Towards an integrated index for sustainability in multifunctional dairy farms: a case study

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OUTLINE

Introduction

Multifunctionality, small-scale mountain farming and impact assessment

Materials and methods

LCA and welfare assessment

Results

Work in progress

Concluding remarks

RELEVANCE

Why do we care to acknowledge
multifunctionality
in LCA studies
for small-scale mountain productions?

BACKGROUND

European farms[1]

18 % in mountain areas

European dairy farms

96 % < 75 animals

Italian Farms[2]

31 % in mountain areas

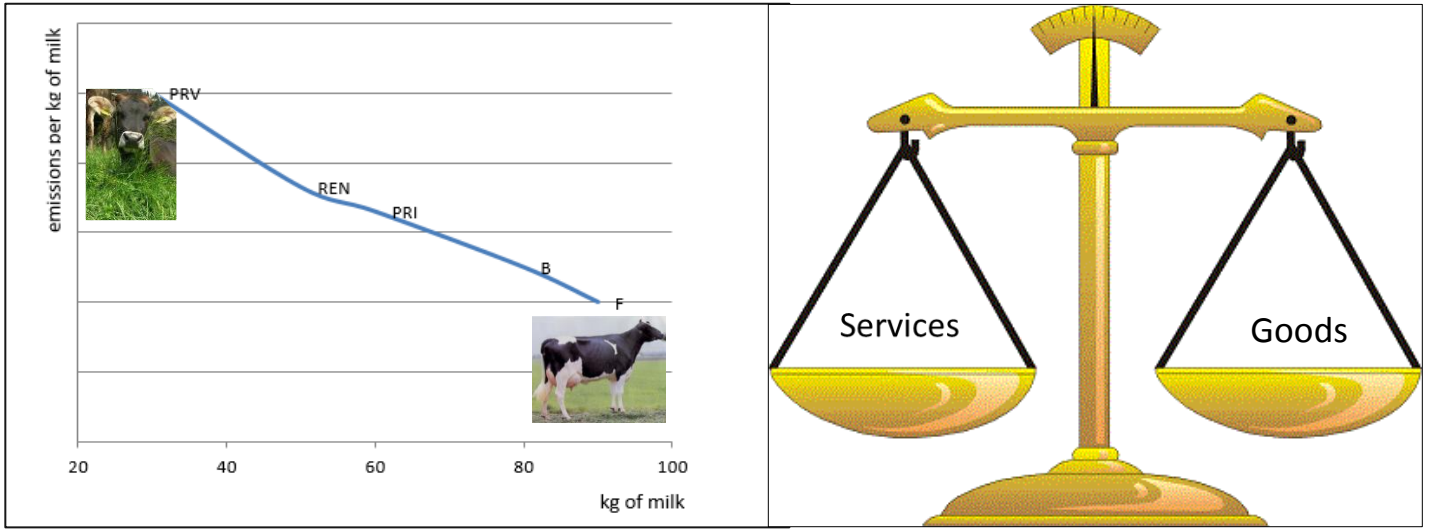
Italian dairy farms

90 % < 75 animals and 40% in mountain areas

[1] FSS Eurostat, 2010

[2] ISTAT, 2010

AIM



Integration of Ecosystem Services into the LCA:
Bernues et al., 2014; Weiler et al., 2014; Kiefer et al., 2015

WHAT SERVICES ARE WE LEAVING OUT?
Animal Welfare

MATERIALS AND METHODS

The case study

- 16 small scale dairy farms
- Organic and conventional
- Family farms
- Mountain area
- Local dual-purpose breed

MATERIALS AND METHODS

LCA

SYSTEM BOUNDARIES all processes up to the farm-gate

FUNCTIONAL UNIT milk (1 Kg FPCM)

IMPACT CATEGORIES

- Global warming potential
- Eutrophication potential
- Acidification potential

ALLOCATION

- No allocation
- Economic allocation

MATERIALS AND METHODS

Farm characteristics	Organic		Conventional	
	Mean	SE	Mean	SE
Total farm land, ha	79.5	31.90	70.9	32.96
LU total, n	57.0	11.96	55.0	15.04
Lactating cows, n	36.6	7.83	33.3	9.80
Milk yield, kg FPCM cow^{-1} $year^{-1}$	4,491	436.8	5,092	260.2
Concentrate feed, %	26.5	3.60	28.0	4.51
Forage self-sufficiency, %	74.0	7.60	75.8	7.86
Culling rate, %	16.9	1.65	21.3	1.98

SOME RESULTS

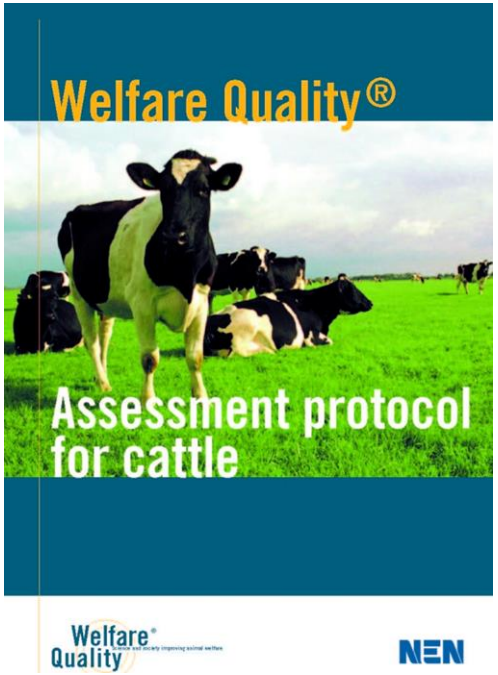
Impact category	**Global warming**		**Acidification**		**Eutrophication**	
Farm type	**Org**	**Con**	**Org**	**Con**	**Org**	**Con**
Unit	kg CO_2-eq/kg FPCM	kg CO_2-eq/kg FPCM	g SO_2-eq/kg FPCM	g SO_2-eq/kg FPCM	g PO_4^{3-}-eq/kg FPCM	g PO_4^{3-}eq/kg FPCM
No allocation	1.46 (0.067)	1.40 (0.056)	27.24 (2.026)	24.44 (1.492)	3.60^{α} (0.343)	4.39^{β} (0.307)
Economic allocation	0.89 (0.026)	0.99 (0.057)	16.64 (0.937)	17.36 (1.258)	2.20^{a} (0.182)	3.16^{b} (0.322)

^{a,b}: different letters within impact categories differ for $P < 0.05$

$^{\alpha,\beta}$: different letters within impact categories differ for $P < 0.10$

MATERIALS AND METHODS

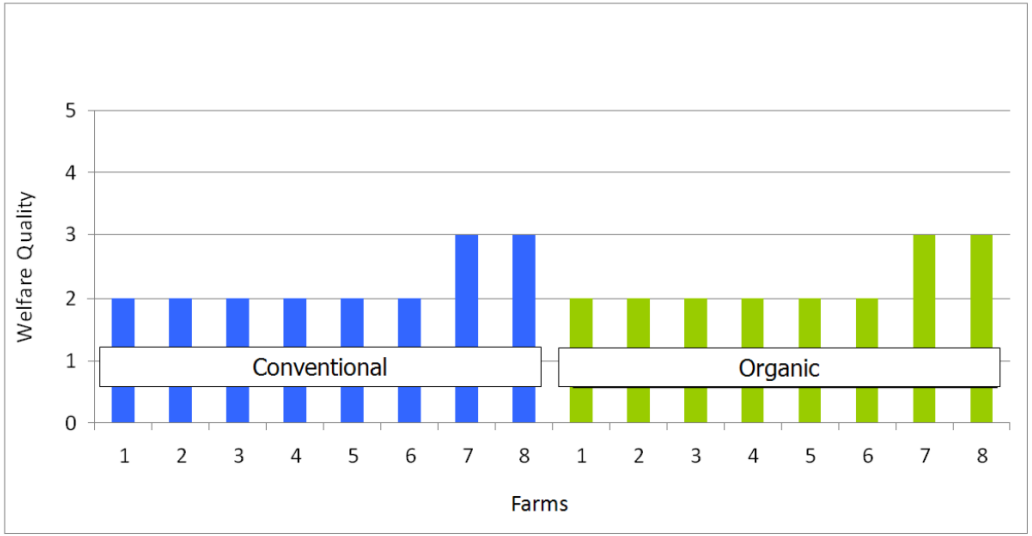
Animal Welfare



	Welfare Criteria	
Good feeding	1	Absence of prolonged hunger
	2	Absence of prolonged thirst
Good housing	3	Comfort around resting
	4	Thermal comfort
	5	Ease of movement
Good health	6	Absence of injuries
	7	Absence of disease
	8	Absence of pain induced by management procedures
Appropriate behaviour	9	Expression of social behaviours
	10	Expression of other behaviours
	11	Good human-animal relationship
	12	Absence of fearfulness

SOME RESULTS

Animal Welfare



Welfare principles	Farm Type	
	Org	**Conv**
Good Feeding	49 (12)	47 (23)
Good Housing	54 (18)	44 (25)
Good Health	50 (11)	62 (28)
Appropriate Behaviour	46 (18)	49 (11)

SOME NEWS

SCIENTIFIC OPINION

Scientific Opinion on the assessment of dairy cow welfare in small-scale farming systems[1]

EFSA Panel on Animal Health and Animal Welfare (AHAW)[2,3]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

This opinion reviews information on small-scale dairy cow farming systems in Europe, including the impact of production diseases on welfare of cows, and proposes a methodology for welfare assessment in those systems. To address specific expectations of consumers that food be produced locally or regionally or maintaining acceptable animal welfare conditions, in addition to herd size, criteria to define farms as "non-conventional" were proposed. Several sources were investigated for identifying criteria for the description and categorisation of small-scale farms, including dairy umbrella organisations and literature. In addition to herd size (up to 75 cows), proposed criteria related to small-scale farming comprise the workforce source, input level, indigenous breed use and production type certification. To cover the large diversity of farming systems across Europe, it was proposed that farms meeting at least two of these criteria be considered non-conventional. To adapt the welfare assessment to small-scale farms, the same risk factors and welfare consequences, as measured by corresponding animal-based measures identified in previous opinions for intensive farming systems were considered to be also relevant for small-scale systems. In addition, factors related to resources provided on pasture (e.g. shelter), management of pasture (e.g. mixing herds) and management of the cows (e.g. use of local breeds) were considered more likely to be present in small-scale systems. An on-farm survey was run to collect data for welfare assessment from 124 European farms. The distribution of risk factors and animal-based measures varied across the full range in study farms and showed similar patterns in farms with different grazing systems (from no time to full year on pasture). The animal-based measures identified for intensive farming are well suited for application in small-scale dairy farms. Production disease impact on the individual animal's welfare state does not depend on herd size or farming system.

KEY WORDS

small-scale farming, dairy production, welfare assessment, animal-based measures, production diseases

CONCLUDING REMARKS

- Mountain farms are highly **multifunctional**
- **Economical allocation** of GHG emissions also to ecosystem services is an option when applying LCA approach to small scale mountain production systems
- **Animal welfare** is socio-cultural service and can be objectively measured

CONCLUDING REMARKS

LCA and animal welfare assessment methods, if properly **adapted and integrated**, could:

- better characterize impacts
- inform targeted policies to support the provision of ecosystem services

in small scale mountain productions.


Suggestions
and
Questions

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