The History of Forage Cultivar Testing in Saskatchewan

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Forage crop testing at federal research farms in the 1920's consisted of demonstration seeding of 'tame' forage species and varieties introduced from northern Europe and eastern Canada, often in cropping system experiments. According to the Experimental Farm Annual reports of that era, productivity was limited by drought and persistence was limited by cold winter temperatures.

Forage crop breeding started in the 1930's at U of S. Professor Kirk developed and released Fairway crested wheatgrass. Testing was done at Saskatoon and federal research stations but uptake was rapid and extensive. The PFRA used this new species and cultivar to reseed millions of acres of degraded soils abandoned during the "Dust Bowl" years. Crested wheatgrass established quickly, stopping wind erosion of soil and providing a grazing resource for livestock.

The Second World War interrupted many research programs during the 1940's. After the war, new graduates with PhD degrees became the exciting new cohort of forage crop breeders. Tame forage breeding programs were re-instituted at Swift Current and Saskatoon Research Stations. The program at Saskatoon expanded from crested wheatgrass to include smooth bromegrass and intermediate wheatgrass. Swift Current also bred intermediate wheatgrass and Russian wildrye grass. Both programs developed alfalfa cultivars; Swift Current focused on creeping-rooted alfalfas for drought prone SW Saskatchewan while Saskatoon focused on tap-rooted alfalfas with higher yield for the Parkland region. Saskatoon also had minor programs on sweet clover and slender wheatgrass.

Cultivar testing was done across the federal stations in Saskatchewan in the 1950's. In addition, federal stations had demonstration farms located on private farms where additional testing was done and Field Days held to extend the results. The new plant breeders coordinated the cultivar trials and required that the tests be replicated at each site so appropriate statistical analysis could be used. The tests were small with only a few entries per species. Calculations were done on mechanical calculators so statistical analysis was a winter activity and results were usually published a year after the data were collected. Check cultivars, such as Vernal alfalfa, were established to determine performance of potential new cultivars compared to a benchmark. Many alfalfa entries were cultivars developed by public breeding programs in the USA.

The 'off-station' cultivar testing dwindled in the 1960's due to budget constraints. The development of private breeding companies, especially in alfalfa, resulted in demand for more entries per test. Improved technology in dedicated small plot drills and forage plot harvesters

allowed each location to conduct larger tests with less labour. Testing was done at Agriculture Canada stations at Indian Head, Swift Current, Scott, Saskatoon and Melfort. The check cultivar for alfalfa was changed to Beaver for Parkland sites and Rambler at Swift Current. Swift Current also conducted irrigated alfalfa trials on land adjacent to the PFRA canal on site. The data was used to recommend cultivars for Saskatchewan farmers and ranchers through the provincial ministry's "Guide to Farm Practice" publication. There were usually only a few cultivars per species except for alfalfa. The aim was conduct trials as consistently as possible across sites and the name "Uniform Test" was used in the reports.

The efficiency of the cultivar testing program was improved in the 1970's by use of punch card data storage and the ability of the coordinators to electronically compute statistical analysis of the trial results. This reduced the analytical labour per test and shortened the time to publication of the results. Some alfalfa cultivar tests exceeded 25 entries with the majority representing proprietary entries from USA breeding programs. The cost of testing of such a large number of alfalfa cultivars was rising dramatically. Other regions, the Ontario system for example, instituted an entry fee for testing cultivars. Private breeders paid for the testing because performance data was required to register new cultivars with CFIA Variety registration system.

By the 1980's the forage cultivar testing program in Saskatchewan was coordinated by public plant breeders but providing a free testing service to private plant breeders. The cost of running trials by Agriculture Canada staff at smaller locations became too onerous and the cooperators at Scott, Indian Head and Melfort Research Stations dropped out of the program. The Saskatchewan Advisory Committee on Forage Crops and its Variety Testing Committee supported cultivar testing for both recommendation and registration purposes. Critics of the system pointed out that the public plant breeders as coordinators had control of the testing program. Other participants, such as the seed companies, private breeding companies, producer groups and the provincial government, wanted more engagement and input into the testing program.

In the 1990's two major changes occurred in forage cultivar testing. The Saskatchewan Forage Council obtained ADF funding to conduct recommendation testing for the province. Additional sites were set up for replicated research trials to better represent the province's agricultural regions and expand the database for recommendation. In addition to yield and persistence, forage quality was determined through the application of Near Infrared Reflectance Spectroscopy (NIRS) techniques. The grant paid for a full time technician, summer students, travel costs, and lab analysis costs. Plot equipment was initially borrowed from Agriculture Canada and then purchased as the program could afford it. The provincial recommendations were expanded to include performance data relative to the check cultivars so producers had more information for variety selection. These trials ended prior to 2000.

At the same time, the public forage breeders reorganized the testing program under the name Western Forage Testing System (WFtest). These trials continued to be used for registration

purposes and the sites in Saskatchewan were at the Agriculture and AgriFood Canada stations, namely Melfort, Saskatoon, Swift Current and Outlook (irrigated). There were also four sites in Alberta and three in Manitoba. Check cultivars were updated; for example, AC Blue Jay alfalfa added as a check cultivar for irrigation testing. There was a testing fee for both public and private entries to cover some of the cost of the testing. Computerization of data entry at harvest and in the lab reduced the time to publication of the results with reports often released by the end of the calendar year. The WF testing system was managed by a committee that included three representatives from each province, one from a public research institution, one from a private company, and one provincial agriculture representative. Data were used in applications to CFIA for cultivar registration and cultivar descriptions and for provincial forage crop production guides.

The philosophy of extension changed in that forage scientists and extension specialist were not to "recommend" cultivars any longer. The data were to be published and producers could make their own selection of cultivars based on performance data.

Since 2011, there have been no new trials in the WF testing system. There have been a few entries submitted, but not enough to justify the seeding of trials and the eleven sites. This was due to considerable consolidation in the seed industry, thus fewer companies selling seed of forage cultivars. In addition, the CFIA regulations were moving towards a forage cultivar registration system which did not require merit testing and this was implemented in 2014. However, public breeders and other forage researchers continue to collaborate amongst themselves for evaluating their experimental lines which could become potential new cultivars. Performance data are still needed to negotiate commercialization agreements on new cultivar releases by public institutions.

In 2015, the Saskatchewan Forage Network and the Saskatchewan Advisory Committee on Forage Crops identified forage cultivar testing as a critical research need for the province. End-users of forage crops, primarily beef and dairy producers but also other livestock producers, are concerned that there is little or no data available to them to choose among recently released forage crop cultivars. These groups are in the process of initiating a provincial forage cultivar testing program to generate such information which would be funded by several parties, provincial government, industry, producers, researchers, etc. Producers need good information before making large investments in forage seed purchases.

At the same time, seed marketers indicate that their customers purchase forage seed based on price. The value of cultivar performance data to make seed purchase decisions is not recognized by many end users. These marketers also point out that the certified seed price premium over Common No. 1 commercial seed is not always valued by producers. Is the forage seed consumer really demanding comparative cultivar performance test data? Many seed producers are successfully selling seed of old cultivars (Algonquin and Rambler alfalfa for example) while demand for new cultivars is lagging.

In 2016, the same questions and issues need to be addressed as they have been in the past:

1. Who benefits from forage cultivar testing? These are the groups that should pay for it.
2. Who should conduct forage cultivar testing? If testing is to be independent of the public or private plant breeders, then who should do it?
3. How do we increase the adoption of new forage cultivars? If old cultivars are still valued by customers, why do they not perceive the value of the new cultivars?

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