

Mitigation of greenhouse gas emissions from two different Emilia-Romagna (Italy) dairy systems

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INTRODUCTION

The *governance* project LIFE+ Climate ChangE-R has an integrated approach towards crops, plants and animals and agriculture, industry and distribution. Its aims are to reduce greenhouse gases (GHGs) emissions in the agri-food chain and to create a system for the exchange of

AIM

In future, to minimize the impact on climate change, the dairy systems will need to reduce greenhouse gas (GHG) emissions per kg of milk whilst continuing the development of dairy

information and experiences of the partners involved. This project aims to improve on saving water and energy, reduction of chemical herbicides and pesticides, and the advancement in the techniques of food and livestock management.

production. This paper aims to assess the carbon footprint of two dairy systems in Emilia-Romagna (Italy) and to identify farm-specific mitigation options.

MATERIAL AND METHODS

Twelve dairy farms were surveyed, six "with silage" (S) as forage base for fresh milk dairy system; six "without silage" (WS) for milk for the production of the PDO Parmigiano Reggiano cheese. A specific tool was developed to estimate net GHG emission. Results are expressed in kg CO₂eq per kg FPCM (fat and protein corrected milk). The data input required by the model are: herd characteristics, feed composition and supplies, housing and manure

management, crop type, fertilizer input and data describing soil's characteristics. Due to the high influence of forage quality on enteric emissions a specific methodology was developed to assess feed digestibility. Apparent digestibility of DM and NDF was estimated using uNDF₂₄₀ fraction as indicator. The apparent digestibility of the TMR (DM and NDF) was calculated from NIRS analysis (feces and TMR rations) using the formula:

$$\text{Apparent digestibility} = \left[\frac{(\text{Foecal uNDF} - \text{uNDF Ration})}{\text{Foecal uNDF}} \right] \times 100$$

RESULTS

Data collected over the two years show that the main contribution to the GHG emissions of both the dairy systems comes from the enteric emissions and the production of purchased feed. The main drivers that reduce the carbon footprint of the milk production are the improvement of farm productivity and the increase of TMR digestibility. Both are achieved by reducing the number of non-productive animals (through improved performance and increasing the dairy cows' productive life, so cutting down on replacement) and by improving forage quality.

Carbon footprint was estimated in 1,2 kg of CO₂ Eq/kg of (FPCM) milk in the case of fresh milk and 1,3 in the

case of milk for Parmigiano Reggiano cheese. Carbon footprint evaluation helps to identify the most effective mitigation options:

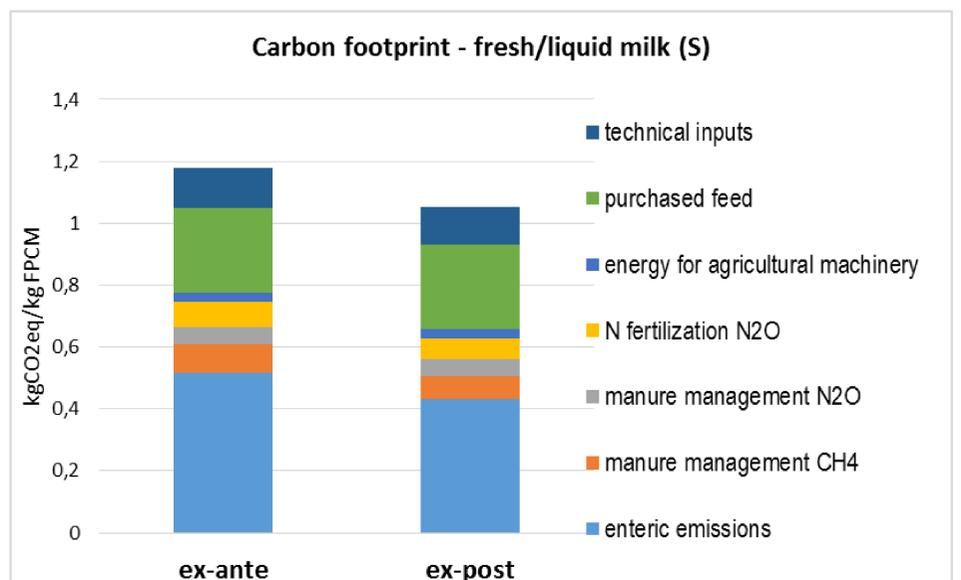
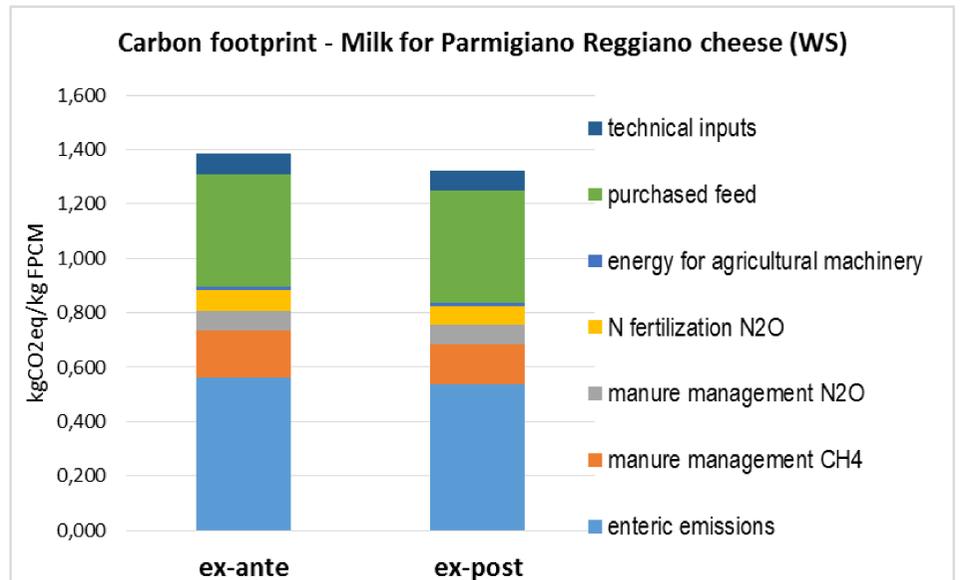
- ~ improvement of the production level efficiency.
- ~ high quality of feed (hay and fodder),
- ~ reduction of the share of non-self-produced feed,
- ~ reduction of protein content of the Total Mixed Ration,
- ~ reduction of mineral fertilizers use, due to optimizing the Nitrogen Use Efficiency of manure
- ~ saving of energy and fuel.

These measures allow, in general, better economic margins for farmers.

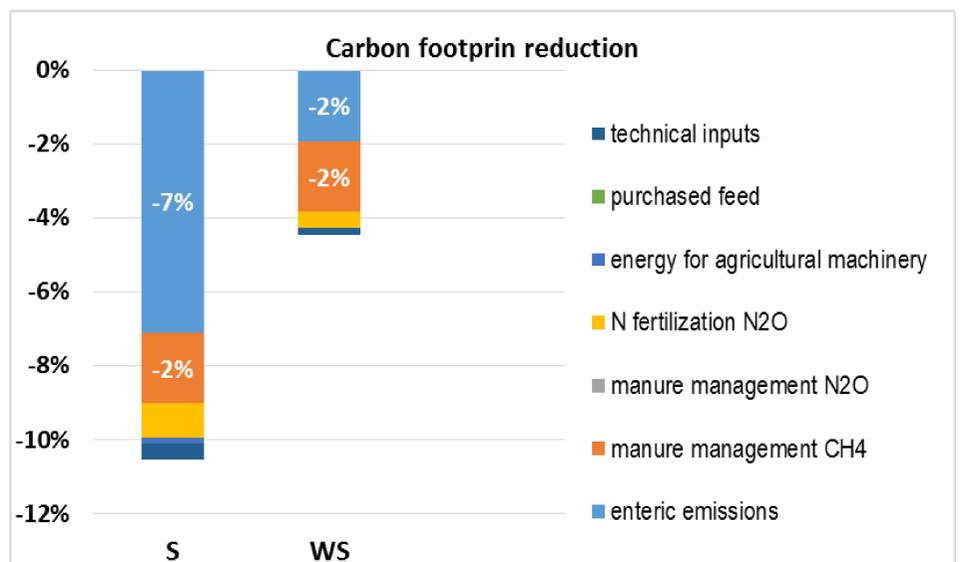
CONCLUSIONS

In the governance LIFE+ Climate ChangE-R project, the best practices used for carbon footprint reduction will be introduced in the

regional livestock chains. Payment of specific measures are introduced in the new Rural Development Plan 2014-2020.



Dairy chain	NDF apparent digestibility	DM apparent digestibility
	% NDF	% DM
Fresh/liquid milk (S)	52,6	70,3
Milk for P-R cheese (WS)	39,4	63,9



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