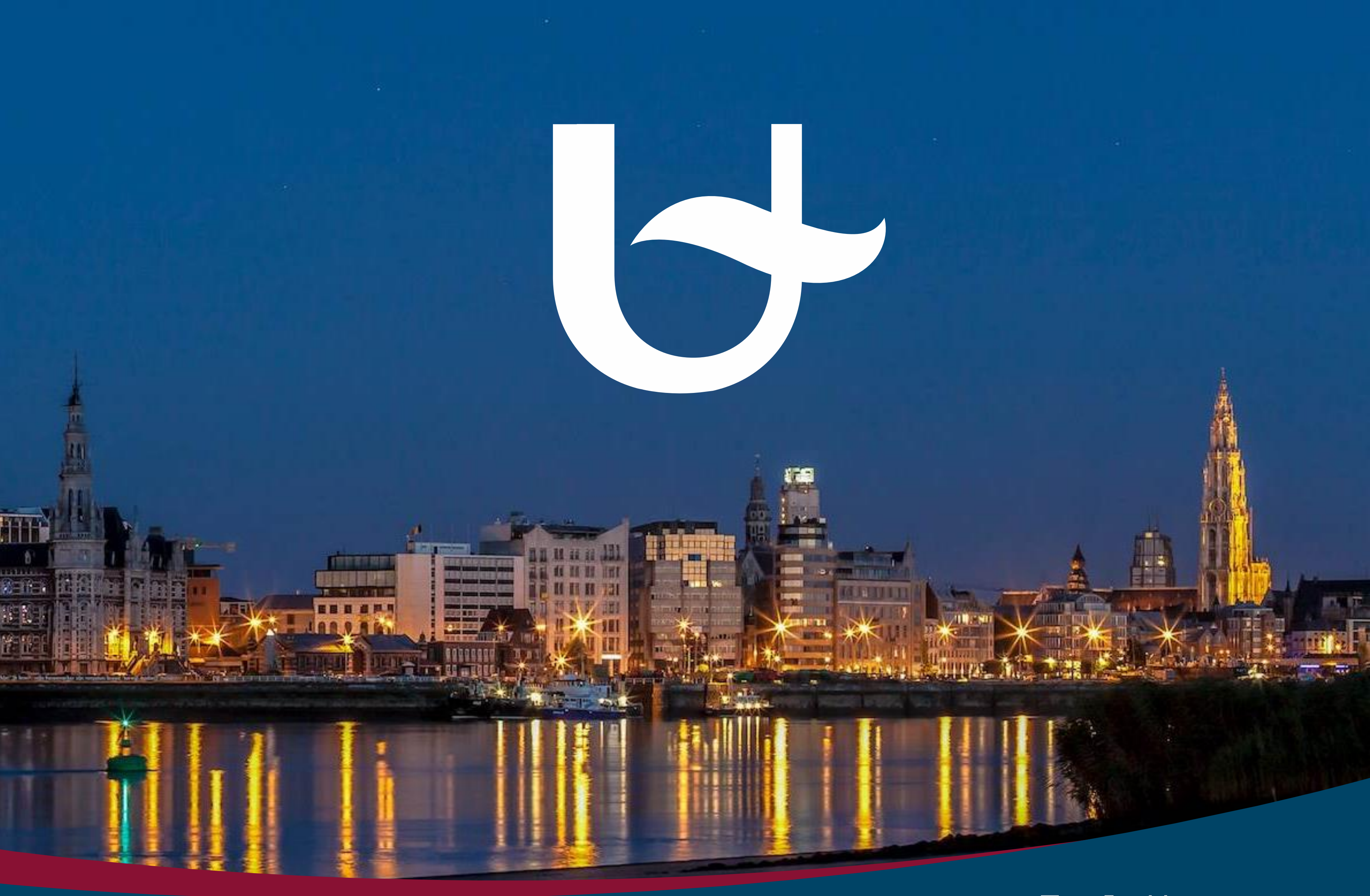


University of Antwerp

June 6, 2019

Benchmarking farm sustainability performance

Steven Van Passel (University of Antwerp)

6 June 2019

University of Antwerp

key messages

Benchmarking is a useful performance measure

Rural food systems are not (yet) sustainable: Economic assessment should be complemented with ecological and social aspects (= sustainability assessment)

All aspects should be assessed carefully with appropriate methods (e.g. Life cycle costing, Life cycle analysis,…)

Value-orientated sustianability performance tools have several advantages (and disadvantages).

Unsustainable socio-technical systems

Unsustainable rural food systems

or

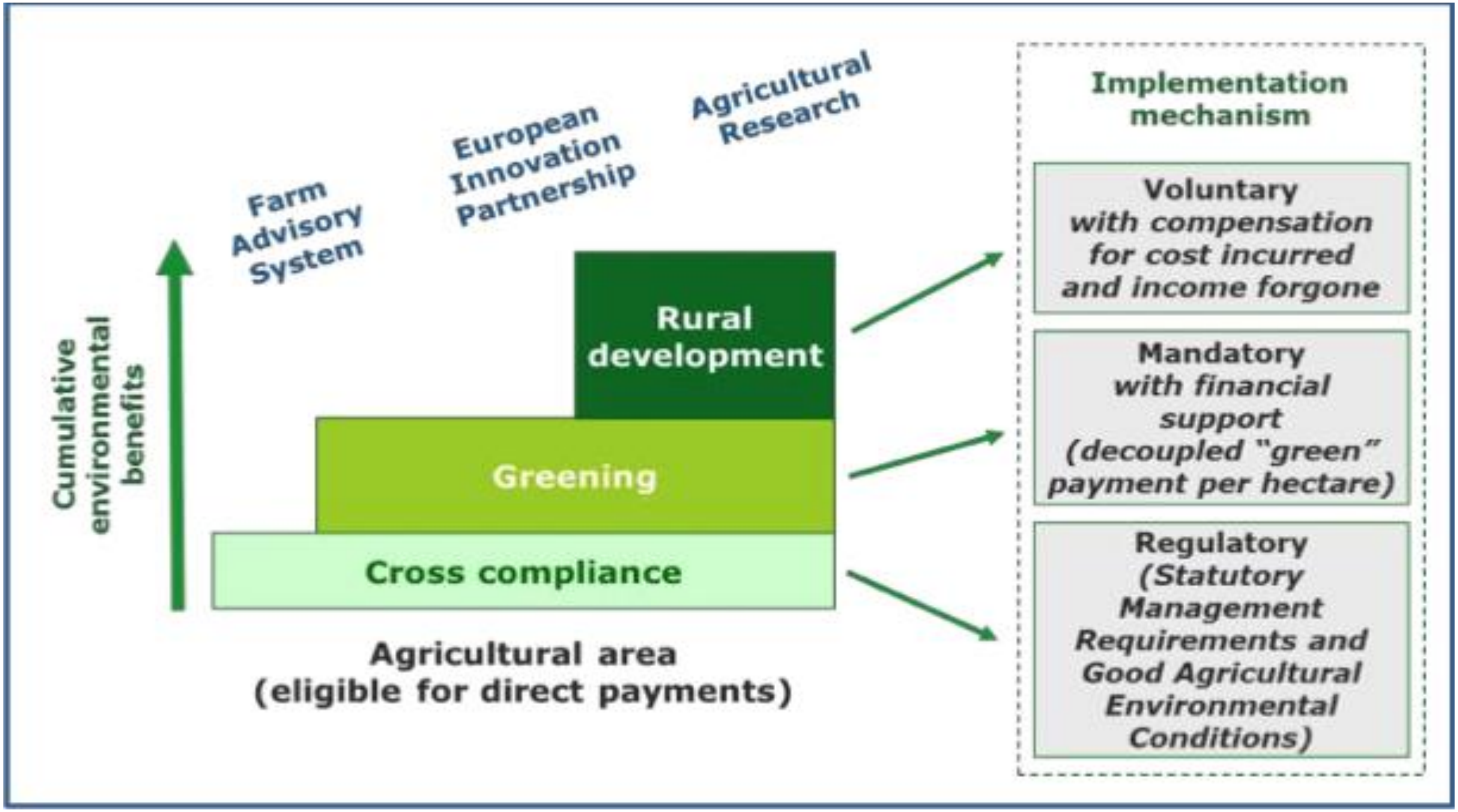
or

Unsustainable rural food systems

Unsustainable rural food systems in Europe

- Land use change and biodiversity
- Leaching of nutrients and eutrophication of waters
- Water availability and increasing demand for water
- Soil degradation and pollution (e.g. erosion, acidification)
- Greenhouse gas emissions to the air

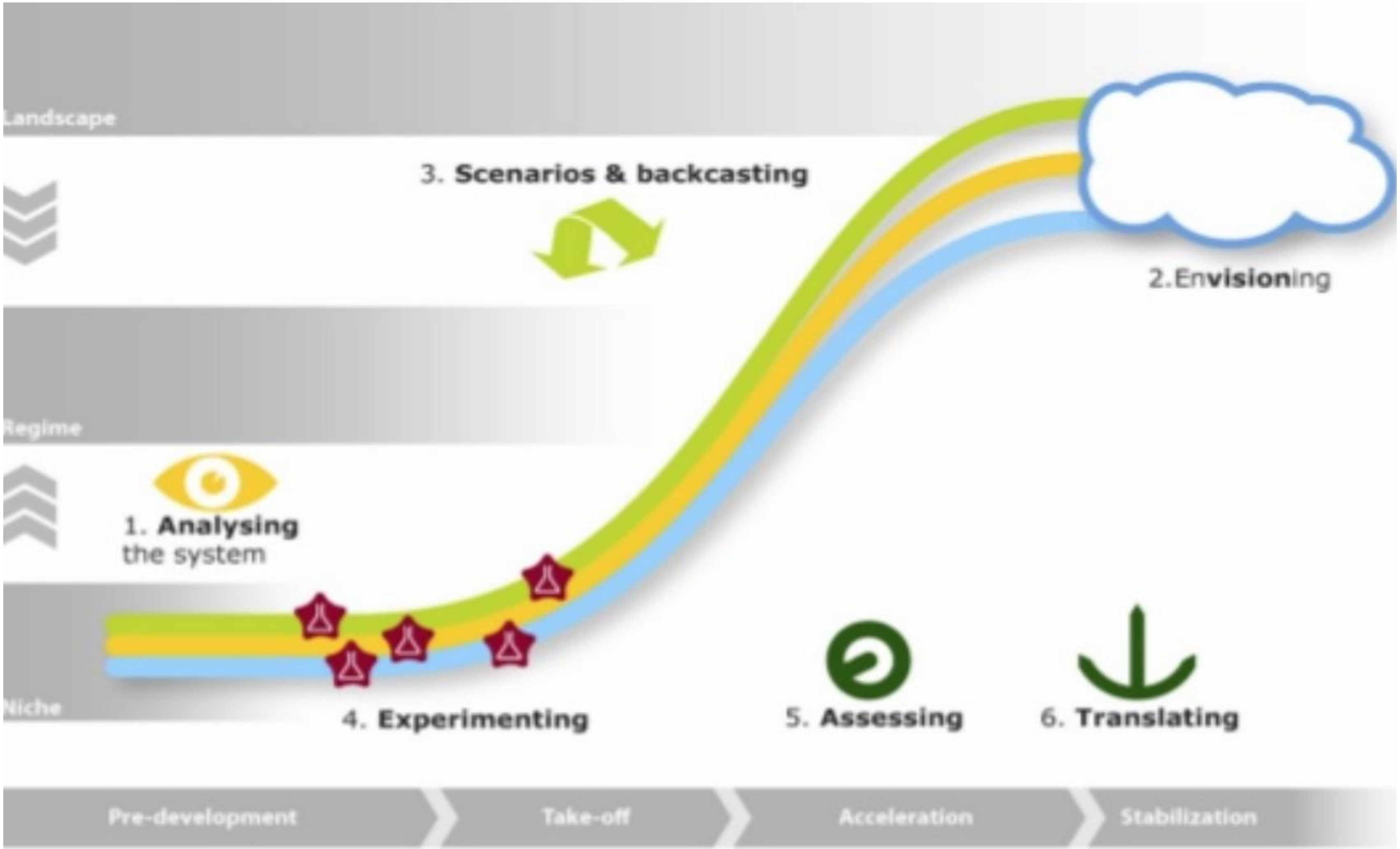
European Common Agricultural Policy (CAP)



CAP beyond 2020: Modernizing and Simplifying the Common Agricultural Policy (CAP)

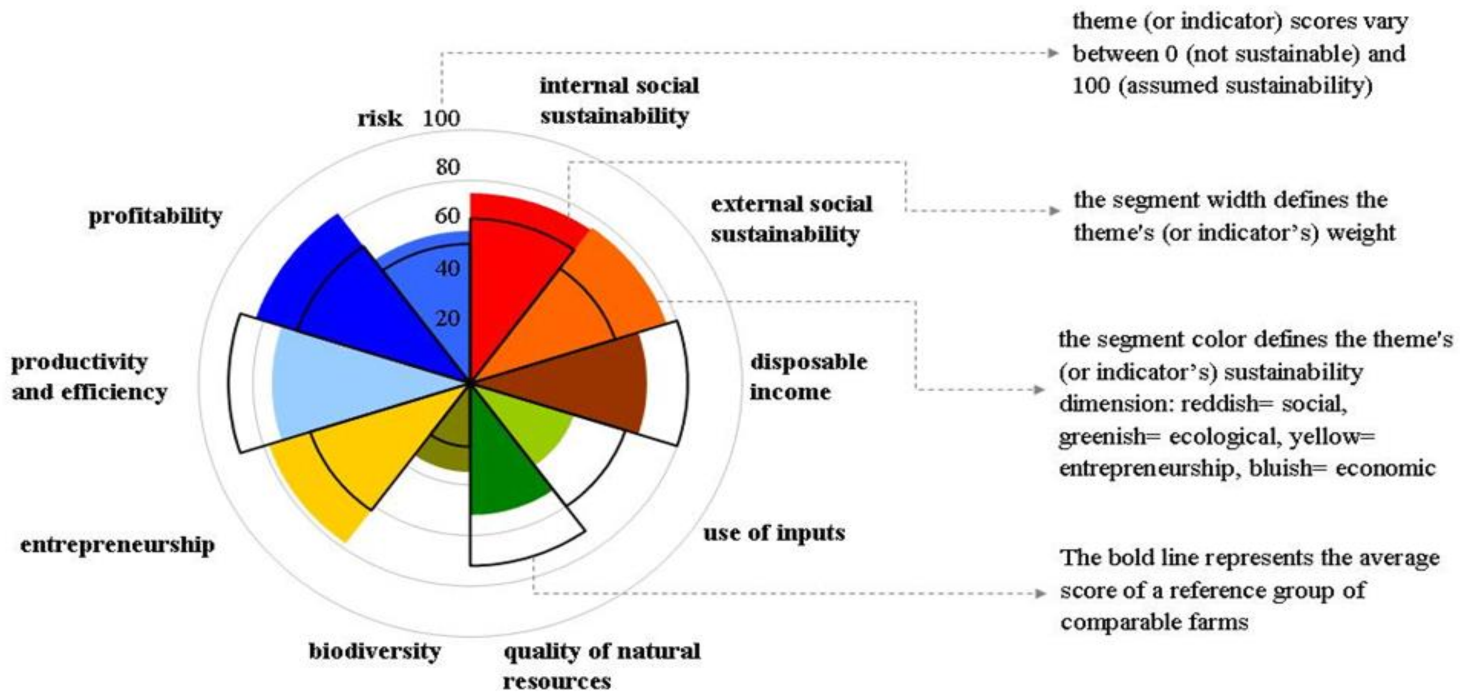
Global challenges

Sustainability assessment



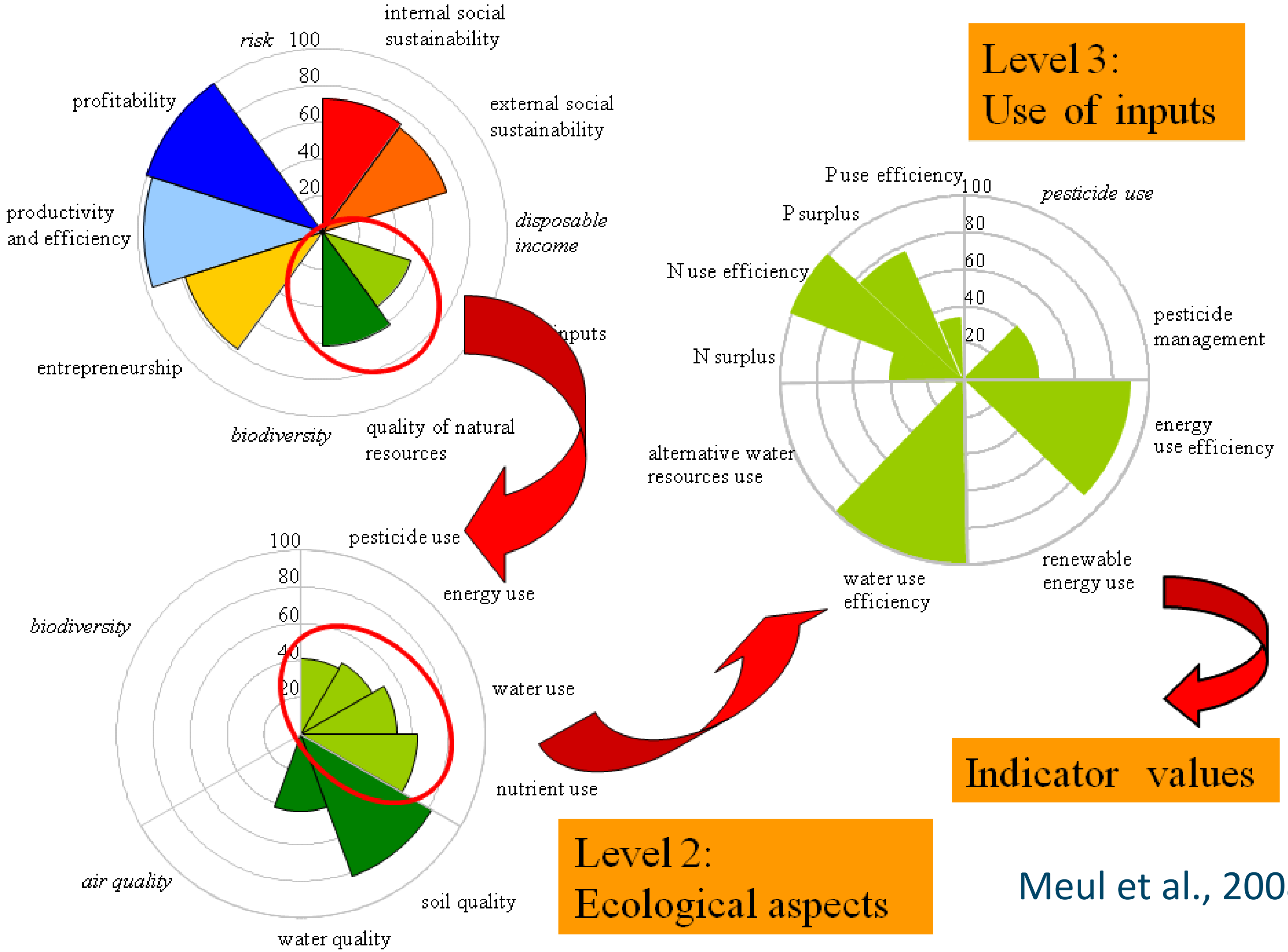
Nevens et al., 2008

Sustainability assessment: Example 1 (MOTIFS)



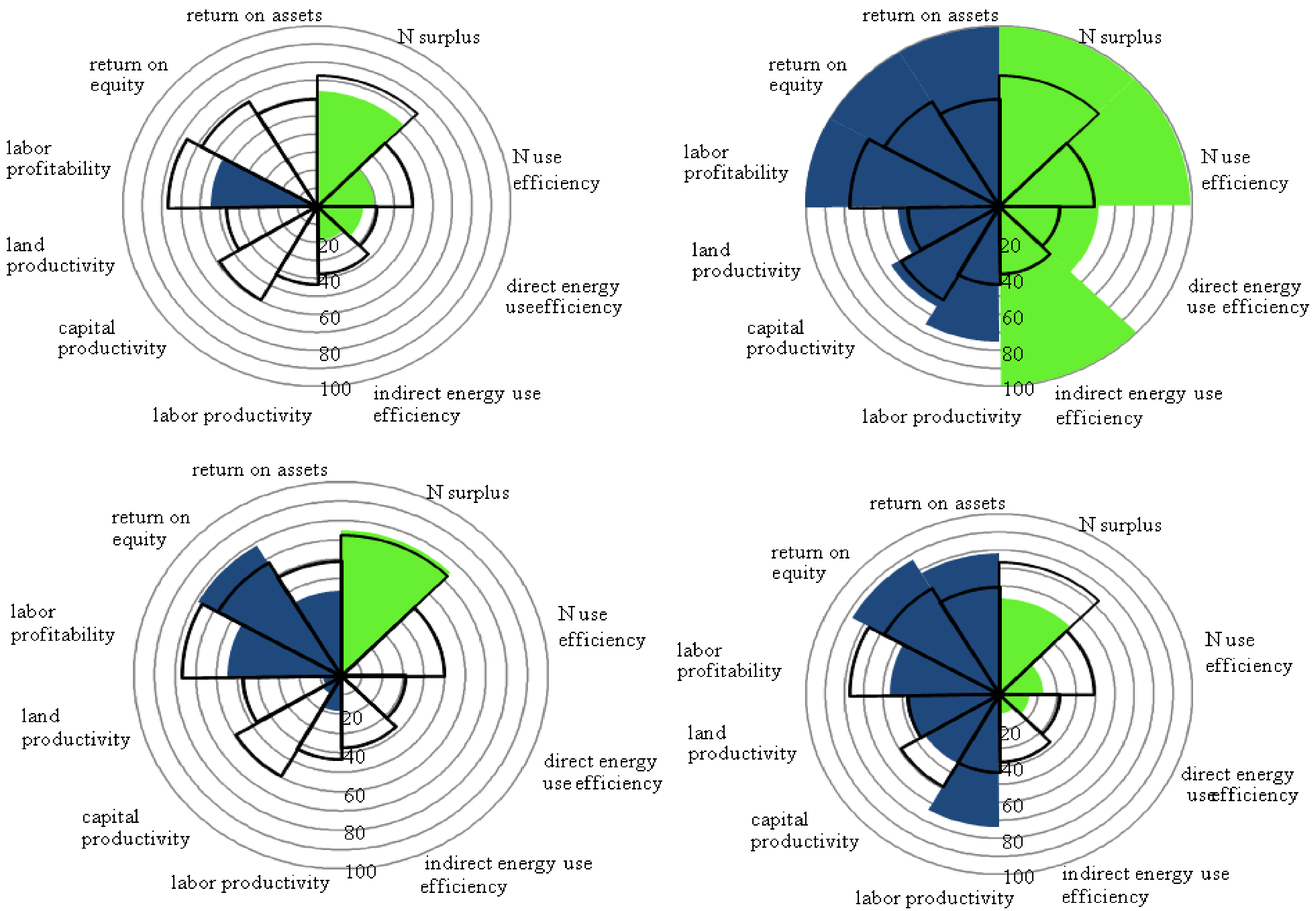
Meul et al., 2008

Sustainability assessment



Meul et al., 2008

Sustainability assessment



Van Passel & Meul, 2012

Sustainability assessment: Example 2 (Sustainable Value Approach (SVA))

Numerical integration

SVA shows in monetary terms the value that a company creates or destroys by the use of a set of different resources (Figge & Hahn, 2005)

SVA-choices

- Selection of economic activity or entity to be analyzed
- Selection of resources
- Selection of benchmark
- Selection of production technology

- More information: Figge & Hahn (2004, 2005, 2010); Van Passel et al. (2007, 2009); Kuosmanen & Kuosmanen (2010); Ang & Van Passel (2010), Ang, Van Passsel & Mathijs (2011)

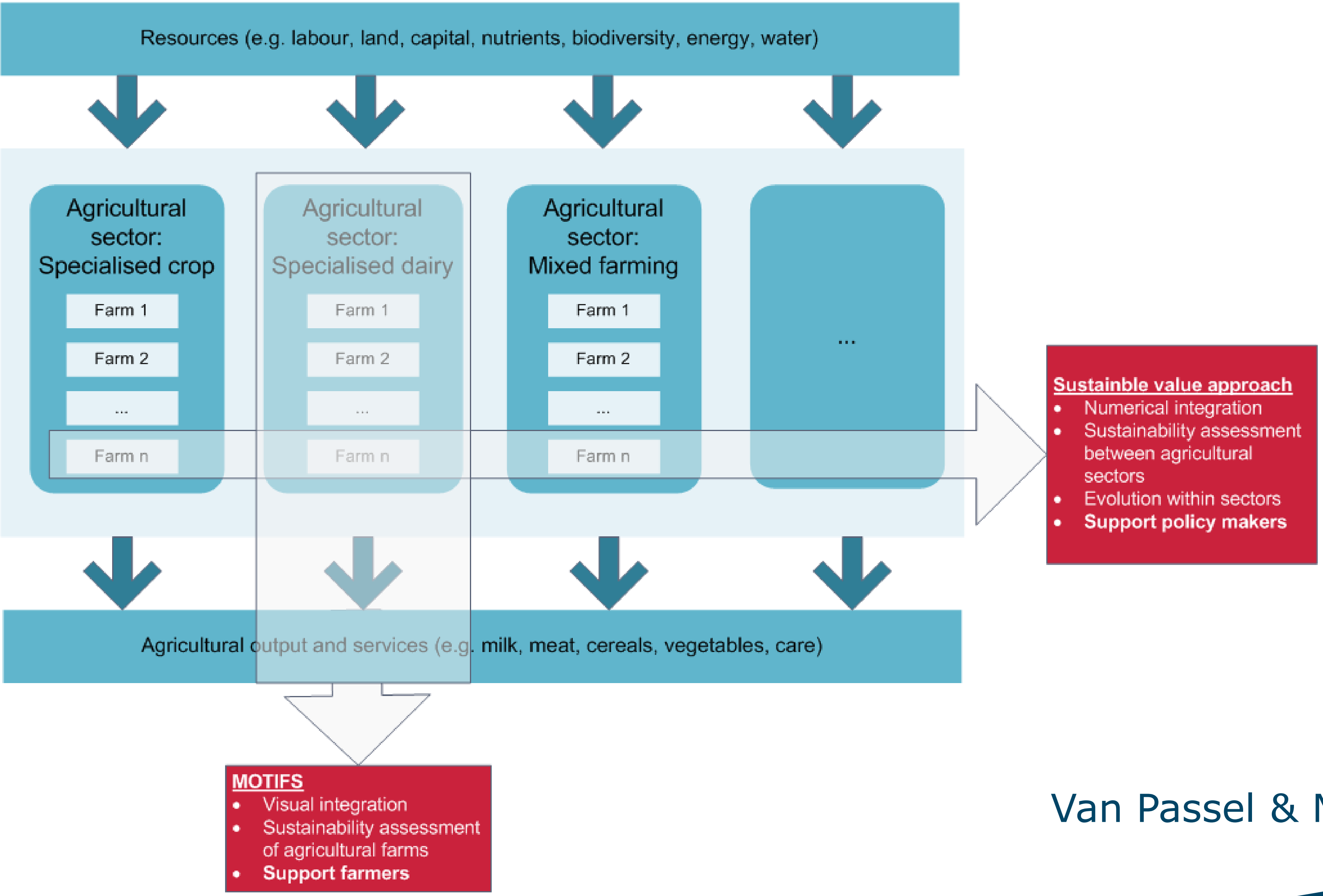
Example of the calculation of the sustainable value

Calculation of the sustainable value of a dairy farm with a value added of € 80 000: example

Resource	**Resource use of farm**	**Productivity of use (Value added / Resource use)**		**Value contribution (€)**
		Farm	Benchmark	
Land	30 ha			2010
Labour	1.00 fte			30 000
Farmcapital	€ 300 000	0.27	0.27	0
Energy use	1 000 000 MJ	0.08	0.07	10 000
N-surplus	6000 kg N	13.33	17.78	- 26 700
		Sustainable value		3062

30 ha * (2667 Euro/ha – 2600 Euro/ha)
= 2010 Euro

Sustainability assessment: multi-level & multi-user



Van Passel & Meul, 2012

Case-study: intensive versus zero-grazing

- (More) integrated analysis of specialized dairy systems in Flanders (Belgium) using visual integration of MOTIFS-results
- Zero-grazing perfomed worse from an ecological and economic point of view due to a less efficient use of concentrates and byproducts
- Social sustainability performance did not differ

Meul et al. (2012)

Case study: LCA to support environmental decisions at commercial dairy farms

Life Cycle Assessment (LCA) can support decision taking

Key aspects are:

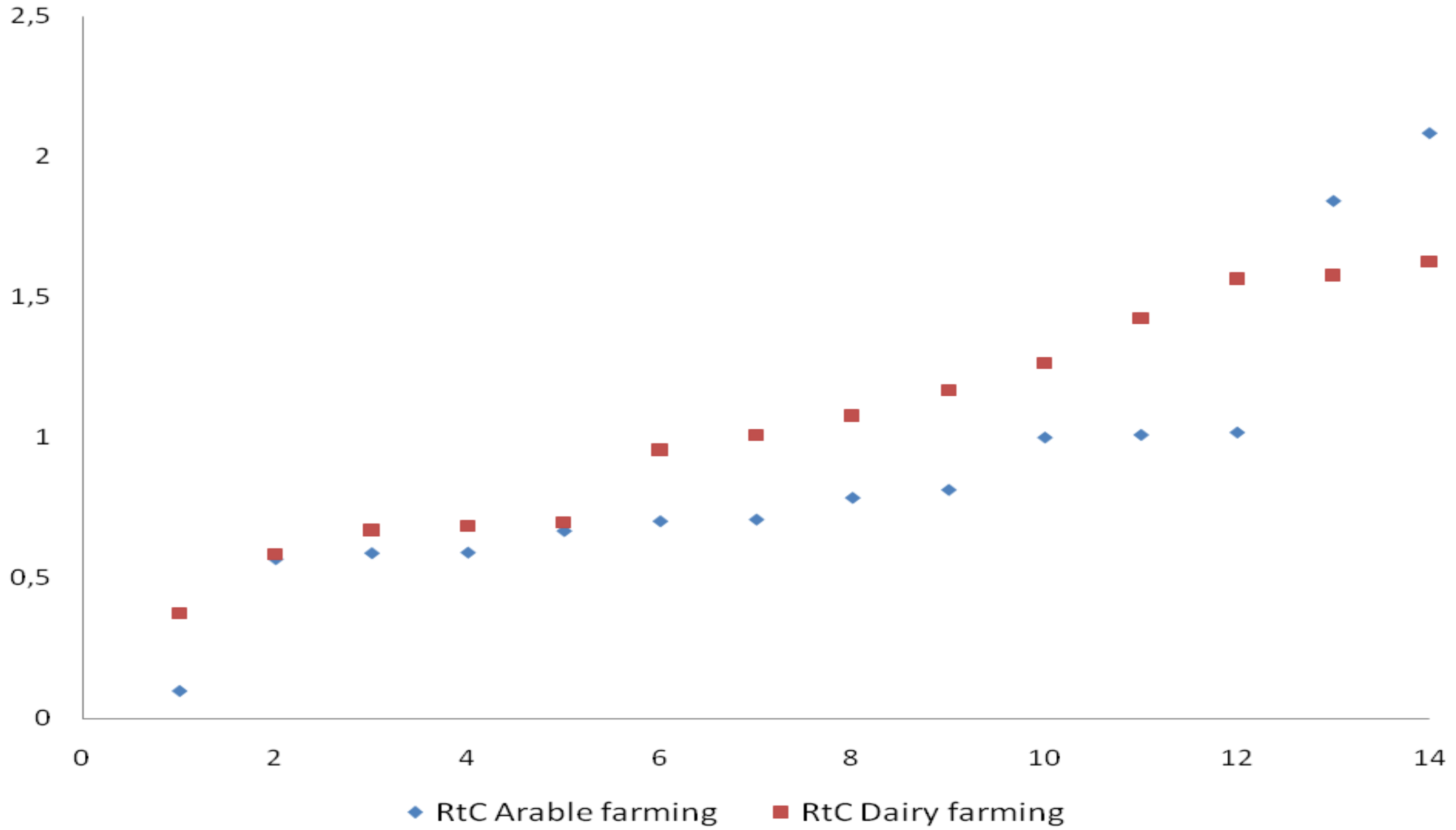
- the flexibility and accessibility of the model
- the use of readily available farm data,
- farm advisors being intended model users,
- the identification of key farm and management characteristics affecting environmental performance and
- the organization of discussion sessions involving farmers and farm advisors.

Attention should be paid:

- to provide sufficient training and guidance for farm advisors on the use of the applied LCA model and the interpretation of results,
- to evaluate the correctness of the used data and
- to keep the model up-to-date according to new scientific insights and knowledge concerning LCA methodology.

Meul et al., 2014

Case-study: Spec. dairy versus arable farming (BE)



Average resource productivities and eco-efficiencies.

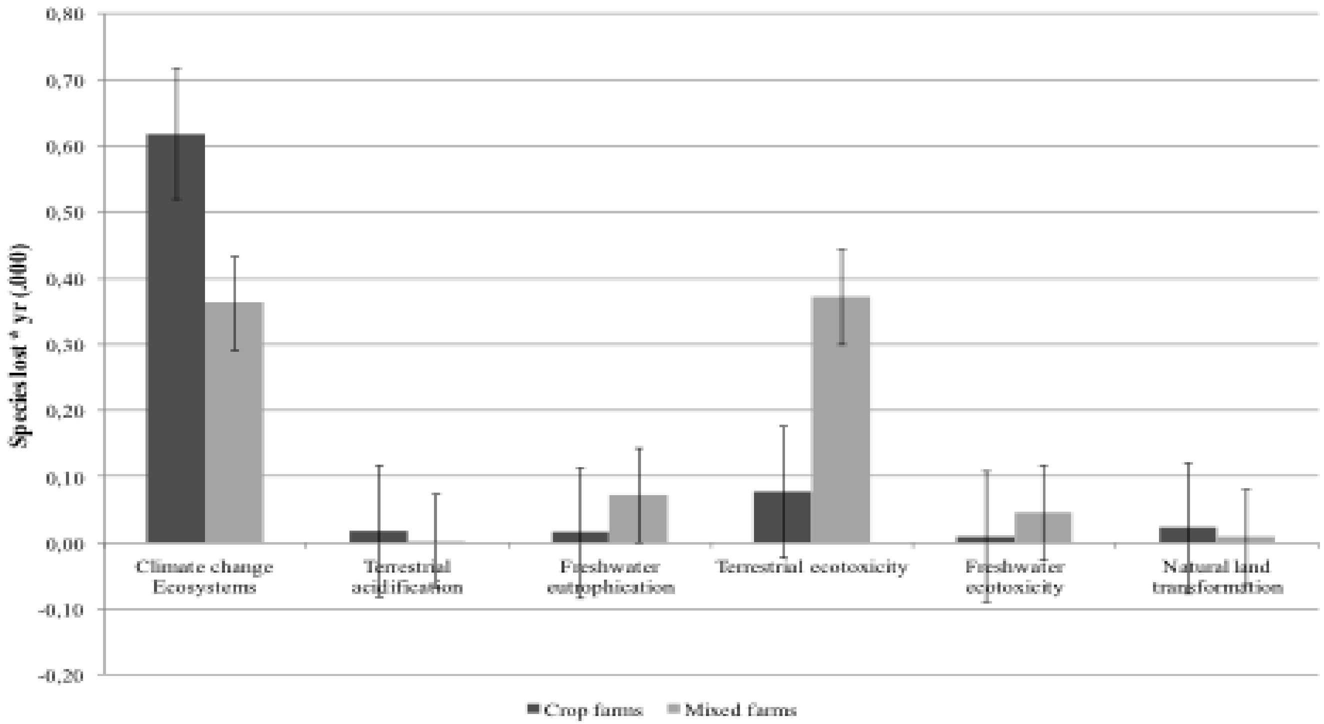
	Labor productivity (€/hours labor)	Capital productivity (€/€)	Land productivity (€/ha)	Eco-efficiency energy use (€/MJ)	Eco-efficiency N surplus (€/kg N)
Arable farms	9.17	0.18	713.48	0.03	9.37
Dairy farms	11.3	0.10	1568.94	0.04	6.21

A one-way ANOVA test shows that the average capital and land productiveness differ significantly between arable and dairy farms (F-value>4.23).

Van Passel & Meul, 2012

Case-study: agro-ecological systems (IT)

Alta Murgia national park (Italy)



	Capital productivity (€/€)	Labour productivity (€/AWU)	Land productivity (€/ha)	Eco-efficiency Biodamage (€/species lost*yr)
Crop farms	1,10	113.747	507	3,4E+07
Mixed farms	0,34	36.235	792	9E+06

Moretti et al., 2016

Case-study: Organic versus conventional farming

Agro-environmental farm modeling to build an environmentally sustainable farm (ESF)

Dairy farming in Mugello area, Northern Tuscany, Italy

The sustainable value (SV) of organic farming (OFS) outperformed the SV of conventional farming (CFS)

Merante et al., 2015

Indicators	Farming system		
	OFS	CFS	ESF
Environmental impacts			
Nitrogen leaching (kg ha^{-1})	8.80	18.28	5.10
Soil erosion (t ha^{-1})	3.88	4.60	1.00
EPRIP[1] (score ha^{-1})	1.00	22.62	22.45
Species Richness (score ha^{-1})	18.21	15.80	16.63
Sørensen's S. (score ha^{-1})	0.35	0.31	0.34
Economic output			
Gross Margin (€ ha^{-1})	3479	2854	3219

[1] Environmental Potential Risk Indicator of Pesticide use

Case-study: Evaluation of AEM (IT)

Combination of farm modeling with the Sustainable Value approach (SVA)

Dairy farming in Mugello (Italy)

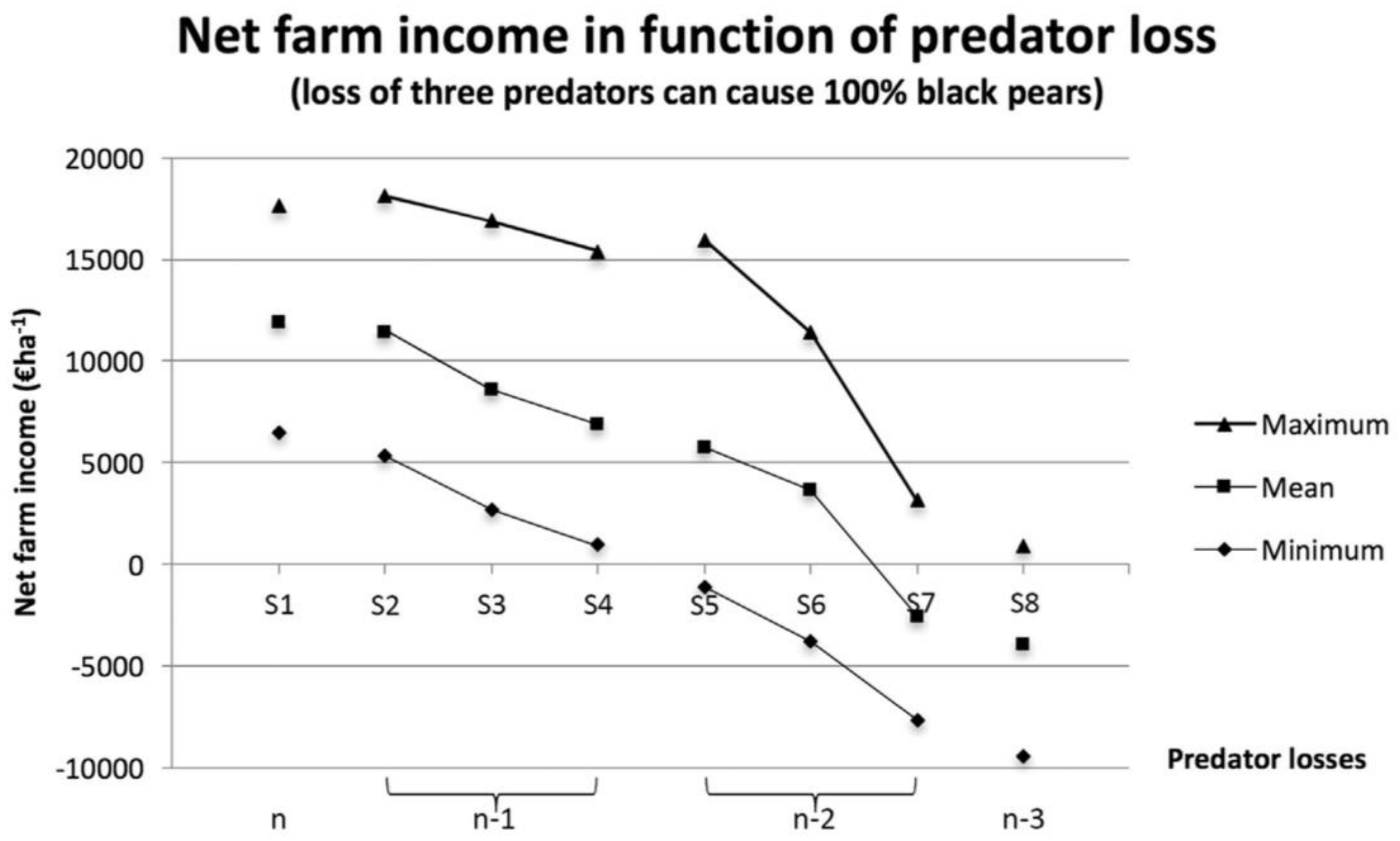
Soil erosion and nitrogen leaching should be addressed with specific policy measures to further increase the efficiency of organic farming

Designed organic agriculture support scheme almost closes the GAP with the sustainable benchmark farm.

= more cost-effective and efficient AEM

Pacini et al., 2015

Case-study: Monetary Valuation of Natural Predators for Biological Pest Control in Pear Production



Daniels et al., 2017

Sustainability assessment

Wide range of sustainability tools exist

More value-orientated integrative tools are needed

Valuation of positive externalities (non-market provisioning services) is still problematic and difficult to integrate

(More) evidence-based studies to assess the sustainability performance are needed

Output based cost-effective policy tools to stimulate the use of benchmarking

Impact of value-chain effects on sustainability performance is not well studied

Trade-off between data needs and soundness of assessment

Conclusions

Integrated assessment is needed

- ✓ It is multi- and interdisciplinary
- ✓ Scientific and evidence based
- ✓ Useful information to decision makers

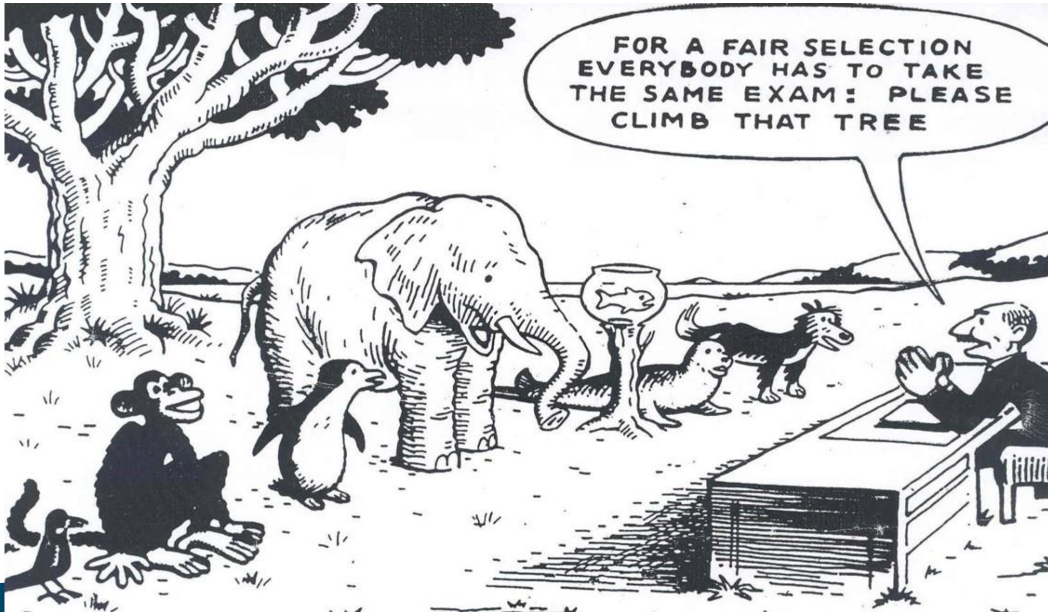
Different decision makers (end-users) require different formats:

- ✓ visual integration,
- ✓ tabular integration,
- ✓ graphical integration,
- ✓ numerical integration
- ✓ ..

Conclusions

Integrated assessment can be based on different conceptual frameworks & approaches

- ✓ Valuation versus non-valuation
- ✓ Quantitative versus Qualitative
- ✓ Focus on spatial and temporal concerns
- ✓ Stakeholder involvement or less/no involvement



Reading

EIP-AGRI Focus Group

Benchmarking of farm productivity and sustainability performance

FINAL REPORT
10 JANUARY 2017

1

funded by European Commission

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Daniels, S., Witters, N., Beliën, T., Vrancken, K., Vangronsveld J., Van Passel, S. 2017. Monetary valuation of natural predators for biological pest control in pear production. **Ecological Economics** 134: 160-173 (IF: 3.90)

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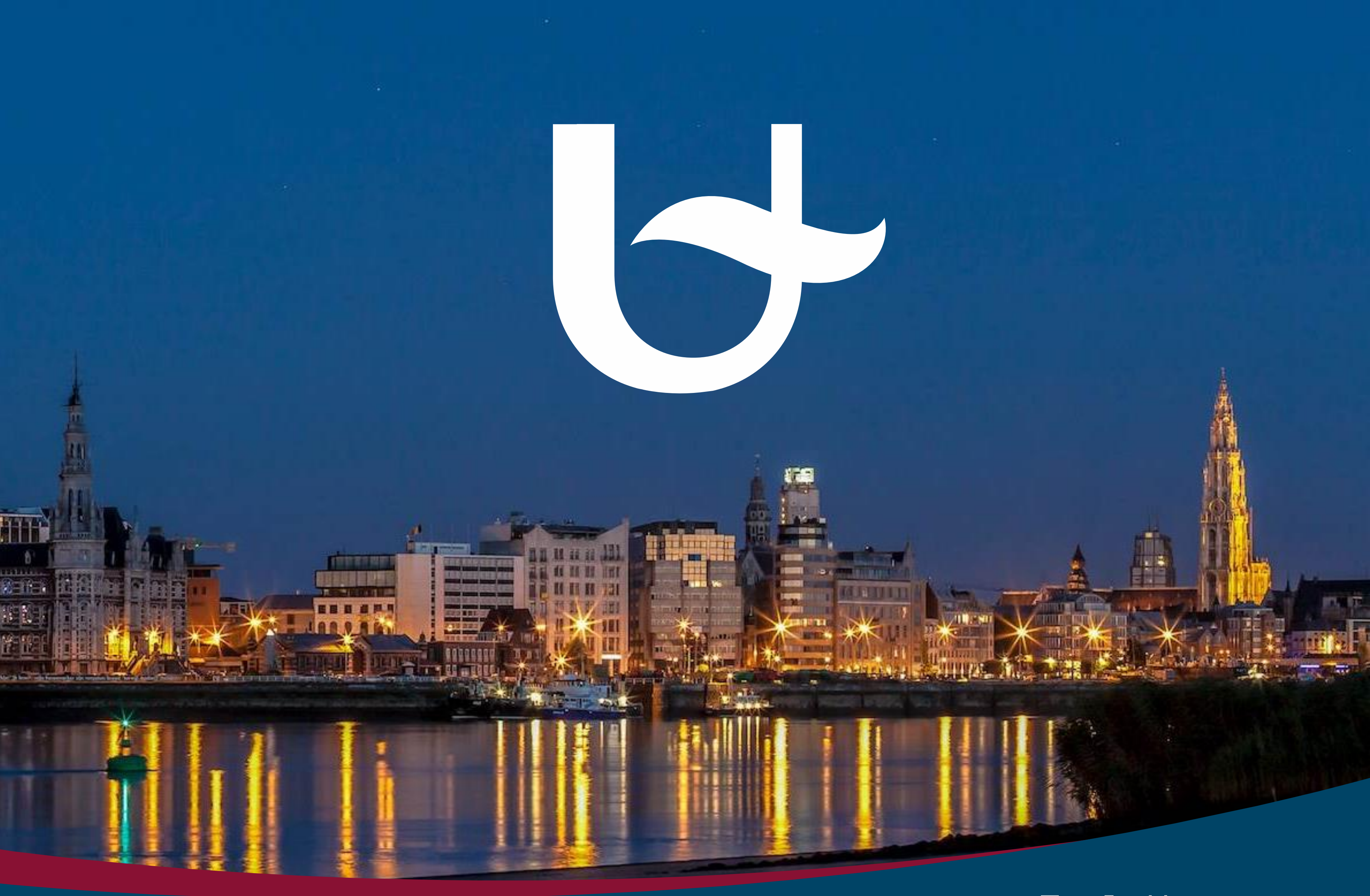

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