Forage & Grassland GUIDE

Canadian Forage and Grassland Association

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2017

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For more information on forage and grassland management in your area, we encourage you to contact and participate in the activities of your regional or provincial association.

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Who will breed the next generation?

Forages aren't only suffering from a shortage of research dollars, but a shortage of researchers to do the work if the money were available

BY RON FRIESEN

See if you can answer these two skill-testing agricultural questions.

What is the largest crop in Canada?

Which crop has one of the poorest records for funding research and breeding programs?

If you answered "forages" to both, you're right. You've also put your finger on a chronic problem in Canada's forage industry.

Statistics show the total acreage of pastureland, tame forages and native hay far exceeds the seeded area for wheat and canola. You'd think that would put forages at the top of the list when it comes to research funding. Sadly, no.

Historically, Agriculture and Agri-Food Canada has been the major player in forage breeding. But there are only five publicly funded programs for breeding tame forages in Canada. Government funding for forage research has been largely static for the last 10 years. It's estimated only about a third as much forage research is being done nationally today as in the 1980s.

The bottom-line reason for this state of affairs is a lack of money and, subsequently, a lack of qualified people.

"There is a critical shortage of forage researchers, in particular plant breeders, in Canada and several of the few remaining researchers are nearing retirement in the near future," says a recent Beef Cattle Research Council report on developing improved native and tame forage varieties for Western Canada.

Thin talent pool

Given the thin talent pool, the question becomes not just what new forage varieties will be bred, but who will do the breeding.

"There is a lack of human resources for forage breeding in Canada," says Doug Cattani, a perennial crop breeder who mans the lonely ramparts of forage breeding at the University of Manitoba. "It's getting to the point where there's almost no one left."

Those who are left tend to focus on major species. Research projects often focus on alfalfa, clover and grasses because there are not enough breeders to cover all species.

Part of the reason for the shortage of forage researchers is a long-standing decline in public funding with industry players not taking up the slack. Reynold Bergen, the Beef Cattle Research Council's science director, says the beef industry always recognized the importance of forages but had extremely limited research funds. So BCRC deferred research to the forage industry. However, the forage sector couldn't fund research because it had no commodity checkoff and no way to implement one. As a result, Bergen says, no one in the industry was funding research, so it became a low priority in the public sector as well. Declining government budgets and provincial cutbacks to universities only aggravated the problem.

Although some private companies are involved in forage research, especially in the U.S., there appears to be no great incentive for them to cash in either.

"(Private companies are) in business to be profitable and forage breeding does not lend itself to a good return on investment," says Cattani. "Who wants to buy a perennial crop that did well in the first year and did nothing thereafter?"

BSE casualty

Edward Bork, a rangeland ecology and management specialist at the University of Alberta, pins part of the blame for the "slow systematic erosion" in forage research on BSE. After BSE hit in 2002 and international barriers closed to Canadian beef and live cattle, industry priorities suddenly shifted to herd health and marketing strategies. Research into forage breeding and development became less important, given the immediate market crisis.

Another reason why forages appear to get short shrift is the very nature of the crop. Forages are perennials that take a long time to breed and even longer to show a financial return on investment. Compare that to high-value annual crops such as corn and soybeans, which see new hybrids and strong returns every year. Guess which crop gets most of the attention when it comes to breeding programs and agronomic research?

Still another problem is a basic lack of information about how to place a value on forages. Obviously, a ton of hay is worth less than a few bushels of canola or soybeans. But, as University of Manitoba agriculture dean Karin Wittenberg points out, it's hard to measure the financial worth of grasslands because most hay and tame forages are consumed on the farms where they were grown. Since there are few price discovery or marketing mechanisms for them, it's hard to evaluate their value.

Not just a crop

However, that's assuming you only see hay and forages as a crop. Researchers and producers are quick to point out the value of grasslands goes far beyond that. They say grasslands also provide environmental goods and services such as water storage, flood mitigation, wildlife habitat, biodiversity, carbon sequestration and greenhouse gas reduction.

That's the new frontier forages should be focusing on, says Wittenberg, a ruminant nutritionist by training.

"Forages serve a sustainability value. How you develop a forage

University of Manitoba forage breeder Doug Cattani says there's not much incentive for private companies to invest in perennial crops for which they can't sell seed every year. PHOTO: LORRAINE STEVENSON

breeding program that can serve a sustainability function as well as a competitive function — that has not been given much time and thought."

Wittenberg says she and her colleagues have tried to put an economic value on the services grasslands and forages provide. Unfortunately, they could find virtually no data to provide hard numbers.

However, there are signs that may be changing. Bork, a forage agronomist, says policy-makers in Alberta are showing "a marked interest increase" in environmental goods and services from native grasslands and perennial forage systems.

Bork says the last six years have seen "a massive investment" in Alberta in quantifying and understanding the environmental goods and services that perennial grasslands provide. People are waking up to the fact that forages give producers a "social licence to operate" by providing public benefits in carbon sinks, biodiversity and ecological improvements, he says.

"It's getting to the point where there's almost no one left."

DOUG CATTANI, UNIVERSITY OF MANITOBA

"I can tell you, we're gaining an enormous amount of traction."

The next step will be to use this data as ammunition in persuading regulators and policy-makers to reward landowners for these goods and services," says Bork.

"We need to recognize it and start (implementing) ways that landowners can get paid for retaining, or even improving, these things for society's benefit."

More research funds

As for funding research, that may be starting to improve, too. The BCRC's Bergen says about eight years ago Canada's beef and forage sectors got their heads together and decided the industry had to step up to the plate instead of waiting for governments to do so. Now, 15 cents out of every dollar collected by a national checkoff on cattle sales goes toward BCRC research projects, compared to only five cents previously. Today, Bergen says, 30 per cent of BCRC's budget focuses on forages, up from 10 per cent before. Funding is levered three to one through Growing Forward.

"It's a bigger slice of a bigger pie," says Bergen.

Reversing the funding decline in the private sector is resulting in new forage research positions being created in government and universities across Canada, Bergen adds.

"They're starting to say 'wait a minute, industry is investing in this, this is important, we'd better be in that game, too.'"

Cattani says there should be no difficulty getting graduate students to train as forage specialists, as long as funding is in place before the students arrive.

A sign, maybe, that the tide may finally be starting to turn for forage research. ■

Grass is a crop too

Just because forage is on marginal land doesn't mean it should get marginal management, says a recent Beef Cattle Research Council study

BY RON FRIESEN

If grain farmers routinely fertilize their crops to get higher yields and profits, why don't forage producers do the same to their pastures?

That question is at the heart of a recent Beef Cattle Research Council study into improving forage yields in Canada.

The study notes that while annual crops have seen significant yield increases over the past 60 years, hay yields in Canada have hardly budged at all. This puts Canada's cow-calf sector at a competitive disadvantage because the cost of forage per tonne is higher here than in other countries.

"Over the long term, improving forage productivity is crucial for future competitiveness of the cattle industry," says the study.

It concludes that a major reason for this low productivity is soil nutrient deficiency in pastures and grasslands.

You'd think the solution to the problem would be easy. Fertilize hay lands and you increase forage yields. Greater yields mean higher stocking rates, improved animal performance and a lower cost per unit of production, which translates into reduced winter-feeding costs per cow.

Unfortunately, it's not that simple. The study recognizes there are reasons why producers tend not to fertilize forages the same way they do wheat and canola.

Marginal land mindset

One reason is economics. As Reynold Bergen, Beef Cattle Research Council's science director explains, farmers tend to invest heavily in high-value annual cash crops. That involves buying or renting more land for those crops. Doing so increases competition for land, drives up land prices and pushes forage production to marginal land that cannot produce high-value crops. As a result, forage land has lower expectations put on it, along with less investment such as fertilizer.

That's counterproductive because lower fertility inevitably means lower yields, and low forage yields are the most common reason for terminating a stand, Bergen says.

"If you're expecting to get yields from a crop, you don't just need it to get rainfall or irrigation. You need to feed it. It needs nutrients. If you keep pulling off those nutrients without replacing them, you're going to starve the plants. And that's why yields go down. So stands get broken up after only a few years."

Currently, application of fertilizer to forage crops in Canada is minimal. The BCRC study estimates only 25 per cent of improved pasture and hay land is fertilized. Just 15 per cent of alfalfa hay fields receive fertilizer. Given the combination of low nutrient input and the high nutrient uptake by the crop, it's hardly surprising that forage stands in high-moisture regions of Western Canada are maintained for only three to five years. In semi-arid regions, the average life of a forage stand is six to nine years.

Other reasons why farmers don't fertilize pastures include high fertilizer prices and poor financial margins (until recently) in the cattle industry. Moisture limitation is another factor. Fertilizer applied to forage is top dressed, not incorporated (as with annual crops). This can result in nutrient loss through volatilization (evaporation of N) in dry conditions, or runoff in wet years, which in turn creates environmental concerns.

Fertilizer considerations

That said, fertilizing forages can produce results. The study cites a 10-year project in Manitoba which showed adding fertilizer increased the productivity of grass pastures when applied to soil test recommendations. The downside was that target yields were often not reached due to moisture limitations.

The type of soil can also influence the effectiveness of fertilization. The study points out that sandy loam soil (the kind of marginal soil where

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forages are often grown) has a low water-holding capacity, limiting the moisture available to the plant. This reduces plant growth, forage quality, stocking rate and rates of gain in animals. As a result, there may be a limited benefit to fertilize and less incentive to do so.

Even if you do fertilize forages to increase yields, you need sound economic reasons for doing it. Bergen points out higher yields do not necessarily translate into lower costs or increased profits. The profitability of fertilizing forage crops depends on the cost of fertilizer and the price of hay.

"You can double your yield and increase your carrying capacity in the number of bales. But if it costs you $500 to double that yield and that doubled yield is worth only $250, it just doesn't make sense," says Bergen.

For that reason, it's important to know the per-unit cost of production for hay (e.g. $/tonne) to determine which is the more economical choice: fertilizing hay or just buying it.

Keeping fertilizer at home

The trick is to get nutrients on forage land in a cost-effective way to improve forage productivity, other than adding chemical fertilizer or composted manure. Bergen lists several options for achieving that.

One option is to use in-field winter feeding systems such as bale grazing. Bergen says bale grazing kills two birds with one stone. First, when cattle graze bales during the winter, they deposit fertilizer on the field in the form of manure. Second, the bales cattle do not eat stay on the ground and become another soil nutrient. Together, these practices end up leaving more nutrients on the land than it had to begin with, thus improving soil fertility. An added benefit is that bale grazing reduces winter feeding costs because producers are not always hauling in feed.

Another option is to mix legumes (usually alfalfa) with grasses in a stand. The study notes that properly

"If you keep pulling off those nutrients without replacing them, you're going to starve the plants. And that's why yields go down. So stands get broken up after only a few years."

REYNOLD BERGEN, BCRC

inoculated alfalfa fixes nitrogen from the atmosphere. As a result, additional N is not needed to increase dry matter yield and protein content. In this way, adding alfalfa to the mix increases productivity without the extra cost of fertilizer. It also reduces the risk of bloat because animals are not grazing straight alfalfa.

The practice seems to be catching on. It's estimated the area of alfalfa and alfalfa mixes as a percentage of total tame hay production increased from 44 per cent in 1971 to 66 per cent in 2011.

Bergen acknowledges it's hard to measure how much soil fertility practices are improving. But BCRC offers webinars on the subject and is starting to conduct followup surveys with participants to measure the take-up of its recommendations.

More information is available on the BCRC website at www.beefresearch.ca. ■

MAINTAINING THE GRASS-LEGUME MIX

It's one thing to have a grass-legume production system. It's another thing to maintain that stand. Studies show the percentage of alfalfa or sainfoin in a grass-legume mix tends to decline significantly over four years. The Beef Cattle Research Council recommends several management techniques to help maintain legumes in a mixed stand:

- In spring, wait until alfalfa is three to four inches tall before grazing. After spring grazing is over, let the alfalfa regrow for 25 to 40 days before cutting it for hay.
- Let plants rest during September and October. Or control grazing to maintain six to eight inches of standing alfalfa.
- Do not leave stubble lower than two to three inches in fall. This helps protect alfalfa from winter damage.
- Let plants grow without cutting or grazing for four to six weeks before the first killing frost.

BCRC also provides some tips to reduce the risk of bloat while grazing alfalfa:

- Do not graze alfalfa when it's wet.
- Don't turn hungry animals on to an alfalfa pasture because they'll overeat.
- Wait until alfalfa is in full bloom before grazing it. The risk of bloat is highest when alfalfa is in the vegetative to early bloom stages of growth.
- Do not graze alfalfa for two to three weeks after a killing frost. Frost can increase the risk of bloat.

For more information about legume grazing, check out www.foragebeef.ca.

Less volume, but more profit?

Quebec researcher says that since dairy farmers are paid based on components, forage-fed cattle can outperform those fed on corn silage

BY RAY FORD

Corn silage use is trending on Quebec's large dairy farms, but Valacta's Robert Berthiaume argues farmers who run against the herd can bulk up their bottom line with perennial forages.

"If you make the best use you can of perennial forages, you can make a lot of money, at least as much or more than your friends with corn silage," says the forage systems expert for Quebec and Atlantic Canada's dairy herd improvement agency. "We're trying to prove to our clients that the milk that is produced by (perennial) forages can and should be the most economical milk that is in that bulk tank."

For Berthiaume, the key lies in component pricing. Dairy farmers get paid for fat, protein, and other solids in their milk, rather than total milk volume. So even if an alfalfa and grass-fuelled herd doesn't crank out the same volume as a herd powered by corn silage, it can hold an edge on components.

He points to a 2013 New York State study of six herds. Five were fed corn silage as the bulk of their forage, while one herd relied on a grass/legume mix. In terms of output, the legume/grass-fed cows placed second from the bottom, at 88 pounds per cow per day. But in gross income per cow, those same perennial forage eaters finished second from the top.

The secret? The herd outperformed its peers in components, (especially milk fat, at 4.3 per cent.) When it comes to milk production, Berthiaume says high components are what "really writes the cheque."

The milk from forage equation

One way to gauge the efficiency of forage use is the "milk from forage" (MF) calculation developed at Laval University in the 1970s. "In Quebec, the concept is quite well known," Berthiaume says, adding "it hasn't been exported very well."

The math behind MF looks complex, but the basic concept is simple. If you subtract the milk production boost from concentrates, you're left with output that's fuelled by forages. By further subtracting the forage required to maintain the cow, you're left with the total milk produced by the forage in the diet.

Not surprisingly, herds with high MF tend to be efficient producers. But when the paycheque comes, the most efficient farmers using perennial forages outperform their corn silage counterparts.

Using detailed financial and production figures from 672 Quebec dairy farms, Berthiaume says the top 20 per cent of corn silage-fed herds produced 136 more kilograms per cow every year. But in terms of net income, the perennial forage herds brought in an additional $184 per cow.

To produce at those high levels, producers must maximize intake of high-quality forage. That requires the sophisticated use of complementary concentrates, with the right mix of proteins, sugars and starches.

It's a complex balancing act, because "every time you feed concentrate to an animal that is on a forage diet, the animal will reduce its forage intake," Berthiaume warns. This substitution impact is also most significant with high-quality forages, rather than poorer hay or silage.

Closing the productivity gap

There are significant advantages for those who get it right. The top 20 per cent of Quebec producers are pumping out 3,751 more kilograms of milk and $833 more net income per cow than their counterparts in the bottom-performing 20 per cent of dairy farms. If less-productive farms can close that gap, it will mean major gains for individual farms and the entire industry.

Then there's the herd-size gap. Not surprisingly, corn silage herds tend to be bigger, averaging 91 cows. On large farms, corn silage is attractive because it offers roughly twice the yield of perennial forage. Better still, it delivers the yield in one cut, versus three or four for alfalfa and grasses.

"My question is to the research community: how can we make hay crops, silages, alfalfa-grass mixes more appealing to larger farmers?"

ROBERT BERTHIAUME

Low-lignin alfalfa may help reduce silage corn's yield advantage, allowing farmers to take fewer cuts of more mature alfalfa and still get good nutritional quality. But Berthiaume stresses there's more work to do.

"My question is to the research community: how can we make hay crops, silages, alfalfa-grass mixes more appealing to larger farmers?"

Ultimately, he says, deep-rooted perennial crops provide long-term soil-building benefits, and farmers need to factor in the boost to soil health. "I'm worried if we go only to annual crops, without putting perennials in the rotation, we end up with more (plant) diseases and depleted soils." ■

The challenge of growing quality forages

There are many reasons why production and quality may be less than ideal

BY RALPH PEARCE, CG PRODUCTION EDITOR

Perception that forages are too weather-dependent or that producers plant one year and leave them alone for three must be challenged.

The name varies from farm to farm and from one region of the country to another. Some refer to it under the blanket term "forage" while others attempt to be more specific — hay, haylage, silage, dry hay or pasture. Whatever the term, two distinct trends have unfolded in the past five years: forage production is declining, and with it — say some in the industry — the quality.

Statistically and anecdotally, the numbers reflect the drop. Statistics Canada numbers for 1981 to 2011 (Fig. 1) indicate hay and other fodder crops area rose steadily between 1986 and 2006, and then declined, losing acres to oilseeds and pulses, especially in the West.

Some of that trend may be due to increase of canola, pulse and soybean acres — many of those acres, and some in the East — have come out of forages.

Due to factors such as larger acreages, larger livestock operations and producers needing to spend more time with their animals, forages may not be getting the management attention they deserve, but some extension agronomists are trying to reverse that.

Boosting management

Many advisers and specialists have their opinions on improving forage production and quality, yet it seems one recommendation makes the most sense: get the best start. That can include drilling of the seed (not broadcasting it), using starter fertilizer with the drill (especially calcium, sulphur and magnesium) and paying better attention to early weed control.

Perspectives vary, but broadcasting seed is seen by some as little more than a "controlled spill." There's also more packing required. Using a drill has the greater potential for more even emergence and growth.

As for weed management, at least in Ontario, there is a lack of registration of more-effective herbicides such as Broadstrike, which is already registered for use in Ontario, just not for alfalfa. Instead, producers are left with 2,4-DB or a tank mix of 2,4-DB with something like MCPA. The problem with 2,4-DB

is that some producers don't like it because of stress on alfalfa.

Time management

Another disincentive to forages is the commitment to a three- or four-year crop. Producers who rely on forage generally want to spend more time in the barn, which means less on forage management.

For Carl Loewith, time management comes down to two things: finding the right production system and hiring the right people. Loewith, a dairy producer who farms just west of Ancaster, Ont., is a first-year no tiller with his forage crop, and he hires custom workers, allowing him to spend more time paying attention to the other end of the operation.

Loewith doesn't agree that forage production yields are in decline.

"It's just that they're not keeping pace with the advances that other crops are experiencing, and the technology that's been incorporated in others. I think we may be holding our own and we should be advancing but other crops are doing a better job."

Some of the biggest challenges are still wrapped up in the basics of good weed-free establishment in that initial year, followed by attention to fertility in subsequent years.

"I think we're still stuck in that mindset that 'we're going to plant this crop, it'll be good for three or four years, and we'll plant it and maybe fertilize it once a year and we'll let it do its own thing,'" says Loewith.

"I don't think we've done the research that other crops have done in terms of seeding rates, plant population, the fertility and the timing of fertility. A lot of research is going into the more popular crops — and forages don't have the glitz or bling that corn, soybeans or wheat have, so farmers believe it's a relatively cheap crop to grow, and they treat it that way."

What's the yield?

Another problem is that forage yields are difficult to measure. Cash croppers know their bushels per acre, but the average forage producer can't quote tons per acre. Forages are generally put in silos or in big bales without being weighed. Measuring the effect of different production practices is difficult if growers don't have a good handle on yields.

As for no tilling alfalfa, Loewith is hesitant to talk about any long-term benefits — he's only been at it for a year. But a lot depends on the custom operator. In the end, it translates to less stress and less time spent in the field. He's uncertain how no tilling might work on heavier ground, although there are examples of other growers on heavier soils that are making it work. But on lighter soils like sandy loams, it's fine. Loewith says he will do the same next year.

"There are some significant pros: first all of all, it's a lot less work for us — because we hire somebody to do the no tilling, so we're not working these fields. The gentleman we have comes in with a 40-foot drill, so he can cover a lot of ground — and it's just a phone call for us. We're not working that field two or three times before or packing it after."

Communications also key

Thomas Ferguson, a forage and grazier specialist with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), sees definite benefits in custom work. But the communications channels must be open and clear to ensure the work is done the way it needs to be done to get high-quality forages off the field at that proper maturity.

"When I talk about 'quality hay,' I refer to three things: harvesting at the correct maturity, harvesting at the correct moisture content, and having the proper storage of the hay," says Ferguson.

"With high-producing dairy cows, it's really important to have that early maturity but for many other end-uses, you don't have as high crude protein, and you can let the plants mature a little more to get more tonnage off the fields. It's still really important that the forages are harvested at the proper moisture level for the storage system that you have, and we don't lose any dry matter — if they're being fermented."

If it's for dry hay, the producer needs to make sure it's dry enough to prevent mould or it doesn't become dusty in storage.

Measuring the value

Ferguson notes that since most of the crop fed on-farm to livestock, growers don't see a financial transaction. Many underestimate the value that forages bring to their operation, so

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"It's just that forages aren't keeping pace with the advances that other crops are experiencing."

CARL LOEWITH, DAIRY PRODUCER

It's not necessarily that forage quality is in decline, but that other crops are advancing faster.

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advisers, feed specialists and extension personnel need to do a better job of showing the financial returns.

"The environmental benefits are huge, too," says Ferguson. "Adding forages to the rotation improves soil structure, drainage and water retention — and it increases the organic matter. And it'll add residual nitrogen to the following crop, so those extra benefits will increase the profitability of the rest of the rotation, and you can add up to 15 per cent in yield potential just to the corn crop that's added the year after the forages are taken out."

Ferguson echoes Loewith's comments on the importance of fertility and an early start.

"We need to see more even emergence with our alfalfa in order to have better weed control, as well," says Ferguson. "We want to make sure that the plants all get off to the same start so that we're not going in when some plants are at two leaves and some are at four. Doing a better job of getting the plants to emerge means weed control will see benefits of that throughout the life of the field, and you'll get increased tonnage on every cut with good stem longevity as well."

Tests, tests and more tests

Many producers and advisers talk about the lack of research for forage relative to corn and soybeans. Jeff Sherman is trying to change that.

As a dairy specialist recently hired by CanGrow, Sherman brings his years of experience with the American dairy sector as well as time spent in the feed industry in Ontario. He agrees production is down, but that in certain instances, quality can be improved.

Sherman is focusing on improving the soil activity and watching the impact on feed quality, uptake and performance. In particular, he's looking at cation uptake, and methods of increasing it. He says cations help to produce sugars, the sugars help to produce the starches and the starches help to produce fats (or fatty acids), which are critical in digestibility.

Sherman says it's not a well-known concept, and it can be a challenge for the industry to grasp. He says growers are not doing the best job of matching fertilizer applications to crop uptake and that more growers are over-applying, especially their nitrogen. The answer is a "whole systems" approach, not just with the crop in the field, but including the soil, roots, organic matter, and nutrient uptake.

Understand the soil

Many dairy producers rely on the MILK2006 feed calculator, and Sherman agrees that it's a good foundation for measuring feed quality. However, it doesn't address the shortfalls seen from soil test results. Soil activity needs to be part of the equation, understanding that it's alive and moving constantly.

"Too often, we just want to take the easy way out, whether we're dairy farmers or grain farmers, we want to talk about N, P and K — and it's not just N, P and K," says Sherman.

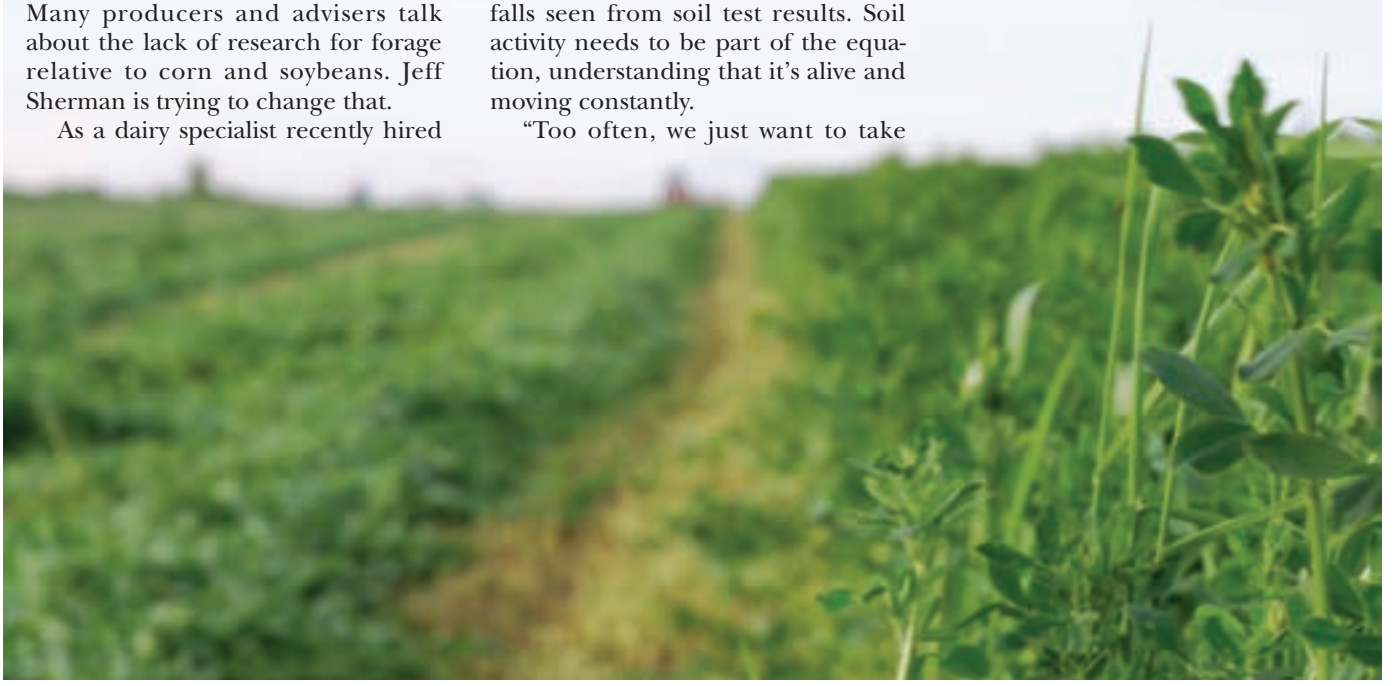
For example, he cites involves four years of alfalfa and an average harvest of 10 tons of dry matter per acre. Alfalfa will generally contain two to three per cent potassium — at 10 tons (20,000 lbs.) of dry matter, that's 400 pounds of potassium per year leaving the field.

Producers also need to be aware of relative feed value and relative feed quality, as well as testing their forages to determine the balance of amino acids, particularly methionine and lysine.

There are certainly encouraging signs of opportunity and recognition in forage production, and the potential that comes out of that process. But there's still a lot of room for improvement. ■

"Too often, we just want to take the easy way out and talk about N, P and K."

JEFF SHERMAN, CANGROW CROP SOLUTIONS



The same principles that apply to corn and soybeans must also apply to forages, including even emergence and good early-season weed management.

Research examines impact of grazing on carbon storage

By Trudy Kelly Forsythe

A direct economic value of $5.09 billion makes forages Canada's third largest crop. And, research shows the impact of Ecosystem Goods and Services (EG&S) increases that value even more.

Perennial grasslands purify and store water, mitigate flooding, support pollinators, provide habitat for wildlife and sustain biodiversity. They help reduce carbon because their root systems can store up to 2.7 times more carbon than annual crops. They sequester carbon deeper in the ground and can slow the breakdown and release of carbon into the atmosphere.

Daniel Hewins, an assistant professor of ecosystem ecology at Rhode Island College, spoke about rangeland EG&S at the Canadian Forage and Grassland Association's annual conference in Winnipeg in November, highlighting research at the University of Alberta (U of A) being done in collaboration with Alberta Environment and Parks (EAP).

Researchers, led by U of A professor Dr. Edward Bork, took samples from 114 grassland enclosures maintained by EAP, including from areas both inside and outside long-term cattle enclosures. They then assessed plant biomass, composition, diversity and carbon storage.

Mark Lyseng collects a forage biomass sample inside a cattle exclosure (a non-grazed area) in the Aspen Parkland region of Alberta. PHOTO: DANIEL HEWINS

GRAZING FOR CARBON STORAGE

Research revealed light-to-moderate intensity grazing over a period of 30 to 60 years promotes carbon storage in the soils of many of Alberta's grasslands-dominated, natural subregions. Hewins explains this may be in part because rangelands evolved with grazing of bison, making many of the plant communities grazing-tolerant. Grazing may directly (via defoliation) and indirectly (via changes in light and moisture) promote biological activity, such as nutrient cycling, which is related to ecosystem health.

In the dry mixed grass prairie, researchers did not observe a grazing effect on carbon storage. However, in the remaining, high-moister regions, they saw a trend toward increases in carbon stores under grazing. They concluded that, in general, moderate-level grazing leads to greater reservoirs of carbon when compared to non-grazed settings.

"Our data also highlights what has already been lost in carbon from past conversion, a staggering $11.3 and $4.2 billion in the Parkland and Prairie regions," says Bork, adding they compared different alternative land uses, specifically annual cropland, tame pasture and native grassland, on soil carbon stocks.

ENVIRONMENTAL INCENTIVES

Hewins says there are currently no incentives to maintain carbon in existing native grassland. The Alberta government is working on policies to value grassland carbon stores and work is underway to directly link comprehensive biodiversity data with cattle producer management practices.

Further research to build a solid foundation of the size and value of the benefits of grasslands is ongoing, Bork says, noting the livestock industry plays a key role in supporting these forward-thinking studies.

CANADIAN FORAGE & GRASSLAND ASSOCIATION
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Quality samples are taken from every plot, assessing diseases, stand establishment and re-growth, among other observations.

At Pickseed, forages are No. 1

Acquisition by a Danish company has allowed a sharp increase in research trials across the country

BY RALPH PEARCE, CG PRODUCTION EDITOR

Forages may lack for attention in Canada's overall research budget, but not at Pickseed, which has long focused most of its attention on the forage and turf sectors.

Now owned by Denmark's DFL-Trifolium, Pickseed operates seven research stations across Canada, with its main facility in Lindsay, Ont., and another near Port Hope. There are also two at Ste. Hyacinthe, Que., one near Portage la Prairie, Man., and two at Taber and Josephburg in Alberta.

The facilities test Pickseed's own varieties as well as those from select competitors, governments and universities. It's part of the company's commitment to improving overall feed quality and production in forages.

"One of the ways we've always tried to differentiate ourselves is to select for forage yield — there's no question about that — but we're also selecting for forage quality," says Matt Anderson, lead researcher with Pickseed. The company has always had a strong research focus and with the acquisition by DLF-Trifolium, that interest has increased considerably.

"To some extent, there's always been a solid background and a strong emphasis on research within our forage portfolio. That's why it was such a good fit going from Pickseed to DLF because a lot of their beliefs are the same beliefs we had before as a private company."

Before the acquisition, Pickseed's Lindsay facility had up to 1,000 replicated trials per year. It's now performing 4,000 trials, and combined with the Port Hope location, Anderson oversees more than 7,000.

He says the additional trials make for better data.

"We have four replicates within each test, so we'd have the variety entered four times and randomized within the trial. We're measuring yield and feed quality from each of those plots, which makes our data more reliable, plus the fact that we're entering that same replicated trial at seven stations across Canada."

HarvXtra — beyond Roundup Ready

One of the more interesting advances in research and development is HarvXtra alfalfa, a unique double-stacked trait variety that combines Roundup Ready technology with a reduced lignin feature. It's part of a strategic alliance that Pickseed has formed with Forage Genetics International, the developers of the HarvXtra technology. It's intended to provide a wider harvest window, plus broad-spectrum weed control for difficult-to-control species such as chickweed.

"What that allows a producer to do is that because you have the reduced lignin, it'll allow a wider window for harvest, so you can delay for up to a week later and still maintain the same feed quality that you would have been doing on a 30-day cutting schedule," says Anderson. "Or you can harvest on your 30-day cutting schedule and the feed quality will be extremely high."

Pickseed has worked closely with Forage Genetics throughout the development of the technology. When

their initial idea was to launch single-trait Roundup Ready alfalfa with no reduced lignin component, Pickseed started testing in 2011. At that time there was no other company in Canada putting the seed into replicated trials.

In 2014, Pickseed then planted their first HarvXtra trials, and then put in another in 2015 and again in 2017.

"Again, we're taking three to four cuts off those trials per season, we're taking quality samples from every plot, numerous field observations — with disease being one of them," says Anderson. "But we're also looking at establishment, and the winter survival rates on those varieties, what's the regrowth — how quickly do those varieties come back after cutting?"

Good varieties need good management

Anderson says that Pickseed's motivation has never altered, even with DFL's acquisition. It's always focused on newer genetics and trying to increase feed yield and quality.

"The other side of that is where newer products like the HarvXtra alfalfa will come into play, and that's in determining how to increase production while at the same time decreasing your input costs," says Anderson. "Those two things combined will prove to be a huge advantage going forward."

Anderson agrees that forages have lacked not only research attention, but attention to good management.

"For the good managers who are out there, there have been improvements in seed genetics and breeding — there's no question about that," says Anderson. "But when you combine that and management, think of the level you can get to. That's what you really have to be paying attention to. If you're just going to fall back on the advances in breeding, they're not going to make up for a lack of attention in management. Management is the key."

He mentions items as simple as ensuring a firm seed bed. That can be missed in the rush to get the crop planted as fast as possible, but a firm seed bed will dramatically improve the stand during its three- or four-year lifespan.

A new species

The list of advances in breeding doesn't stop with HarvXtra. With the plots at Lindsay and Port Hope, Anderson is looking at red clover, white clover, birdsfoot trefoil, timothy, bromegrass, orchardgrass, tall fescue, annual ryegrass and perennial ryegrass.

All are entered into their replicated trials and follow the same guidelines as those for alfalfa: comparisons with current varieties from competitors and government or universities. They measure yield and quality as well as other observations on establishment and winter survival.

One of the other developing stories for Pickseed is the development of festulolium, a new grass species that consists of two hybrids. DLF-Trifolium is the developer. One hybrid is a cross of tall fescue and perennial ryegrass while the other is a cross of meadow fescue with Italian ryegrass. The tall fescue with perennial ryegrass hybrid has the appearance of the former, but has the feed properties of the ryegrass.

"If you're looking for a long-term stand that's going to persist, you'd go with the fescue-type of festulolium," says Anderson. "You're going to get a little more feed quality advantage than what you'd see with a straight tall fescue, but you'll also get a little more winter hardiness than you would have from just a perennial ryegrass alone. So when you're meeting in the middle, you're getting the best of both species."

The meadow fescue/Italian ryegrass festulolium hybrid looks more like a ryegrass, yet it's an annual crop so it's better for short-term and emergency forage situations, or as a good cover crop option. Growers opting for this will get a little bit more persistence than just an annual ryegrass, but still get the improved feed quality over meadow fescue.

"If you're just going to fall back on the advances in breeding, they're not going to make-up for a lack of attention in management. Management is the key."

MATT ANDERSON, PICKSEED

It may sound confusing but Anderson says growers who select one or the other to suit their operations will see huge advantages in stand improvements. It really depends on the duration of the crop that's desired.

"The fescues contribute qualities such as high dry matter yield, resistance to cold and drought tolerance persistence. Then the ryegrass will add more in terms of rapid establishment, good spring growth, good digestibility and higher sugar content."

Pickseed is also studying the potential for a hybrid bromegrass, a true cross between smooth bromegrass and a meadow bromegrass. As with the festulolium, researchers are trying to get the best of both varieties, including the yield of a meadow brome and the feed quality of the smooth brome.

There's also a hybrid ryegrass — a cross between perennial ryegrass and an annual ryegrass, although festulolium is expected to eclipse a lot of the ryegrass hybrids. ■

Festulolium is a new species consisting of two hybrids — crosses of different ryegrass species and different fescues.

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