Comparison of organic and conventional dairy farm economic and environmental performances throughout North West Europe

A. Grignard[1], D. Stilmant[1], J. Oenema[2], S. Tirard[3], L. Debruyne[4], S. Hennart[1], D. Jamar[1], J. Boonen[5], and partners of DAIRYMAN project

[1]Walloon Agricultural Research Centre (CRA-W) ; Rue du Serpont 100, B-6800 Libramont, Belgium, mail : stilmant@cra.wallonie.be; [2]Wageningen UR, Plant Research International, P.O. Box 16, 6700 AA, Wageningen, The Netherlands; [3]Chambre Régionale d'Agriculture de Bretagne ; Technopôle Atalante-Champeaux CS 74 223 35042 Rennes, France [4]Landbouw en Maatschappij; Instituut voor Landbouw en Visserijonderzoek ; Burg. Van Gansberghelaan 115 bus 2, 9820 Merelbeke, Belgium, [5]Lycée Technique Agricole ; 72, avenue Salentiny L-9080 Ettelbruck; Luxemburg

Implications

From an environmental point of view, organic farming (OF) systems have been identified as beneficial thanks to a system allowing fewer losses of nitrogen (N) per ha and lower green house gases (GHG) emissions per ha and per ton of milk (TM). From an economic point of view, milk coming from these OF systems is sold at a higher prize. However, incomes provided by both systems are similar (for similar amount of milk produced). This may be explained by higher input costs per unit of product for OF systems and by more incomes coming from sold crops for conventional farming (CF) systems.

Therefore, on the one hand CF systems may improve their environmental performances by reducing the amount of inputs brought into the system, for example through a better forage and fertilisation management. On the other hand, the valorisation of milk through a differentiated production or market (price premium due to a label and/or on-farm transformation and/or sale) may bring them higher incomes. OF system may increase their incomes by selling one cash crop destined for human consumption and by finding the good balance between intensivity and extensivity in order to better valorise the inputs brought into the system.

Background and objectives

Dairy farming is an important agricultural economic activity in North West Europe (NWE). As underlined in the Dairyman project – an INTERREG project aiming to enhance the sustainability of dairy sector in NWE (The Netherlands, France, Germany, Luxembourg, Ireland, The United Kingdom and Belgium). Unfortunately, inefficiencies in the use of fertilizers, feeds and energy for dairy production can hamper the delivery of key environmental services such as clean water, clean air and biodiversity. Farmers are also coping with the milk price volatility, high investment costs and narrow profit. Therefore, efforts are needed to improve resource management in order to minimise both production costs and environmental impacts. One way to improve resource management might be developing and improving both OF and CF systems thanks to the identification of practices in these systems that could be efficiently implemented in the other one.

Key results and discussion

In the text below, we only present indicators that appear to be significantly different while comparing organic farms with their conventional homologue (we define homologue as farms with similar structures and constrains to the same geopolitical context). We also present differences observed regarding to the regional effect.

OF systems allow a reduction of N balance (66.5 ± 31.4 N kg/ha *vs* 148.2 ± 63.7 N kg/ha, $p < 0.001$) and of GHG emissions per ha and per TM (6,930.8 ± 3,468.1 kg of CO_2 equivalent/ha *vs* 13,118.9 ± 5,979.7 kg of CO_2 eq./ha, $p < 0.001$ and 1,024.3 ± 179.62 kg of CO_2 eq./TM *vs* 1.267.0 ± 360.1 kg of CO_2 eq./TM, $p < 0.1$). Furthermore, differences were observed for some descriptive indicators: OF systems have, in average, higher proportion of grassland in the agricultural area (90.4 ± 10% *vs* 73.6 ± 22.3%, $p < 0.001$), smaller proportion of maize and crops (respectively 3.9 ± 5.5% *vs* 14.3 ± 13.7%, $p < 0.01$ and 5.7 ± 12.3% *vs* 12.1 ± 13.1%, $p < 0.001$). In addition, OF systems provide, in average, less concentrate per cow and per kg of milk (987.7 ± 705.8 kg/cow/year *vs* 1,547.4 ± 768.8 kg/cow/year, $p < 0.1$ and 125.9 ± 80.1 g of concentrate/kg of milk *vs* 191.1 ± 87.6 g of concentrate/kg of milk, $p < 0.1$) but they also get lower cow yield (6,570.6 ± 1260.7 kg of milk/cow/year *vs* 7796.3 ± 871.6 kg of milk/cow/year $p < 0.01$). OF systems valorize milk produced in a better way (0.37 ± 0.04€/kg of milk *vs* 0.32 ± 0.02 €/kg of milk, $p < 0.001$). Despite such differences in milk price, incomes per labor unit (LaU) provided by both systems are statistically similar (39,835 ± 13,508 €/LaU for OF systems *vs* 35,770 ± 14,725 €/LaU for CF systems) while amount of milk produced are also similar.

From a regional point of view (whatever the farming system), two regions are identified as significantly different from the others for some characteristics. The Netherlands (NL) and Flanders (BF) have bigger dairy cow herds per labor unit and produce much more milk ($p < 0.001$, average of 117.1 ± 43.2 dairy cows for NL and BF *vs* 62.5 ± 7.7 dairy cows for the others region). Furthermore, they have higher input costs ($p < 0.000$, in average 2,356 ± 147€/ha vs 748 ± 322 €/ha). However, they get in average higher incomes per LaU ($p < 0.1$, in average 51,542 ± 7.780 €/LaU for NL and BF *vs* 33,223 ± 12,333 €/LaU for the others). Although their N balances are in average bigger (152.2 ± 79.4 N kg/ha for NL and BF *vs* 92.4 ± 54.3 N kg/ha for the others), no significant differences were observed due to high standard deviation minimizing the regional systems effect, neither for the GHG emissions per TM. However, significant differences were noticed regarding to GHG emissions per ha ($p < 0.000$, 12,281.7 ± 5,519.5 kg of CO_2 eq./ha for NL and BF *vs* 7,939.3 ± 4,128.3 kg of CO_2 eq./ha for the others).

How work was carried out?

Amongst a network of 126 pilot dairy farms across NWE 16 farms have been selected. This sample gathers 8 organic farms and their homologue conventional farm in each region which means 2 farms from Flanders (BF), 4 from Wallonia (BW), 6 from Brittany (FB), 2 from Luxemburg (LU), 2 from the Netherlands (NL). Farm-pairs have been identified to be as similar as possible, using Principal Compound Analysis based on structural data (size of herd, size and occupation of the agricultural area, quotas and familial labour unit) and thanks to discussion with experts following the network.

Environmental performances were assessed through N and P balances per ha, N and P efficiency, GHG emissions allocated to the dairy herd per ha and per TM. GHG emissions were calculated based on the tier 2 method of the IPCC (Intergovernmental panel on climate change) guidelines. Until now, biodiversity and water management haven't been included but such issues should be taken into account in the future analyses. Economical performances (incomes, inputs efficiency, variable cost, etc.) were assessed. Due to the interregional level of the study, incomes have been corrected with the indicator of consumer prices (Eurostat, 2011). Environmental and economic results were compared based on a two ways variance analysis according to the farming systems (fixed factor; 2 levels: organic *vs* conventional) and the region (random factor; 5 levels). Square means were compared using Student–Newman–Keuls test. Furthermore, using the same statistical methods, groups were characterized and compared through a set of descriptive data (such as age at the first calving, calving interval, amount of concentrate provide, herd size, amount of labor unit, cow productivity, etc.) in order to identify differences in farming strategies.

References

Eurostat (2011), Consumer prices - inflation and comparative price levels, http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Consumer_prices_-_inflation_and_comparative_price_levels/fr [last consultation on 20/02/2013]