

ICAR 2023

TOLEDO **SPAIN**
22nd to 26th May 2023



Livestock
Genetics
from
Spain

Breeding for resilience: transitioning diverse livestock farming systems into the future



SWEDISH UNIVERSITY
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SCIENCES

Farm-to-Table Science:

Dairy Data Mining for Future Resilience

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ICAR 2023 Toledo

SESSION 5.1: PLF TECHNOLOGY DEVELOPMENT AND DATA ACCESSIBILITY

SLU infrastructure for cattle data: Gigacow

- Collect deep, diverse data from dairy farms
- Unify and store for use by researchers and farmers
- Enable new connections of genotype, phenotype, and environment
- Accelerate new dairy science studies
- Provide testbed for new PLF data integration

Gigacow: Current organisation



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Tomas Klingström
Researcher/
Coordinator



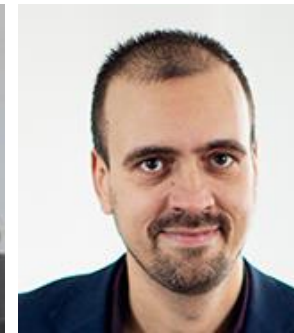
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Researcher/
Programmer



D.J. de Koning
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Ivan Clegg
Database developer



Jonas Västibacken
Consultant



Huge thanks to Freddy Fikse, Karl-Johan Petersson, Natalie von der Lehr, Hans Persson, all our farmers and collaborators at SLU, Växa and NAV

Gigacow: Structure

- Connected dairy farms
 - DelPro (++) management system
 - Daily script transfers data to SLU
 - Simulates farmer access
- Gigacow server
 - Pseudonymizes identities
 - Unifies data format
 - Transfers to storage
- External data sources
 - SNP genotypes from NAV
 - Växa Kokontrollen
- Data storage
 - Raw data accessible by SQL query
 - R package available for SQL access

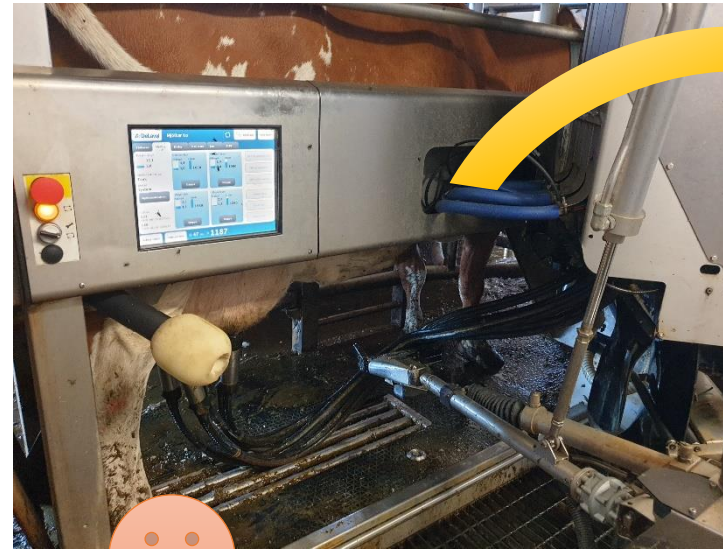
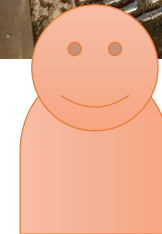
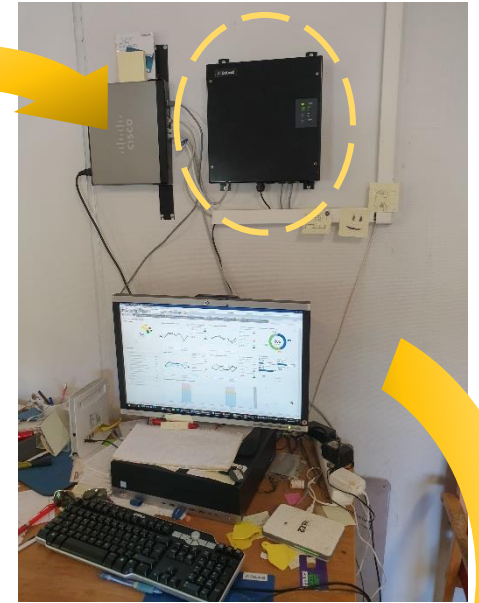
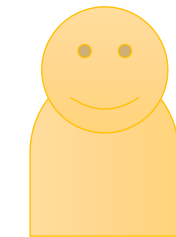


Photo: Tomas Klingström



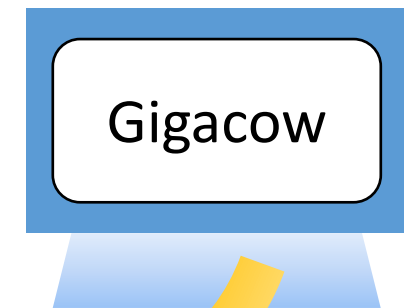
Farmers



Researchers



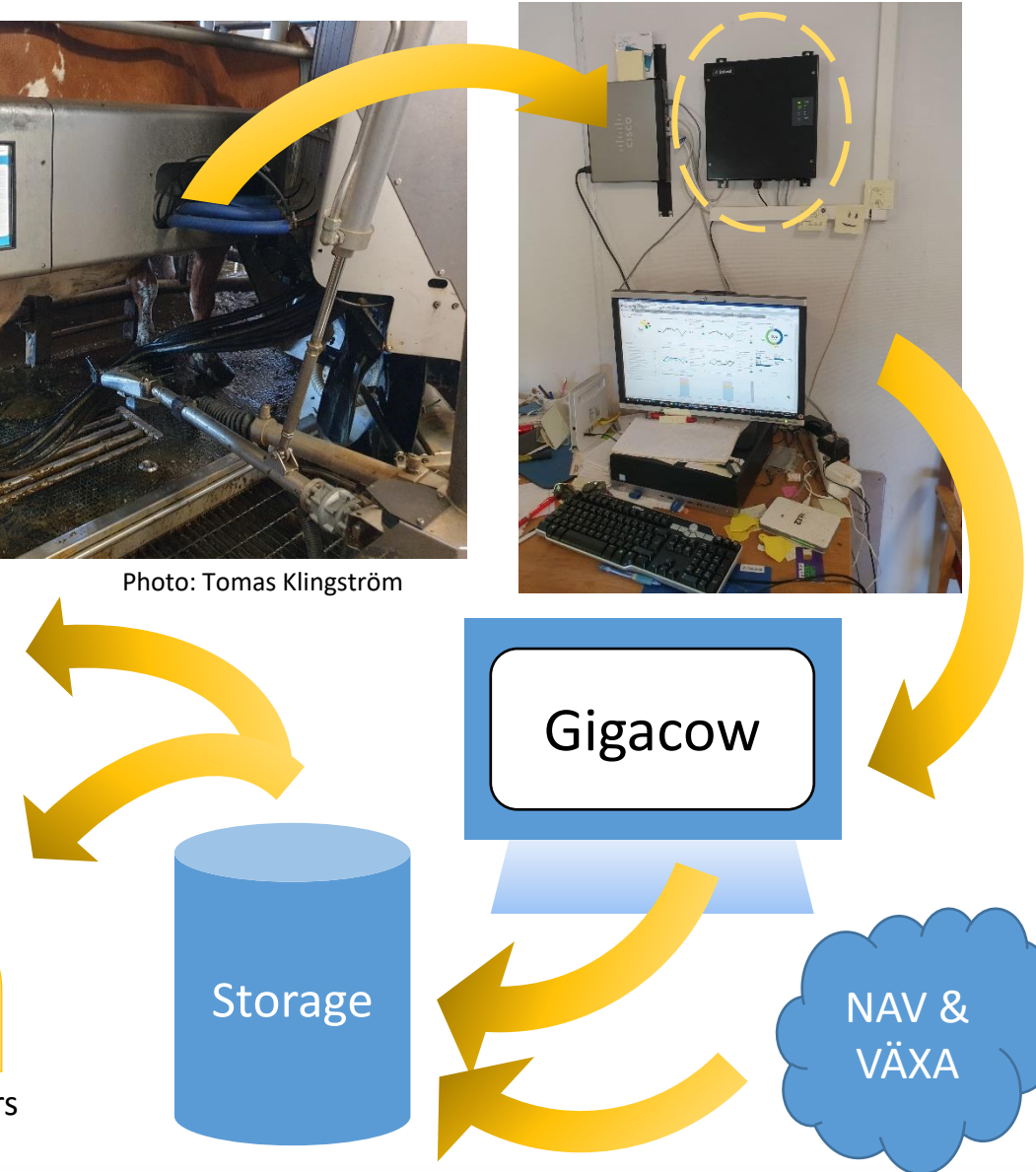
Storage



Gigacow

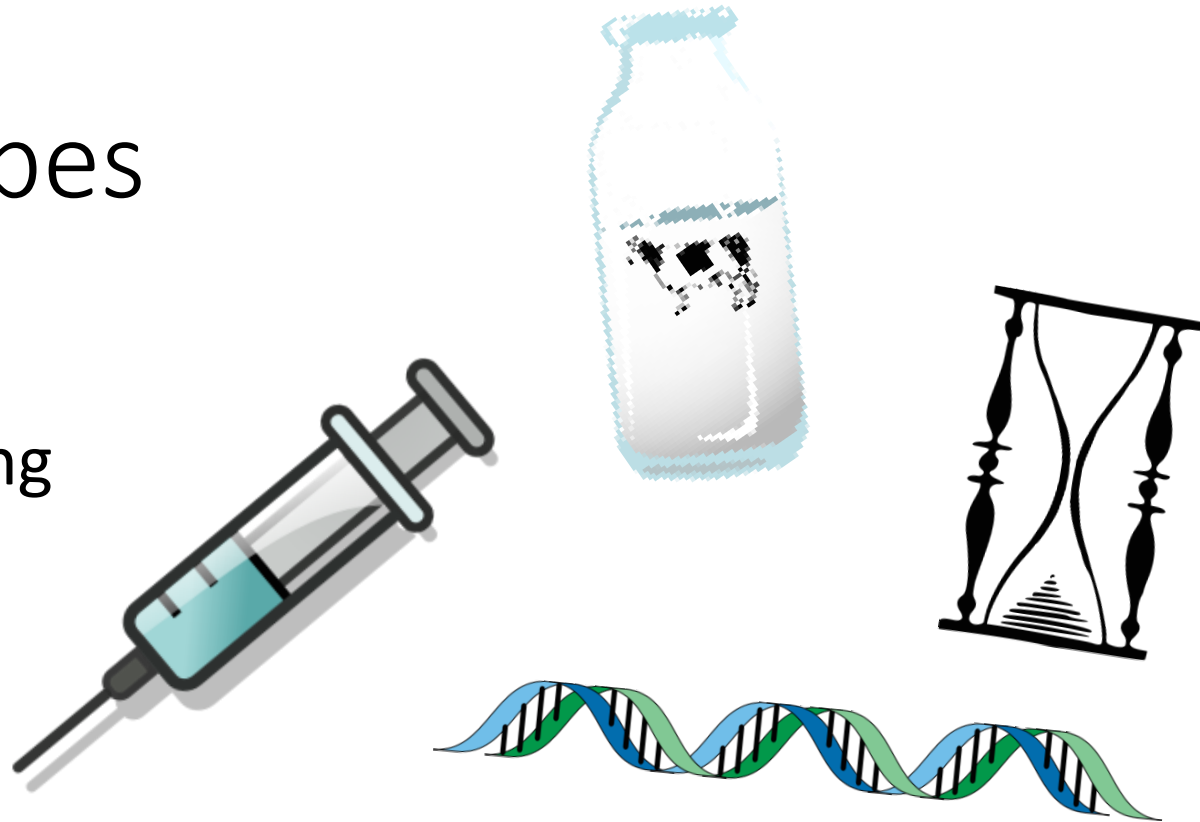


NAV &
VÄXA



Gigacow: Data Types

- Milking records
- Health & life events, culling
- Feed regimen
- SNP genotype
- Gate traffic
- (working on barn temperature, movement, behaviour ...)



Gigacow: Challenges

- Cow ID: surprisingly tricky!
- Farm uniqueness
 - Specific adjustments required
 - Varying records: health on paper/DelPro? Feed system separate? ...
- Weak data sharing support in FMS
 - Standards would help!
 - Open APIs needed!
 - Data access -> new PLF systems -> more FMS utility -> more data ☹

tklingstrom.github.io/gigacow_exampladata

The Gigacow example data website displays the following content:

Activity data

DeLaval activity sensors are facing serious competition from other providers such as SenseHub and Växa Control (Nedap). Växa recently switched from being a distributor of SenseHub to selling "Växa Control" which is provided by the sensor manufacturer Nedap. SenseHub and Nedap are both recognised as highly reliable for heat detection and more advanced subscriptions can also include health monitoring, feeding behaviour and even position tracking. Currently DeLaval activity sensors are the only ones available in Gigacow.

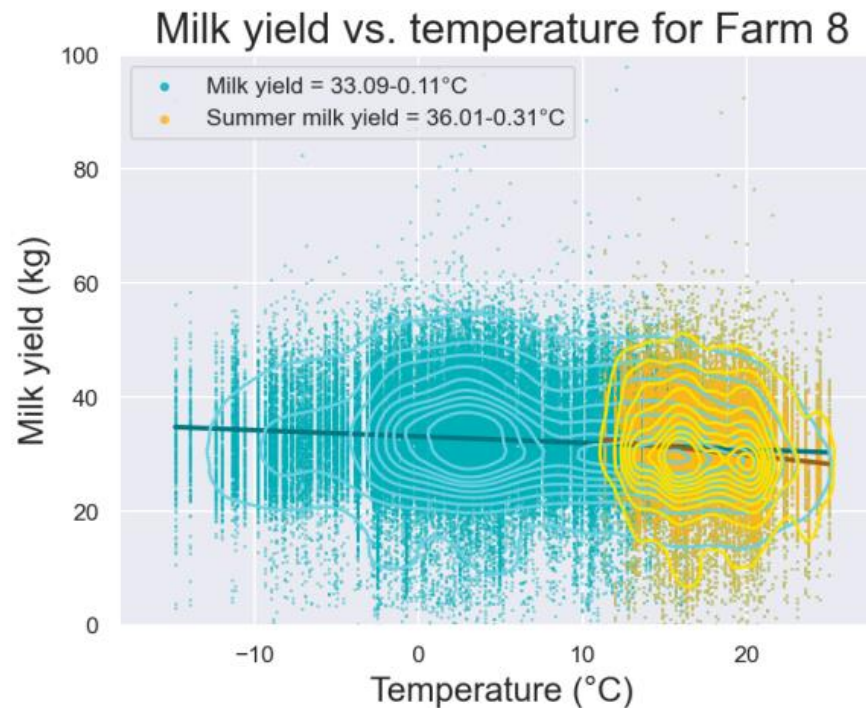
```
## # A tibble: 8 × 3
##   FarmName_Pseudo nrActivity nrAnimals
##   <chr>           <int>    <int>
## 1 169e580a         27401     355
## 2 ab18b151        25658     161
## 3 752efd72        74725     487
## 4 a624fb9a       128945     276
## 5 ad0a39f5       135299     485
## 6 f454e660       38036     232
## 7 540275a1       1008      168
## 8 a756bc39        505        1
```

Activity_Id	FarmName_Pseudo	SE_Number	AnimalNumber	Gigacow_Cow_Id	SourceFileDateTime	AverageActivityLast24Hou
428952	752efd72	SE-a624fb9a-1408	5900	943	2023-04-20 00:00:00	
429019	752efd72	SE-a624fb9a-	1359	13417	2023-04-20 00:00:00	

Mining Gigacow for Resilience Research

- Interpolate national weather data for mean air temp
- Associate air temp per farm and daily milk yields per cow
- Found summer milk yields decreased an average $0.31 \text{ L}/^{\circ}\text{C}$
- Can further explore genetics of cows in study

Minjia Zhou and Robert Ginlund
Student project: The impact of weather factors on the productivity of dairy cows



Lena-Mari Tamminen



Martin Johnsson

Figure 44: Linear regression for farm 8



Thank you for your attention!