



Critical evaluation of functional unit and co-products handling methods to assess the environmental impact of dual purpose cattle system: A case study in Costa Rica

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

Paulina Letelier, Mauricio Chacón and, Michel A. Wattiaux

OBJECTIVES

- (1) To quantify the contribution of milk and meat to human-edible protein (HEP) from cattle systems of Costa Rica;
- (2) To evaluate the effect of functional unit (FU) and co-product handling method on emission intensity ($\text{CO}_2\text{-eq} / \text{kg}$ of FU).

MATERIALS AND METHODS

Survey data

677 farms

Cattle System

Specialized
Beef
(SB)

Non-specialized
Toward Beef
(NSTB)

Non-
specialized
(NS)

Non-specialized
Toward Dairy
(NSTD)

Specialized
Dairy
(SD)

Income from
milk

0%

1-39%

40-59%

60-89%

90-100%

$\text{CO}_2\text{-eq}$

Costa Rica emissions factors per animal type to estimate enteric CH_4 emissions.

FU

(a) Milk with meat as a co-product and (b) HEP from milk and meat.

Co-product
allocation

(a) 100%-to-milk, (b) mass-basis, (c) biological-basis, and (d) system expansion.

Methodology
(major steps)

Survey
(input) data

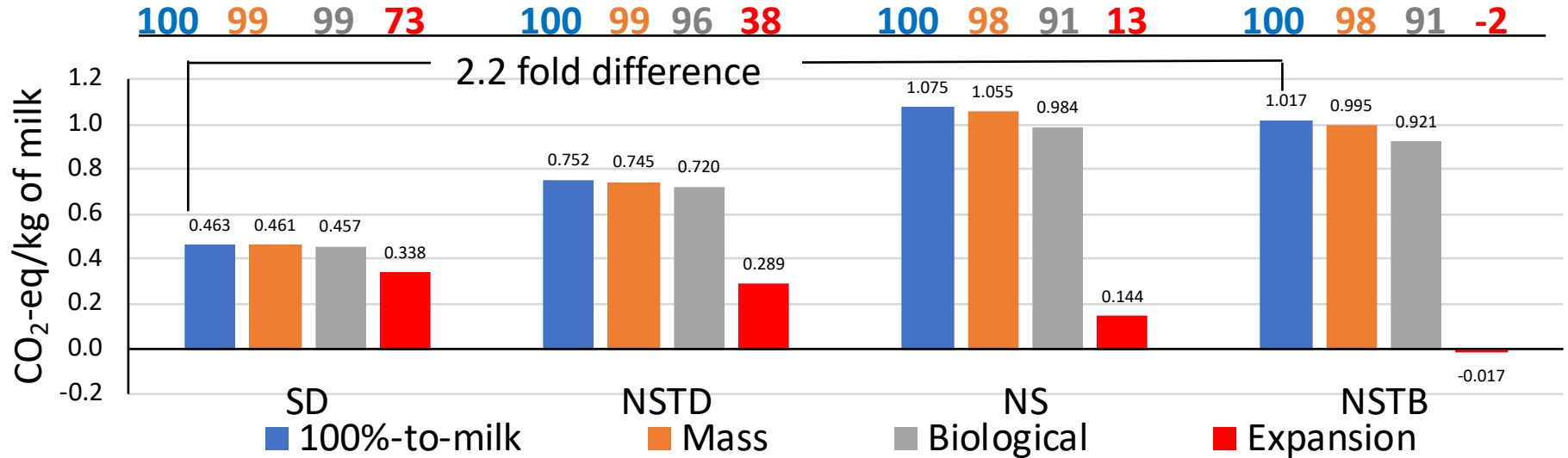
One
representative
animal

Annual
production of
milk and meat

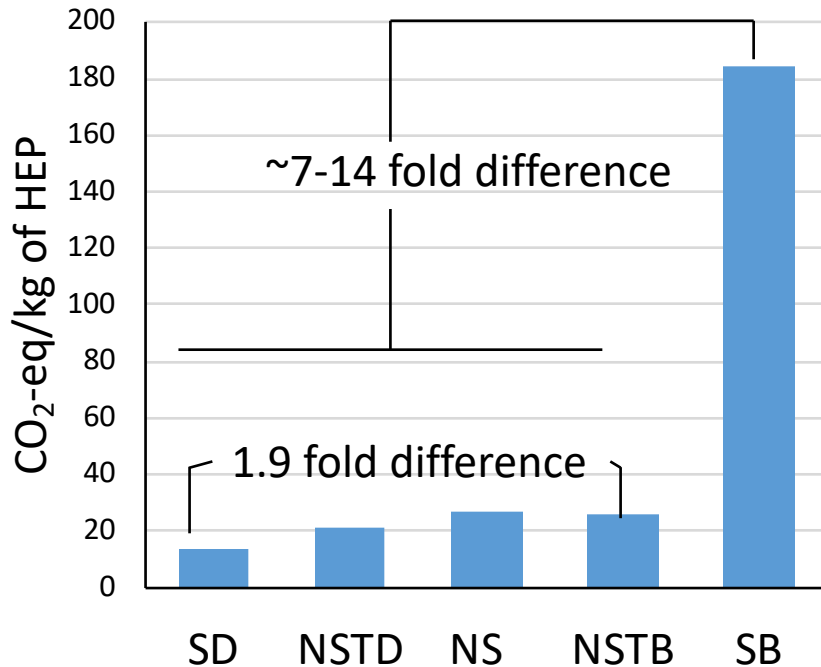
FU
(Milk and HEP)

RESULTS AND DISCUSSION

% of CO₂-eq allocated to milk



CONCLUSIONS



- **Milk** drives the production of HEP from dual purpose systems.
- The emission intensity increased by the same order of magnitude among systems whether the **FU** was milk or HEP.
- In this study, low meat productivity of SB (36.6 kg of meat) led to high emission intensity and high deduction of emissions from meat, which in turn led to unrealistically low emission from milk when using **system expansion**; raising question about the value of this allocation method for dual purpose systems of developing countries.