Greenhouse gas emissions of organic and conventional dairy farms – results from a pilot farm network in Germany

Franziska Schulz¹, Jan Brinkmann, Helmut Frank, Solveig March, Hans Marten Paulsen, Harald Schmid, Kathrin Wagner, Sylvia Warnecke

¹Johann Heinrich von Thünen Institute, Westerau, Germany, e-mail: franziska.schulz@thuenen.de

In 2009, a network of paired organic and conventional dairy farms in various climatic and soil regions in Germany was started within the project ‘Climate effects and sustainability of organic and conventional farming systems’ (www.pilotbetriebe.de). This abstract presents some key results in regard to greenhouse gas (GHG) emissions of milk production. The farm model REPRO was used to calculate complete GHG balances of 34 farms. Total GHG emissions of milk production at the farm gate were (mean (min-max)) 983 (835–1397) and 1047 (911–1248) g CO₂eq kg⁻¹ energy corrected milk (ECM) for organic (n=16) and conventional farms (n=18), respectively. The values were rather farm individual and means did not differ. Product related GHG emissions declined with increasing milk yields up to approximately 9000 kg ECM cow⁻¹ a⁻¹ and reached a plateau at milk yields beyond that level. The results confirm the importance of methane (CH₄) emissions from enteric fermentation in dairy cows as the main source of GHG emissions. REPRO estimated enteric CH₄ emissions based on daily dry matter intake (Ellis et al., 2007). As feeding practices of dairy cows differ between organic and conventional farming, enteric CH₄ emissions from cows were additionally estimated by taking results of feedstuff analysis of the pilot farms into consideration (Kirchgeßner et al., 1995). These values were on average 0.11 kg CO₂eq kg⁻¹ ECM higher than those based on Ellis et al. (2007). Apart from feeding, milk yield is also influenced by cow health and welfare, thus affecting product related GHG emissions. Hence, cow welfare was determined on all pilot farms in the course of the ongoing project by applying the Welfare Quality® assessment protocol for cattle. In a preliminary study with four pilot farms, scenarios to improve cow health and welfare (e.g., by introducing pasture to dry cows) on environmental burdens and resource efficiency were calculated. Overall, effects on GHG emissions per kg ECM were relatively small (-5 to 2.6 %). Simultaneously considering animal related parameters, management procedures, and environmental performance of production provides an innovative possibility to address different sustainability goals on whole farm level and to approach win-win solutions. Advisory tools to perform individual calculations of GHG emissions in crop production and to evaluate cow welfare in farms were made available to the public. Currently, the scientific work within the network is being completed.

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Dr. Claudia Heidecke  
Thünen Institute of Rural Studies  
Bundesallee 64  
38116 Braunschweig, Germany  
Telefon: +49 531 596-5219  
Fax: +49 531 596-5599  
E-Mail: claudia.heidecke@thuenen.de

Hayden Montgomery  
Special Representative  
Global Research Alliance on Agricultural Greenhouse Gases

Dr. Hartmut Stalb  
Research and Innovation  
Federal Ministry of Food and Agriculture  
Rochusstraße 1  
53123 Bonn, Germany

Dr. Lini Wollenberg  
University of Vermont  
Low Emissions Agriculture  
617 Main Street  
Burlington 05405, United States of America

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