A Bonnefield Research Paper

Canada's Forage Crop

the overlooked cornerstone of Canadian agriculture

Bonnefield
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Introduction

Drive along any stretch of the Trans-Canada Highway and a common sight from British Columbia to Nova Scotia is a farmer's field dotted in large, rolled hay bales. Speeding past in early winter, the snow-dusted bales resemble a large piece of the sugar-coated breakfast cereal shredded wheat, however, this important crop has little to do with Canada's well-discussed wheat crop. Common conceptions of Canadian agriculture would place wheat or canola as the country's largest crops, however, forage crops, including these iconic round-bales, are in fact Canada's largest crop by production volume. Forage also uses more arable land than any other crop accounting for ~70 million acres between natural pasture and cultivated forages. Independent and provincial studies have estimated the Canadian forage industry as a ~$5.1 billion industry. This places forage as the third most valuable crop product in Canada, behind wheat and canola.

Forage describes fresh or dried plants consumed by animals, in particular ruminant livestock including cattle, sheep, bison and horses. The fact that 95-99% of the Canadian forage crop is domestically consumed and less than ~15% is commercially traded leaves the industry in the shadows compared to the wide attention that export crops like wheat, canola and even more recently, pulse crops receive.

This report is designed to take a high-level look at the Canadian forage industry from natural grasslands to high-quality seeded crops to highlight the important role this crop plays within the Canadian agriculture industry and the emerging opportunities for forage managers and producers across the country.

Natural Grasslands

Canada's natural landscape boasts a remarkable variety of native grasslands from coast-to-coast, which supported indigenous grazing herds such as bison, elk, caribou and deer long before European settlers introduced cultivated agricultural practices and domesticated livestock such as cattle and horses. Western Canada houses the vast majority of the nation's natural grasslands. According to the FAO (Food and Agriculture Organization of the United Nations) ~96% of the nation's ~36 million acres of managed and unimproved grass rangelands used for livestock are in the four western provinces with British Columbia accounting for ~36%, Alberta with ~29%, ~24% in Saskatchewan and ~8% in Manitoba. These grasslands vary from region to region and even property to property in terms of forage productivity. As a result, livestock grazing programs must be adapted for specific areas. ~84% of the Canadian beef herd is located in the western provinces where ranchers employ innovative and sustainable grazing rotation programs to maximize cattle production and sustain the natural productivity of their lands. Despite the productive natural grasses, due to harsh winters, unpredictable weather and production expectations, natural grazing can not fully support livestock in Canada and so harvested forage is crucial to sustaining the country's livestock sector.

Figure 1: Hay bales near Okotoks, AB

Source: Michael Interisano (fineartamerica.com)

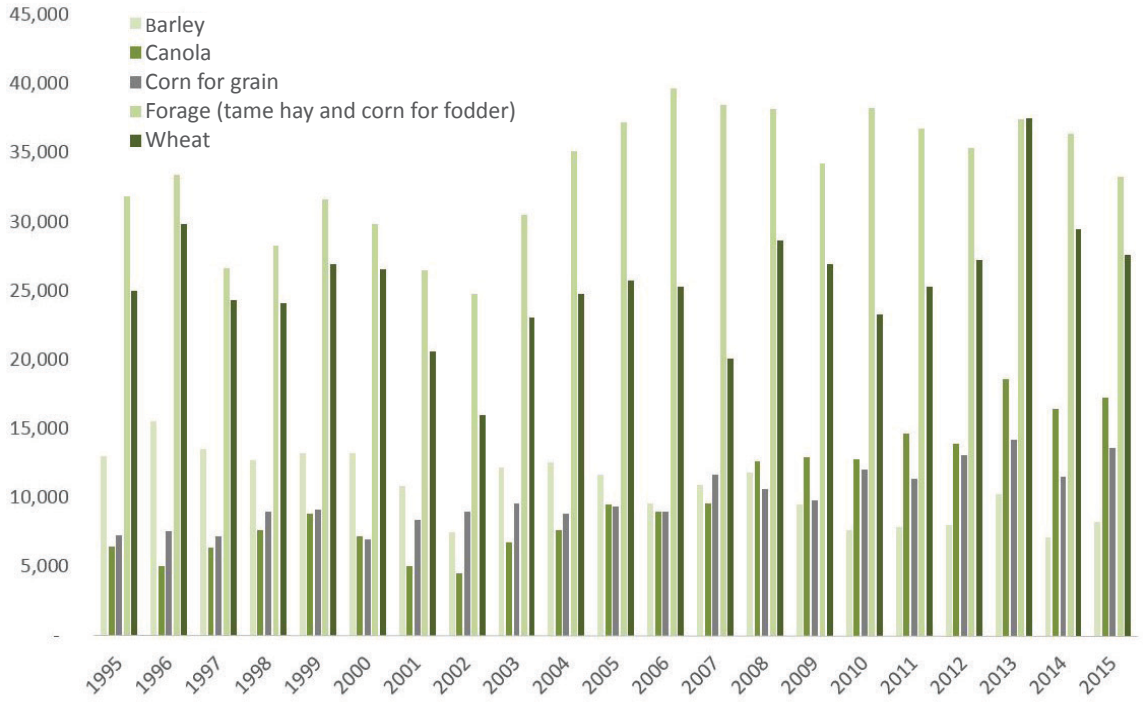
Figure 2: Grazing cattle near Calgary, Alberta

Source: Calgary Herald - Joe Klamar, AFP, Getty Images

Cultivated Forages

At more than 34 million acres, the land that is devoted to cultivated forage production takes up ~39% of the total land devoted to all crop production in Canada, the largest crop by acreage in the country. The second largest crop, wheat occupies ~20.4 million acres, ~23% of the total cultivated land. Forage is used to describe a variety of different species including grasses, legumes and grains and when aggregated together they typically make-up Canada's largest crop by production volume each year. Forage varies from region-to-region and farm-to-farm with alfalfa and timothy grasses being the most popular. Cultivated forages include high-pedigree seeds which are planted similar to row crops and can utilize sophisticated irrigation systems but can also be as simple as the cutting and baling of natural grasses. Forage is considered an important part of a crop rotation program with many cash crop operations. They are mainly produced to secure feed for a farmer's own internal needs such as cattle feed for the winter months and during dry spells. However, large scale commercial opportunities for forage crops are emerging both domestically and abroad.

Figure 3: Canadian crop production volumes (,000 metric tonnes)



Source: Statistics Canada, Bonnefield

Species and Products

Grasses and Fescue

Grasses and fescue plants are the natural diet of most grazing animals as well as being the most indigenous to North America. Most cultivated grasses in Canada are improved and adapted European species bred to thrive in different soil conditions and climates across Canada. Timothy grass is the most common species of grass cultivated for forage, particularly in Ontario and Quebec. It is often seeded with a mixture of other types of grasses and legume forages for improved yield performance. A pure timothy, crop however, is often cultivated as a premium forage product and used for horses. Timothy hay is highly palatable to livestock and provides a protein level anywhere between 5% and 12% depending upon when the crop is taken off the field. Most cultivated grass crops in Canada will be harvested in the field twice a season with the first cut providing the most protein and subsequent cuts dropping in protein levels. There are many other grass and fescue species grown in Canada including Crested Wheat Grass, which is popular on the prairies, Orchard grass or Kentucky Bluegrass which farmers will select according to their specific growing environment and the nutrition attributes they demand for their livestock.

Figure 4: Timothy grass in the midst of being harvested

Source: Barr-Ag Hay and Grain Exporters (barr-ag.com)

Legumes

Alfalfa is the most common forage crop grown in Canada, valued for its high level of protein, fibre and general nutritional value offered to ruminant livestock as well as its resilience and ability to grow in less-than-ideal conditions. Alfalfa is considered an important part of any dairy or beef cattle herd's diet. Like the cultivated grass forages, alfalfa and other legume crops, such as clovers, are typically harvested twice a year depending upon the region of the crop and the length of growing season. Other legume species of forage crops popular in Canada include red clover, alsike clover and white clover.

Figure 5: Alfalfa plants after swathing and before baling

Source: Barr-Ag Hay and Grain Exporters (barr-ag.com)

Grains and Others

Crops that are traditionally bound for the human consumption market have increasingly become popular forage crops for a variety of different reasons. Pulses (lentils, chickpeas, beans, ect…), for example, are becoming an increasingly important export crop in the Canadian prairies but when adverse growing conditions such as drought or hail diminish the quality of the crop below export or human consumption standards it will often be diverted towards the forage or feed markets. Pulses are high in protein and an ideal addition to many livestock feed programs.

Corn is another popular crop in Canada that can be planted with the intention of forage or fodder or for the expressed intention of human consumption. Corn has increased its portion of the total Canadian forage crop from ~15% in 1995 to ~32% in 2015. Corn has traditionally been tremendously popular cattle feed in the US and has become increasingly popular in Canada as growing conditions across the country become more hospitable and different strains are developed specifically for the Canadian climate.

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Packaging and Distribution

Bales

Most forage is typically harvested from the field and compressed into bales, either round or rectangular in shape, to be easily transported, stored and then fed to livestock. The crop is cut or swathed and left to dry under wind and sunlight on the field to a moisture level of optimal nutritional value and shelf-life. The crop is then baled into various shapes determined by the storage needs and the ease of delivering them to the livestock. A small cubed bale is considerably easier to ration for horses kept in stalls while a large round bale can be untwined in a snow-covered pasture with ease for a herd of cattle. Demand for Canadian forage as an export product has encouraged the industry to discover increasingly efficient methods of compacting bales to a better weight-to-volume ratio for overseas logistics. Double-compressed bales can fit more forage into shipping containers increasing the value to both the end customer and the producer.

Figure 6.1: Square field bale (approximately 35-50 kg depending upon species and size)

Figure 6.2: Round field bale (approximately 500-900 kg depending upon size and species)

Figure 6.3: Double compressed bales in a shipping container (~420 kg each)

Source: Barr-Ag Hay and Grain Exporters (barr-ag.com)

Figure 7.1: Typical concrete silos at a dairy farm

Source: Wikipedia, Stock internet image

Silage

Silage, shredded and fermented forage, is a popular way to process forage crops as the process can increase palatability for livestock as as well as improve shelf-life. Silage is produced from most varieties of the forage crops discussed above but is especially utilized with cereal and grain crops. The process involves the crop being mulched and stored in a manor that deprives it of oxygen, often in a large plastic storage bag or upright silos commonly seen at dairy operations, where a fermentation process occurs which converts sugars into acids and is typically complete within two weeks.

Figure 7.2: Typical silage storage bag

Source: Wikipedia, Stock internet image

Pellets and Cubes

A more intensive means of forage production is to process it into pellets and cubes and is done by chopping up the crop, mixing with water and a binding agent and then compressing it into either cube or pellet shapes and dried to an ~11% moisture level. Cubes and pellets are mostly used in the equestrian market and are also popular for export due to the weight-to-volume-to-nutritional value ratio. Pellets can be processed on farm but are typically processed by larger commercial operations which sell the products into either the domestic or export markets.

Figure 8.1: Alfalfa pellets

Source: Archer Daniels Midland

Figure 8.1: Alfalfa cubes

Source: Archer Daniels Midland

Domestic Markets

Anywhere from 95-99% of the Canadian forage crop is domestically consumed in any given year and is most commonly consumed by the farmer's own livestock. It is difficult to assess the value of privately consumed forage, however, it is the main feed supply for the entire Canadian livestock industry including beef cattle, dairy cattle, horses and sheep.

Assessing the Economic Value of the Canadian Forage Industry

Since the majority of the forage production never trades through a market and is internally consumed by the producer, it is hard to determine economic value of the industry. However, an attempt was made in 2012 through the consolidation of provincial market studies by Yungblut and Associates which determined that the Canadian forage industry's economic value was ~$5.1 billion. This places forage as the third most valuable crop after wheat and canola. Provincial forage industries range in size from ~$1.5 billion in Alberta to ~$650 million in Ontario according to the report. The report acknowledges that the forage industry is the base of both the dairy and beef industries in Canada which generate well over ~$50 billion in economic combined activity.

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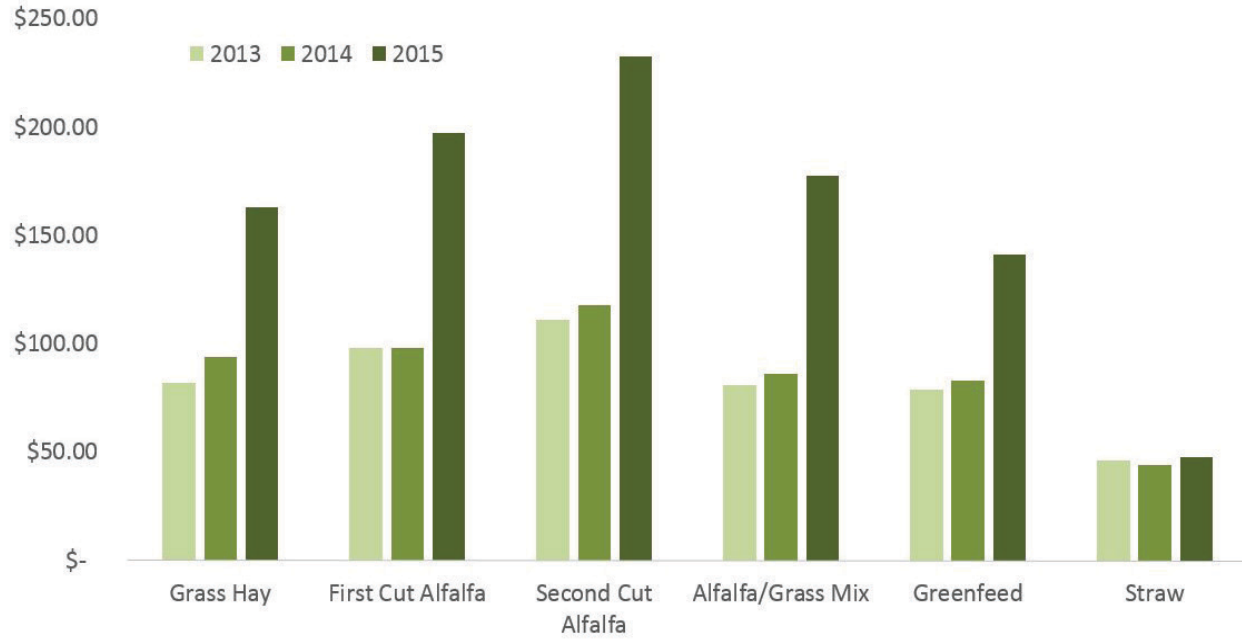
Price Discovery

Since only a small portion of forage is traded in commercial markets it has remained an informal "farmer-to-farmer" market. While established exporting operations and brokers exist throughout the country, for the most part hay is traded when farmers grow surpluses or deficits to their own needs and usually deal within their regional network. Extraordinary circumstances in outlier years, such as the drought in Western Canada in 2012 and early in 2015, can encourage hay to move from local markets to further sales points as a function of price. Price discovery is a challenge in each provincial market with the lack of a formal exchange, mandatory reporting or a financial contract as with crops such as canola and wheat.

The Saskatchewan Forage Council produces an annual report detailing its market investigation which uses unscientific sources such as hay listed for sale on kijiji.ca and hay producer group pages on Facebook. The latest report published in September of 2015 details how the early season dry growing conditions caused most prices to double year-over-year, fuelled by the drop in the Canadian dollar with demand from northern U.S. states. As rains arrived late in the season, restoring standing grass pastures and allowing some producers to even obtain a third cut from some cultivated forage fields, anecdotal evidence suggests that prices dropped back down to normalized levels. This volatility is caused by the lack of transparency in executed deals coupled with inadequate production data, contributing to fear among livestock producers who look to ensure adequate supplies before the end of the season.

Figure 9: Saskatchewan forage crop prices ($CAD/tonne)

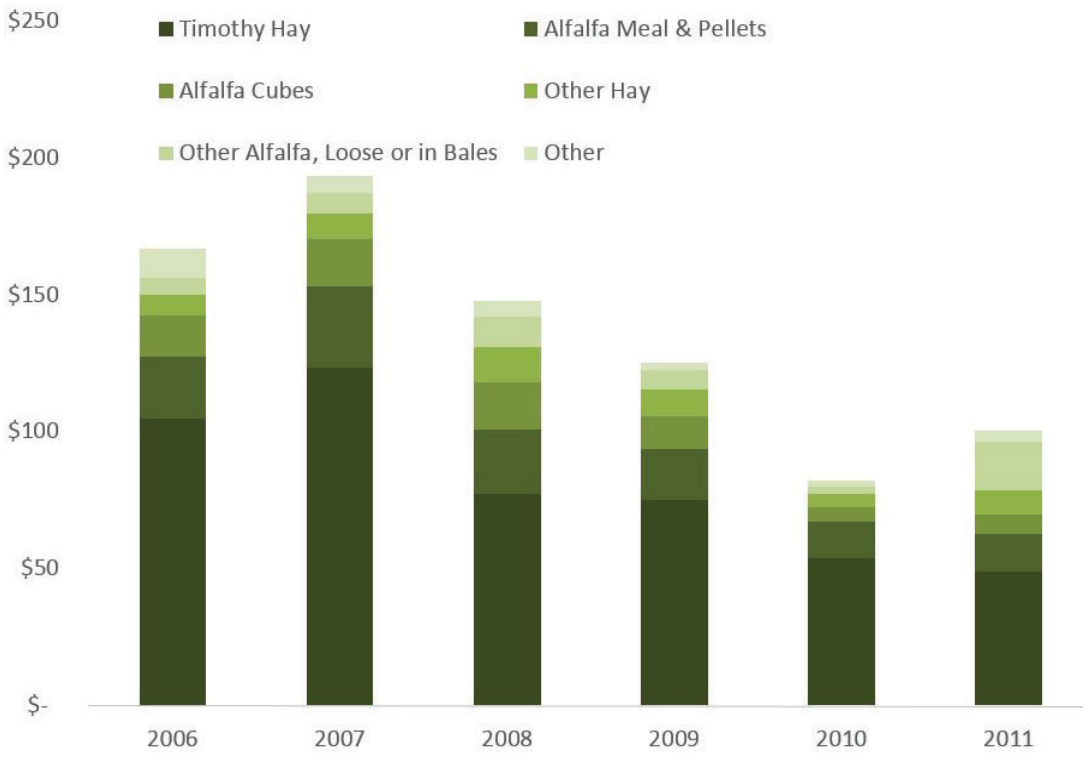


Source: Saskatchewan Forage Council, Forage Market Price Discovery – September 2015

Export Markets and Opportunities

The export market for Canadian forage is a relatively small but growing portion of the overall export of agricultural goods, in both volume and value. Detailed statistics are not always available as Statistics Canada does not include forage products in its monthly report of crop exports by destination. The Canadian Forage and Grassland Association estimates that the Canadian market exports an average of ~600,000 tonnes of forage each year with the main destinations being the U.S. and Japan. In 2008 Statistics Canada published a report stating that 67% of Canadian forage exports in 2007 were delivered to Japan, 25% to the U.S. with South Korea and Taiwan rounding-out the majority of the remainder. The U.S. market can fluctuate dramatically year-to-year for Canadian forage based upon local growing conditions in regional U.S. markets. Asia remains the most important market for Canadian forage while Europe continues to import small amounts of high-quality forage from Canada for specialty industries such as thoroughbred racing.

Figure 10: Canada's top varieties of exported forages ($ million)



Source: National Forage and Grasslands Assessment, Yungblut & Associates Inc. June 2012

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Growing Export Opportunities for Canadian Producers

China

Canada exported its first load of forage to China in 2012 with ~$600,000 worth of double-compressed alfalfa. China has increased its forage imports at an impressive compound annual growth rate of ~290% from ~$119,000 in 2006 to over $103 million in 2011 and even more during the past few years. China's growing dairy industry (with recent goals of doubling milk production) and its beef industry, demand an increasing amount of forage products which the agriculturally stretched nation cannot fulfill itself. China maintains strict standards for agriculture imports, which was demonstrated when the country refused a number of shipments of corn meal loads from the U.S. when traces of a specific genetically modified strain were found in 2014. The rejection of these shipments sent the corn meal and auxiliary feed product markets in the U.S. and around the globe into a tailspin. China approaches forage imports no differently and Canadian producers have been working directly with Chinese officials to ensure that Canadian forage products will meet specifications for import into China.

Saudi Arabia

The Middle Eastern nation recently announced that it will be phasing out the production of forage over the next three years due to drought and lack of irrigation water. This has prompted fears for domestic industries like dairy as well as camel, goat and sheep herds. Saudi Arabia has pulled back on all efforts to become self-sustainable in agriculture production after those efforts caused dramatic draw-downs on their scarce water reserves. Reports have pegged their domestic forage demand at ~3.8 million tonnes, which the Canadian market is well poised to gain solid access to considering the joint venture between Bunge and SALIC (Saudi Agriculture and Livestock Investment Company) which purchased the assets of the former crown-corporation Canadian Wheat Board in 2015. Furthermore, Saudi companies with specific forage needs are making direct investment in forage producing lands in North America. Almarai, the world's largest integrated dairy producer based in Saudi Arabia, announced in January of 2016 a $US 31 million purchase of 1,790 forage producing acres in California.

Summary

While the Canadian forage industry is not as widely understood as more quantifiable and visible Canadian crops, the industry is one of the most significant agricultural sectors in Canada. The forage industry is the cornerstone of the Canadian livestock industry which is valued at over ~$50 billion in economic activity to the Canadian economy. While advancements continue in research for different species and varieties, new markets are opening up around the globe. When looking at the entire Canadian agriculture space it is important to understand the crucial role of forage crops and the opportunities the ~$5.1 billion market produces for Canadian farmers and farmland owners alike.

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