Blue water productivity of milk produced on six pasture-based farms in Southern Brazil

Authors: Engineer Alessandra Rech Grando, MSc. Sofia Helena Zanella Carra, Engineer Leandro Correia Ebert, Dr. Julio Cesar Pascale Palhares, Dr. Cleomar Reginatto, Dr. Vania Elisabete Schneider

- Introducing the first author

Engineer Alessandra Grando

Bachelor’s degree in Environmental Engineering (University of Passo Fundo, Brazil)

Study: Blue water productivity of milk produced on six pasture-based farms in Southern Brazil

Supervisors: Prof. Dr. Cleomar Reginatto and Engineer Leandro Ebert

• Introduction

- Dairy milk is one of the main products of Brazilian agribusiness.

- The State of Rio Grande do Sul, in southern Brazil, is the second largest milk producer in the country, with over 40,000 farmers
    - 90% of the dairy milk is produced in the pasture-based system (Emater, 2021) mainly on family farms.

- Brazil (2021): worst drought in 91 years.

- Water management in dairy production systems, on a farm scale, should be implemented in Brazil.

• Introduction

- Serafina Corrêa city: tradition in milk production.
- Project of Technical Management for Dairy Cattle started in 2019.
- Led by the rural extension service (Emater/RS-Ascar).
- App GT Leite, managed by Emater/RS-Ascar.

• Introduction

- The App GT Leite is used to support the technical management of dairy milk production in the city of Serafina Corrêa.

- Data collected:

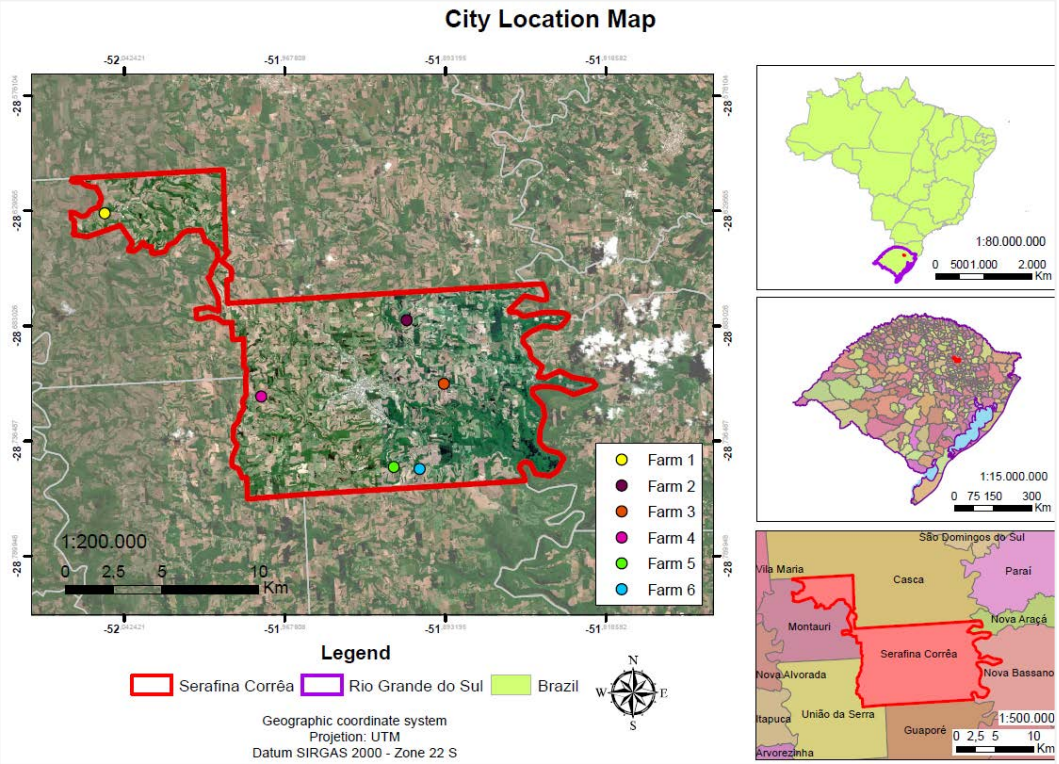
- Herd data (e.g. breed, live weight, lactating cows)
- Milk yield, % of fat and % of protein

- Objective

- The aim of the study was to evaluate the blue water productivity on pasture-based dairy farms located in Serafina Corrêa, Rio Grande do Sul, and propose best management practices.

• Methodology

- Criteria for farm selection (6 farms):
  - pasture based-farms;
  - technical support from the rural extension service (EMATER/RS-ASCAR).
- Data collection – questionnaire + App GT Leite.
- Study year: 2019 - technical support started in March 2019.



• Methodology

- Farms characterization:

✓ Dairy cattle stay in the grassland;

✓ Farm size: maximum 15 hectares;

✓ Herd size:

- annual average of 13 dairy cows, ranging from 10 to 21 cows month-1.

✓ Milk yield:

- 1st semester: average of 16.8 l head-1 day-1;
- 2nd semester: average of 20.5 l head-1 day-1 ;

✓ Dairy breed: Jersey and crossbreed (Jersey + Holstein);

✓ Milking: 2 times per day, mechanical system;

✓ Animal diet: pasture + maize silage + 0.8 – 1% of concentrate (the diet varies in summer and winter).

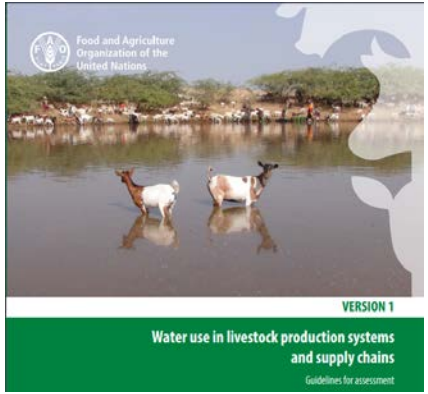
• Methodology

- Blue water productivity

$$BWP = \frac{Milk\ yield\ [kg\ FPCM]}{\text{Technical water [m3]}}$$

Technical water: drinking and cleaning

FPCM: Fat Protein Corrected Milk



FAO (2019)

- Calculation of pasture consumption

Dry matter consumption = (2% * live weight) + milk yield

Source: National Research Council (2001)

• Methodology

- Drinking water

Source: National Research Council (Nutrient Requirements of Dairy Cattle, 2001)

Lactating Cows
(0.9* l head-1 day-1)+(1.58* **DM consumption** head-1 dia-1)+(0.05* **sodium** g head-1 day-1)+(1.2* **minim. Temp**)+15.99

→ **Milk yield** [l head-1 day-1]

Stage	l head-1 day-1
Dry cows	51.0
Heifers	45.0
Calves	12.0

Source: Embrapa (2013)

- Cleaning water 0.02 m3 head-1 day-1 → *Lactating cows*

Source: State of Rio Grande do Sul Law n. (2017)

- Results

Milk yield (kg of corrected milk head-1 day-1)

Month	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Jan	11.5	20.1	22.1	16.5	10.0	19.0
Feb	11.1	15.4	22.6	16.5	9.9	17.8
Mar	11.8	22.0	20.3	17.7	11.6	17.9
Apr	12.4	17.5	19.6	13.9	10.5	16.8
Mai	14.3	24.4	17.4	14.2	13.6	22.3
Jun	15.6	26.2	16.6	14.1	15.5	25.2
Jul	14.1	25.3	22.1	20.4	17.0	25.3
Aug	12.6	22.4	23.2	18.1	16.7	25.6
Sept	17.0	21.9	23.2	16.2	18.1	26.9
Oct	17.0	24.5	23.3	22.0	16.1	25.2
Nov	13.6	22.9	24.3	19.1	12.3	21.8
Dec	16.0	23.2	26.1	19.8	17.6	26.8
Mean	13.9	22.2	21.7	17.4	14.1	22.6
SD	2.0	3.0	2.7	2.5	3.0	3.6
Max	17.0	26.2	26.1	22.0	18.1	26.9
Min	11.1	15.4	16.6	13.9	9.9	16.8
Coefficient of variation (%)	14.5	13.7	12.3	14.5	21.2	16.1

Technical assistance

- Results

Water consumption (m3 month-1)

Month	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Jan	35.4	57.7	50.5	45.0	47.8	97.7
Feb	33.9	64.6	44.8	40.3	44.9	88.3
Mar	34.4	56.3	49.1	39.5	45.4	88.2
Apr	34.8	60.8	49.1	39.4	47.7	86.1
Mai	35.3	72.3	41.0	41.0	47.7	80.8
Jun	33.2	68.6	42.4	40.2	45.0	78.9
Jul	31.6	65.8	38.5	36.9	43.4	88.5
Aug	31.3	68.6	40.4	34.7	42.7	95.3
Sept	27.0	70.9	47.0	38.8	42.8	83.2
Oct	28.8	74.2	47.8	38.1	47.3	94.8
Nov	29.3	54.2	49.3	31.6	47.2	63.9
Dec	32.6	56.1	48.3	37.9	48.6	67.5
Mean	32.3	64.2	45.7	38.6	45.9	84.5
SD	2.6	6.7	3.9	3.2	2.0	10.0
Coefficient of variation (%)	8.2	10.4	8.6	8.3	4.4	11.9

- Results

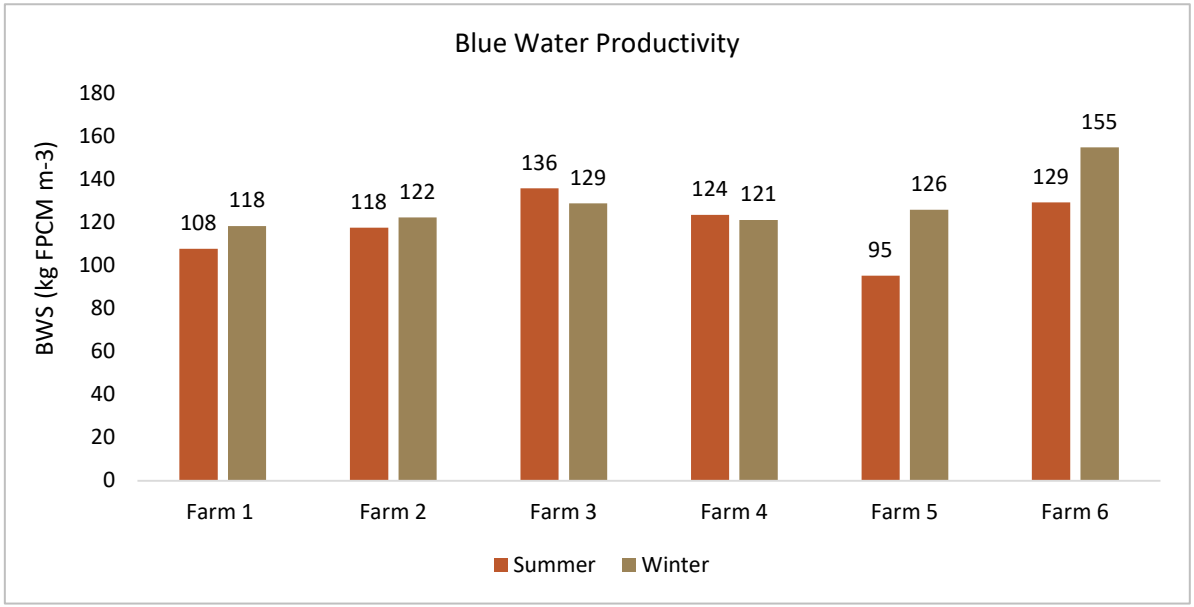
Blue Water Productivity (kg of FPCM m-3)

Month	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Jan	91.7	122.1	137.1	120.0	71.5	125.7
Feb	84.0	81.3	140.5	104.0	68.3	107.2
Mar	101.1	95.5	144.8	125.8	99.0	119.3
Apr	107.6	83.2	129.3	100.3	92.8	114.4
Mai	116.1	129.3	122.8	111.4	116.2	147.3
Jun	120.1	121.2	113.5	109.2	125.8	132.0
Jul	118.2	118.5	144.3	126.4	138.4	150.0
Aug	108.4	125.2	138.0	126.9	124.4	153.4
Sept	129.0	117.5	126.3	132.2	125.0	192.3
Oct	127.4	121.0	127.0	143.3	115.6	162.9
Nov	108.0	160.0	131.1	133.6	92.8	136.8
Dec	135.2	160.1	141.6	137.9	126.7	139.4
Mean	112.2	119.6	**133.0**	122.6	108.0	140.1
SD	14.6	23.8	9.2	13.1	21.8	22.4
Coefficient of variation (%)	13.0	19.9	6.9	10.7	20.2	16.0

Technical assistance

FPCM: Fat Protein Corrected Milk

- Results



Winter (more pasture and less maize silage) = higher milk yield; lower temperature
We did not identify the reasons why Farm 3 and Farm 4 presented higher BWP in summer

- # Results

Best practices proposed:

- Installation of water meter;
- Water pressurization of cleaning systems;
- Rainwater harvesting;
- Performe preventive maintenance of collection systems and water distribution;
- Protect springs and wells in order to preserve the water resoures.

• Conclusion

- Blue water productivity was influenced by the season and milk yield throughout the year. It suggests that if farmer have more control on these aspects, the indicator could be improved;

- Smallholder milk farms should be supported and encouraged to implement best practises that result in environmental benefits such as reduced water consumption and improved BWP.

- Acknowledgement

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Thank you!

Engineer Alessandra Grando
email: alessandrarechgrando@gmail.com