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Environmental impact of milk production in two samples of organic and conventional farm in Lombardy

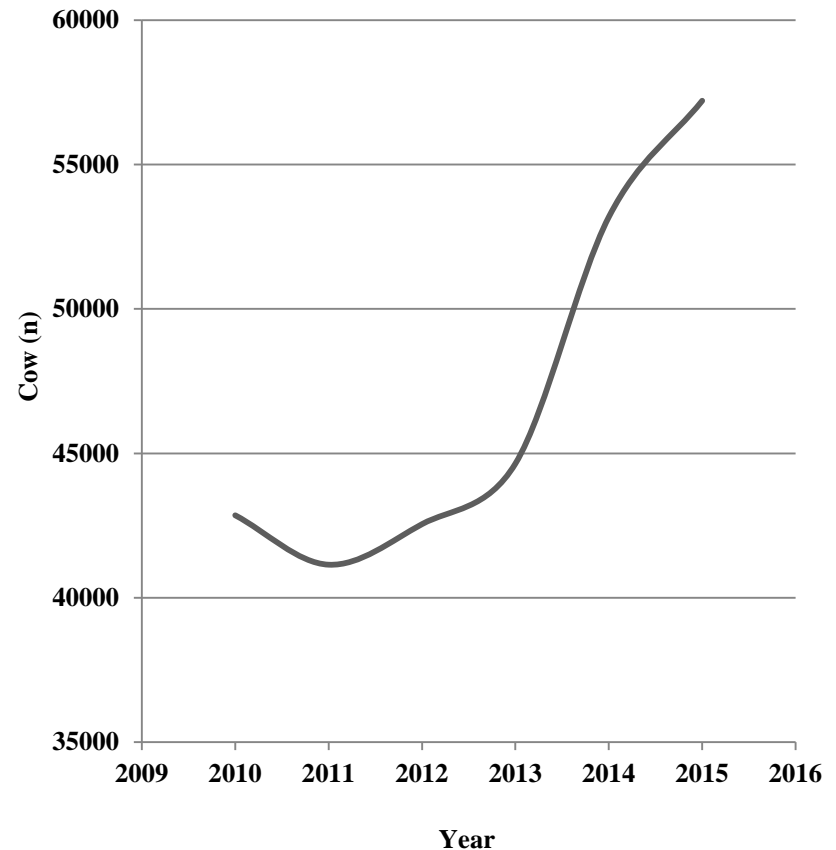
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Research project VaLatteBio

Organic milk production in Italy

- Crises of milk market
- Wide volatility of milk price
- Strong competition with foreign producers
- Reduction of milk consumptions
- Public environmental and health concerns
- Increase of organic milk demand (11% per year)
- Nevertheless only about 4% of dairy cows are reared according to organic system
- There are different causes hampering organic milk production



Why should organic system be more environment friendly?

European regulations **834/2007** and **889/2008**

- Livestock rate limit (170 kg/ha)
- Synthetic fertilizers are not allowed
- Synthetic pesticides are not allowed

Effects on:

- environmental and human health and biodiversity
- air emissions (GW, AC)
- water emissions (EU)

Previous studies

There are at least 9 papers where climate change, acidification and eutrophication associated to organic milk production are compared with those associated to conventional ones

1. Cederberg e Mattsson, 2000. J. Cleaner Prod., 8: 49
2. Haas et al., 2001. Agric. Ecosyst. Environ., 83: 43
3. Weiscke et al., 2006. Agric. Ecosyst. Environ., 112: 221
4. Thomassen et al., 2008. Agric. Syst., 96: 95
5. Hortenhuber et al., 2010. Renew. Agric. Food Syst., 25: 316
6. Tuomisto et al., 2012. J. Environ. Manag., 112: 309
7. Kiefer et al., 2014. J. Dairy Sci., 97: 7564
8. Hietala et al., 2015. Org. Agr., 5: 91
9. Salvador et al., 2016. J. Cleaner Prod., 124: 94

Characteristics of Italian organic dairy farms

Italian organic dairy farms show some special characteristics:

- little homogeneity
- maize is a major crop
- there are some highly producing farms
- grazing is uncommon

Objectives

Considering special characteristics of Italian organic farms, the objectives are

- estimate environmental impact referred to product unit
- estimate environmental impact referred to land unit

Materials and methods

- Data have been collected at 8 conventional and 6 organic dairy farms on the Lombardy plain
- Year 2015
- Processed with LatteGHG (Pirlo and Carè, 2013) updated with EU and AC estimation, carbon sink and feed database
- FU 1 kg di FPCM and 1 ha of occupied area
- No allocation
- From cradle to farm gate

Results 1 – Main characteristics

	Conventional		Organic		
	Mean	CV	Mean	CV	
Cultivated area (ha)	78,6	0,54	191,5	0.80	P<0,001
kg FPCM/cow/year	9004	0,13	7736	0,18	P<0,05
Heads (n)	317	0,35	330	0,89	NS

Results 2 – Product unit (1 kg FPCM)

		Conventional		Organic		
		Mean	CV	Mean	CV	
GW	kg CO₂eq	1,32	0,20	1,37	0,22	NS
AC	kg SO₂eq	0,025	0,19	0,026	0,12	NS
EU	kg PO₄³⁻eq	0,011	0,18	0,013	0,61	NS

Results 3 – Land unit (1 ha)

	Conventional		Organic		
	Mean	CV	Mean	CV	
Milk (t FPCM)	20,0	0,35	8,1	0,46	P<0,01
GW (t CO ₂ eq)	25,8	0,30	11,5	45,7	P<0,001
AC (kg SO ₂ eq)	507	0,42	225	0,42	P<0,01
EU (kg PO ₄ ³⁻ eq)	210	0,26	117	0,64	P<0,01

Results – NH₃

	Conventional		Organic		
	Mean	CV	Mean	CV	
kg SO ₂ eq	18203	0,32	20983	0,92	NS
kg SO ₂ eq/kg FPCM	0,013	0,18	0.013	0,12	NS
kg SO ₂ eq/ha	265	0,44	118	0,42	P<0,01

Conclusion and considerations 1

- Variability in the sample of organic milk farms for land occupation, animal number and whole characteristics is larger than that in conventional farms
- Cow average production is lower in organic farms, but some of them produce as much milk as conventional farms

Conclusion and considerations 2

- There are no differences if systems are compared on product-unit base
- Systems differ on land occupation-base
- This is relevant if there are severe pollution concerns (as in the case of air quality for NH_3 , PM_{10} e $\text{PM}_{2,5}$)

Conclusions and consideration 3

- To make this possible, productivity of organic farms are to be improved
- Actually organic farms pursue two different strategies: to increase productivity or to improve ecological services
- The first one seems to meet better the need to reduce environmental pressure

Acknowledgments

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