



PRODUCTIVITY AND SUSTAINABILITY OF BEEF PRODUCTION SYSTEMS

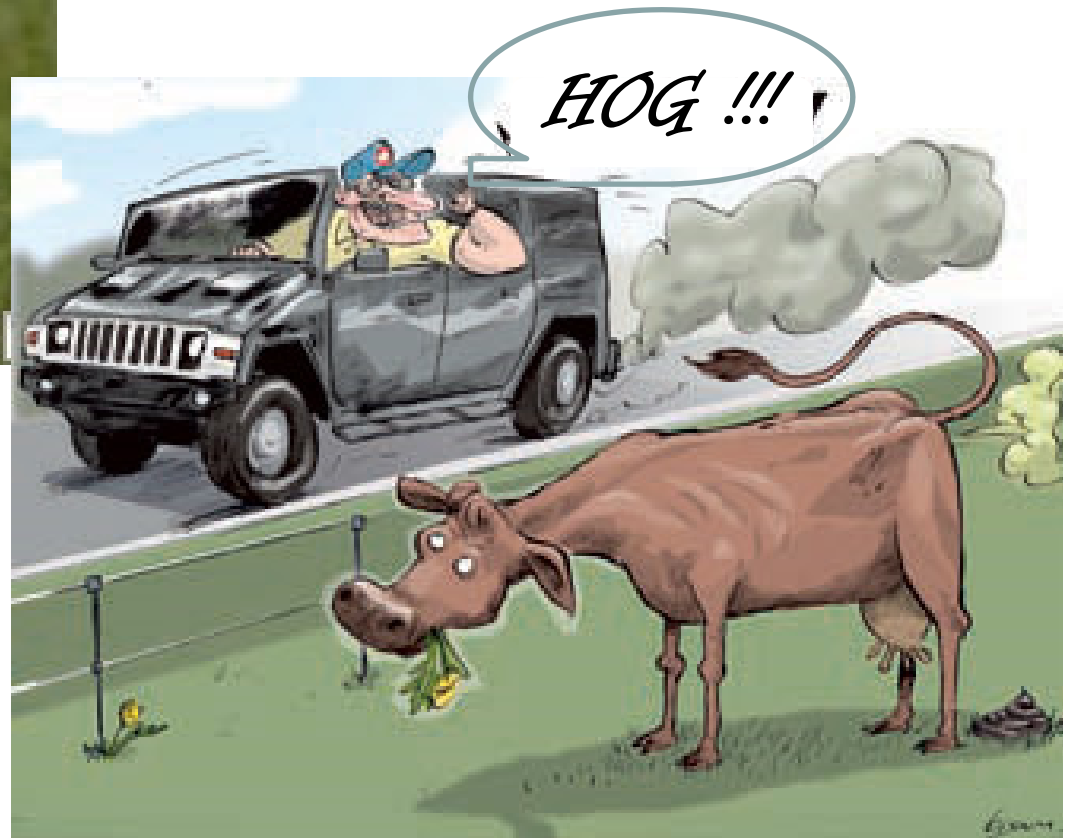
Lisbeth Mogensen¹, Troels Kristensen¹, Nicolaj I. Nielsen²,
Arne Munk², Eva Søndergaard³, Mogens Vestergaard¹

1: Aarhus University, Denmark,

2: Knowledge Centre for Agriculture, Denmark,

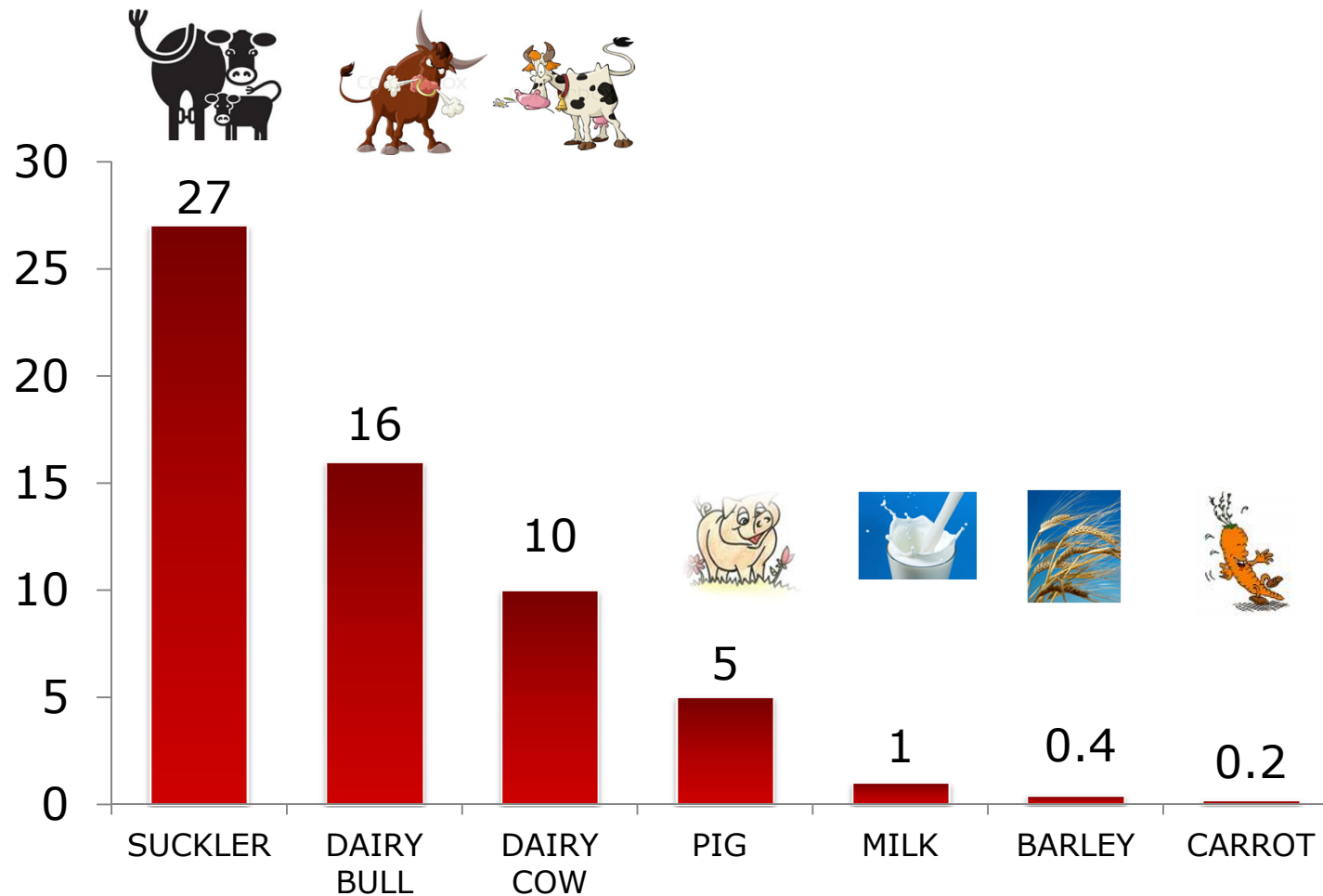
3: AgroTech A/S, Denmark,

Background

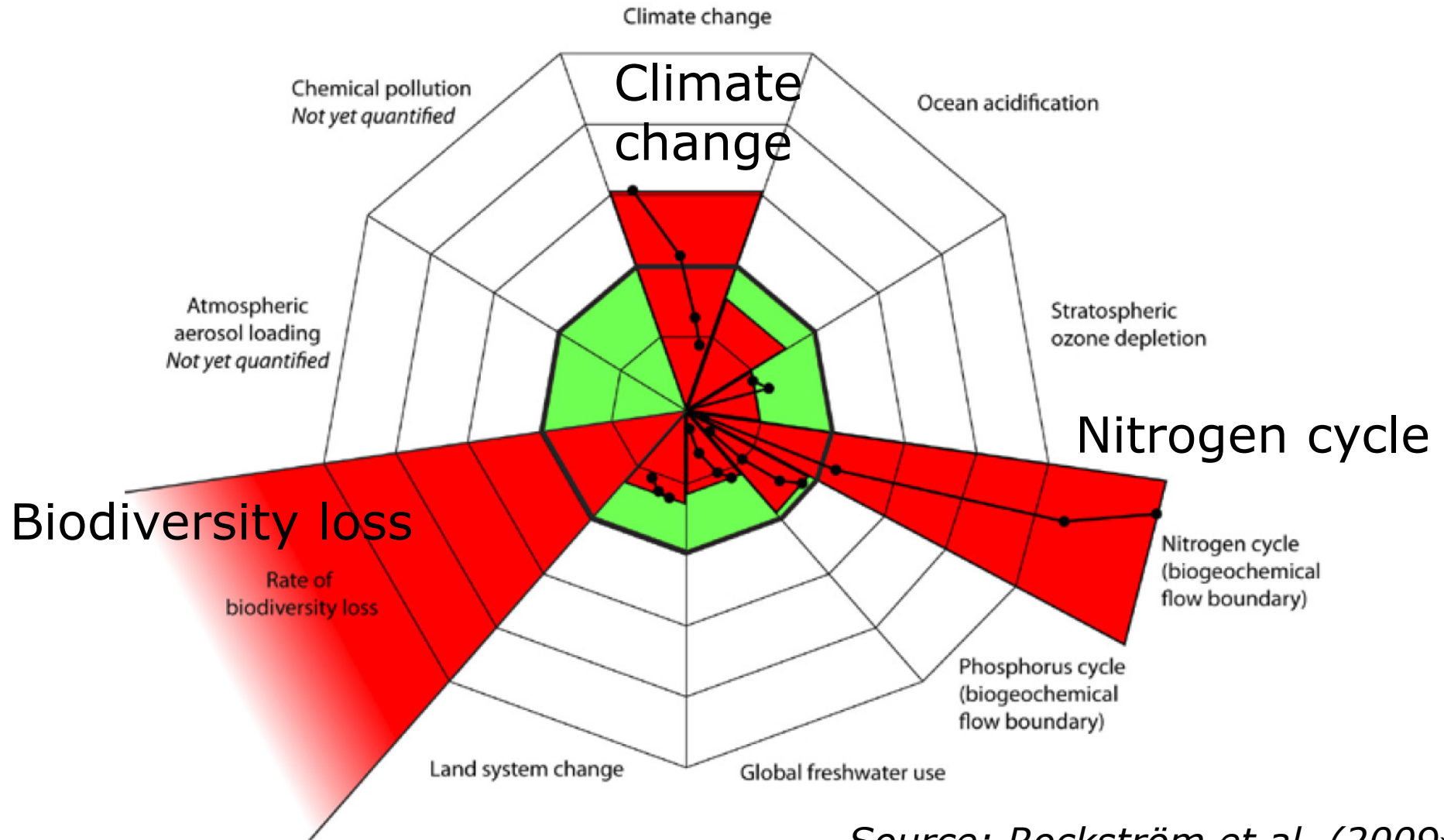


Climate impact

CO₂-eq, kg/kg product



Planetary safe threshold boundaries



Source: Rockström et al. (2009)

Aim

To develop a method for evaluating the overall impact of different beef production systems using a holistic approach



Method for evaluation of sustainability

- An indicator-based sustainability index
- Express the sustainability of beef production at farm level, typically for 1 year
- Based on data that already exist at the farm (or that is easy to collect)
- Applicable for very different beef production system -developed for Nordic systems (Denmark and Sweden)



The sustainability index



Two beef production systems

- An extensive pasture based system with specialized beef breeds
- An intensive indoor fattening system based on bull calves of dairy breeds



Extensive pasture based system

- High Land Cattle
- High level of grazing 180 days, permanent pasture
- Winter: housed at deep litter
- Maximum roughage to stimulate growth during summer
- 0.9 weaned calves/cow/year (20% replacement)
- Heifers: first calving at 36 months
- Bull calves slaughtered at 22 months (430 kg LW)

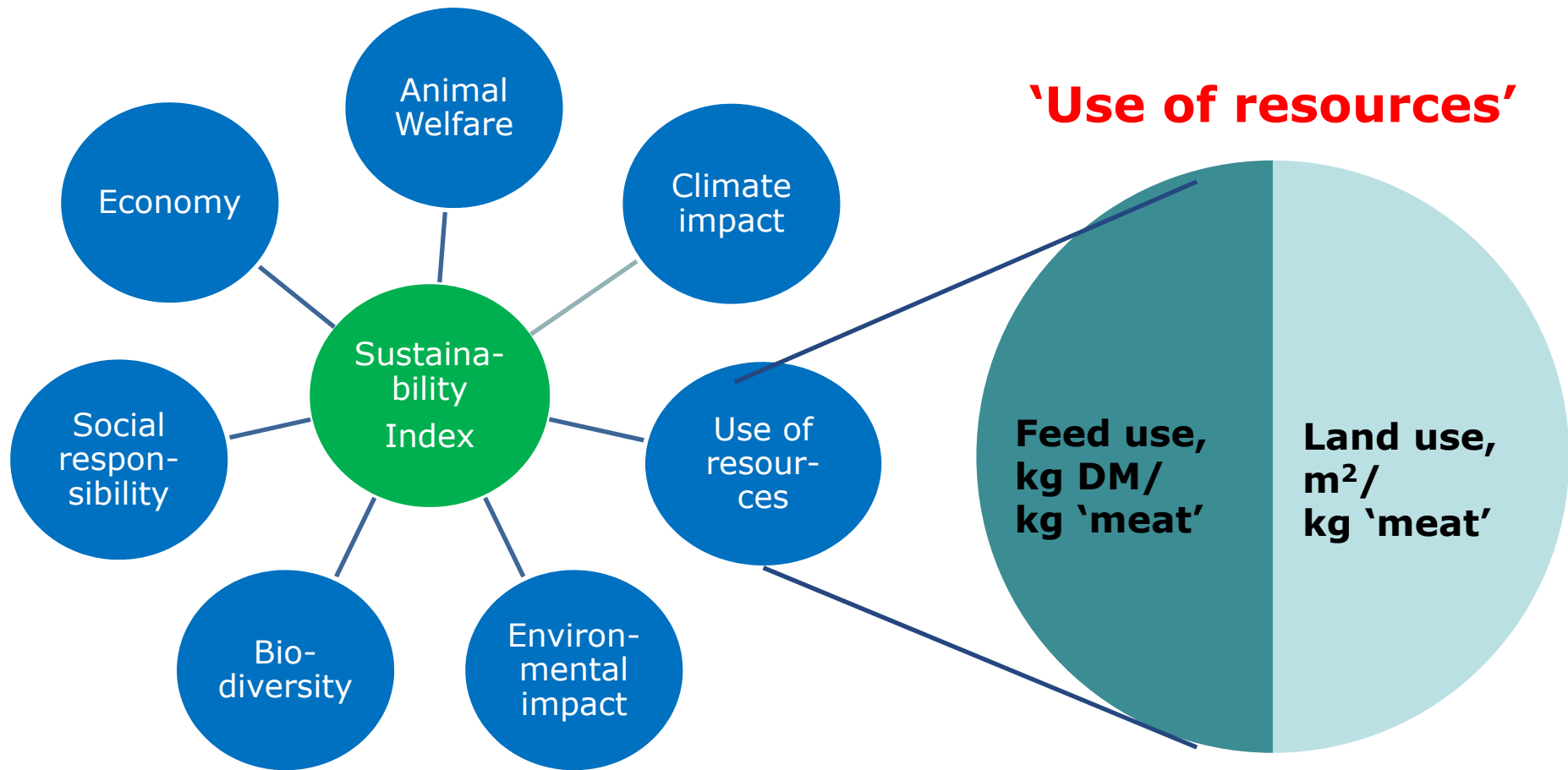


Intensive indoor fattening system

- Dairy calf of 55 kg LW (30 days)
- Slaughtered at 9.4 months (380 kg LW)
- Produced on contract 'Danish veal'
- Requested: Deep litter until 6 months, age of 8-10 months, 180-240 kg carcass
- 1410 kg DM/produced bull, 10% roughage (straw, grass silage)

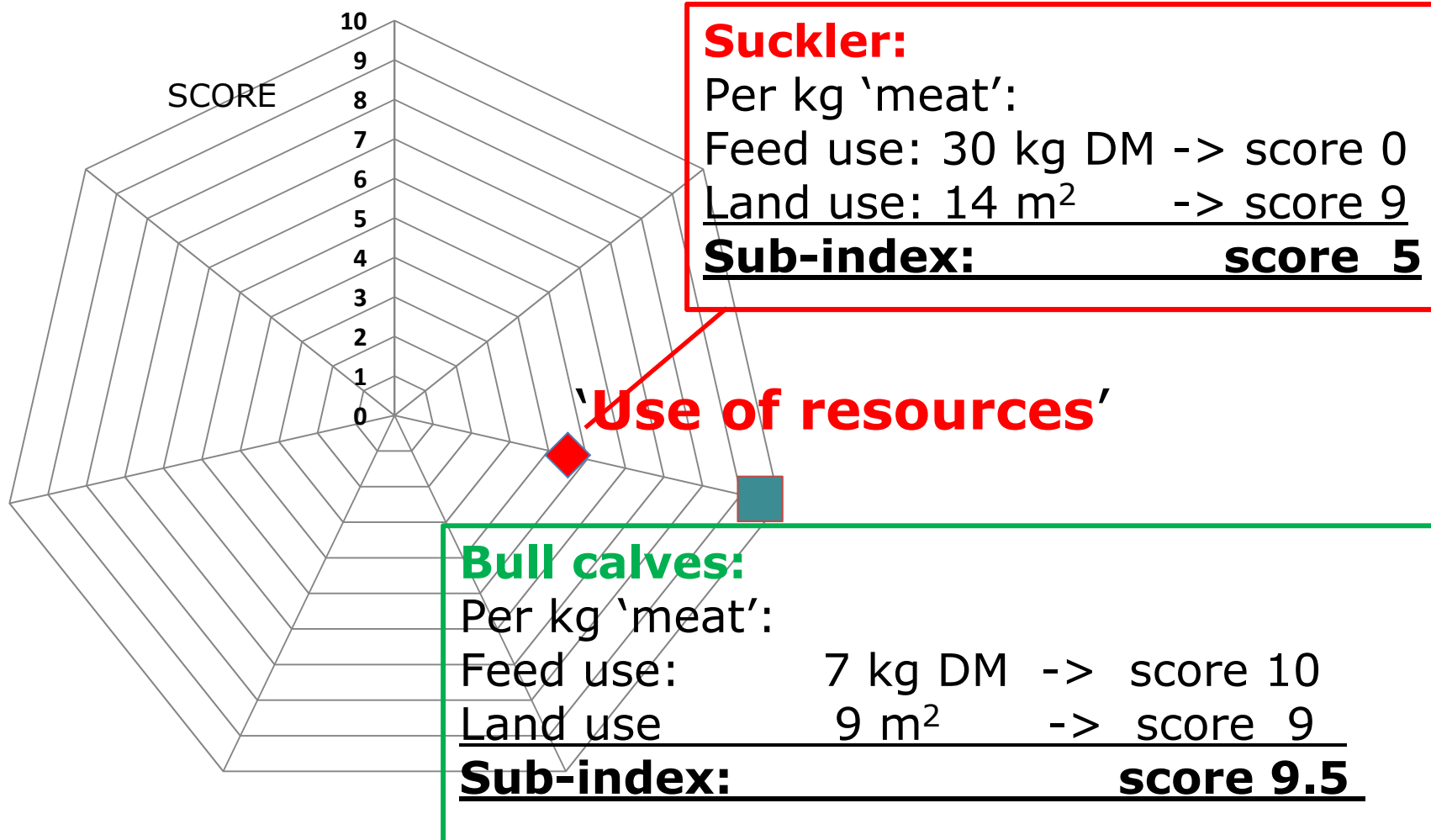


Subindex: 'Use of resources'

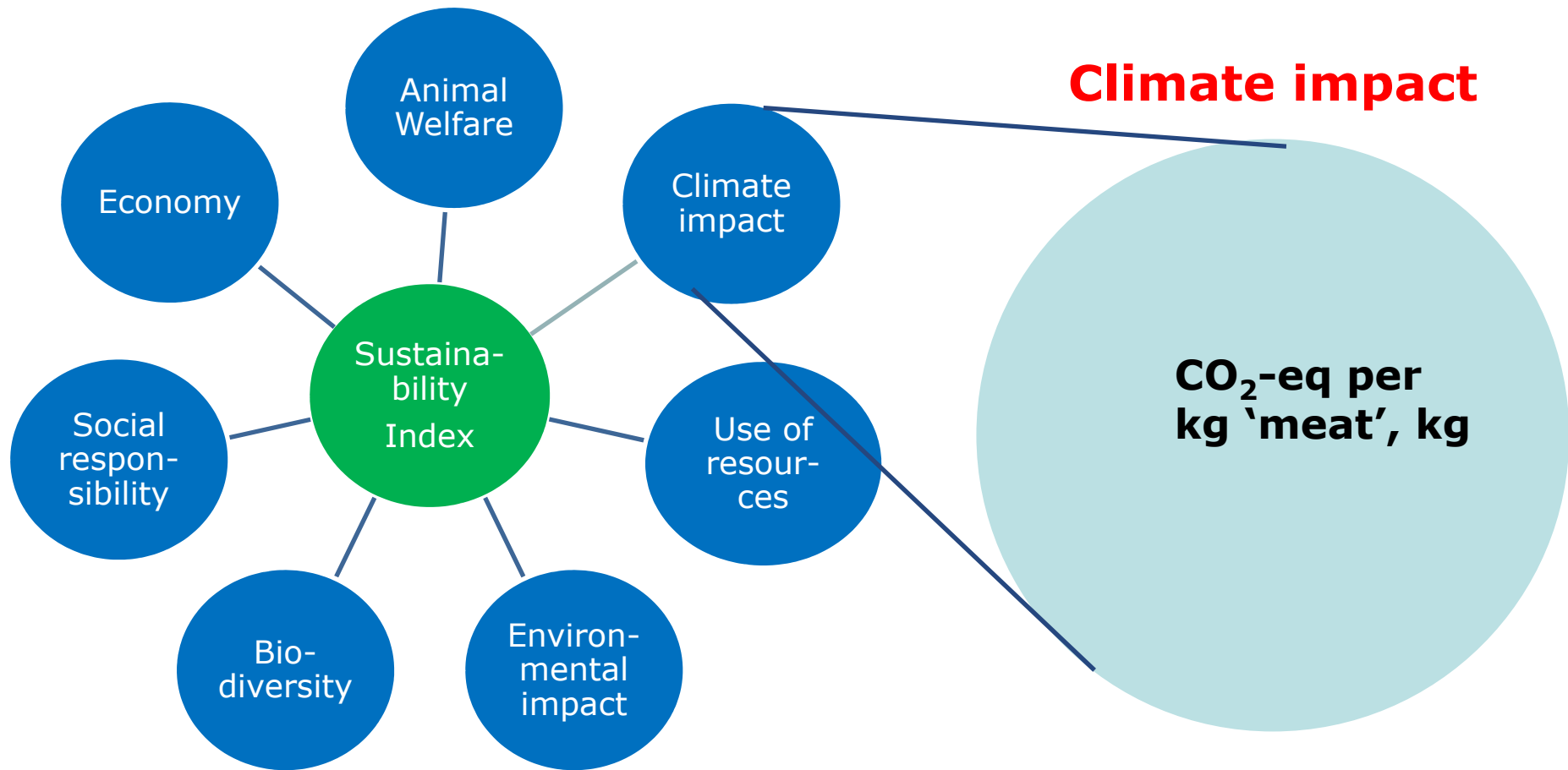


Subindex: 'Use of resources'

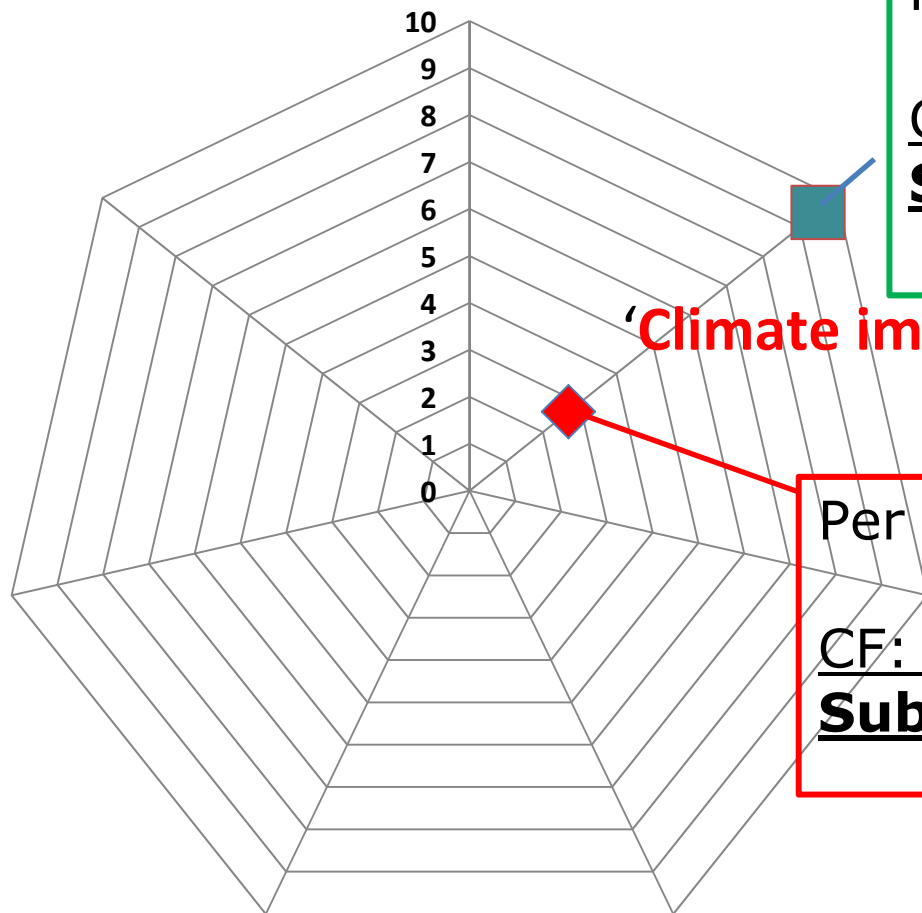
◆ Suckler cows ■ Bull calves from dairy herds



Subindex: 'Climate impact'



Subindex: 'Climate impact'



Per kg 'meat' **from bull calf:**

CF: 9 kg CO₂ -> score 10

Sub-index score 10

'Climate impact'

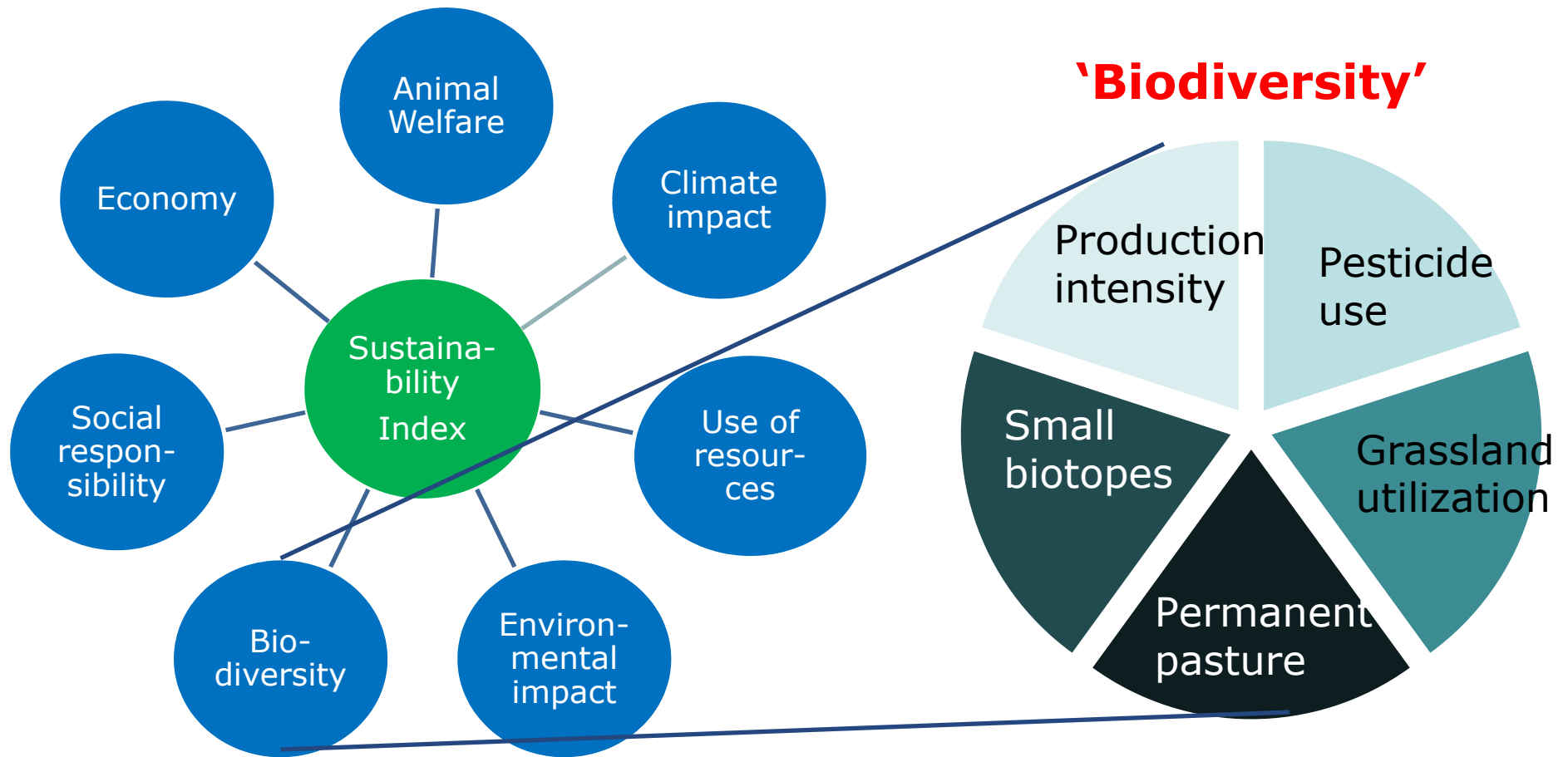
Per kg 'meat' **from suckler system:**

CF: 30 kg CO₂ -> score 3

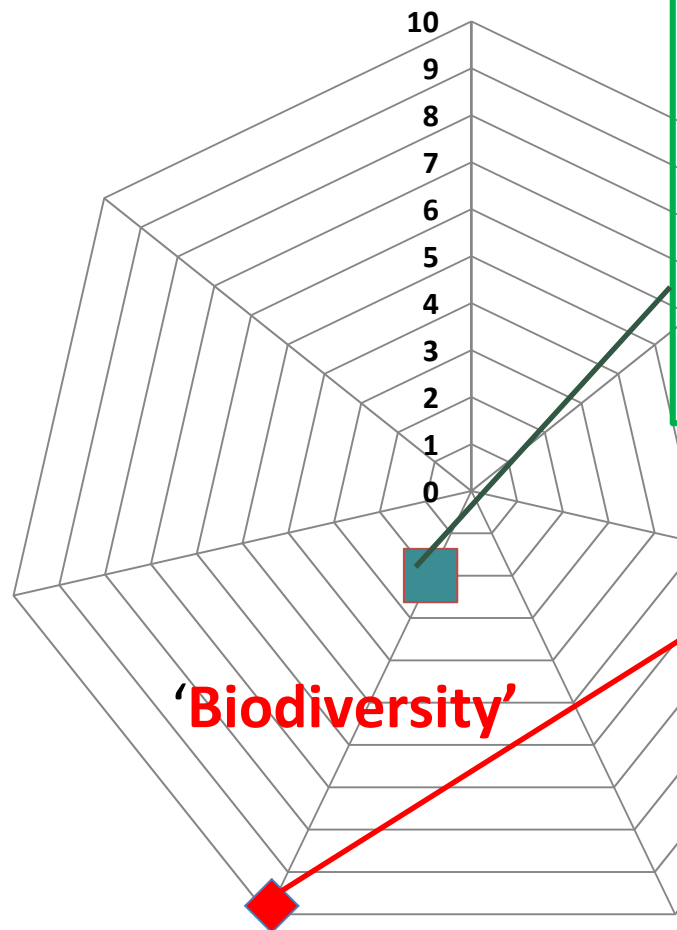
Sub-index score 3

◆ Suckler cows ■ Bull calves from dairy herds

Subindex: 'Biodiversity'



Subindex: 'Biodiversity'



BD bull calves:

Prod. Int.: 138 kg N/ha	->	score 8
Pesticide, % area: 99%	->	score 0
Grassland util.: 80% silage	->	score 0
Perm. Past.% of area : 0%	->	score 0
Small biotopes % of area: 0%	->	score 0

Sub-index: score 2

BD suckler:

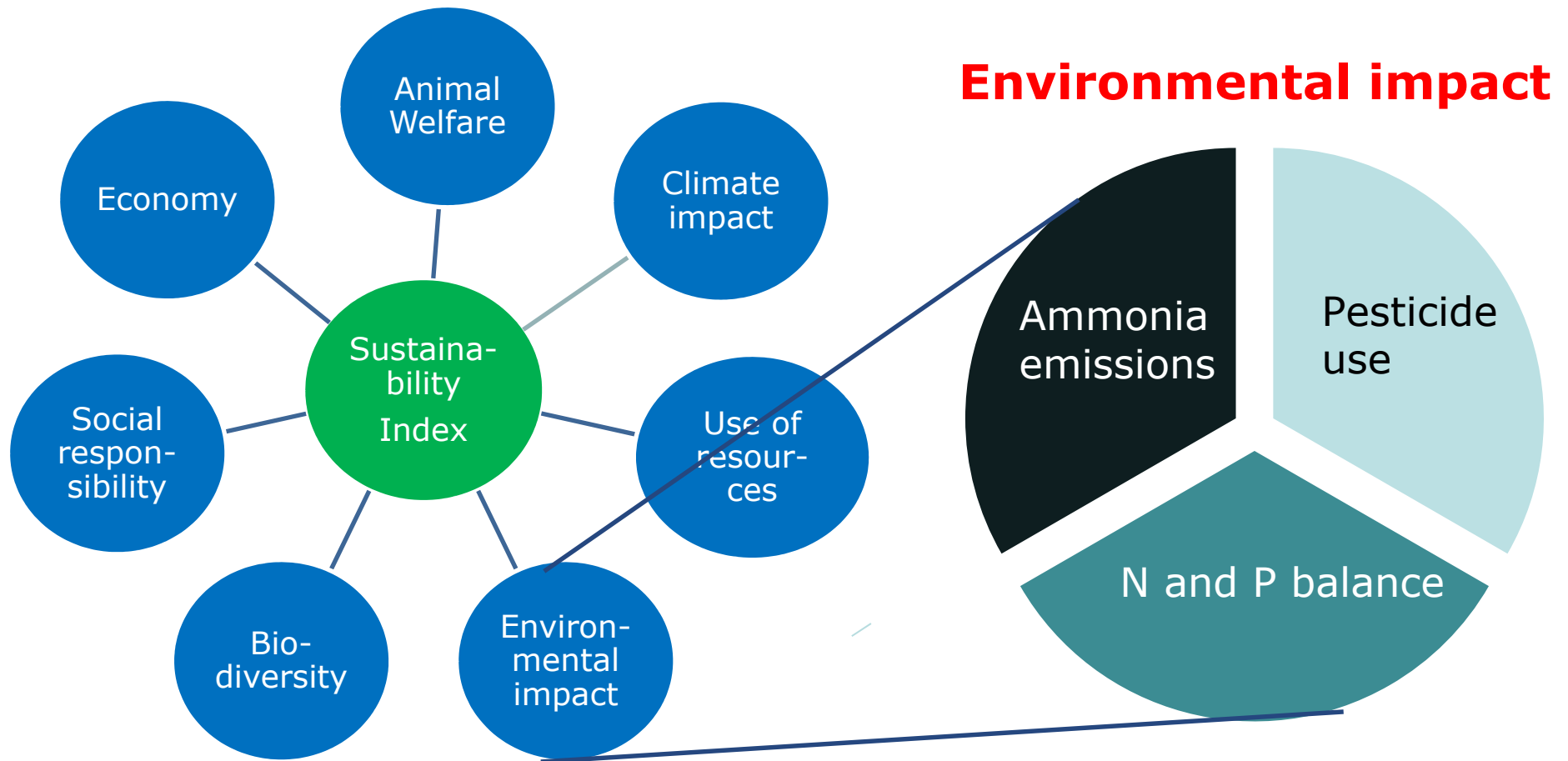
Prod. Int.: 19 kg N/ha	->	score 10
Pesticide, % area: 2%	->	score 9
Grassland util.: 20% silage	->	score 10
Perm. Past.% of area : >60%	->	score 10
Small biotopes % of area:	->	score 10

Sub-index: score 10

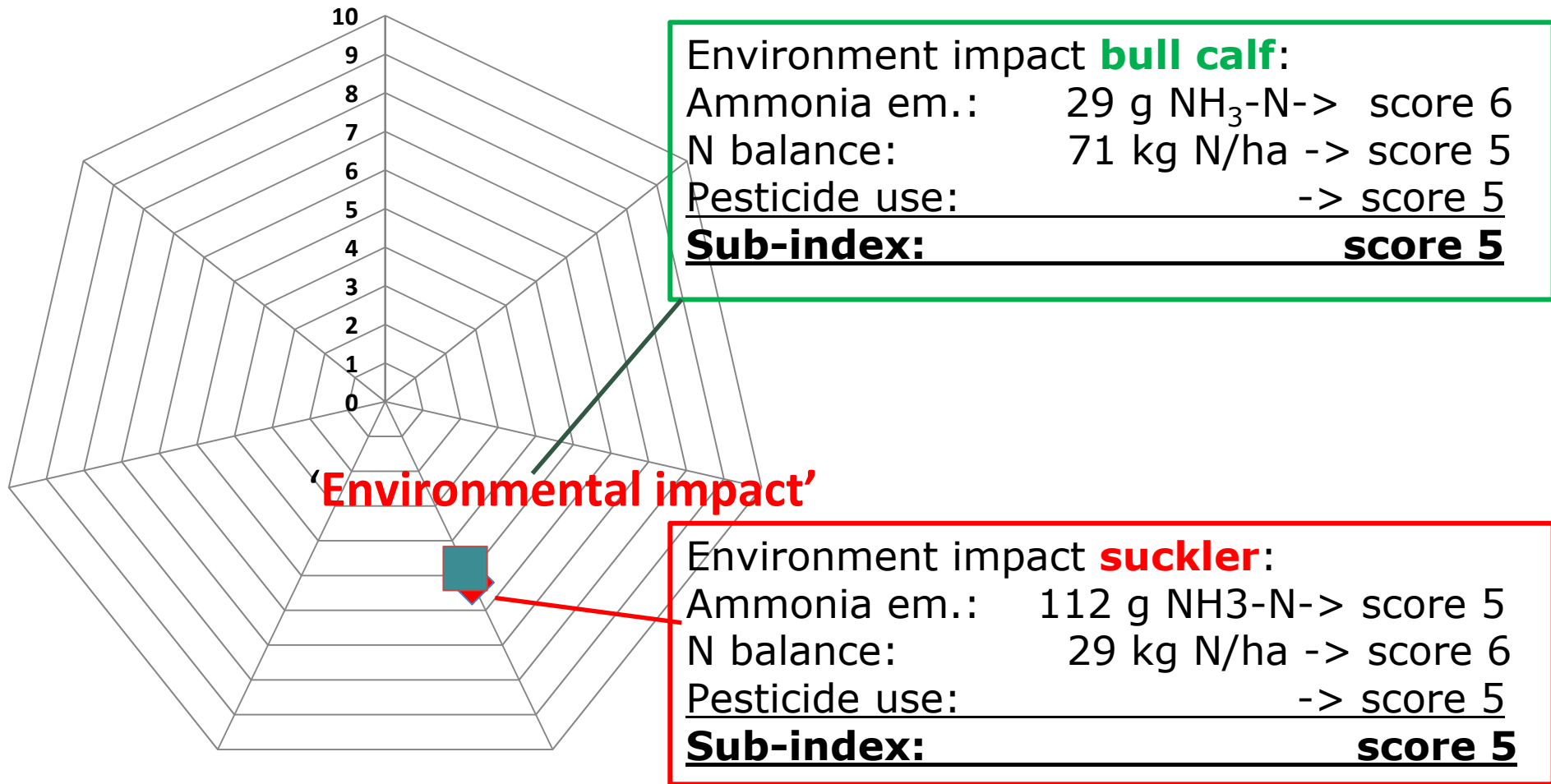
◆ Suckler cows

■ Bull calves from dairy herds

Subindex: 'Environmental impact'

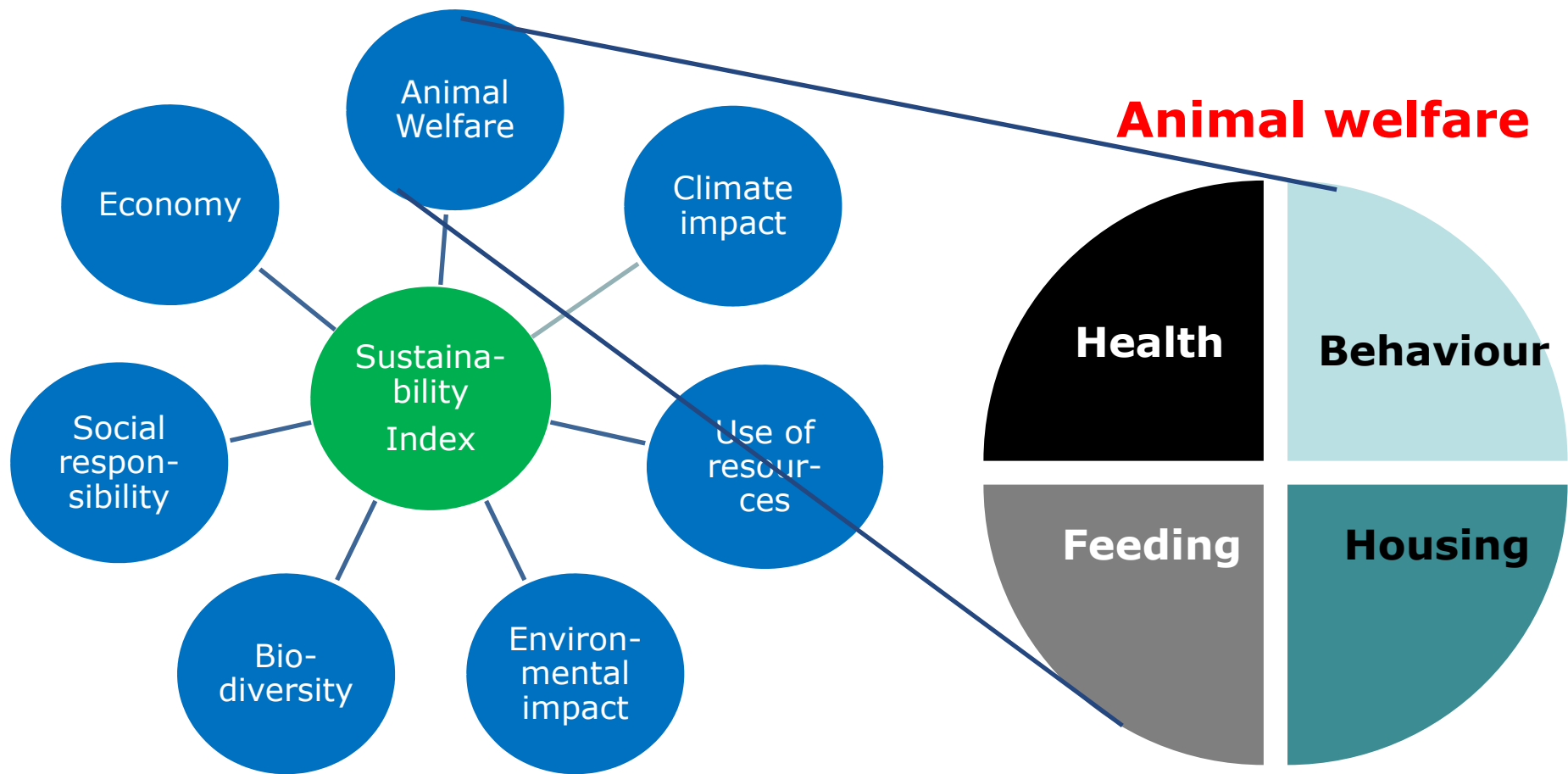


Subindex: 'Environmental impact'

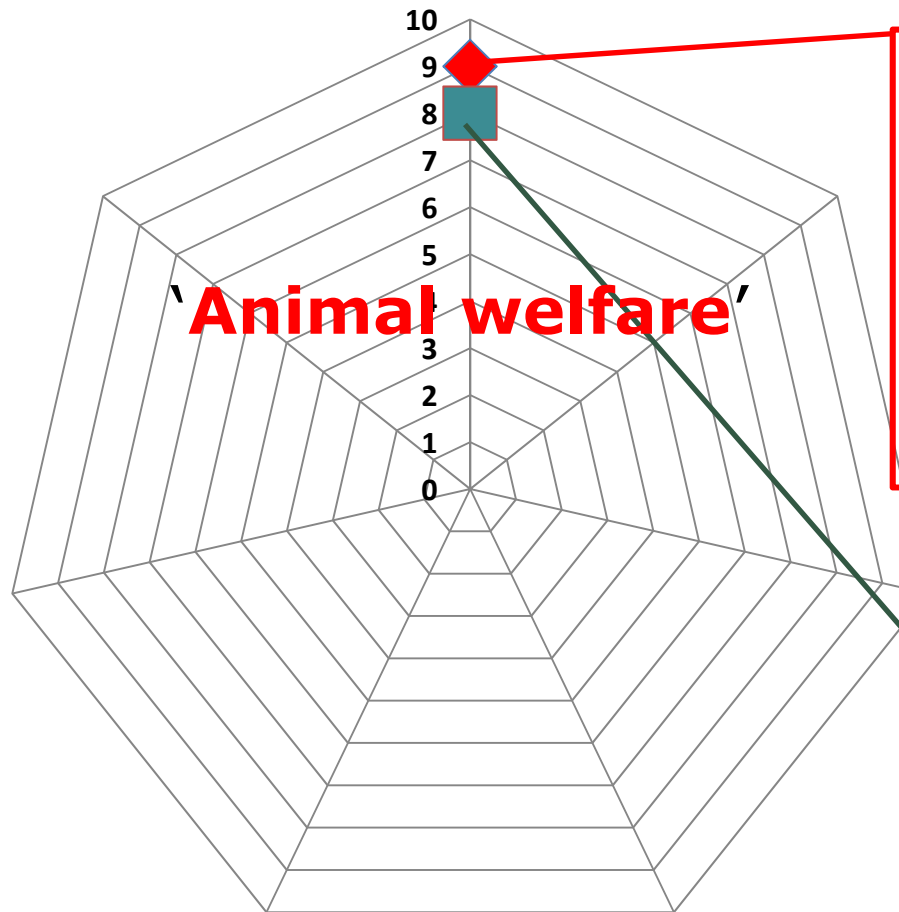


◆ Suckler cows ■ Bull calves from dairy herds

Subindex: 'Animal welfare'



Subindex: 'Animal welfare'



Suckler:

Behaviour	score	10
Health	score	9
Feeding	score	9
Housing	score	9

Sub-index **score: 9**

Bull calf:

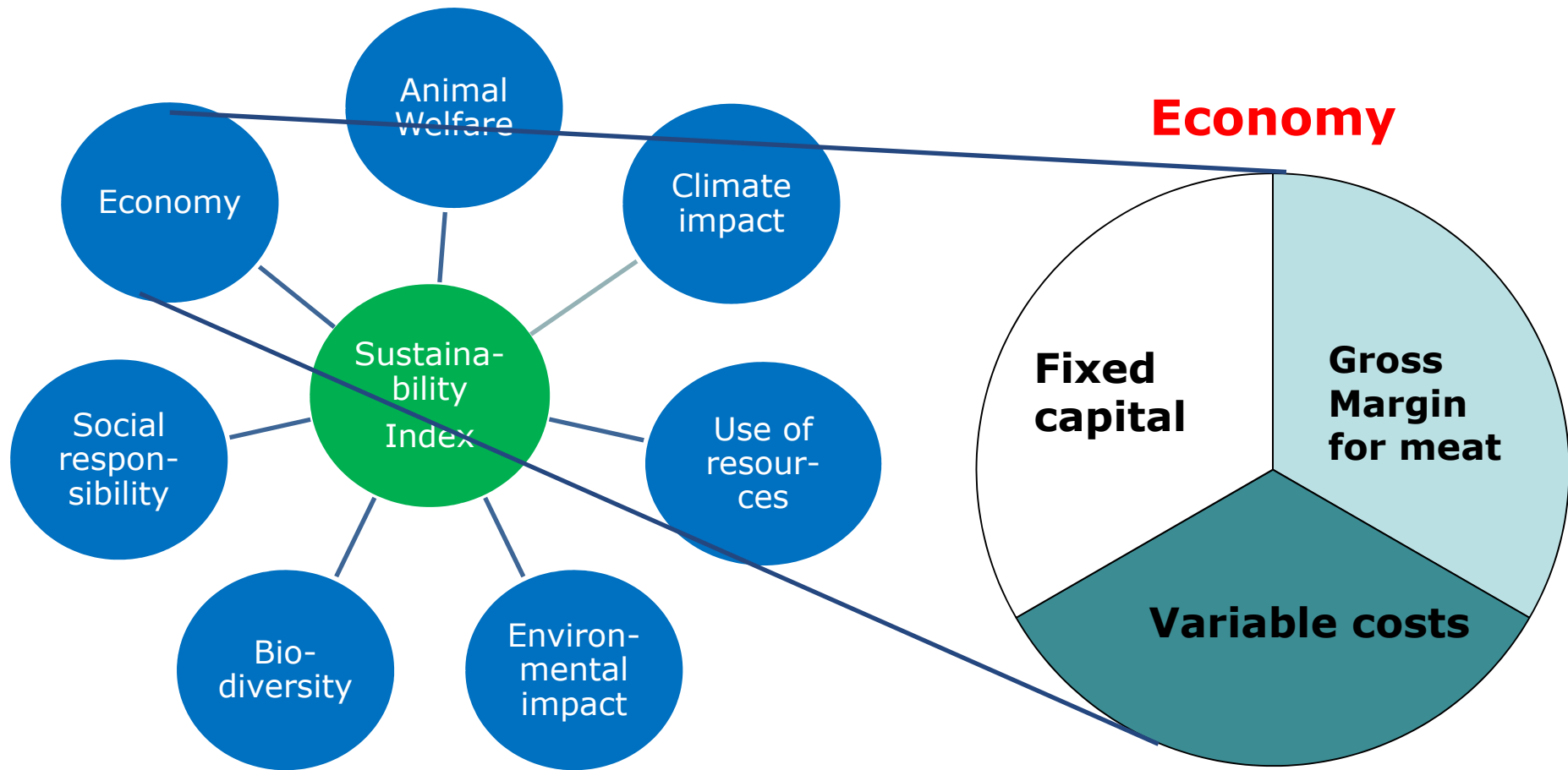
Behaviour	score	4
Health	score	9
Feeding	score	9
Housing	score	9

Sub-index **score: 8**

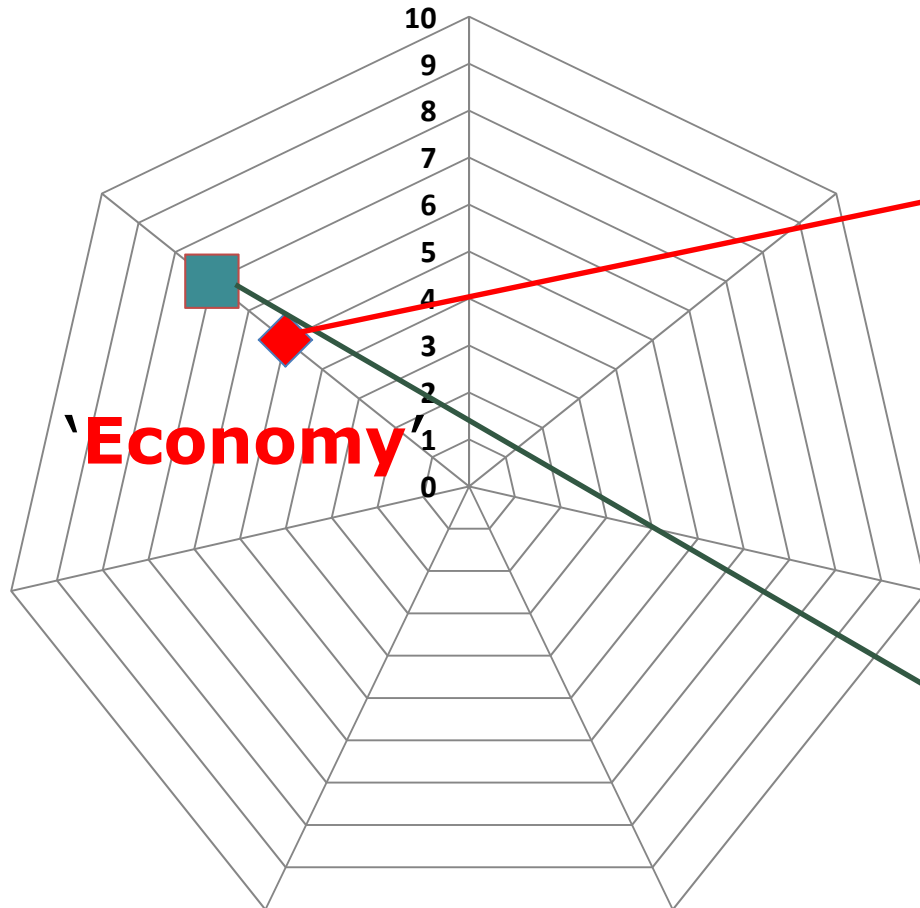
—◆— Suckler cows

—■— Bull calves from dairy herds

Subindex: 'Economy'



Subindex: 'Economy'



Suckler:

Fixed capital:

Gross margin:

Var. Costs:

Sub-index:

Score: 5

Bull calf:

Fixed capital:

Gross margin:

Var. Costs:

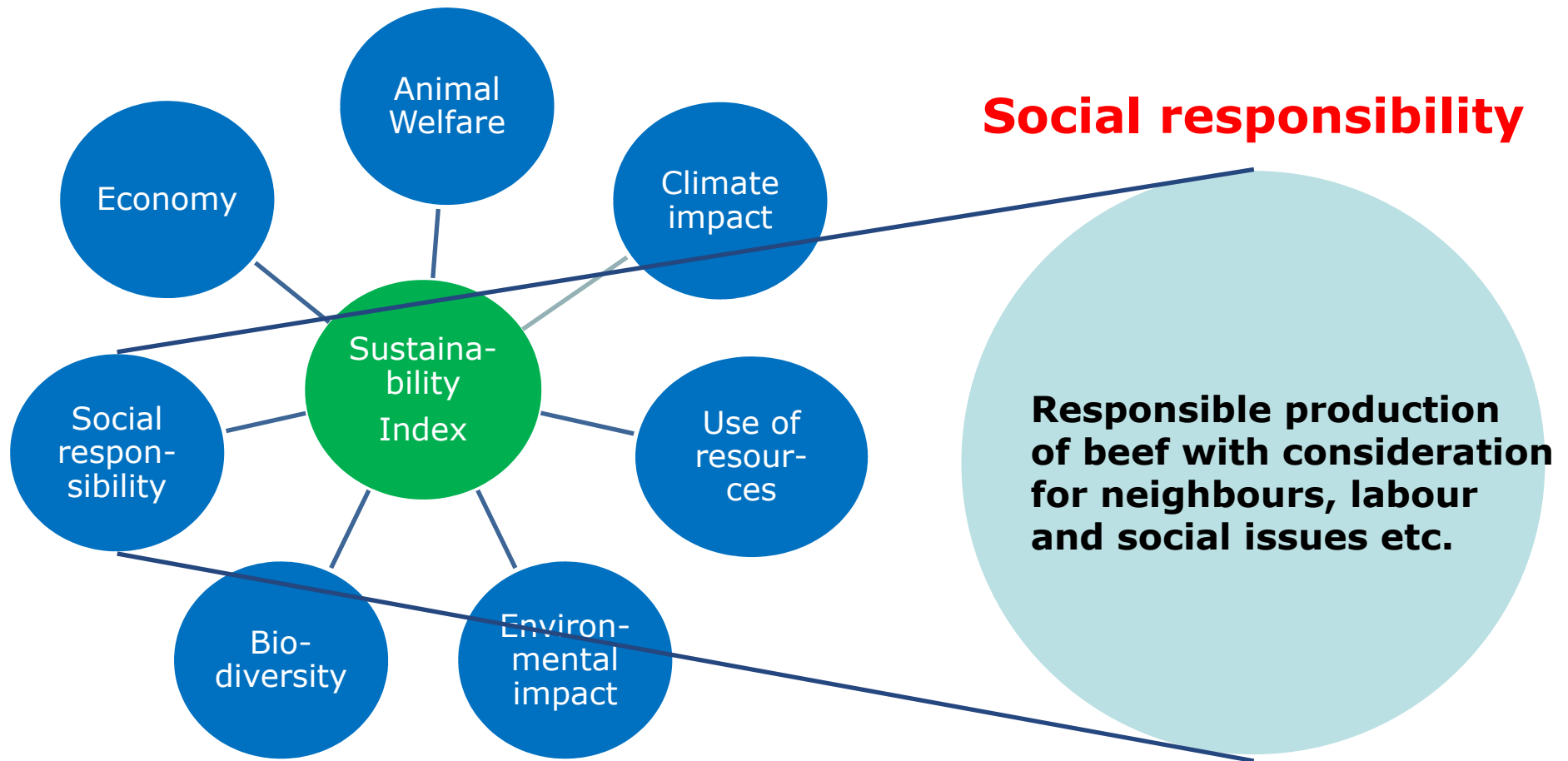
Sub-index:

Score: 7

◆ Suckler cows

■ Bull calves from dairy herds

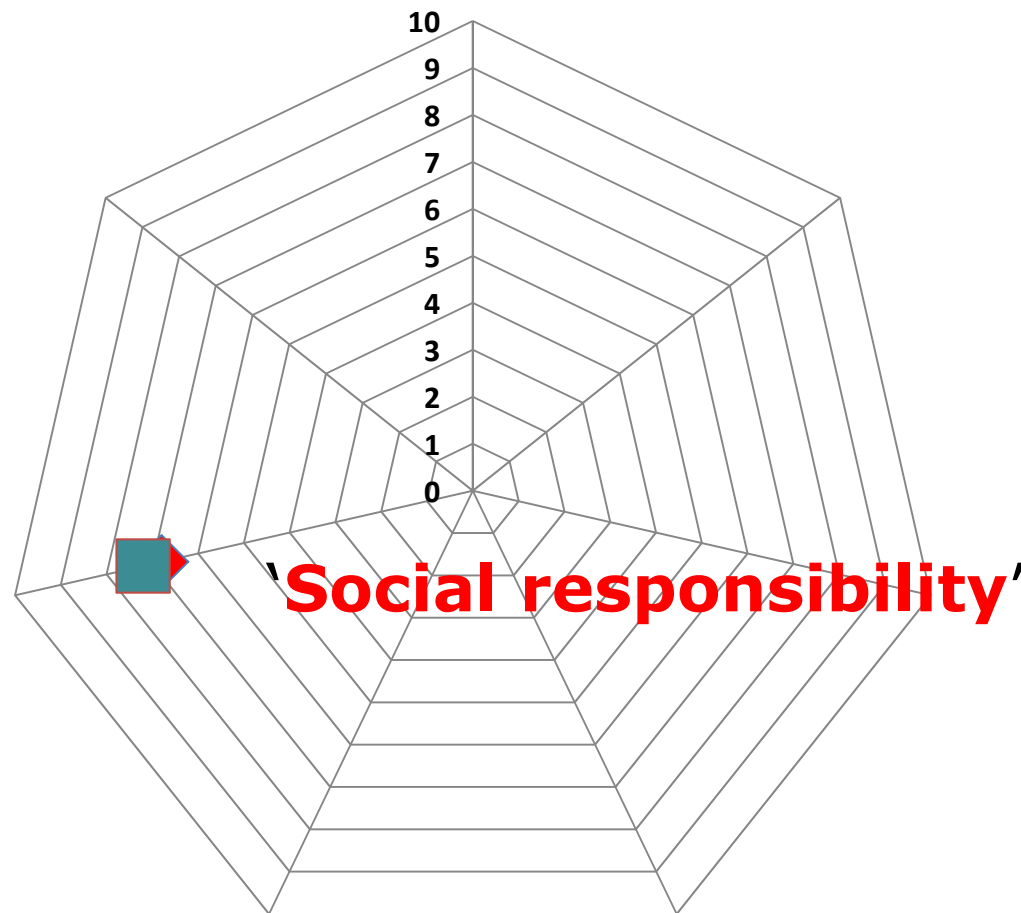
Subindex: 'Social responsibility'



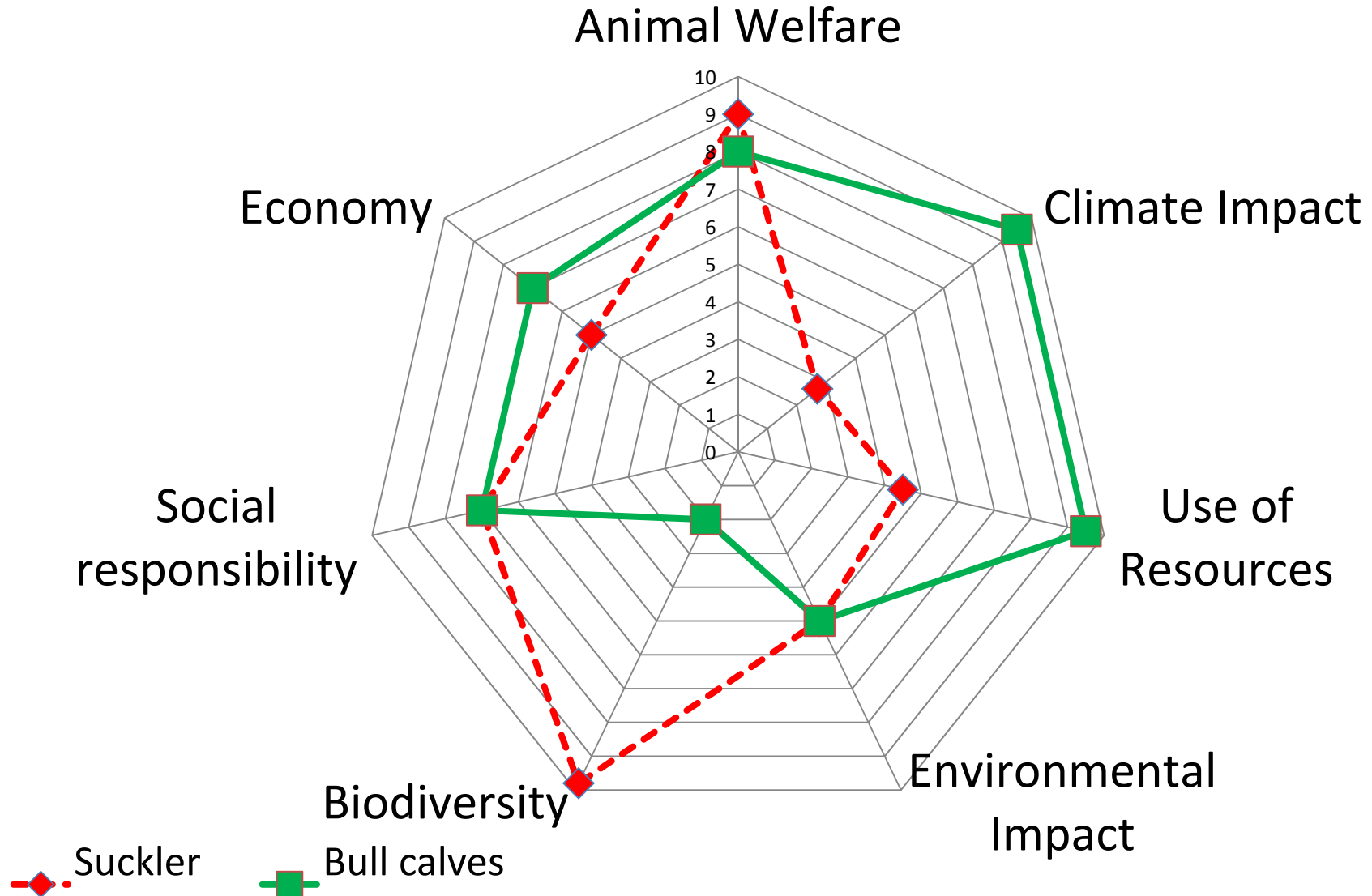
Subindex: 'Social responsibility'

◆ Suckler cows

■ Bull calves from dairy herds

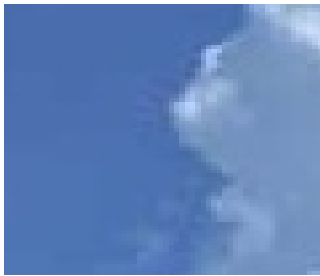


The sustainability index



Conclusion

A holistic approach, like a sustainability index, is needed to evaluate different beef production systems to secure a sustainable development that at the same time considers nature, climate, animal welfare and socioeconomic conditions



Climate impact



Biodiversity



Environmental impact



Use of resources



Animal welfare

Thank you for your attention



What's next?

- This first version of the index show that it was able to asses the sustainability of various beef production systems
- The index needs to be evaluated before it is ready for general use, including data collection from a larger number of farms
- Validation of the translation from calculated indicator value to score value (from 1 to 10, with 5 as medium level)
- So far no weighting between individual indicators with-in sub-indexes, or between sub-indexes.

Other sustainability indexes

RISE from Switzerland:

Indicators: Soil fertility, Animal welfare, N surplus, water use, energy and climate, biodiversity and plant protection, labour, economic sustainability, quality of life,

Agri-environment footprint index from Ireland:

Indicators:

	Natural resources	Biodiversity	Landscape
Crop and animal husbandry			
Physical farm infrastructure			
Natural and cultural heritage			