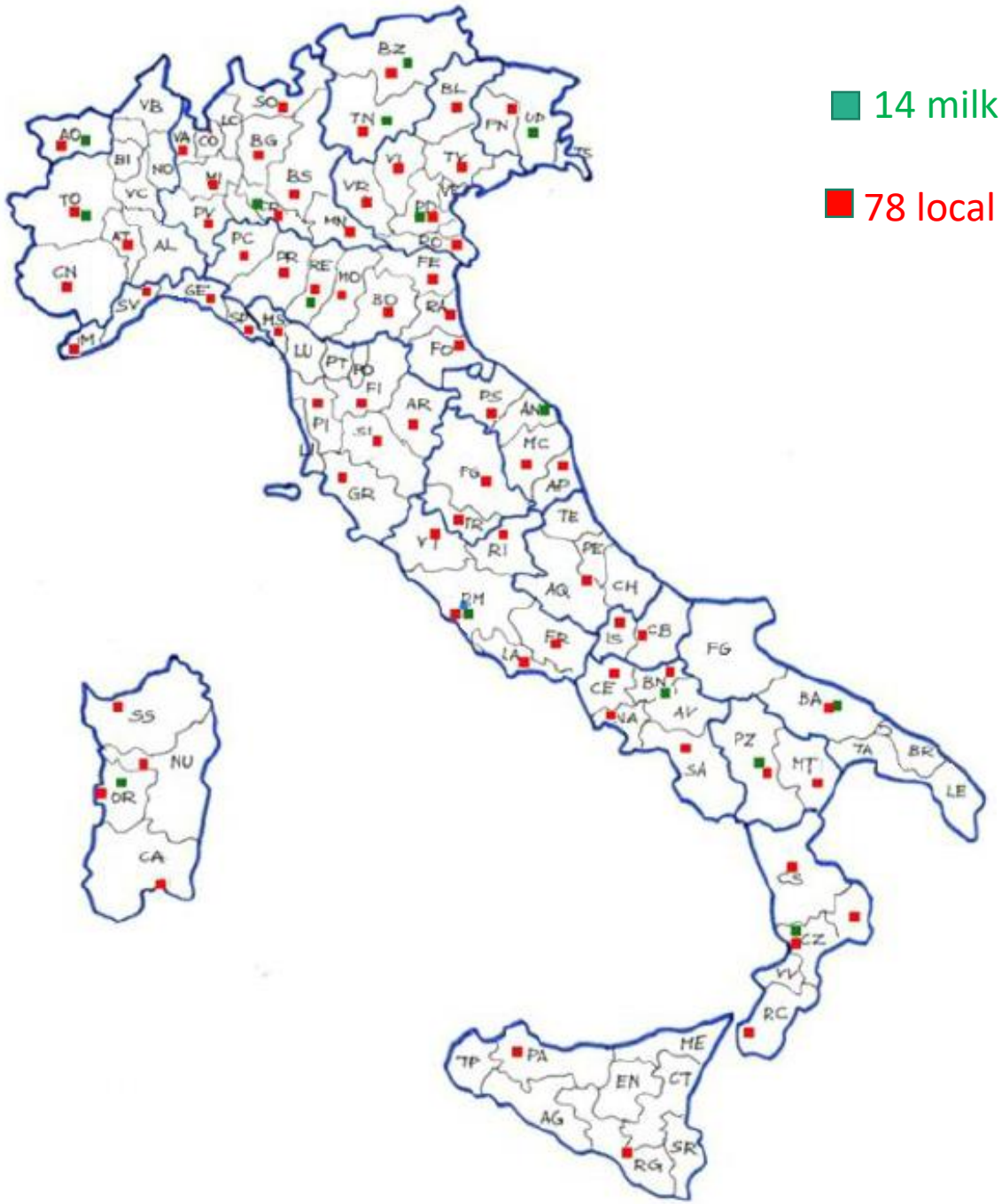
How complex is to calculate daily yields?
The Italian situation

Mauro Fioretti

R&D Office, A.I.A.

Numbers

- Recorded dairy cows : **1351614**
- Recorded herds : **15495**
- Average herd size: **87.2** heads/herd



- 14 milk analysis laboratories
- 78 local offices (performance recording)

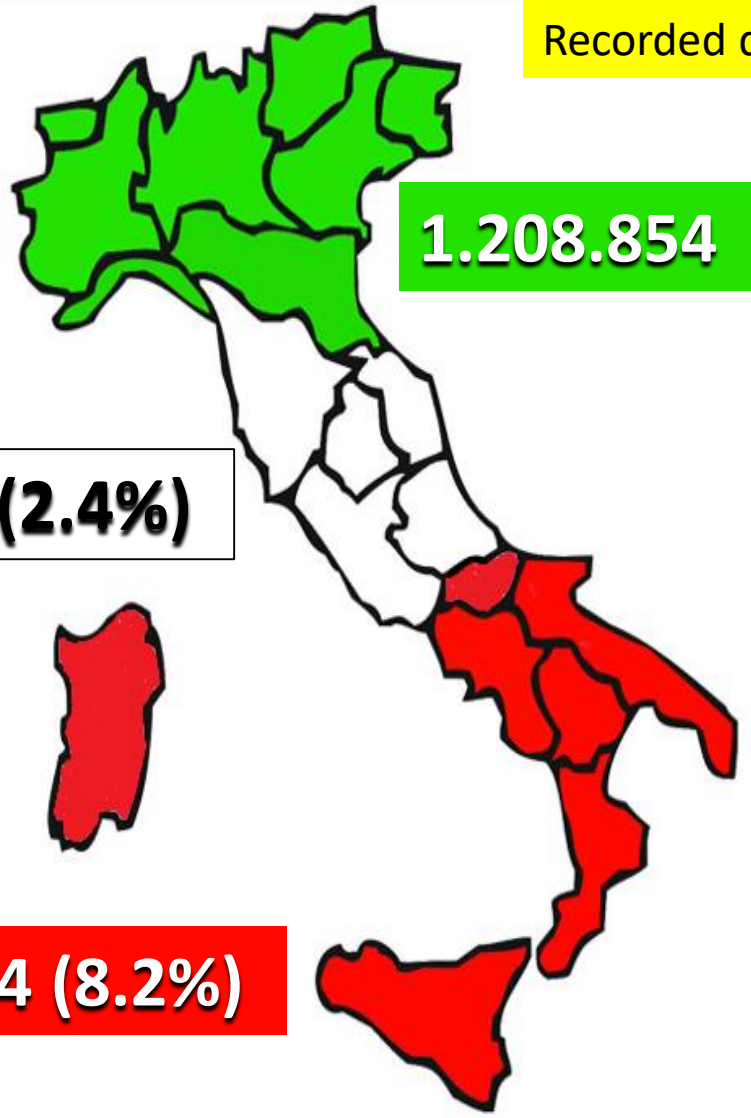
Some figures

Recorded dairy cows

1.208.854 (89.4%)

32.976 (2.4%)

109.784 (8.2%)

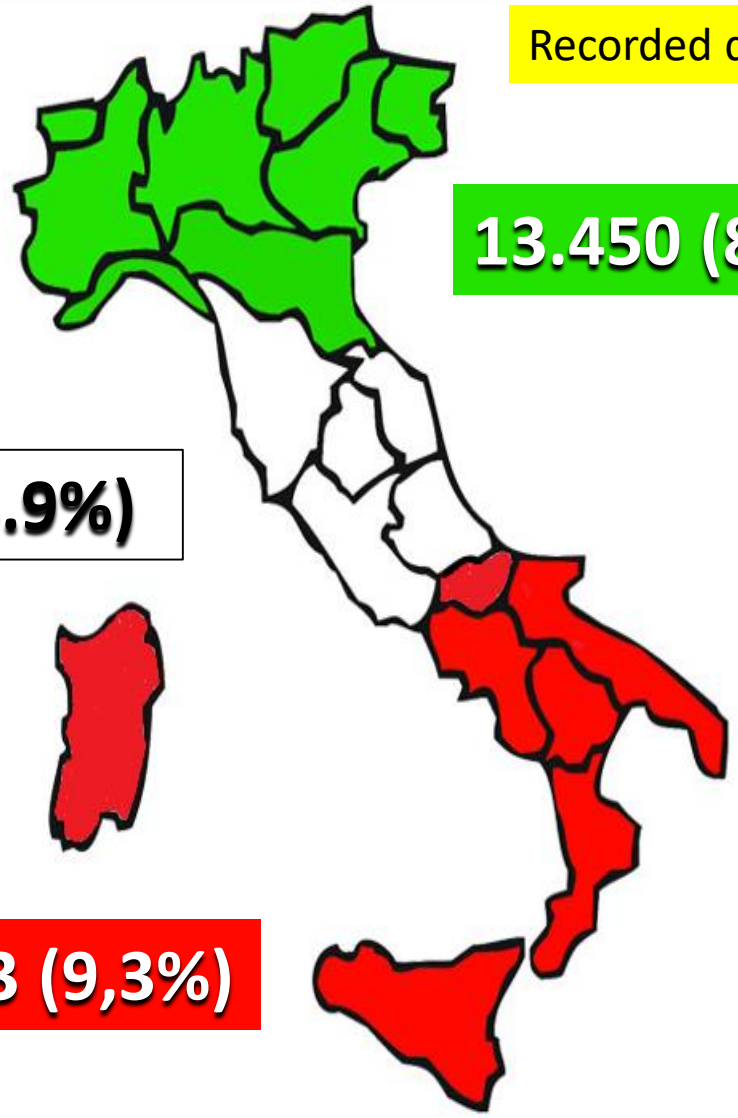


Recorded dairy farms

13.450 (86.8%)

602 (3.9%)

1.443 (9,3%)



Type of recording	Frequency (Weeks)		
	4	5	
A	0.2	0	0.2
AT	24	69	93
ATJ	1.8	2.4	4.2
AMS	0	2.6	2.6
	26	74	

Type of recording

WHO: PERFORMANCE RECORDING IS PERFORMED BY AN OFFICIAL TECHNICIAN («A» method)

- **A(4,5)** = **a**ll milkings in 24 hours recorded
  - Sample in only one milking, alternated

- **AT(4,5)** = only one milking in 24 hours recorded, the other one is estimated by coefficients (Liu)
  - Alternated
  - Sample in the recorded milking

- **ATJ(4,5)** = in case of electronic systems where all milkings are saved in a file; only one milking recorded, the other one is collected directly by production's file => **NO ESTIMATION** (*)
  - Sample in the recorded milking

(*) In case of missing identification of the cow in the previous milking (e.g. broken podometer), coefficients are applied

Sample collection

- No proportional sampling in type A (avoid complex procedures)
- Only one sample is taken and analysed (AM/PM)
- Vials type:
  - Barcode generally
  - No barcode : only one province with 1.79% of total recorded heads
- Sampling is always performed by official technician
- Sample is analysed by accreditated labs
- Results are merged with cow yield by barcode and inputted in central database

Methods to calculate daily yields

A4, A5

24 hours milk yield = sum of all recorded milking in 24 hours

- Morning + Evening
- Morning + Afternoon + Evening

Only 1 AM/PM sample

Sample composition is attributed to the whole 24 h yield

Methods to calculate daily yields

AT4, AT5

Only one milking recorded

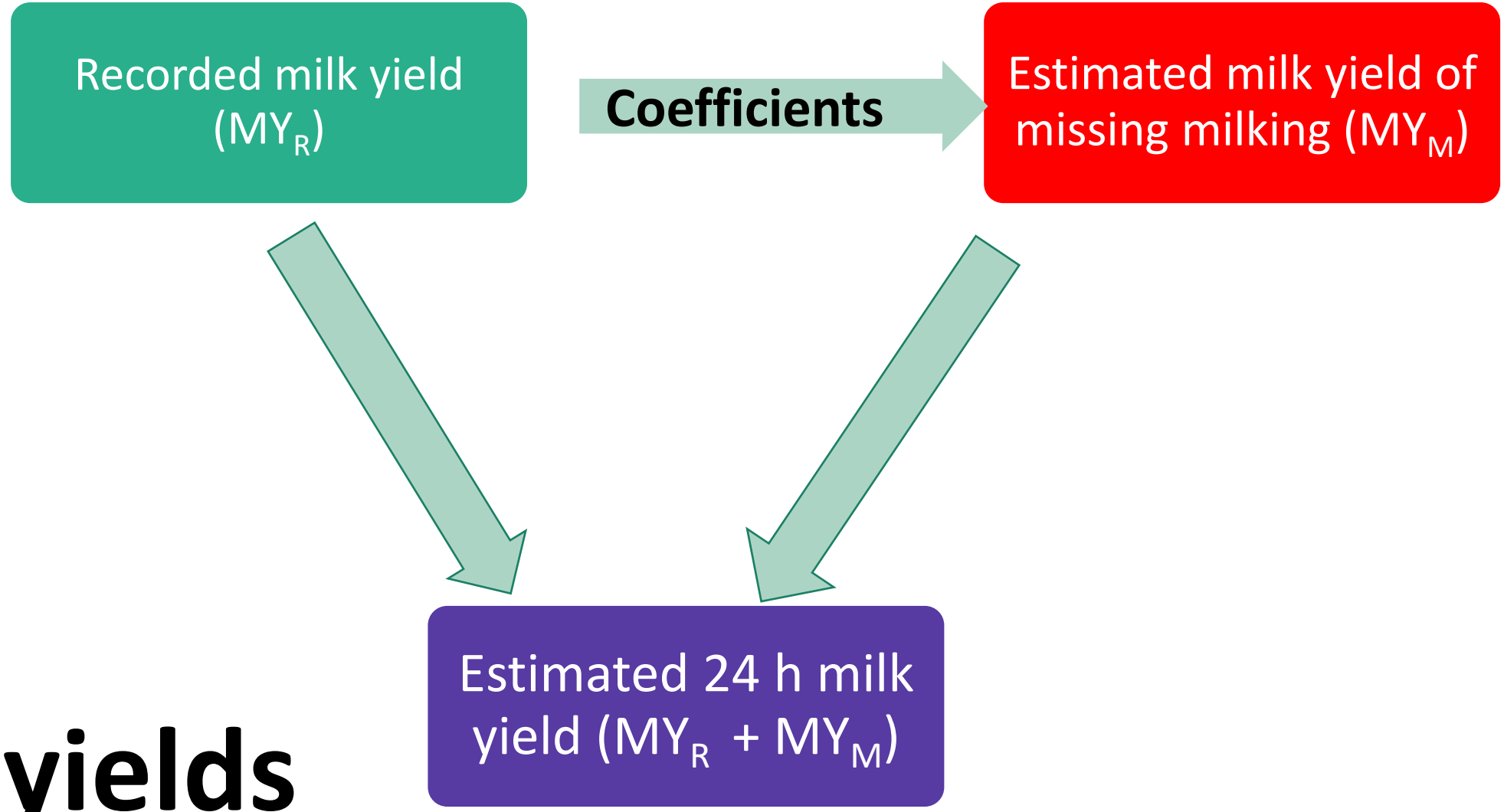
Alternate (AM/PM) milking + sample

Milk, fat and protein yields in the missing milking are estimated through multiplicative coefficients (ICAR Method: Liu)

Coefficients depend on

- Time distance from previous milking
- Milking time (morning or evening)
- Parity (primiparous; pluriparous)
- Month of milking (0,1,2,…)

24 hours yields' estimation (AT) - Flow



Milk yields

Step 1

Recorded fat (protein) percent (%R)

Coefficients

Fat (prot) kg yield of recorded milking (KgYr)

Fat (prot) kg yield of missing milking (KgY_m)

Sum

Estimated 24 h fat (prot) yield (KgY_R + KgY_M)

Step 2

$$100 * \frac{\text{Estimated 24 h fat (prot) yield } (KgY_R + KgY_M)}{\text{Estimated 24 h milk yield } (MY_R + MY_M)} = \text{Estimated 24 h fat (prot) percent}$$

Fat & protein %

AMS

- Recording using AMS in 2.6% of total recorded farms (around 400 farms)
- One sample (sampler)
- Performance recording length: at least 12 Hours (starting time: sampler insertion, end time = sampler extraction) in order to have enough time to sample all the cows in the farm.
- Alternance (AM/PM)
- The day in which sampler is exctracted is the performance recording date

AMS

- All yields recorded for a cow within 48 hours back from the end time of test are recorded together with their milking starting times.

- Daily milk yield is calculated as

½ * (sum of all recorded yields in 48 hours)

- Yields are taken from AMS software
- Fat and protein % are imputed to the whole daily yield

Main issues – A4, A5

Fat and protein content

One sample only (AM/PM)

Fat and protein content from a single milking are imputed to the whole 24 h yield

Main issues – AT4, AT5

This method allows to pay only one visit to the farm to be recorded, so it is economically more affordable

Issues about the accuracy of estimated yields

Main issues – AT4, AT5

Check in real situation – milk

Farms with electronic milk meter (ATJ)

- Retrieved 2 years of single milkings (times – yields) (AM/PM)
- Estimation of daily yields (Liu) using AM or PM milkings
- Differences between AM/PM estimated and real 24 h yields

Main issues – AT4, AT5

Differences ESTIMATED (Liu) – REAL (Milk Meter software) yield					
	Total milkings	Mean	Std Dev	Min	Max
AM	25.838	0.32	2.24	-23.91	19.05
PM	25.950	-0.40	2.43	-22.79	28.26

	Average REAL 24 h milk yield, Kg	Average ESTIMATED 24 h milk yield, Kg	Average % difference
AM	35.00	35.32	+0.85 %
PM	34.96	34.56	-1.02 %

- Overestimation for AM milkings
- Underestimation from PM milkings

Main issues – AMS

24 h milk yield calculation system

12 hrs enough?

Inputs for consider new calculations method with protocol changes (Pavel)