

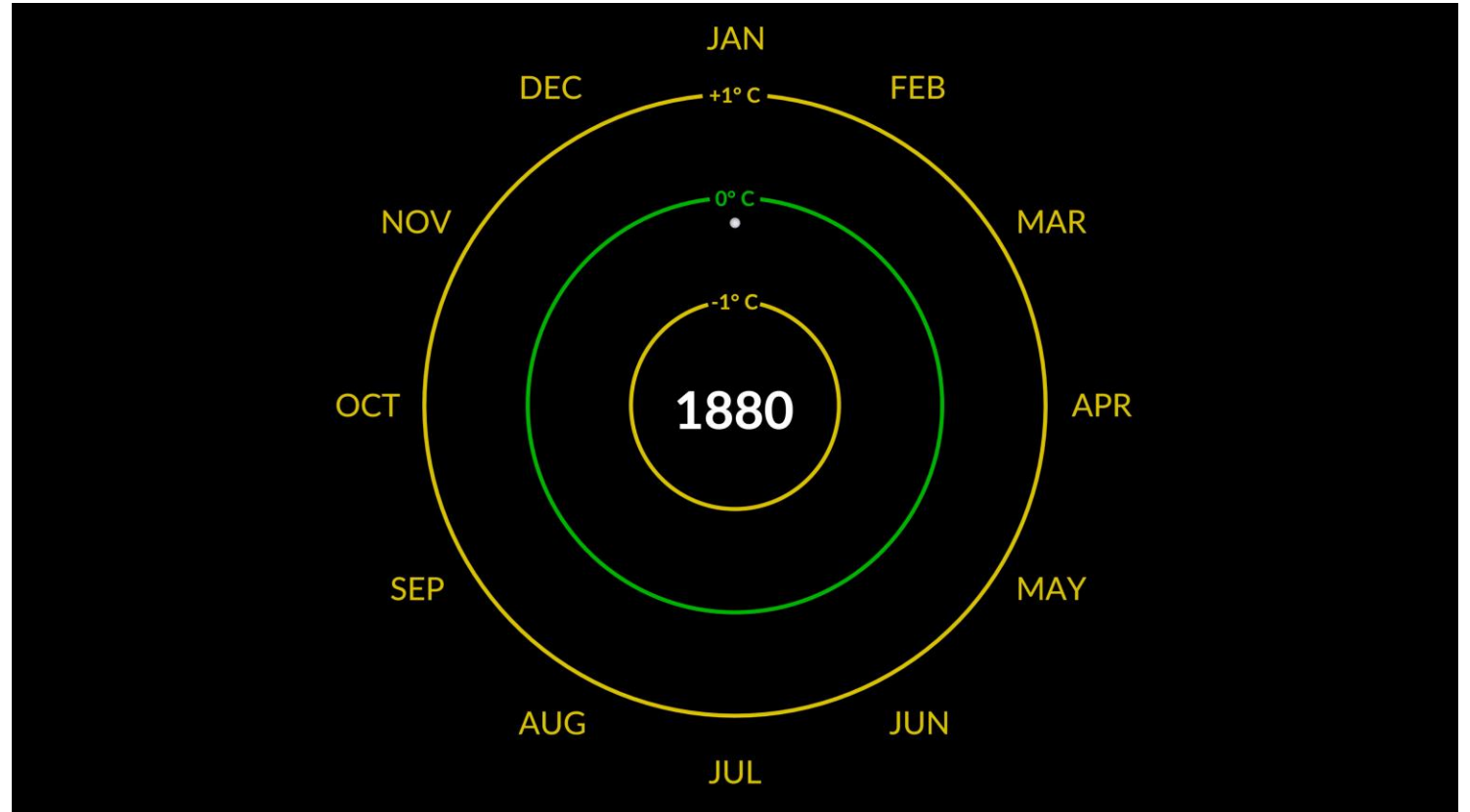
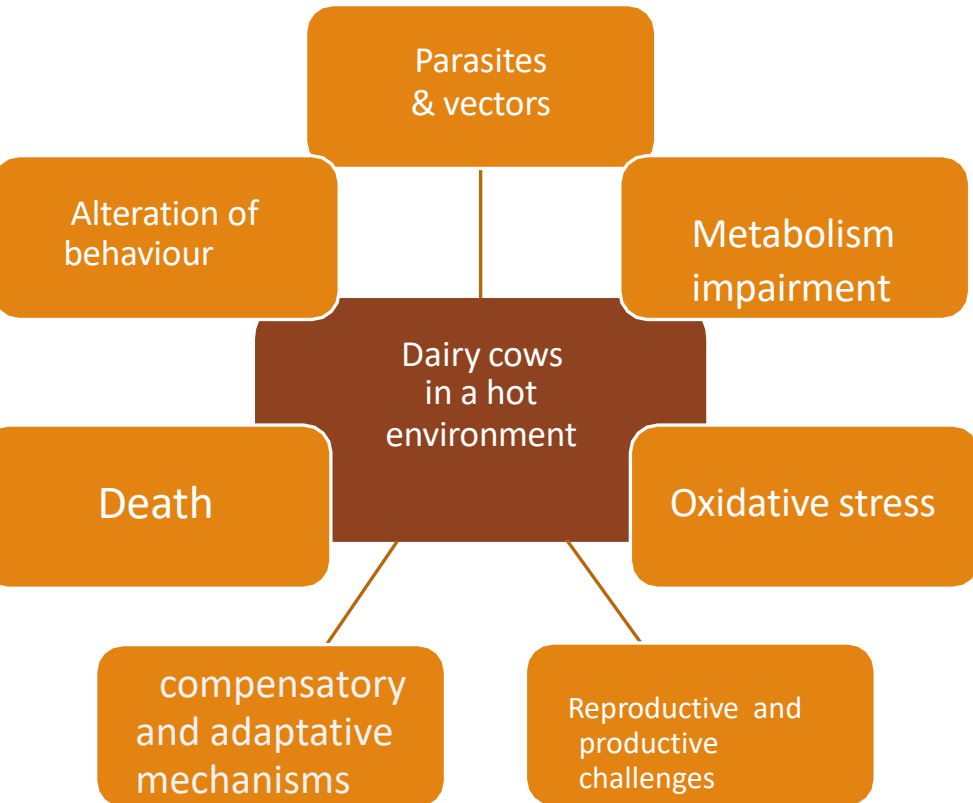


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# Preventing heat stress in dairy farm







Riccardo Negrini  
negrini.r@aia.it

# Global warming: more than a perception



# AIA: two levels integrated approaches

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 <b>OUTDOOR</b>	 <b>CLIMATE THI forecast</b>
	 <b>CLIMATE THI detection</b>
 <b>INDOOR</b>	 <b>MICROCLIMATE THI tracking</b>
	 <b>SUMMER to WINTER report</b>

# THI forecast

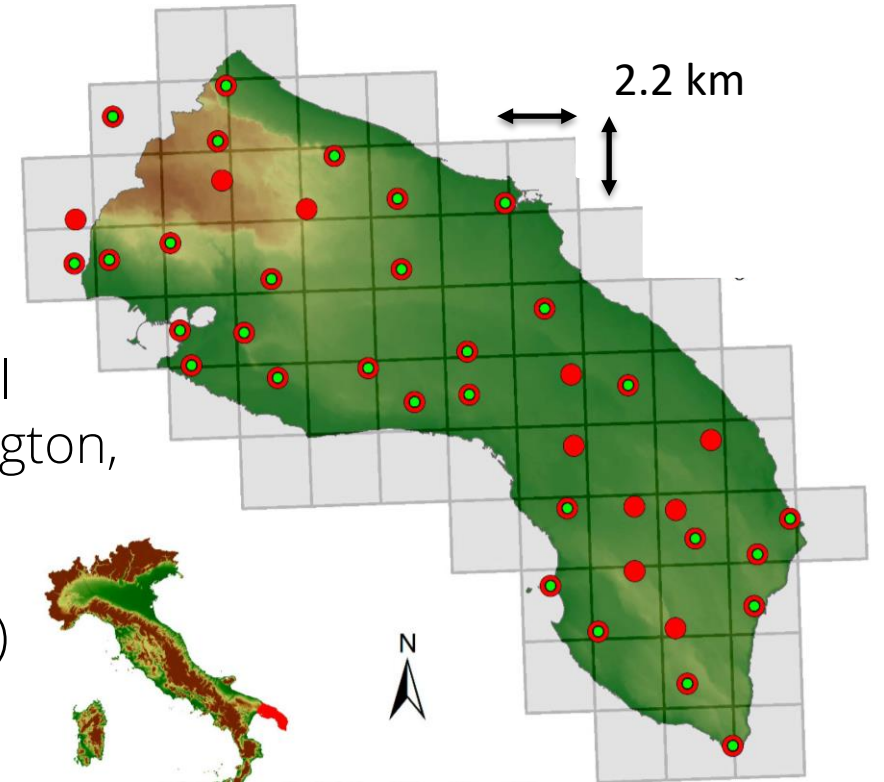
COSMO-IT forecasting model (data from Italian Airforce meteo service)

48h Tm and Hu forecast downloaded twice/day (6.00 AM and 6.00 PM)

Interpolation from grid nodes to exact farm GPS location

48h THI forecast following NRC. 1971. A Guide to Environmental Research on Animals. National Academies of Sciences, Washington, DC.

THI  $\left( \left( (1.8 * T + 32) - (0.55 - (0.55 * U/100)) * ((1.8 * T + 32) - 58) \right) \right)$

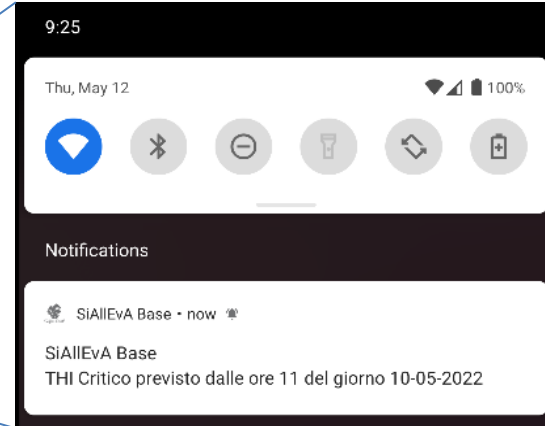


# from THI forecast to THI alert

Si@lleva free App



Mobile



push notification

- THI  $\leq$  70 ●
- $70 <$  THI  $\leq$  75 ●
- THI  $>$  75 ●

Data e ora	Temp (°C)	Umidità	THI	Indicator
<b>10/05/2022</b>				
12:00	20.5	58.8	66	●
13:00	22.7	77.9	70	●
14:00	24.3	85.6	75	●
<b>11/05/2022</b>				
12:00	27.1	94.0	80	● ⚠
13:00	28.1	92.7	81	● ⚠
14:00	28.9	93.1	81	● ⚠
15:00	30.4	92.1	85	● ⚠

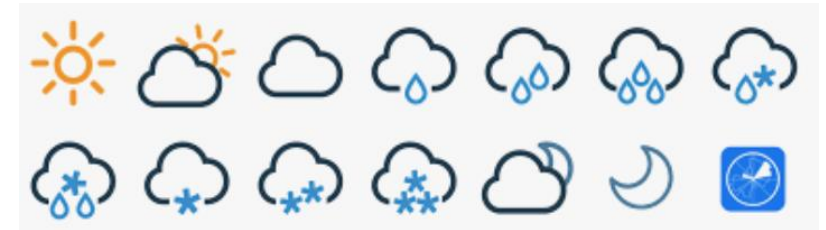
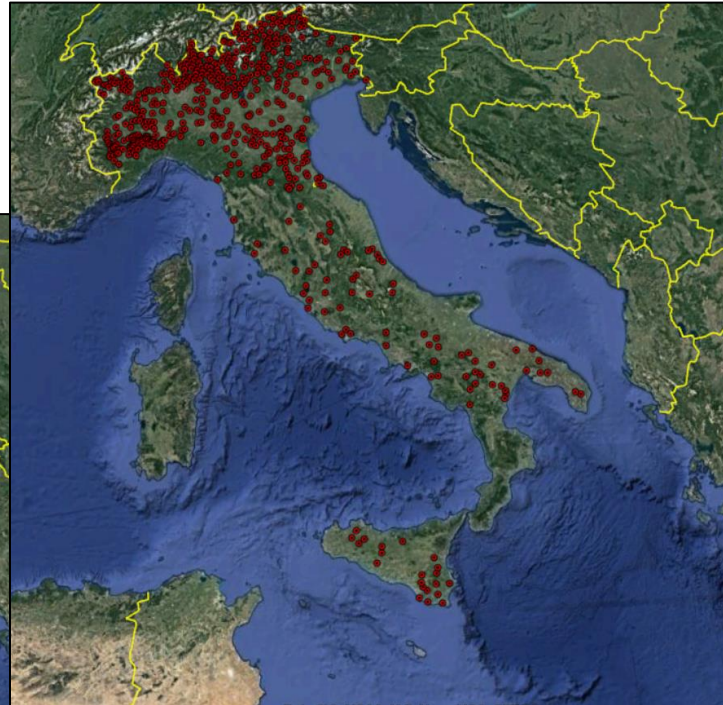
# THI recording from ground weather stations

Climate data from 695 ground weather stations

National/Regional (593)



Air Force (102)



$T_{Max}$

$T_{Min}$

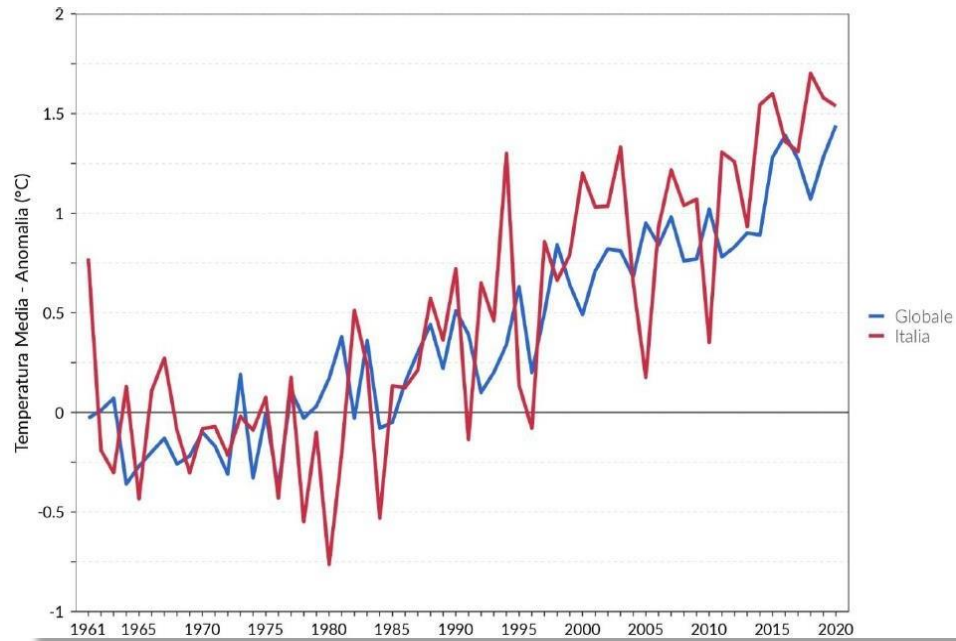
$Hu_{Max}$

$Hu_{Min}$

Rainfall

# THI recording from weather stations

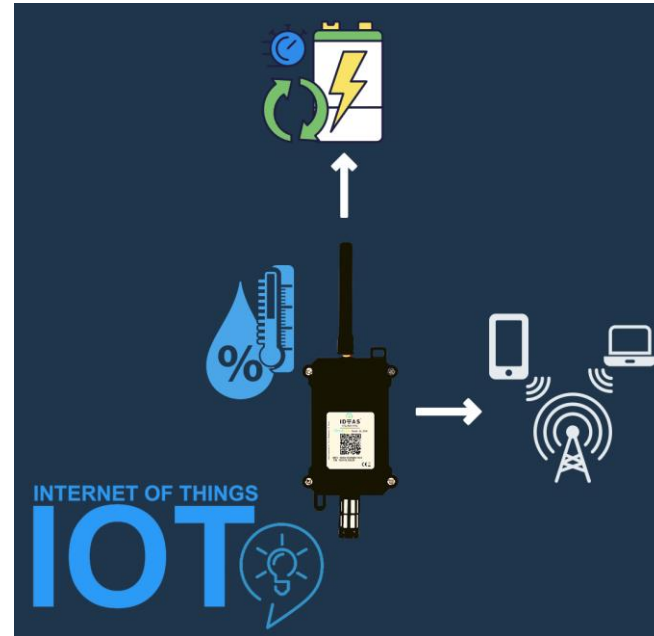
Creation of an open database with historical data (2017-today; more than 6 Million records up to now)



Predictive Modelization of THI

# In-barn THI tracking

1000 herds equipped with datalogger



- 3.6V battery powered (~4 years, maintenance free)
- Does not require an internet connection. communicates, at configured intervals, relative humidity and room temperature values to a remote IoT platform via its built-in NB-IoT wireless connection.
- Does not need to be configured (ready-to-use).
- Suitable for any environment (IP66 plastic box dust/water intrusion protection)
- Auto-reset feature to re-establish connection
- Device powered by





# In-barn THI tracking

Visualizzazione dati Centraline del Lazio, progetto LEO



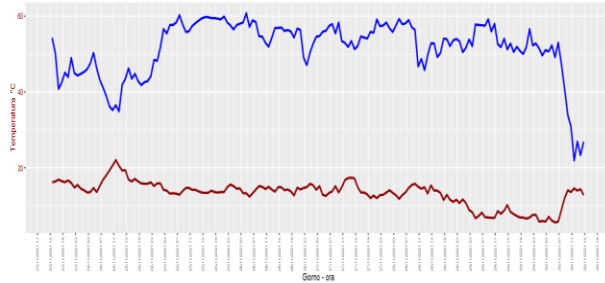
Codice AUA e codice IMEI centralina:

5700508-411056757180

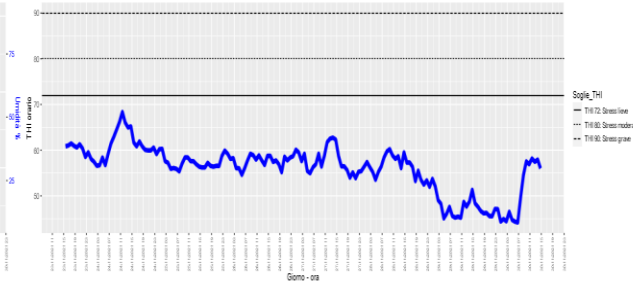
Giorno

23/11/2021 a 30/11/2021

Azienda sita nel comune di PONTNIA (LATINA)  
Sensore cod. IMEI 411056757180 installato in zona Riposo Esposizione OVEST



Azienda sita nel comune di PONTNIA (LATINA)  
Sensore cod. IMEI 411056757180 installato in zona Riposo Esposizione OVEST



Data dei rilevamenti	Numero letture orarie	Media temperature (°C)	Minimo temperature (°C)	Massimo temperature (°C)	Deviazione Standard temperature (°C)	Media umidità (%)	Minimo umidità (%)	Massimo umidità (%)	Deviazione Standard umidità (%)	Media THI	Minimo THI	Massimo THI	Deviazione Standard THI
23/11/2021	8	16.20	14.80	16.90	0.60	69.50	61.20	81.40	6.70	60.60	58.50	61.50	0.90
24/11/2021	24	16.70	13.50	22.10	2.40	64.00	52.30	75.50	5.90	61.20	56.60	66.40	3.30
25/11/2021	24	14.00	12.90	15.90	0.80	85.60	72.30	90.40	5.00	57.30	55.40	60.30	1.30
26/11/2021	24	14.30	12.40	15.60	0.80	84.20	73.60	91.20	3.70	57.70	54.60	59.90	1.40
27/11/2021	24	14.40	12.00	17.40	1.70	81.70	70.60	88.70	4.20	57.80	53.90	62.70	2.70
28/11/2021	24	13.50	11.00	15.80	1.40	81.10	68.60	88.90	6.00	56.40	52.50	60.20	2.20
29/11/2021	24	8.10	6.60	11.70	1.50	80.70	75.00	88.80	4.40	47.70	45.10	53.70	2.40
30/11/2021	16	9.60	5.60	14.60	3.80	82.10	32.90	79.50	17.80	50.60	44.20	58.20	6.00

- Data recorded quarterly
- Rest Area, Milking Waiting Parlour area
- Cooling/ventilation systems optimization
- Microclimate monitoring
- Animal Welfare
- Temperature /Humidity/THI report daily, weekly and monthly

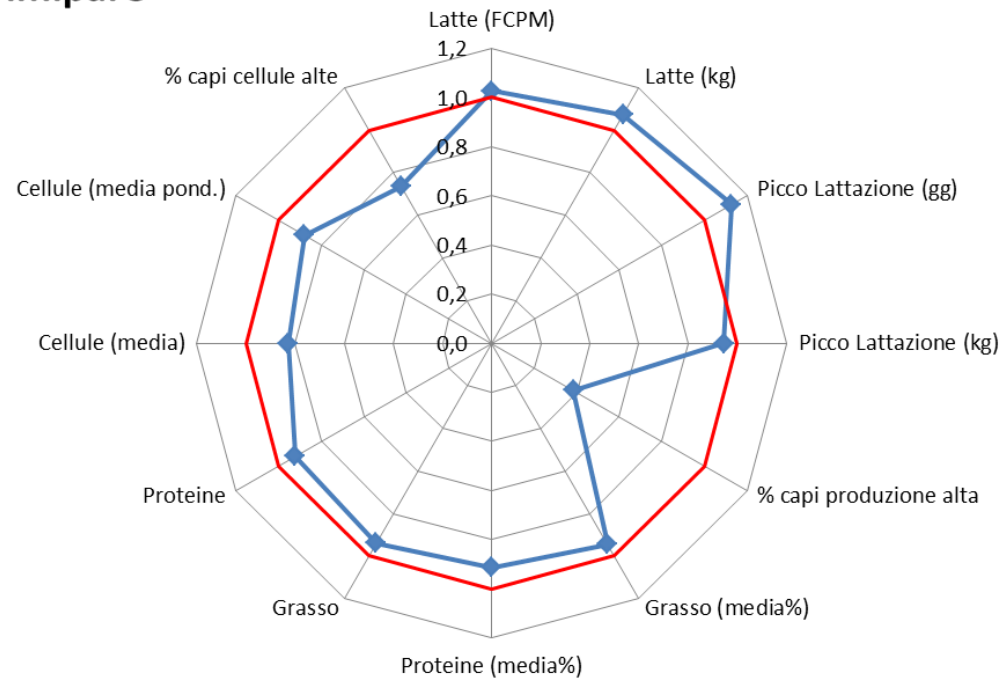
# Yearly SUMMER:WINTER report

- Compare winter and summer average performances (WINTER: Jan-Feb-Mar; SUMMER: Jul-Aug-Sep)
  - Winter Performance as reference
  - Parameters considered: Milk, fat, protein, lactation peak, cells and reproduction
  - S:W Ratio: dimensionless
- 
- Report issued annually
  - Compares each farm to its “relative group” (sorted by region and production level)
  - Compares each farm to its data in previous 4 years

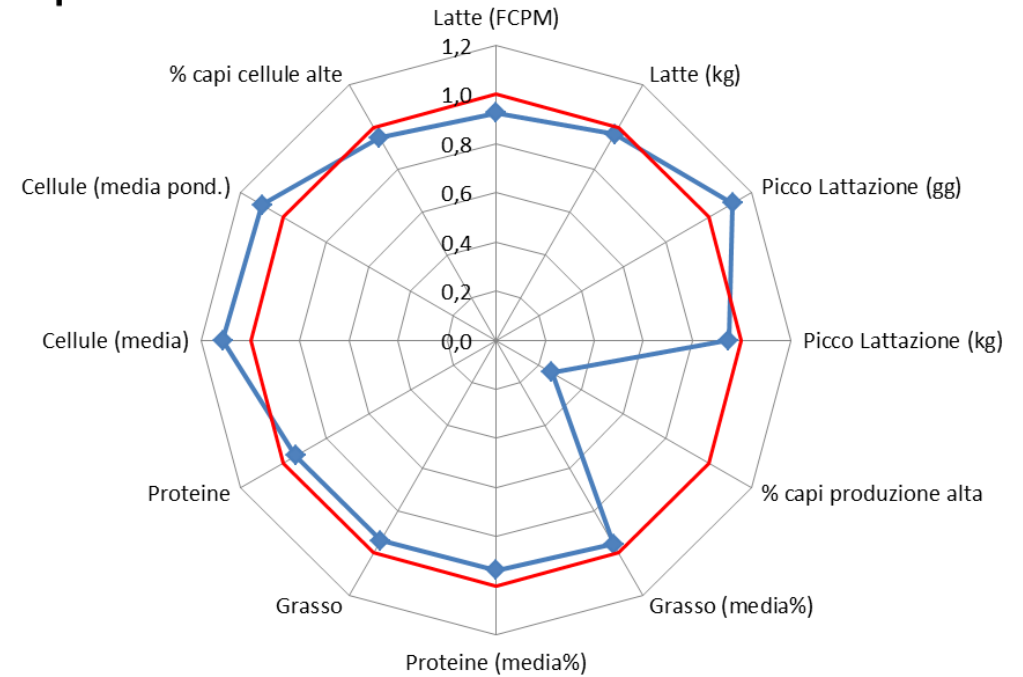
*Flamenbaum.I and E. Ezra (2007). "The Summer to Winter performance ratio" as a tool for evaluating heat stress relief efficiency of dairy herds" J. Dairy Sci. Vol. 90, Suppl: abstract 753.*

# Yearly SUMMER:WINTER net

## Primipare

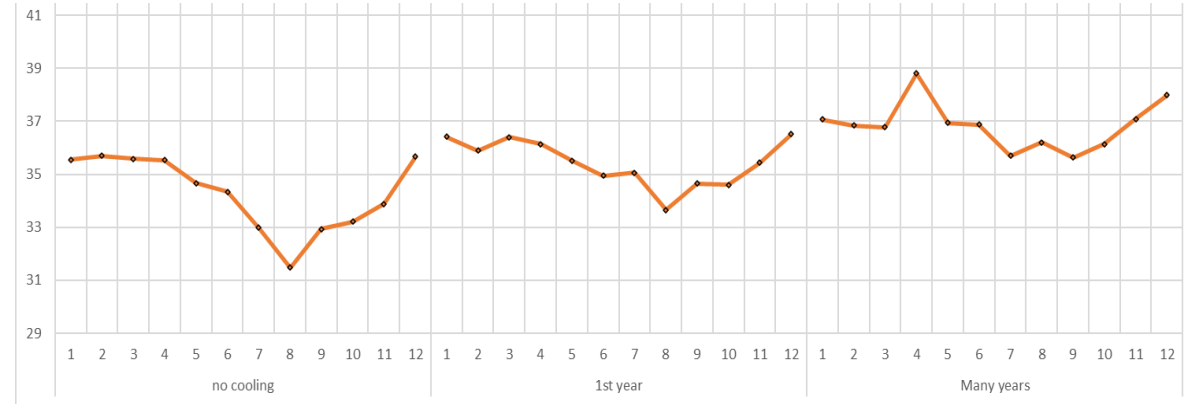
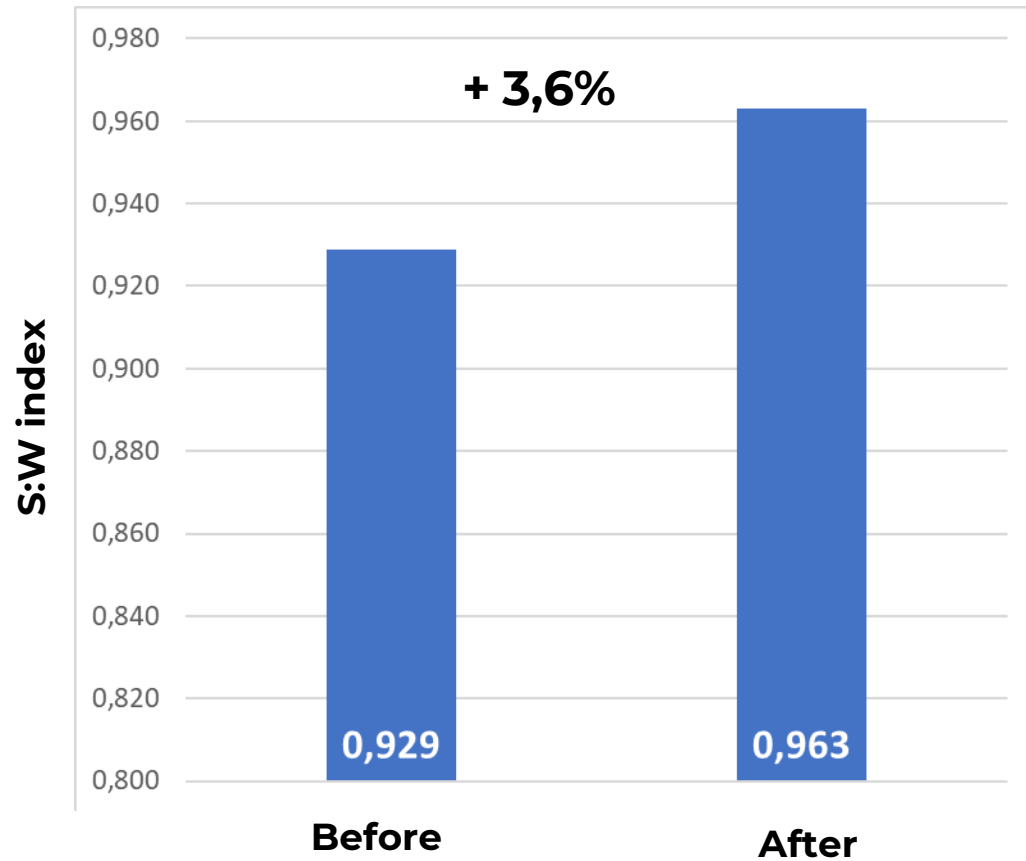


## Pluripare

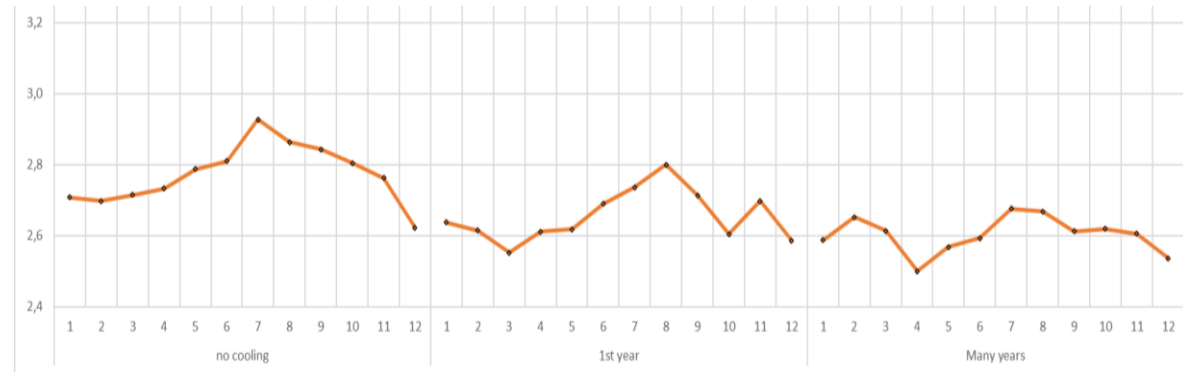


# It seems working

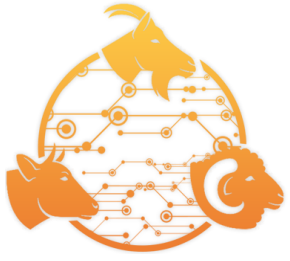
## Average improvement of 99 FARMS adopting the Heat Management Strategy



*FPCM milk yield production*

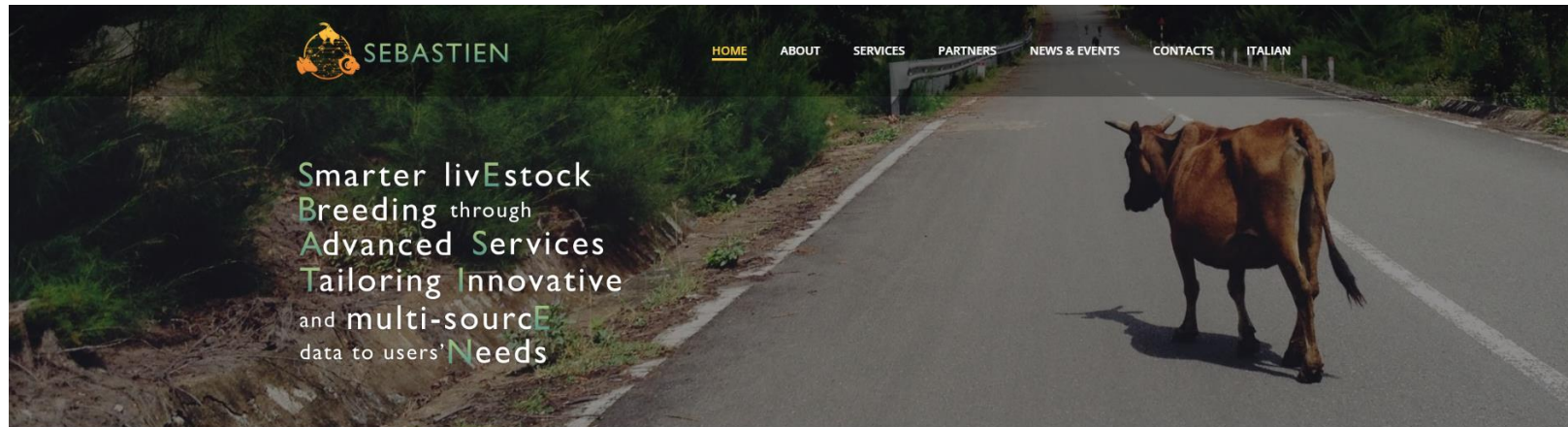


*Somatic cell linear score*



# SEBASTIEN

The main goal of the **project SEBASTIEN** is to deliver a **Decision Support System (DSS)** for a more efficient and (economically and environmentally) **sustainable management**, and consequent valuing, of the livestock sector in Italy and in particular cattle, sheep and goat breeding.



[www.sebastien-project.eu/](http://www.sebastien-project.eu/)

## The Project

SEBASTIEN wishes to implement large-scale ICT-





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Sperimentale  
Umbria e Marche



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DI PALERMO



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TUSCIA

Dafne Dipartimento di Scienze  
Agrarie e Forestali



bluarancio

# Thanks for being here

[www.leo-italy.eu](http://www.leo-italy.eu)



Livestock Environment Opendata

La zootecnia diventa digitale



FEASR  
Fondo Europeo Agricolo per lo  
Sviluppo Rurale  
"l'Europa investe nelle zone rurali"

Progetto finanziato nell'ambito  
della Sottomisura 16.2 - PSRN 2014/2020



Autorità di gestione:  
Direzione Generale dello Sviluppo Rurale  
Ministero delle politiche agricole alimentari e forestali

mipaaf

ministero delle politiche  
agricole alimentari e forestali