29th Members’ Meeting of the Club of Bologna

Agricultural Mechanization and Sustainability

10-11 November 2019
Hannover, Germany

FORAGE DISTRIBUTION AND TMR EVOLUTION

Andrea Ugatti – andreaugatti@faresin.com / Jacopo Ferlito – j.ferlito@itphonotics.com
Founded in 1973 by brothers Sante and Guido, Faresin Industries is today an industrial group specialized on the design, construction and marketing of mixer wagons and telescopic handlers in over 70 countries. The headquarter is based in Breganze, in the North-East of Italy. After 50 years of knowledge the Faresin family have clear vision of the sector evolution.
WORLD MILK PRODUCTION

Milk yield per dairy cow (kg/yr)

0-900 kg 901-1.800 kg 1.801-2.700 kg 2.701-3.600 kg 3.601->4.500 kg

Source: IFCN 2017
AVG FARM SIZE

WW AVG FARM SIZE
3,1 cows

WW AVG MILK DAILY PROD. IN DAIRY FARM
19 L

NORTH AMERICA
191 cows

LATIN AMERICA
14 cows

AFRICA
5 cows

SOUTH ASIA
2 cows

OCEANIA
255 cows

Source: IFCN 2017
FORAGE DISTRIBUTOR TIMELINE

FROM EVER

FIRST TMR TRIALS

1930

1960

1980

1990

2000

2010

2020
MIXER - WORLDWIDE MARKET

Manufacturers (main)

- Australia & New Zeland: 3%
- North America: 16%
- South America: 5%
- Asia: 7%
- Europa: 69%

100 manufactures

Market volume

- SPMW: 5%
- PMW: 94%
- AFS + SMW: 1%
- 36,000 unit

Utilization area

- Meat: 30%
- Milk: 70%
TMR – MEANING AND WHY

Meaning

TMR (total mixed ration) is a livestock feeding technique that permit of “weighing and blending all feedstuffs into a complete ration which provides adequate nourishment to meet the animal needs”. The forages and feedstuff contents can come by different origins but all be mainly expressed as:

Advantages

TMR (total mixed ration) give many benefits:
• providing all the nutrients at the same time
• providing a constant supply over time;
• optimisation of ingredients use and digestion
• reduction of feeding time and overall feeding costs
• increase of milk daily production or meat rate conversion
• Increase of animal welfare

Challenges

• uniform distribution of nutritional factors;
• preserving the physical function of feed;
• limit the selective capacity of animals;
• …
Major needs:
- Increase output
- Lowering costs
- Process optimization

and:
- Human error reduction
- Quick ration preparation
- Homogeneity and standardised ration index
- Costant quality ration, day by day
- Animal welfare and longevity
- …
PROPOSED SOLUTIONS

VS

MAIN CUSTOMERS NEEDS

**AFS**
Automated Feed System
- less human work
- output increase
- high starting costs

**SMS**
Stationary Mixer System
- less human work
- process optimization
- low TMR quality

**SPMW & PMW**
Self Propelled Mixer Wagon & Pulled Mixer Wagon
- lowest TMR application costs
- output increase
- best optimization
MIXER WAGON - FUNCTIONALITIES

- Milling cutter channel
- Mixing tub
- Augers
- Slasher
- Milling cutter
- Unloading belt
- Unloading door
MIXER WAGON – MAIN BENEFITS

- Milk daily production increase
- Ingredients optimisation
- Animal welfare
- Feeding cost reduction
TRACEABILITY IN FEEDING MANAGEMENT

FIELD
- Genetics
- Irrigation
- Pest control
- Fertilizers
- Mechanisation lines
- Precision farming
- Etc.

FEEDING
- Approximative raw material knowledge
- Low feed mill & on-farm fodder knowledge
- Inhomogeneous TMR
- Etc.

ANIMALS
- Genetics
- Output quantity & quality measure
- Output traceability
- Welfare and on barn
- Life duration
- Biosensing technologies
- Biosecurity protocols
- Etc.

PRECISION FARMING

PRECISION FEEDING

PRECISION FARMING & TRACEABILITY
There are 4 different TMR ration definitions:
- the recipe (“on paper”) ration;
- on tub-charged ration;
- the unloaded-on trough ration;
- the daily feed ration.

In all 4 cases there is no measurement control.

Loss of efficiency in the feeding cost which represents from 40 to 65% of the entire cost.
EFFICIENCY LOSSES

EFFICIENCY LOSSES AREA

- TMR Recipe
  - Ingredients load errors (w/height) 3-5%
  - Ingredients load order errors 5-10%
  - Fibers cut/shred (length) 5-10%
  - TMR Inhomogeneous mix 15-20%

- Cow shed variability
  - Ingredients selection on manger by animals 15-20%

- TMR ingested
  - TMR not digested 15-20%

- TMR digested
TMR: WHICH TARGETS AND WHY

- Improvement of feed efficiency
- Reduction of feeding errors & nutrients losses
- Optimization of self-produced feeds
- Efficiency loss reduction
FEEDING: FARESIN APPROACH

LOADING
• Weighing
• Loading sequence
• Receipt matching
• Precise cutting control

MIXING
• Cutting
• Homogeneous ingredients mixture
• Preserved fiber digestibility

UNLOADING
• Homogeneous distribution
• Precise weight distribution

FULLY STANDARDISED FEEDING PROCESS
FARESIN TECHNOLOGY

TECHNOLOGY

- **Milling cutter** combine with slasher: modulable fiber length
- **Mixing tub** shape and **augers** layout, site and **cutters** number

INTELLIGENCE

- Fully integrated feed control system
  - Weighing scale
  - Loading halt
  - poliSPEC\textsuperscript{NIR} precision feeding system
- Farmatics

4.0
Open technology vs each data platform
TMR - PRECISION FEEDING APPROACH
«Homogeneity index»

Homogeneity = quality of the process vs

How much can feed costs affect the farm’s economy?

✓ Feeds costs
✓ Quality of the feeding process
✓ Feeds quality and their digestibility

Feed intake or nutrients digestion?

![Graph showing the relationship between Prod. latte (L/capod) and SS ingerita digerita (kg/capod). The graph includes a regression line with an R² value of 0.5661 and p < 0.01.]
TMR - PRECISION FEEDING APPROACH

«if you can’t measure, you can’t improve it»

Lord Kelvin
PAYBACK

Based on our field experiences:
- NIR payback time was: 8-14 month.

More:
- Avg 2-4 month cow milk lifetime increase;
- Feeding cost reduction by waste reduction;
- ...

29th Members’ Meeting of the Club of Bologna
Hannover, November 10-11, 2019
PRECISION FEEDING 4.0

- RECIPE APPLICATION
- FEEDSTUFF CONTENT MEASURE & VERIFY; HOMOGENEITY INDEX
- MANGER LEFTOVERS MEASURE
- OPTIMIZED FEED CONVERSION RATE
- SHEET UNDIGESTED INGREDIENTS MEASURE
- RECIPE ADAPTATION TO OPTIMIZE FEEDSTUFF USE, FEEDING COSTS & ANIMALS OUTPUT
- OPTIMIZED RECIPE / OPTIMIZED FEEDSTUFF USE
- FARESIN
- poliSPEC NIR

29th Members’ Meeting of the Club of Bologna
Hannover, November 10-11, 2019
MEET OUR VISION, VISIT US
HALL 25
STAND A13


• Lely (2016): These 5 Livestock Wearables are the Futur., C. N. America Luddites, Beware; http://modernfarmer.com/2016/01/wearable-devices-livestock/.


• Piccioli-Cappelli F., Calegari F., Calamari L., Bani P., Minuti A. (2019); Application of a NIR device for precision feeding in dairy farms: effect on metabolic conditions and milk production; Pages 754-765 | Received 23 May 2018; https://doi.org/10.1080/1828051X.2019.1570829