N. 29544

Preliminary results of the BEEF CARBON initiative in innovative beef farms in Italy

Sara Carè, Giacomo Pirlo, Luciano Migliorati

CREA-ZA, Council for Agriculture Research and Economic Research Centre for Animal Production and Aquaculture, 26900 Lodi, Italy,

Corresponding author: **sara.care@crea.gov.it**

INTRODUCTION

In Italy, agriculture accounts for 7% of two greenhouse gas (CH_4 and N_2O) emissions and beef production is considered one of the most contributors, accounting for 34% of CH_4 enteric emissions in 2014. Public concern require to find mitigation strategies to reduce GHG emissions.

For this reason, the EU has funded the "BEEF CARBON ACTION PLAN" project which aims:

- to reduce the carbon footprint of beef production by 15% over 10 years in France, Ireland, Italy and Spain;
- to promote innovative livestock farming systems, ensuring the technical, economic, environmental and social sustainability of beef farms.

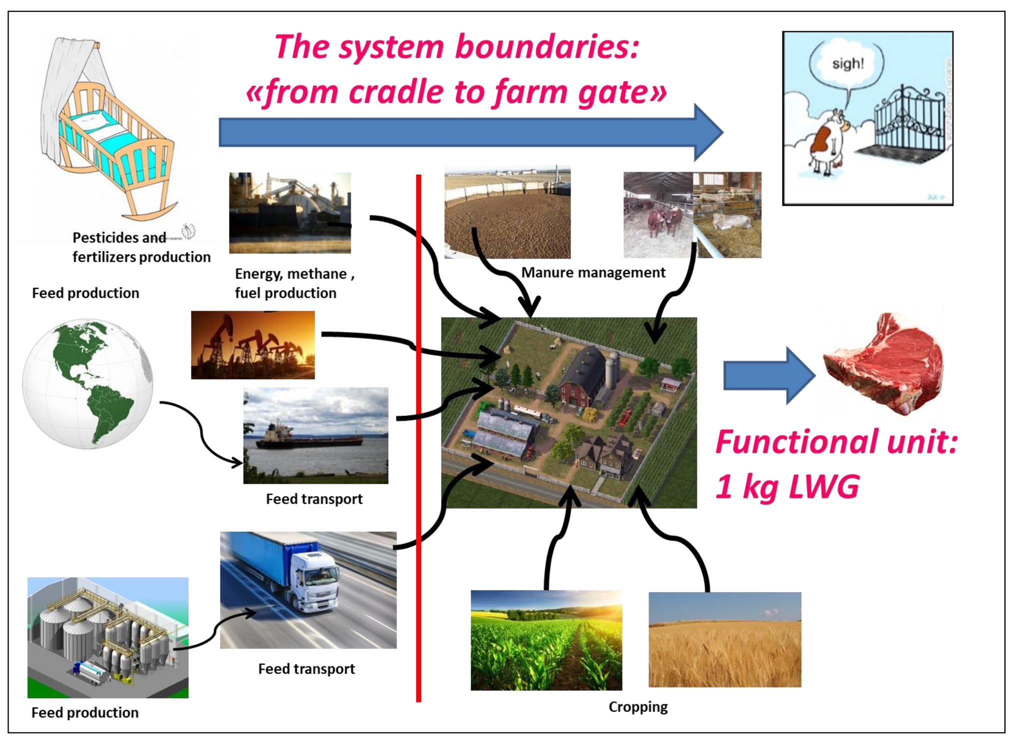
THE AIM OF THIS STUDY WAS TO ESTIMATE THE EFFECT OF MITIGATION STRATEGIES ON CARBON FOOTPRINT OF ONE KILO OF LIVE WEIGHT GAIN IN INNOVATIVE BEEF CATTLE FARMS.

MATERIALS and METHODS

The **CF** of one kg of LWG was estimated in **19** innovative fattening farms located in Veneto and Piemonte before the application of mitigation strategies.

Impact categories

- GW emissions (kg **CO_2eq**),
- acidification (kg **SO_4eq**),
- eutrophication (kg **PO_4eq**),
- energy consumption (**MJ**),
- carbon sequestration,
- contribution of beef farms to the rural landscape.



Environmental impact CH_4 (enteric fermentation and decomposition of organic matter in manure), N_2O (denitrification and nitrification of organic N of manure and urine; N of chemical fertilizers) and direct and indirect CO_2 were estimated using CAP2ER® *niveau 2* developed at the French Institut de l'Elevage.

Statistical analysis linear regression analysis was used to determine relationships between CF of beef farms and average daily gain, initial and final live weight, length of the fattening period, age at purchase and age at sale, by using the procedure PROC REG of SAS 9.1 (SAS Institute Inc., Cary, NC).

MITIGATION STRATEGIES that will be introduced

Type of strategy	Details	Number of farms
Nutrition	Use of CLA; increase feed efficiency	3
Feed efficiency	Robotic feeding	1
Animal welfare	Increase space per animal and use of propellerl	9
Manure management and application	Anaerobic digestion and slatted floor; immediate burial and precision application	7
Cropping operation	No or minimum tillage, sod seeding, no chemical fertilizers	4
Organic farming	Environment, welfare, no chemical fertilizers	1

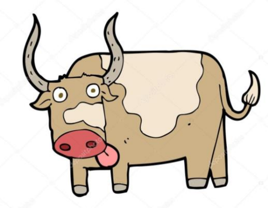
Acknowledgments

This work was carried out in collaboration with ASPROCARNE, UNIVARVE and CRPA and it his is funded by the European Commission, Project "LIFE BEEF CARBON" (2016-2020).

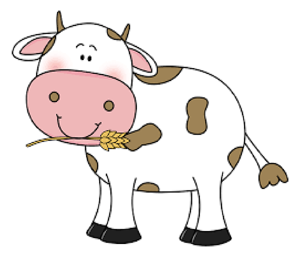
RESULTS

Innovative fattening farms general informations

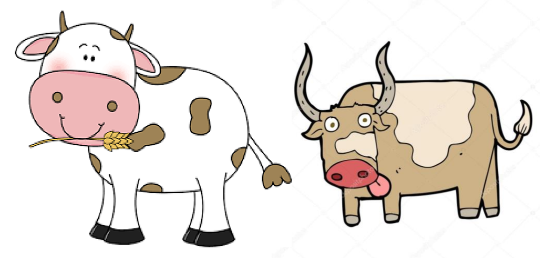
Sex:



9 farms



5 farms



5 farms

Breed: 1 Salers; 2 Limousine; 12 French/Italian crosses; 3 Blonde d'Aquitaine; 1 Charolaise.

Average farm size: 72 ha

Average chemical fertilizer: 118 kgN/ha

Herd parameters

Parameter	Unit	Mean	SD	CV%
Places	n	483	339	70
Initial stock inventory	n	469	304	65
Final stock inventory	n	504	345	69
Animals purchased	n	823	689	84
Animals sold	n	794	638	80
Initial age	month	10	2	22
Final age	month	18	1	7

Table 1. Herd characteristics of beef cattle farms.

Parameter	Unit	Mean	SD	CV%
Average live weight	kg	465	77	17
Initial weight	kg	339	69	20
Final weight	kg	615	73	12
Cycle length	d	238	72	30
Total live weight produced	kg	214257	167515	78
Average daily gain	kg/d	1,20	0,17	15
Livestock rate	LU/ha	7	10	146

Table 2. Production characteristics of beef cattle farms.

Environmental assessment

Parameter	Unit	Mean	SD	CV%
Global warming	kg CO_2 eq/kg LWG	8,49	1,42	17
Air quality	kg SO_2 eq/kg LWG	0,05	0,02	33
Water quality	kg PO_4^{3-} eq/kg LWG	0,06	0,03	53
Energy consumption	MJ/kg LWG	29,18	9,58	33

Table 3. Carbon footprint (kg CO_2 eq/yr) of beef cattle farms .

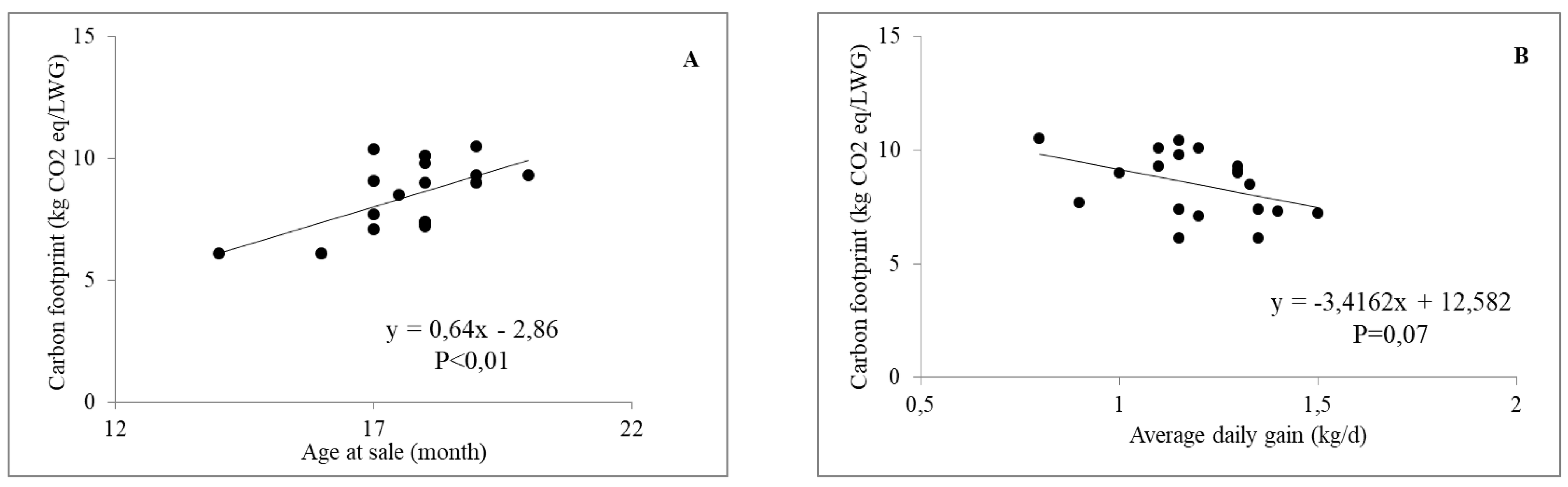


Figure 1. Linear regression between carbon footprint and age at sale (a) and average daily gain (b).

CONCLUSIONS

The relationship between carbon footprint and age of sale can be explained because feed efficiency decreases with age. Further analysis are required to find the most effective combination of different treatments that reduce GHG emissions.