

50 Years of Forage

What were the top trends and game changers in dairy forage systems from 1967 to 2016?

Here's a start. What would you add?



This display was created by the U.S. Dairy Forage Research Center for its exhibit at the 50th World Dairy Expo in Madison, WI, October 4-8, 2016.

Forage Breeding

Corn silage

- ◆ Hybrids developed specifically for silage (not grain) production (1990s).
- ◆ Brown midrib corn silage is commercialized (1980s).

Alfalfa

- ◆ Varieties developed for disease and pest resistance in the 1970s and continuing today.
- ◆ Varieties developed for improved winter hardiness and persistence.
- ◆ Alfalfa genome completed in 2016, and marker assisted selection led to an increased turn-around time for inclusion of conventional traits in new varieties for improved disease resistance, fall dormancy, as well as better selection of multi-gene traits such as yield and drought resistance.



- ◆ Advances in genetics lead to genetically modified alfalfa, such as:

- ◆ Herbicide resistant alfalfa
- ◆ Reduced lignin alfalfa



Decoupling of winter hardiness and fall dormancy ratings in the 1990s allows producers to achieve higher yields from varieties with less fall dormancy and equal winter hardiness. Prior to this, producers had to give up yield to improve winter hardiness.



Forage Harvest

Forage moisture

- ◆ Concept of conditioning forage to enhance drying started in the mid 1960s.
- ◆ Shift toward wider swaths, faster dry-down time continues today.
- ◆ Technology emerging today to measure moisture as the crop is harvested .



Forage maturity

- ◆ Shift toward managing more for quality, less for yield in dairy systems.
- ◆ Cutting earlier, less mature plants.
- ◆ Cutting more frequently.
- ◆ Shorter intervals between harvests.



Processing

- ◆ Corn silage kernel processing for better starch utilization (1990s).



Inoculants and preservatives

- ◆ More widespread use of microbial inoculants for improved silage fermentation.
- ◆ Inoculants created for specific crops and situations.
- ◆ Inoculant (*Lactobacillus buchneri*) used to reduce heating when silage exposed to air.
- ◆ Organic acids (propionic acid) used for hay preservation, applied at baler.

Bigger, Bigger, Bigger!

- ◆ Bigger bales.
- ◆ Bigger harvesting equipment.
- ◆ Bigger loads from the fields.
- ◆ More forage harvested per hour.



Forage Storage

Bigger, Bigger, Bigger!

- ◆ Less silage in tower silos
- ◆ More silage in plastic silo bags and as baleage
- ◆ Increased use of ever-larger horizontal storage – bunkers and piles.
- ◆ With this change, silage management became more important and was a focus of educational efforts:
 - ◆ pack for maximum density
 - ◆ cover quickly
 - ◆ manage the face during feed-out.



Pastures & Grazing

- ◆ 1960s: Use of pastures for feeding dairy cows declines in favor of confinement and harvested forages.
- ◆ 1990s: Grazing grows in popularity as smaller dairy producers look for ways to reduce equipment costs, hire less labor, and meet demands for organic milk.
- ◆ 2000s: Management intensive rotational grazing, with many different alternatives/preferences, is the standard for improved pasture management.



Management intensive rotational grazing



Portable fencing in pastures

New developments in portable fencing make it possible for producers to move cattle more easily from paddock to paddock.



Adoption of management intensive rotational grazing provides more consistent supply of quality pasture.



Forage Feeding

- ◆ Corn silage use goes up in rations across the country.
- ◆ More and more forage fed in Total Mixed Rations.
- ◆ Nutritionists and researchers look for improved methods for predicting the production potential of forages, the most variable ingredient in dairy cattle rations.
- ◆ Research shows that protein is being overfed in many dairy cow rations. For economic and environmental reasons, producers and nutritionists begin to scale back protein levels to 16-17%.



Total mixed rations (TMR), which became widely used in the 1980s, greatly changed how forages are fed and made more precise feeding possible.



Forage Analysis

Due to the highly variable nature of forages, finding the best ways to analyze and predict its feed value/milk production potential is extremely important to dairy producers and nutritionists. Here are a few examples of improvements that have been made in the past 50 years.

Fiber analysis has gone from:

- ◆ NDF (Neutral Detergent Fiber), introduced in the 1960s, to
- ◆ NDFD (NDF Digestibility), introduced in the 1980s, to
- ◆ TTNDFD (Total Tract NDF Digestibility), introduced in the 2010s, and
- ◆ Other methods.

Hay markets began to put a feed value on the hay being sold by using:

- ◆ RFV (Relative Feed Value), which was improved with the introduction of

- ◆ RFQ (Relative Forage Quality)

NIRS (near infrared spectroscopy) forage analysis, implemented in the 1980s, allows producers and nutritionists to get forage analysis results immediately and more economically.



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