

Silage science: The role of corn breeders in feeding the cows

This is the third in a series of articles about PDMP Premier Partners.

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NEW HOLLAND and WASHINGTON BORO, Pa.—When Bob and Mike Rohrer switched their entire corn crop to no-till this year, one part of the transition was to choose hybrids that would not only meet the needs of their 1100 cows, but also have good yield performance in a no-till environment.

At Rohrer Dairy, Washington Boro, all 550 acres of corn are harvested for silage and 90% are double-cropped with rye. Halfway through this year's harvest, they are seeing a crop that is comparable to previous years, despite this being their first year of no-till. "It went better than we expected," the brothers agree.

"Milk per acre is part of the equation, but agronomics also play a big part," says Kent Fritz, the Pioneer representative who has been placing the hybrids at Rohrer Dairy for many years. "We know what our high quality hybrids are for silage, and we factor in the agronomic traits for soil types and fertility, drought resistance, disease pressure, maturities, and so forth."

This is a busy season: evaluating crops, deciding what has done best, and looking at the new hybrids coming along. For dairy farms: energy content, nutrient profiles and fiber digestibility are always part of the discussion in storing this year's crop and planning the next.

Everything from plant selection through harvest and ensiling comes down to a focus on healthier corn, more consistent corn, and silage that meets the forage quality and quantity needs of the dairy.

"We can't keep planting the same hybrids," says Mike Rohrer, who manages the dairy's crops. His brother Bob manages the cows. "I know what I think has done well, and Kent sees our crop but also has results from elsewhere, so the two opinions together bring the end result. Plus we look at the independent yield data from the PDMP trials."

As PDMP members, the brothers see networking with other dairy producers, timely information, and access to the silage trial data as the major benefits of membership.

In planning their crop, the Rohrers aim for high quality forage, but they also have to be concerned about tonnage to minimize the amount of purchased silage they will need.

"We have changes each year just through new genetics and hybrids coming along. We look at milk per acre and our yields. There's a balance there," says Mike.

The Rohrers, for example, planted about eight different hybrids. Behind each one of those individual selections, are years of evaluation, starting with thousands of experimental hybrids. While dairy farmers and their seed sales representatives evaluate performance on the farm, further back in the chain are networks of plant breeders working with parent lines and experimental combinations at research stations and farm plots.

Pioneer Hi-Bred International, for example, has 90 corn research stations worldwide, 26 of them in North America. The New Holland, Pennsylvania station is one of a dozen equipped with a silage plot harvester, for their work in evaluating silage characteristics.

The process begins with the development of hybrids that must pass initial scrutiny for important agronomic traits and stress tolerance. In the next phase, they are evaluated for both their grain and silage characteristics.

Plant breeders—like Dave Whitaker and Polly Longenberger at New Holland—are always looking ahead. For example, knowing how important fiber digestibility is to dairy producers, many hybrids are tested each year for silage that will never even be considered for grain.

This second area of the hybrid program has emerged as traditional markets began to segment. Just as dairy farmers are becoming



(Above) David Whitaker (center) and Polly Longenberger (left) are plant scientists at Pioneer's New Holland corn research station (shown in the background). Matt Meck (right) is one of five full-time employees. He is a research associate, who oversees the 65 part-timers pollinating in the nurseries, supporting the experiments Dave and Polly come up with. Of the 1050 unique-for-silage hybrids tested here this year, 85-90% are new. Corn breeders are always working toward where they'll be five years from now. (Right) Area agronomist Matt Antos bridges the gap between research and the field, advancing hybrids and bringing together hybrid information with production practices.

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(Above) The information 'funnel' ends with the partnership between seed sales representative and farmer: in this case where the silage meets the cows. Pioneer representative Kent Fritz (left) talks about this year's crop with dairy producers Mike (right) and Bob Rohrer. Rohrer Dairy is home to 1090 cows making 26,000 pounds of milk. (Right) Pioneer Livestock Nutrition Center, Polk City, Iowa, tests more than 20,000 silage samples annually. This is the 18th year of their side-by-side customer plot program with corn silage samples expected from 8,400 farms.

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more specific in what they want from their silage crop, the grain markets also drive the quest for more specific grain traits.

Adds Whitaker, "the grain makes up 40 to 45% of the dry matter, so you can't discount that, even in silage corn."

Thus starch availability is an important factor, along with the increasing importance of fiber (or stover) digestibility. Researchers also know the plant has to stand and be healthy for the farm to harvest a good crop.

"By-and-large, a good grain hybrid has historically made a good silage hybrid. However, just being a good grain hybrid does not necessarily make it good for silage, unless it also has high fiber digestibility," notes Tim Markovits, account manager for Lancaster and surrounding counties.

In determining what to put in trials, the plant breeders look for hybrids that are high in tonnage, starch, and stover digestibility, which are important for maximizing milk per acre and milk per ton.

"It's an interesting challenge on the family dairy, and what we're doing is aimed at meeting the needs of the brother who manages the crops—looking at the growing factors and yield—and the brother who manages the cows—looking at digestibilities and excellent feed," explains Matt Antos, area agronomist for 17-years, serving Pennsylvania, Ohio and New Jersey.

The sorting process begins with the people he refers to as the "corn artists."

"We're looking at thousands of hybrids in a handful of locations, while Matt is looking at

fewer hybrids in more diverse environments," explains Whitaker, a scientist at the New Holland corn research station for 19 years. "It's a team effort. We're working together with what we're seeing in our research and what they're seeing in the field and the different needs of customers in different areas, to determine which specific hybrids to advance."

Whitaker enjoys "the creativity, and thinking of new crosses." To him, the parent lines and hybrids developed here "are like children, and this time of year is like opening gifts at Christmas," chopping the samples, sending them for analysis, recording observations, and making decisions.

The researchers also develop inbred silage breeding values when they harvest their silage plots. These breeding values are then used to develop the next class of experimental silage hybrids. Whitaker and Longenberger also collaborate with other plant breeders, internationally, to identify new germ plasm traits they can add to the North American germ plasm base for use in their ongoing genetic developments.

The process of bringing a hybrid to market is typically five years in the making. In the first year of the process, the top 10% of the "incoming freshmen" advance to the next year. Each year, the field narrows, yielding a smaller "top of the class" to advance. By year five, only one or two hybrids are left standing, so to speak, from thousands in year one.

The environments of comparison also broaden each year, from the research station, to the side-by-side farm plots. Researchers

evaluate not only the results, but also the repeatability of the results.

"When I scout a field with a farmer, he'll have his own notes about the crop and say: what do you see?" Polly Longenberger relates. "I'll look up my genetic history on the parents and when I see it makes sense, it's a good feeling to see something reflected in the data and then go to the field and see it there also."

It's mind-boggling: the amount of insight, observation, data collection, and decision-making that go into developing just one commercial hybrid. As Longenberger points out, "the diversity within one nursery of the same pedigree, is interesting. It's the basis of what plant breeders and farmers have been doing for eons."

"We have been doing the side-by-side customer corn silage plots for 18 years now, but our testing for silage characteristics goes back even farther," notes Leo Brown, information manager for a seven-state area, including Pennsylvania.

The Pioneer Livestock Nutrition Center (PLNC), Polk City, Iowa, is a key part, analyzing more than 20,000 hybrid samples a year and having 80 mini silos—each large enough to conduct a feeding trial—to compare the feeding value and digestibility of the hybrids.

Individual Calan Gate feeders are used for preliminary trials with steers and sheep, screening what is further evaluated in dairy research herds at universities. The PLNC also tests fermentation and aerobic stability technologies, comparing the effects of different inoculants on the silage, to offer producers greater flexibility in preserving crop nutrients.

"In the last 10 years, fiber digestibility has increased in importance," Brown observes. "Now grain yield is still important, but so is the whole plant digestibility. We cooperate with the PDMP corn silage trials to get a look at various hybrids at various maturities on a milk per acre and milk per ton basis."

Both comparisons are determined by using Milk2006, developed at the University of Wisconsin. "It's a matter of the dairy producer deciding what is more important to their operation," notes Brown, adding the goal is to offer hybrids that maximize both.

What's the difference? The short answer is quantity versus quality. But there's more to it. "Quantity is how many tons of silage you're taking off the field adjusted to 65% moisture. That's yield," Brown explains. "Quality is when you do the analysis and find out how much starch, protein, digestible fiber, all of the things that are important to the cow. Milk per ton is quality, alone. Milk per acre is taking the quality times the yield to give you the total value per acre."

By evaluating the silage characteristics of hybrids, corn breeders differentiate them for the dairyman and forage producer versus what the grain farmer may need.

"It's important to look at the total package of characteristics," adds Antos. "One of the things we've done is to make significant improvements in the health of the plant with stacked agronomic traits. Keeping a healthier plant, helps produce a higher dry matter yield. The plant first of all has to be agronomically sound, healthy, and able to withstand stresses of drought and disease, with the right maturity level. Then it's important to look for starch and fiber digestibility factors that relate to milk per ton of silage."

Beyond hybrids and inoculants, the company continually looks for ways to help farmers be more profitable. "Sometimes that's a product and sometimes it's a service," notes Brown.

"It's an exciting time to be in this business," says Antos. "In the last three to four years, with the advent of alternative uses for corn and other ag crops, we're now forced to produce the best quality and quantity that we can. The world is going through the next agricultural revolution, using genetic technologies to speed the process of genetic improvement. It's nice to be in agriculture and see its advancement."