemed to provide public goods



**Results**

Achievement of results in terms of public goods provisioning



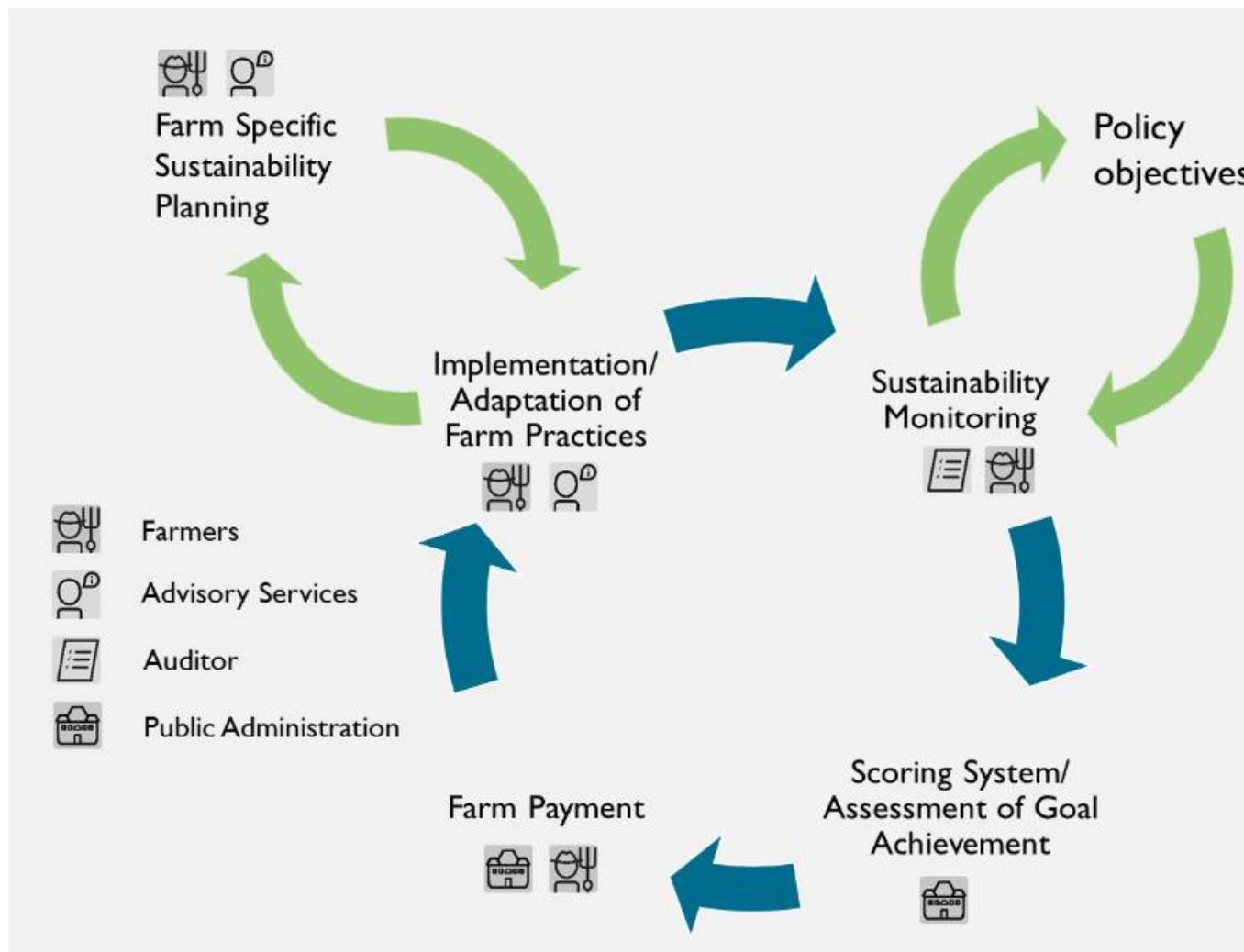
**Policy rationale based on Sustainability Assessment:**

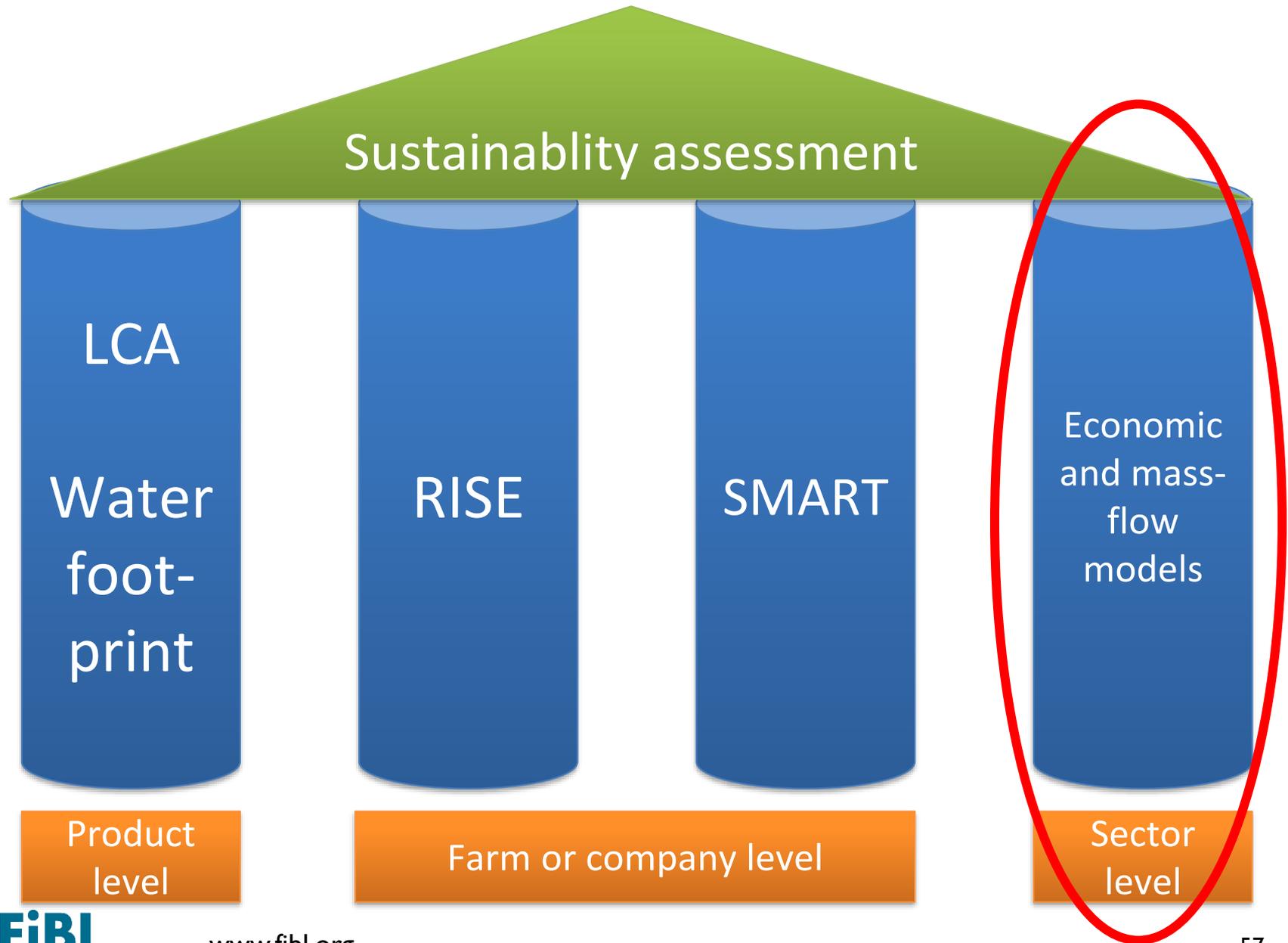
- Basis for Advisory Services and Strategic Development
- Monitoring/Payment based on Sustainability Indicators

**Result-oriented policy rationale:**

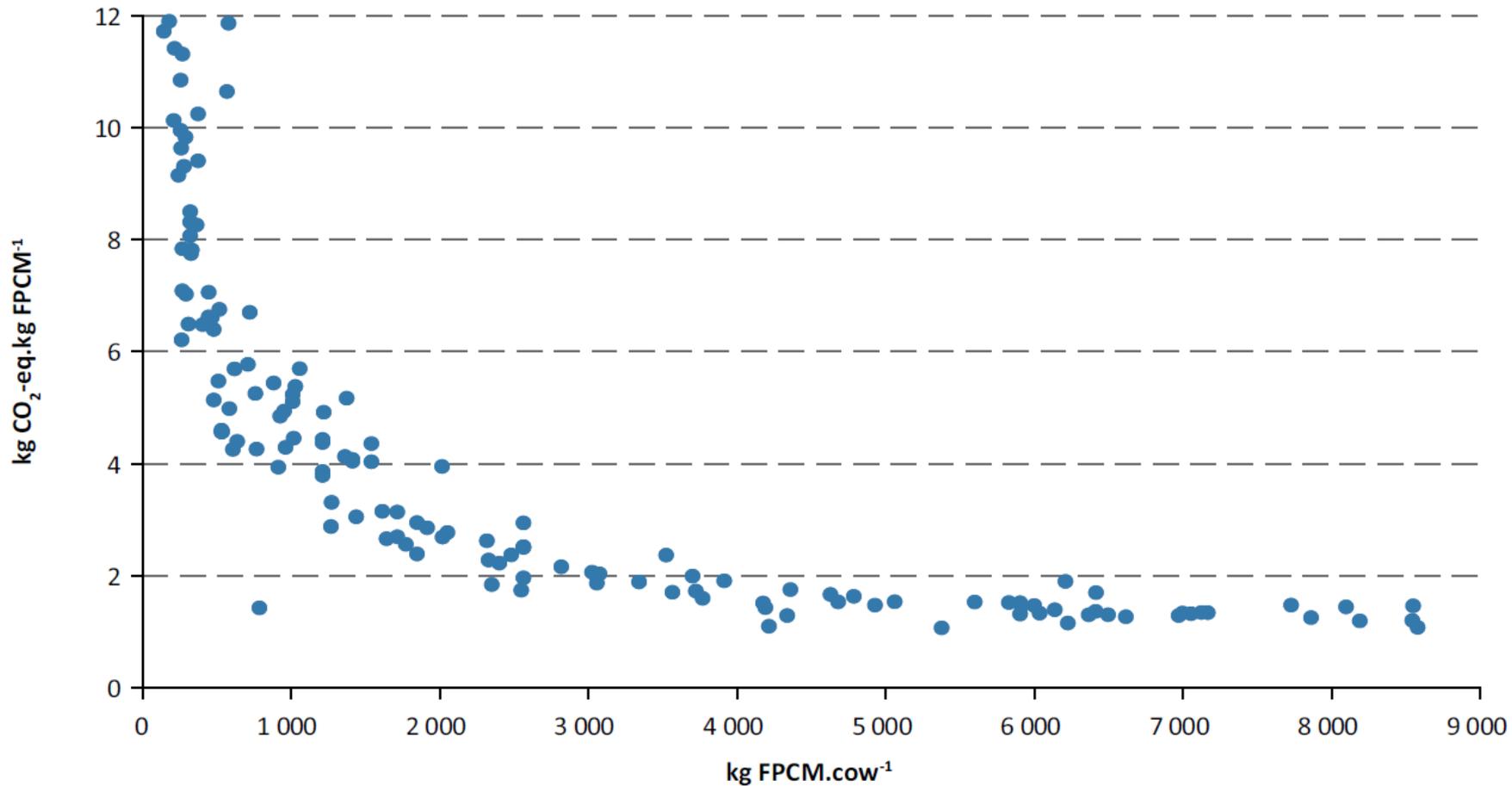
Monitoring/Payment based on achievement of results

# FiBL Proposal for a New Farm Payment System based on Sustainability Assessment



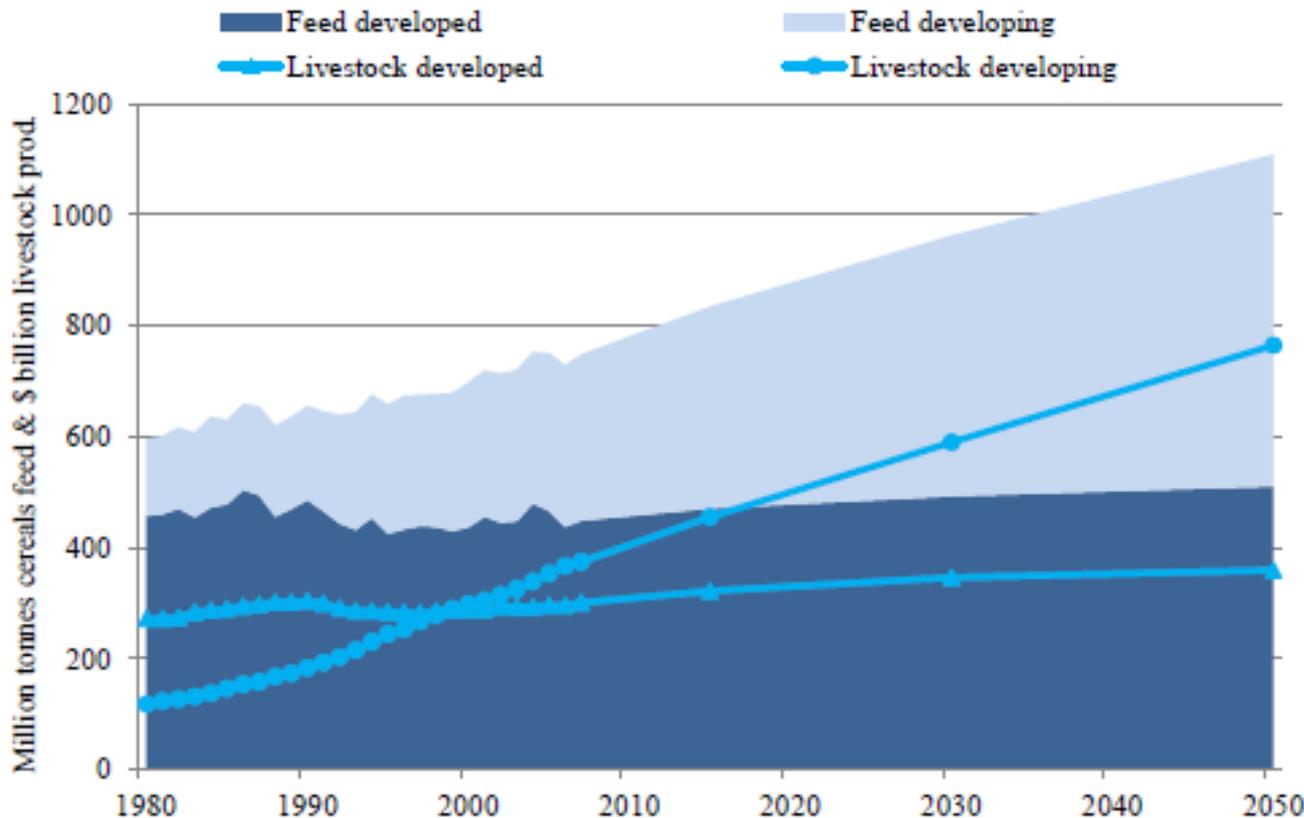


# Relationship between productivity and emission intensity of milk (country averages)



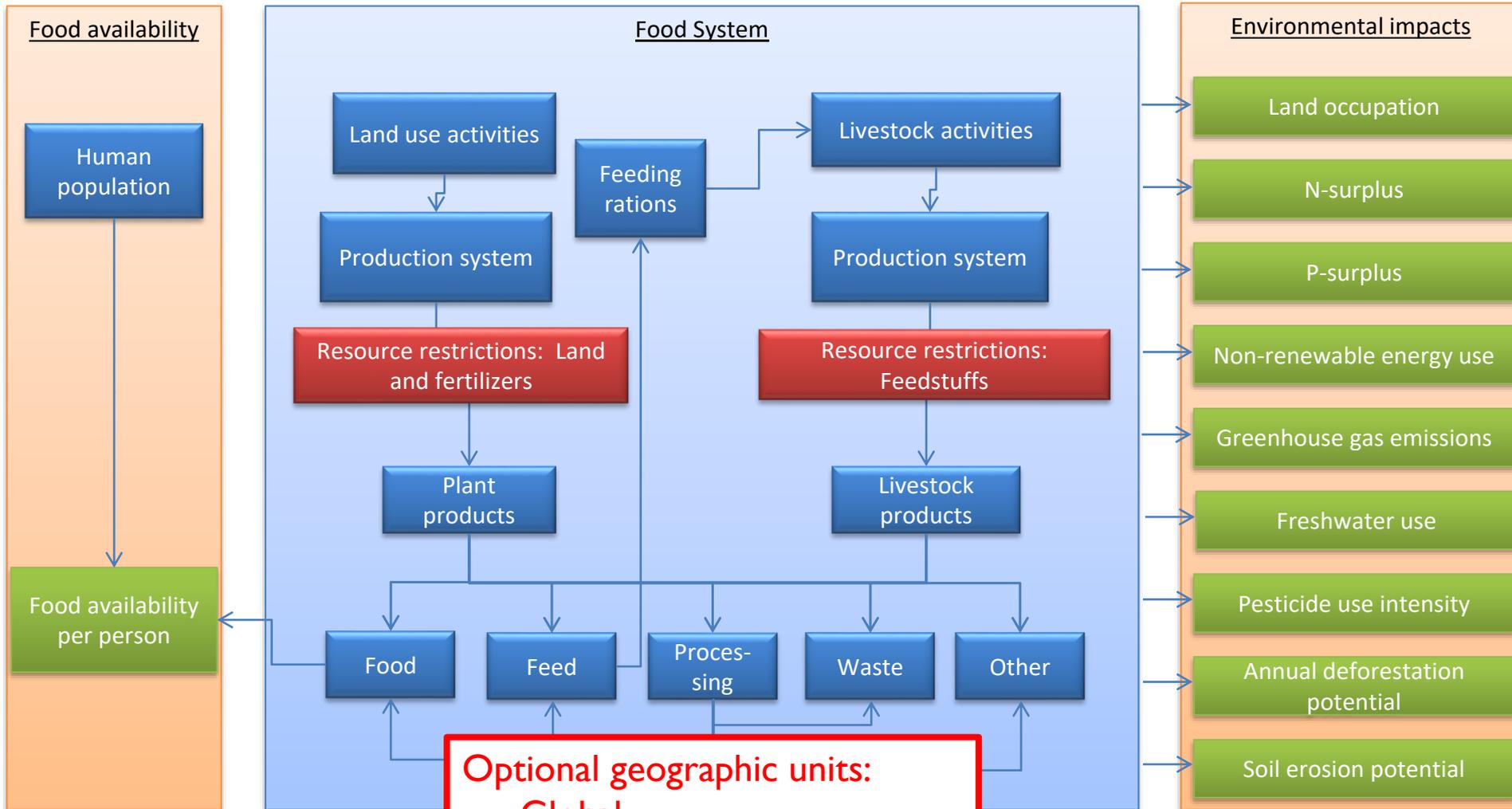
Source: Gerber *et al.*, 2011.

# Cereal feed and livestock production



36% of world cereal production goes to feed: developing countries account 42% of world total and will increase to 56% in 2050

# Model overview



**Optional geographic units:**

- Global
- Regional
- Country

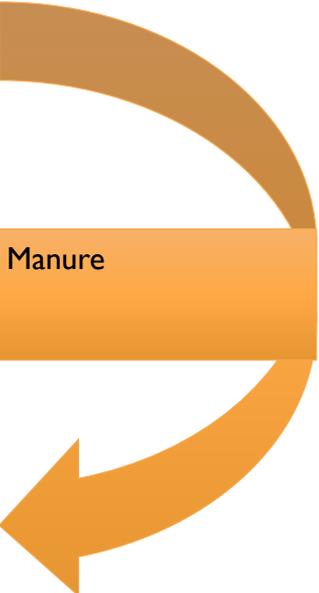
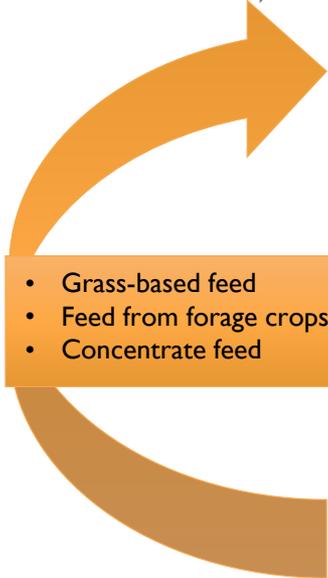
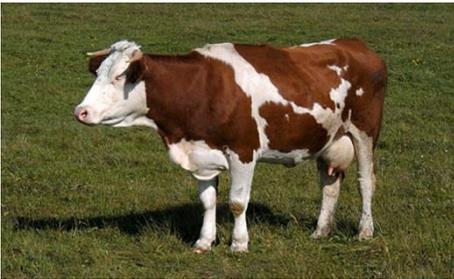
**External Inputs:**

- Grass-based fodder
- Fodder from forage crops
- Concentrates
- Electricity and fuel use
- Buildings and infrastructure

- NH3 losses from manure management
- NO3 losses from manure management
- N2O losses from manure management
- CH4 losses from manure management
- CH4 losses from enteric fermentation

**Outputs:**

- Meat yield
- Milk yield
- Eggs yield
- Hides yield
- Wool yield
- Manure



- Grass-based feed
- Feed from forage crops
- Concentrate feed

- Manure

- Purchased animals

- Crop residues



**Outputs:**

- Crop yield

**External Inputs:**

- Mineral fertiliser
- N-fixation
- Seeds
- Pesticides
- Water
- Electricity and fuel use
- Buildings and infrastructure

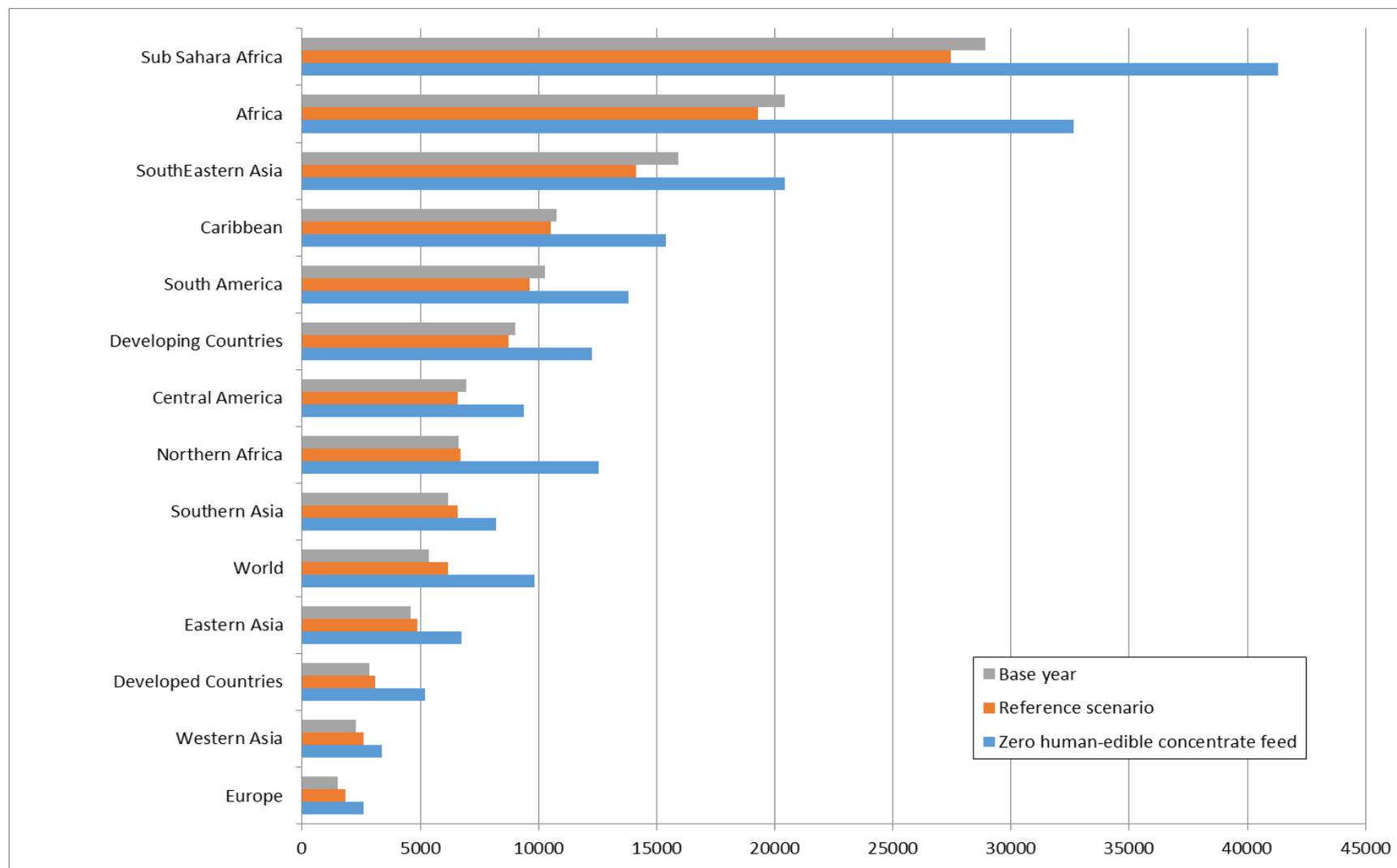
- NH3 losses from fertiliser application
- NO3 losses from fertiliser application
- N2O losses from fertiliser application
- CH4 losses from flooding

www.fibl.org

# Environmental impacts covered in SOL-m

Environmental impact	Indicator
Land occupation	Land occupation in terms of arable, permanent crops and grassland
Soil erosion potential	Crop-specific factor covering the erosion susceptibility of crops
Use of fossil energy resources	Cumulative energy use (CED) 1.05-1.08
Greenhouse gases	GWP IPCC100a
Nitrogen surplus	Nitrogen surplus and losses
Phosphorus surplus	P <sub>2</sub> O <sub>5</sub> surplus
Pesticide use	Pesticide intensity of crops, legislation in the countries and access of farmers to pesticides
Annual deforestation potential	Additionally required crop land
Grassland exploitation	Ratio between ruminants fed on grassland and ruminants that could be fed on grassland in a country

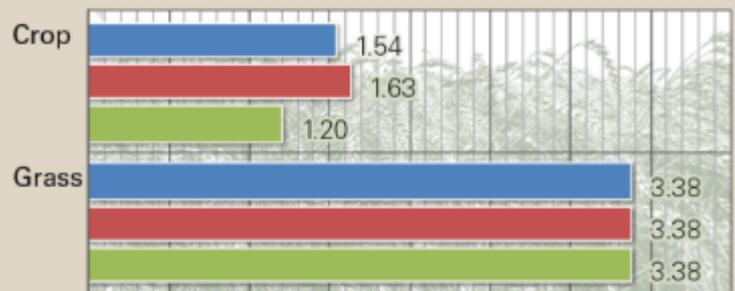
# Comparison of average global warming potential in different regions per t milk delivered by dairy cattle



## Land use

Billion hectares

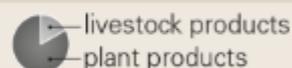
Land occupation:



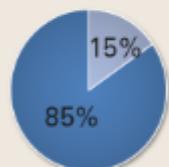
## Diets

### Energy intake

Kcal/cap/day



total: 2,763



total: 3,028



total: 3,028



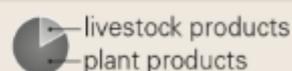
Current situation:  
Base year

2050:  
Reference Scenario

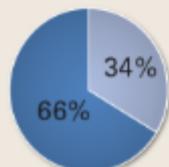
2050:  
Food - not feed

### Protein intake

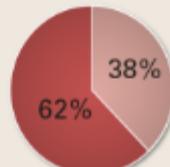
G Protein/cap/day



total: 77



total: 82



total: 78



Current situation:  
Base year

2050:  
Reference Scenario

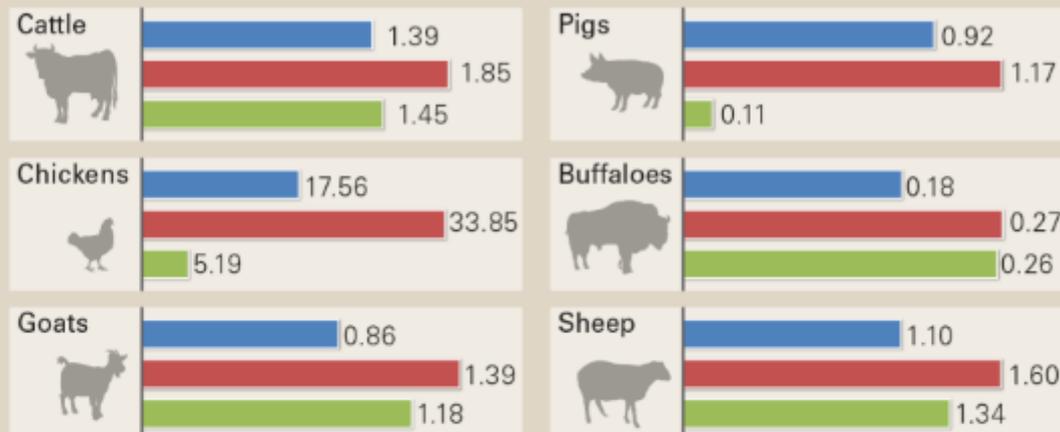
2050:  
Food - not feed

## Livestock

Schader et al. 2015, Journal of the Royal Society Interface

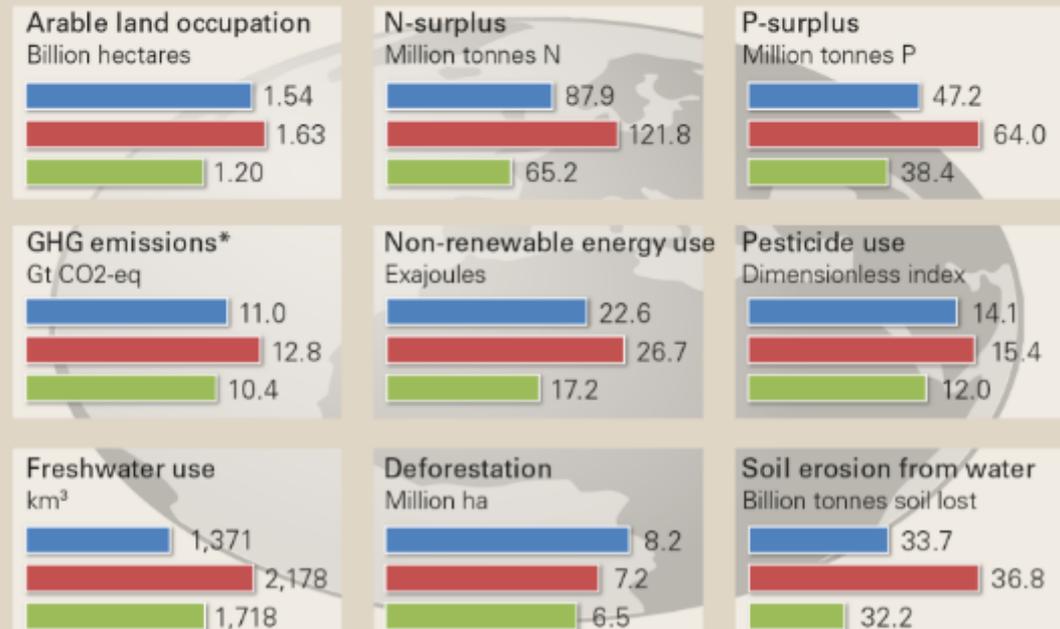
Billion animals

Current situation: Base year 2050: Reference Scenario 2050: Food - not feed



## Environment

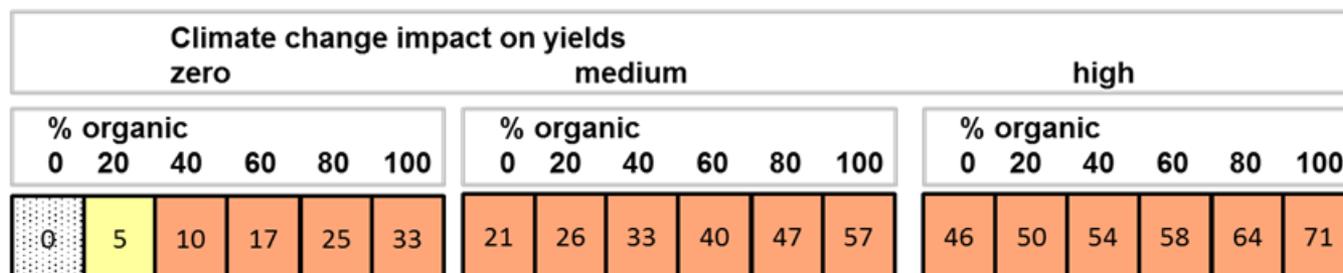
Current situation: Base year 2050: Reference Scenario 2050: Food - not feed



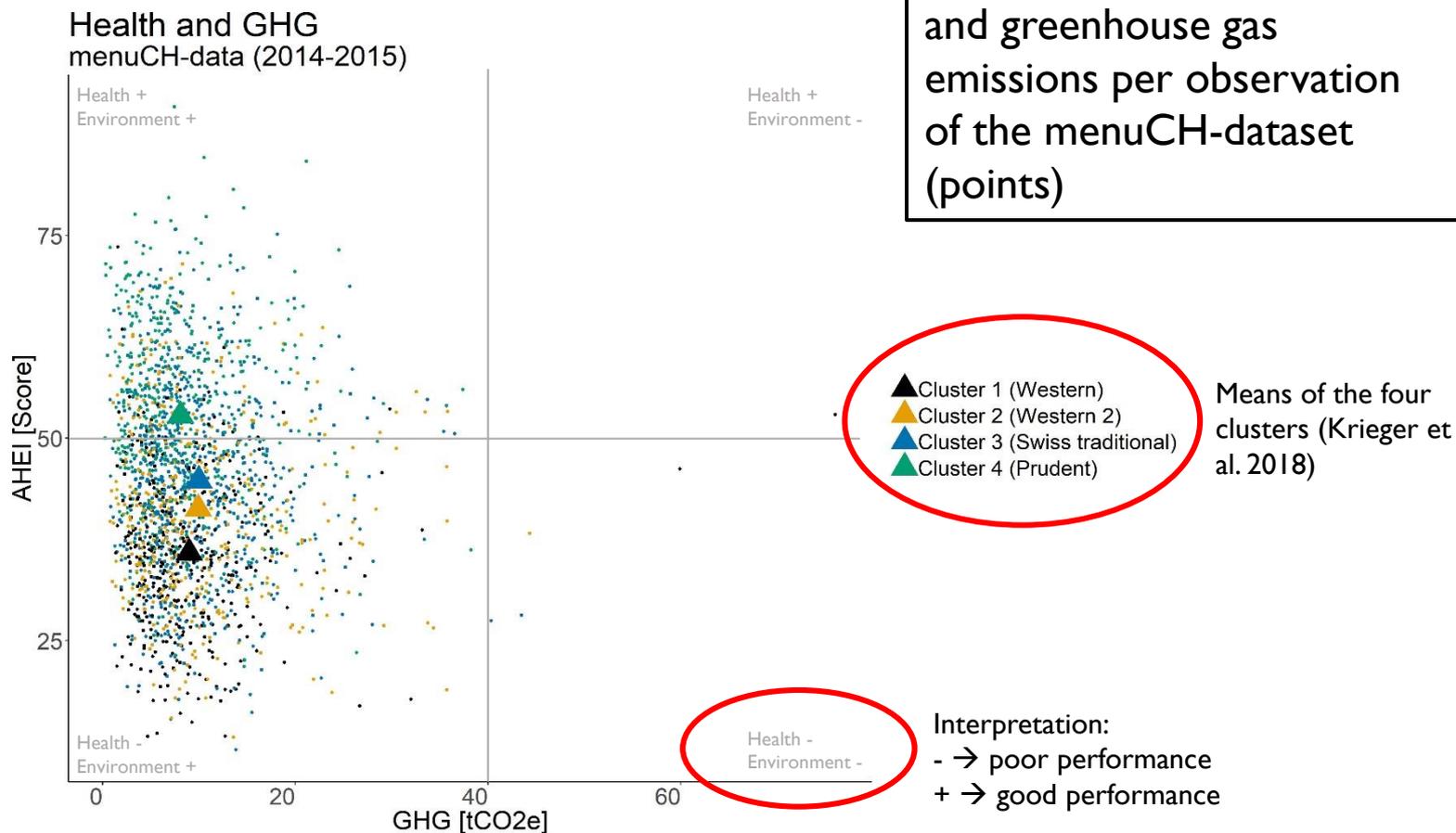
\* GHG emissions include emissions from input provision, deforestation and organic soils.

# Can organic agriculture feed the world sustainably?

## High yield gap between conventional and organic agriculture



# Swiss National Science Foundation NRP69: Healthy and Sustainable Diets: Trade-offs and Synergies



# Key take-home messages

Overview of principal methodological options for sustainability assessment

Different tools for sustainability assessment can come to different results

There is no «one-size-fits-all solution» => Tools should be chosen depending on the purpose of the assessment

Thank you for your attention!



# Thank you for your attention!

## Contact details

Dr. Christian Schader

Head Sustainability Assessment

Research Institute of Organic Agriculture (FiBL)

Ackerstrasse 113

5070 Frick

Switzerland

Phone: +41 62 865 0416

Email: [christian.schader@fibl.org](mailto:christian.schader@fibl.org)

<http://www.fibl.org/en/themes/sustainability-assessment.html>