

Forage distribution and TMR evolution

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1. Introduction

Faresin Industries, based in Breganze (Vicenza), designs, manufactures and sells worldwide feed mixer wagons and ration analysis instruments for the livestock sector and telescopic handlers for agricultural and industrial use. The company, founded in 1973 by the current Chairman Sante Faresin, combines the tradition of solid family leadership with the dynamism of an international group, now present all over the world with its network of branches, distributors and retailers.

2. History of forage distribution

The forage distribution evolution has followed a similar process such as the evolution in other agriculture practices (e.g. ploughing, seeding, fertilizing, ... digitalization, industry 4.0) due to concentration of such activities among less and less people working in growing scales. Over the years the number of stables decreased but the number of animals per stable increased and in parallel appear the need to better feed the animals providing a total mixed ration instead of separate ingredients.

The forage distribution till the 1930 has been a manual activity, only from 1930 started the first trials to improve the forage distribution in the stables and only from 1960 the first mixers were introduced in the market. The machines were equipped by horizontal augers and from the 1980 the first vertical augers mixers appear into the market. The scope of the introduction of the mixer wagon was to reduce the time for ration preparation, ensure an accurate weighing, mixing and allow a fast distribution.

3. TMR meaning

TMR means total mixed ration. The TMR is created by a mixer and permit to weight and blending all feedstuff into a complete ration which provides adequate nourishment to the animals.

The TMR is composed by different nutrients such as physical fibers, grains, proteins, fat, additives (**Figure 1**).

The purpose of the TMR is to make sure the cattle ingest all the nutrients without selection in order to optimise ingredients use and digestion.

4. MIXER WAGON functionalities and benefits

In the market exist three types of mixer wagons:

- stationary mixer wagon;
- trailed mixer wagon;
- self-propelled mixer wagon;

The main elements are the following (**Figure 2**):

- milling cutter (not available in the stationary one);
- slasher (not available in the stationary one);
- milling cutter channel (not available in the stationary one);
- mixing tub;
- augers (horizontal or vertical);
- unloading system.

The self-propelled mixer wagons allow the operator the following operations:

- a. loading: the operator can load by the milling cutter and milling cutter channel to a precise quantity of products according to the TMR receipt;
- b. mixing: once the ingredients are into the tub, are mixed by the augers and relevant knives into a homogeneous mixture;
- c. unloading: the mixture is unloaded and served to the cattle.

The mixer wagon main benefits are:

- milk daily production increase;
- ingredients optimization;
- animal welfare;
- feeding cost reduction.

5. The Mixer Wagon within the “precision farming” and the “industry 4.0”

The modern agriculture so called “precision farming”, provides the operators with precise information from the crops genetics in order to select the best variety depending on geographical area and soil composition, fertilizers to be used and in which quantity, all guided by satellites, multispectral cameras, automated machines, etc.

In the dairy and meat farming the livestock are also selected by genetics, animal output traceability is available as well as biosensing technologies and biosecurity protocols.

In the feeding process instead we, as Faresin Industries, have discovered approximative raw material knowledge and inhomogeneous TMR.

The mixer wagon usage and target are to prepare the recipe and reduce loss of efficiencies in an area, the TMR preparation, which represents between 40 to 65% of the entire feeding cost.

The main inefficiency areas are related to (**Figure 3**):

- Ingredients weighing errors (weight): from 3 to 5%;
- Ingredients loading order errors: from 5 to 10%;
- Fibers cut errors: from 5 to 10%;
- TMR inhomogeneous mix: from 15 to 20%.

The FARESIN integrated technology allow to measure and constantly optimise the TMR preparation and distribution system thanks to:

- a milling cutter combined with a slasher that allow to modulate the fiber length;
- a mixing tub shape and augers layout allowing a homogeneous mixing process;
- an integrated “intelligence” guiding the operator during the receipt preparation (weighing scale, loading halt, polispec NIR system and the FARMATICS).

FARESIN, thanks to the mentioned integrated technology, introduces for the first time in the sector the concept of PRECISION FEEDING for the TMR preparation and distribution.

All TMR ingredients are measured and checked by the polispec NIR system before storage and before the TMR preparation (composition, weight, humidity, etc) (**Figure 4**). All ingredients are then inserted in a precise quantity and weight into the mixer wagon and checked again when distributed into the manger.

The FARESIN approach to the feeding process wants to grant the farmer (**Figure 5**):

- to measure the raw material used;
- to maximise the efficiency during the feeding process;
- to measure the indigested TMR;
- to adjust the TMR according to the undigested ingredients and reduce feeding errors and ingredient losses.

6. Conclusions

In the “Agriculture 4.0” era, data and measurements systems are key elements to take the facts-based decision. Especially when the animals we grow to feed humans are involved we as FARESIN INDUSTRIES work in order to ensure all the resources involved are optimised, the animal welfare is granted and, in the meantime, increase the animal profitability. This concept is easy apply and can immediately impact in the main worldwide production (milk and meat) slice.

The Earth have limited resources and food waste means loss of money and planet losses. Right feeding to our animals means less food losses, healthy and happy animals and sustainable processes (**Figure 6**).

FIGURES

Figure 1 – TMR compisition.

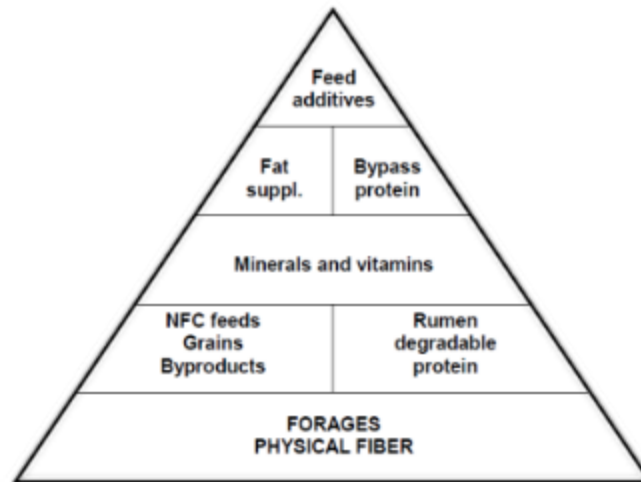


Figure 2 – Main elements of a mixer wagon.

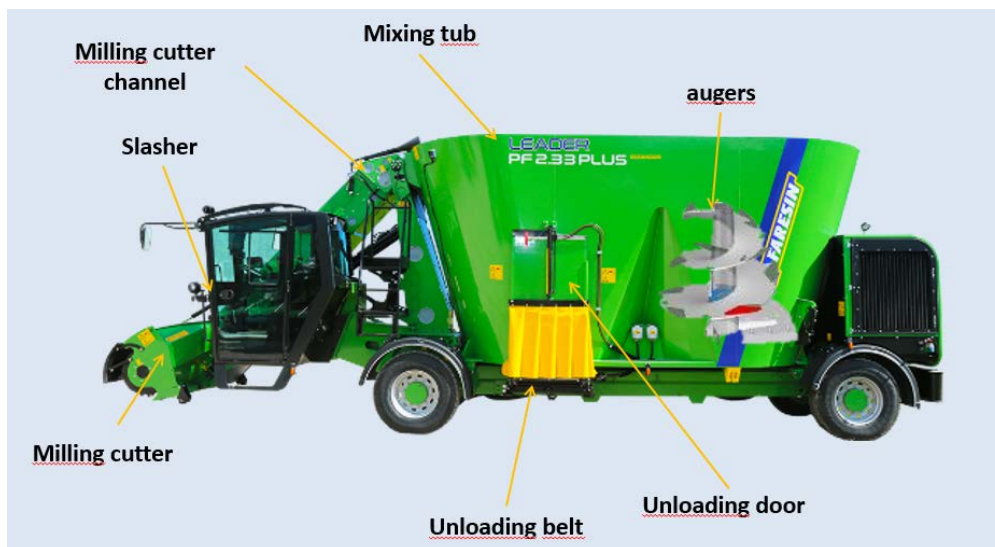


Figure 3 – Efficiency losses area.

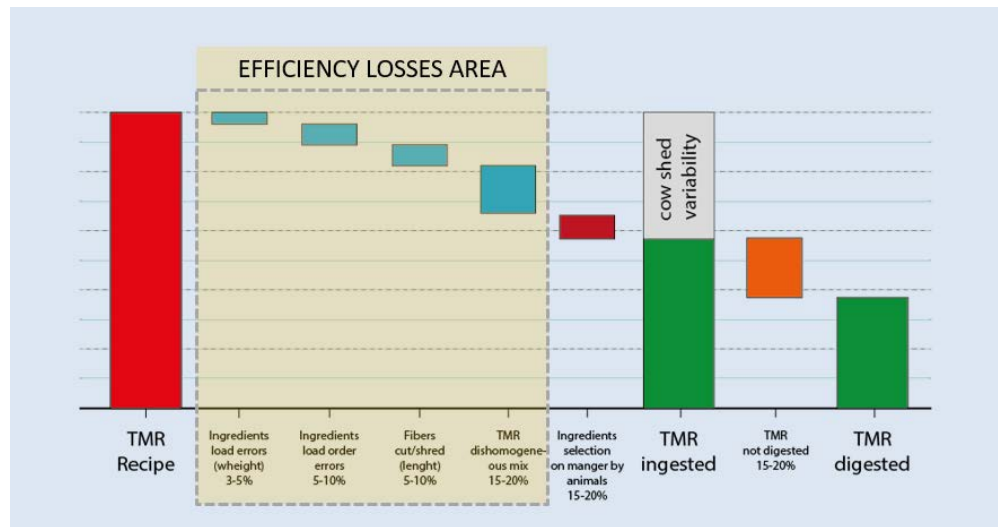


Figure 4 – Precision Feeding.

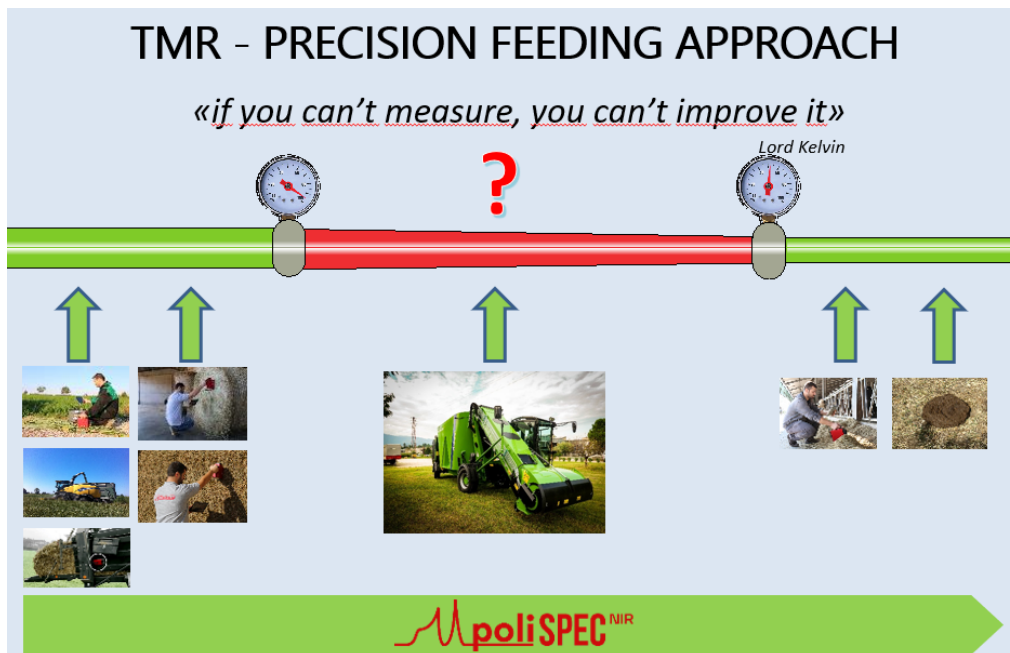


Figure 5 – TMR precision feeding optimization circle.

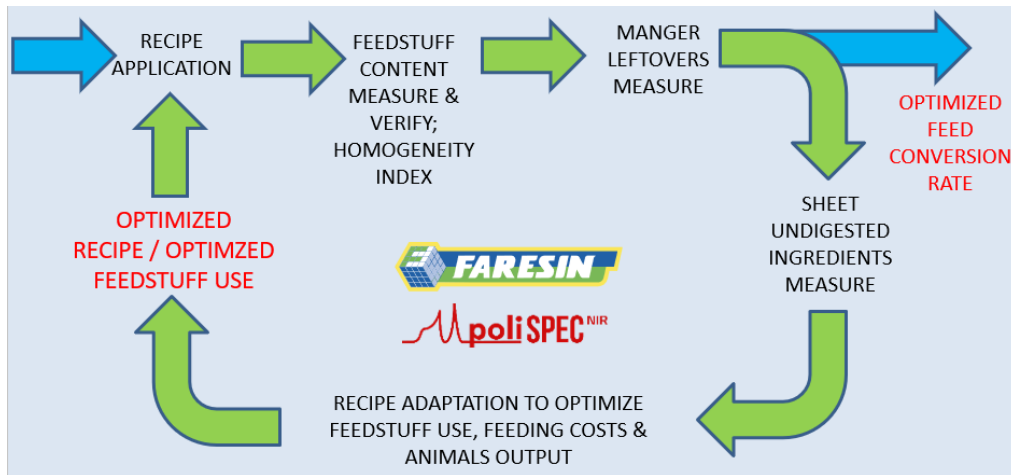


Figure 6 – Homogeneity Index.

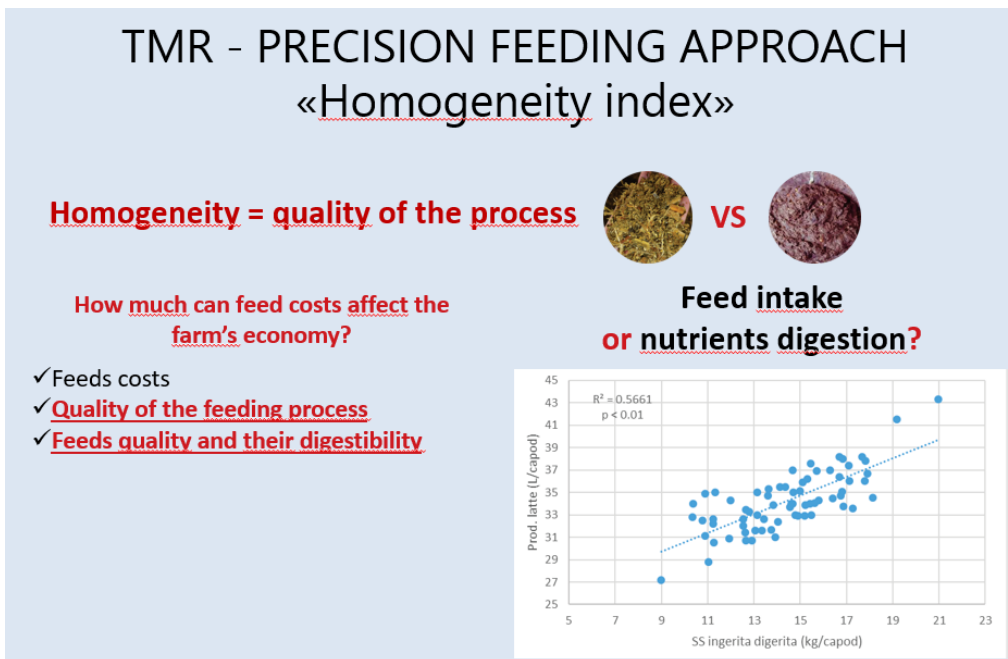


Figure 6 – Feresin Industries: animal welfare and sustainable pProcesses.

