9.10 MBFI extensive wintering project

2016 INT 11

Extended grazing and extensive wintering project

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MBFI Location(s):	Brookdale Farm
Collaborating Partners:	Mitchell Timmerman, Agri-Ecosystems Specialist - Nutrient Management, Manitoba Agriculture; Tod Wallace, Industry Development Specialist- Beef, Manitoba Agriculture
Start Date:	2015 Status: In progress

9.10.1 Introduction

Extended grazing using stockpiled, swath, corn or bale grazing allows livestock to return most of the nutrients they consume directly to the landscape. Feed costs can be comparable to traditional winter feeding, but yardage and feed dispersion costs are lower, as are manure removal costs. Manure and feed residues contain valuable nutrients that can fertilize future annual or perennial crops on fields that may not be regularly fertilized. This improves crop productivity and quality and can extend the grazing season and thereby reduce overall feeding costs[1].

Portable windbreaks are movable, affordable in-field shelter, but may not be adequate in extreme winter conditions with a high wind chill. Additional shelter maybe required to provide optimal protection.

With all types of extended grazing, cross fencing can minimize waste and improve utilization. A powerful electric fencer is necessary for optimal livestock control since snow is a good insulator. Using multiple wires including a ground on the cross fence may be required. Portable steel reels with a braided steel cable works well along with a wider poly-tape, which is more visible.

For both economic and environmental reasons, we want to capture and utilize as much of the imported nutrients as possible. Site selection to minimize leaching and runoff is critical for this to occur.

Agriculture and Agri-Food Canada (AAFC) has two new tools that support sound adoption and management of extensive wintering: a site selection tool and a nutrient loading calculator.

The cows were body condition scored (BCS) and weighed before and after each method of extended grazing. At the Brookdale Farm, cattle utilized stockpiled forage, swath, corn and bale grazing during the winter of 2016/2017.

9.10.2 Objectives

The project objectives are to determine the soil nutrient status and change over time after stockpile, bale, swath and corn grazing. It will determine the effect of extended grazing on beef cattle BCS and performance; the savings in winter-feeding costs, yardage and manure removal cost; and, the practicality of being able to graze year round in Manitoba.

9.10.3 Project Design and Methods

9.10.3.1 Soil testing

Qualitative monitoring of the condition of the land where the extensive wintering takes place will occur in subsequent years. This project will run for several years in order to analyze the long-term impacts of winter grazing practices on the landscape and soil fertility.

Soil samples are taken before the cattle are wintered at this site using GPS coordinates to mark each sampling location. Two composite samples per field will be collected for zero to six, six to 24 and 24 to 48" depths and sent for analysis. Soil testing will be done on a yearly basis to determine the change in soil fertility. The zero to six and six to 24" samples will be analyzed for nitrogen (N), phosphorus (P), potassium (K), sulfur (S), pH, salts, organic matter (OM), cation exchange capacity (CEC), base saturation, carbonates, zinc (Zn), calcium (Ca), magnesium (Mg), sodium (Na), iron (Fe), manganese (Mn), copper (Cu), boron (B), and chlorine (Cl). The 24 to 48" samples will be analyzed for N, P, K, S, pH, salts, Zn, OM.

9.10.3.2 Swath grazing

The swath grazing crops that will be used include millet, oats and barley. Most annuals should be cut at the early dough stage for highest quality and yield. Access to the swaths is controlled by strip grazing using portable electric fence to ensure higher utilization and minimize waste. Nitrates can be a concern in annual crops and are safe up to 0.5% NO_3 for beef cows and calves. Swathing before a frost can help manage nitrate accumulation especially if the crop is not heavily fertilized and is still actively growing.

9.10.3.3 Corn grazing

Growing hybrid corn can produce a significant volume of high-energy feed that can be used for winter grazing. Some of the concerns producers have with grazing standing corn is the level of residue or waste left behind and the risk of grain overload. When grazing corn, the harvesting cost is eliminated and the corn can be limit-fed by using electric fencing at a minimal cost. Electric fences help to improve crop utilization and decrease the risk of grain overload by forcing the cattle to eat more than just the cobs. The cow grazing days/ac (CGD/ac) calculation is based on a 1,300 lb cow consuming 2.5% of her body weight in dry matter (DM) basis and includes 20% waste or residue. The yield and quality of the standing corn will be evaluated using three samples of 1/1000 of an acre per variety.

9.10.3.4 Bale grazing

Most of the bales will be placed in late November for bale grazing. They will be set at a high and low bale density of 10 and 40 bales/ac, based on nutrient importing, average densities and to uniformly cover the field. The haylage bales will be placed just prior to feeding to minimize spoilage and freezing.

The bales will be grazed whole versus unrolled; to compare nutrient dispersion and to try to more uniformly spread the nutrients out.

A 1,250 lb bale of alfalfa-grass hay at 14% crude protein (CP) contains approximately 24 lb of N, 2.5 lb of P and 21 lb K. Livestock only capture a small per cent of these nutrients (10 to 20%) so most of the nutrients are returned to the land. If 30 bales/ac are fed and the animal utilizes 20% of the nutrients, 570 lb of N, 51 lb of P (117 lb P_2O_5) and 434 lb of K would be returned to the land. A challenge with bale grazing whole bales is the nutrients are concentrated closest to the bale. Unrolling the bales will spread the nutrients out more uniformly resulting in better plant uptake and less potential losses. The value of the nutrients returned to the land would be over $500/ac at current prices but would vary year to year depending on the price of fertilizer.

9.10.4 Results and Discussion

9.10.4.1 Swath grazing

The millet was seeded on June 15, 2016 at a rate of 16 lb/ac, the barley was seeded on June 9 at 2.24 bu/ac and the oats were seeded on May 24 at 2.3 bu/ac. There was 11.1 acres of millet, 11.9 acres of oats and 8.2 acres of barley grown for a total of 31.2 acres of annual crop grown for swath grazing.

The residual N ranged from 22 to 38 lb to two inches, seven to 14 ppm P and 278 to 333 ppm K from zero to six inches. Fifty pounds of N and 23 lb of actual P was broadcast in the spring. All three crops were sprayed with a broadleaf herbicide, Buctril M.

The oats, barley and millet were cut and windrowed on August 29, 31 and September 9 respectively in the soft dough stage. Fifty-three cows, 50 bred heifers and 51 calves swath grazed the millet from October 7 to 13, the oats from October 13 to 24 and the barley from October 24 to 28 for a total of 21 days. The paddock size ranged from one to six acres. The time the cattle spent on each paddock ranged from one to four days with an average of 1.9 days. On average, the cattle were supplemented with 5.1 lb/hd/d of polycrop bales. Supplementing the cattle, helps encourage better utilization as the cows are on a grazed area longer. The cattle consumed a 2:1 mineral and they had free choice access to blue salt blocks.

Overall crop growth was best in the oats, followed by the barley and then the millet; this was reflected in the yields. The oats produced 5,930.4 lb DM/ac, followed by the barley at 4,982.4 lb DM/ac and the average of the millet was 3,284.9 lb/ac. This produced an average of 152, 128 and 85 CGD/ac for the oats, barley and millet respectively. The millet had the highest CP and the barley had the highest total digestible nutrients (TDN, an estimate of energy) and relative feed value (RFV). Six yield measurements were taken for each crop and a composite sample was taken for nutritive analysis.

Table 9.10.1 Swath grazing feed quality, sampled on Sept. 14, 2016

2016 Swath Grazing	DM, %	CP, %	TDN, %	RFV	DM Yield, tonnes	CGD/ac
Millet #13	79.6	7.6	52.4	77	1.68	95
Millet #11	78.8	7.9	55.7	80	1.30	74
Oats	89.9	5.4	58.5	105	2.69	152
Barley	93.8	6.6	61.0	108	2.26	128

9.10.4.2 Corn grazing

The corn varieties were planted on a 30" row spacing on May 19 with a corn planter 2 to 2.5" deep. The corn was fertilized with 120 lb/ac N and 23 lb/ac of actual P in the spring. The 2015 fall soil test measured 30 lb/ac N and 108 lb/ac S to 2', 13 ppm P and 280 ppm K at zero to six inches.

The plant population ranged from 36,000 to 38,000 plants/ac on June 17. Manitoba Agriculture has recommended 30,000 plants/ac in the *Grazing Cattle on Corn*[2] factsheet, and the Manitoba Corn Committee silage trials are conducted at 28,000 plants/ac. Twenty per cent residue is a reasonable amount of residue to target based on producer and personal experience.

The five corn varieties grown for extended grazing at the Brookdale Farm were sampled on Nov. 2, 2016 for yield and feed quality. All five varieties grew very well but suffered some hail damage in July and had some visible blackbird and mold damage by the fall.

Fifty-three cows, 50 bred heifers and 51 calves started grazing the corn on Nov. 14, 2016 until they were taken off on Jan. 4, 2017 for a total of 52 days. The cattle were supplemented with an average of 15.6 lb/hd/d of hay, greenfeed and haylage along with blue salt and mineral. A 2:1 mineral (two parts calcium to one part phosphorus) is required since corn has low Ca levels and cattle require more Ca than a corn-based ration can provide to them.

The cattle grazed each paddock from one to four days, the paddocks were 0.17 to 1.4 acres in size. A few cows suffered some lameness issues due to grain overload but later recovered. Hay was being fed regularly to help minimize grain overload and as a result, more hay was fed during the corn grazing period. Cattle should be adapted to grazing corn to allow the rumen to adjust to the grain corn in the diet.

Across the five varieties the CP ranged from 6.4 to 8.7%, the TDN ranged from 66 to 81% and DM was 41.7 to 62.4%. The CP, TDN and DM averaged 7.4%, 75.9% and 49.4% respectively. The average DM yield of the corn was 6.1 tonne/ac producing 342 CGD/ac with a range of 279 to 376 CGD/ac.

The bred heifers had the highest average daily gain on the corn grazing at 0.87 lb/hd/d.

Table 9.10.2 Corn results harvested/sampled on Nov. 2, 2016, all values are averaged

Sample Description	CHU[z]	Plant Pop/ac	CP, %	TDN, %	DM, %	Wet Yield, tonnes/ac	DM Yield, tonnes/ac	CGD, d/ac
Pioneer 39D95	2175	37 K	7.6	78.3	54.9	11.22	6.16	348
Pride A4705	2225	38 K	7.2	76.7	47.2	14.08	6.65	376
Pickseed 2210VT2P	2175	36.7 K	7.9	77.4	55.7	11.74	6.54	370
Dow	2425	35 K	7.4	73.2	44.6	11.05	4.93	279
Brett Young Yukon	2150	38 K	7.0	73.7	44.7	13.37	5.98	338

[z]CHU = corn heat units

9.10.4.3 Bale grazing

The calves were weaned prior to the start of the bale grazing and along with the bred heifers were moved to the Johnson Farm location. Forty-six cows bale grazed at the Brookdale Farm from Jan. 5 until Feb. 27, 2017. They were moved every one to eight days and bale grazed for a total of 53 days. One cow

was removed (culled) on January 31. The cows were moved to the Johnson Farm at the end of February to bale graze better quality feed at that location.

At the Brookdale Farm, the cows were fed a combination of alfalfa hay, oat greenfeed, small alfalfa hay bales and alfalfa silage at 21.6, 9.6, 5.2 and 7.8 lb/hd/d of each forage respectively, for a total of 44.2 lb/hd/d. This is equal to 3.2% of body weight on an 'as-fed' basis and on average provided 32.9 lb of dry matter equal to 2.4% of body weight.

Table 9.10.3 Feed quality of bales grazed at Brookdale

2016 Feed Test	DM, %	CP, %	TDN, %	RFV
1st cut alfalfa/grass	79.1	16.5	48.3	88
Oat greenfeed	80.2	9.8	47.8	75
Alfalfa-grass Silage	50.6	15.2	42.9	74
Small alfalfa/grass hay	79.1	16.4	42.0	71

9.10.5 Economics

Swath grazing had the highest feed cost at $2.40/hd/d ($2.58 with supplemented feed), followed by bale grazing at $1.06 and corn grazing at $0.85 ($1.38 including supplemented feed). The high cost of the swath grazing was due in part to the lower millet yield and the excessive trampling and waste caused by the wet conditions. Including all costs (tractor, labour, supplemented feed and actual feed) the bale grazing was the most economical method of extended grazing at $1.85/hd/d, followed by corn grazing at $2.02/hd/d and swath grazing at $2.95/hd/d.

Manitoba Agriculture's cost of production (COP) for a cow-calf operation[4] provides a guideline of $1.57/cow/d for winter feed, plus $1.31/d yardage; for a cost of $2.88/cow/d based on a 1,300 lb cow. Using the MB Ag COP value as a base cost would result in the bale grazing saving $1.03/cow/d and corn grazing saved $0.86/cow/d. Grazing 100 cows for 200 days would save $20,600 by bale grazing and $17,200 for corn grazing in one year. Along with a reasonable feed cost, other benefits of corn and bale grazing include lower yardage cost, no manure removal cost and the nutrients stay on the land.

Manitoba Agriculture's COP guideline for silage[5] of $308.00/ac for corn and $179.43/ac for cereals (oats, barley and millet) were used. For each fence move, two hours of labour were allocated to that activity, which covers setting up the fence and checking the cattle. The per head cost for swath, and corn grazing includes cows, bred heifers and calves converted to a 1,300 lb cow equivalent whereas the bale grazing cost is only the cows. The tractor cost was based on $70/hr, labour at $20/hour and feed at $0.025/lb.

In the fall of 2016, swath grazing did not work well since the conditions were wet prior to freeze-up. Due to the soft ground and muddy conditions, there was considerable trampling and excess waste or residue, which increased the cost and decreased the feed utilization. Overall utilization in the swath grazing is difficult to calculate due to the excessive trampling and wet conditions. In the past, the level of corn residue has ranged from 15 to 25%, and that value generally increases the later the corn is grazed into the winter. This is based on measurements taken in farmer's fields in the Portage and Austin areas.

Table 9.10.4 Extended grazing data and cattle performance

Start Date	End Date	# of Days	Supplement, lb/hd/d	Cattle Type	Average start wt, lb	Average end wt, lb	Start BCS	End BCS	ADG, lb/d
				Swath Grazing					
7-Oct-16	28-Oct-16	21	5.1	Cows	1,393	1,343	2.9	2.9	-1.40
				Bred heifers	998	980	3.1	3.1	-0.90
				Calves	395	441			2.18
				Corn Grazing					
14-Nov-16	4-Jan-16	52	15.1	Cows	1,365	1,366	2.9	3.0	0
				Bred heifers	1,003	1,048	3.2	3.1	0.87
				Calves	482	557			1.48
				Bale Grazing					
11-Jan-17	27-Feb-17	53		Cows	1,366	1,387	3.0	2.9	0.46

Table 9.10.5 Costs associated with each extended grazing type for a 1,300 lb cow

Method	Feed	Supplement Feed	Labour	Tractor	Total
Swath Grazing	$2.40	$0.18	$0.19	$0.18	$2.95
Corn Grazing	$0.85	$0.53	$0.15	$0.49	$2.02
Bale Grazing	$1.06		$0.53	$0.26	$1.85
MB Ag Cow/Calf COP[4]	$1.31				$2.88

On May 2, 2017, the corn grazing residue ranged from 18 to 28% and averaged 22%. The corn varieties that were grazed earlier had lower residue versus the varieties grazed later in the winter. The barley, oats and millet swath grazing had 55, 20 and 23% residue, respectively. The millet value is the average of two fields. The excessive trampling in the fall made the residue sampling difficult in the barley, oats and millet.

9.10.6 Summary

Both the cows and bred heifers lost weight on the swath grazing, while maintaining body condition. The calves had the highest ADG while swath grazing. The cows had the highest ADG on bale grazing due in part to the calves being weaned. The bred heifers had the highest ADG on the corn grazing. Overall cow BCS change was minimal as it only went up 0.1 on the corn and dropped 0.1 on the bale grazing. From the start of swath grazing in October to the end of bale grazing at the end of February the average cow BCS stayed the same at 2.9.

In a three-year study the Western Beef Development Centre has shown that, there are cost benefits to grazing cows during winter months[2]. By utilizing a variety of extended grazing methods, MBFI has shown that beef cattle can be kept out of confined areas all winter long in Manitoba. The cattle were fed on the landscape at a cost saving while maintaining cow body condition.

9.10.7 Acknowledgements
Thank you to our Extended Grazing sponsors Pickseed, Brett-Young, Dow, Pride, Dupont/Pioneer, Northstar Seeds, and Secan.
Thank you to all the MBFI staff for their hard work and assistance in carrying out this trial.

9.10.8 References
[1]Lardner HA, Damiran D, Hendrick S, Larson K and Function R. Effect of development system on growth and reproductive performance of beef heifers. J Anim Sci. 2014; 92:3116–3126.

[2]Kelln BM, Lardner HA, McKinnon JJ, Campbell JR, Larson K and Damiran D. Effect of winter feeding system on beef cow performance, reproductive efficiency and system cost. The Professional Anim. Scientist. 2011; 27(5):410-421.

[3]Grazing Cattle on Corn. Factsheet published by Manitoba Agriculture, Food and Rural Initiatives, Agriculture & Agri-Food Canada and Manitoba Forage Council.

[4]Guidelines for estimating beef cow-calf production costs in Manitoba [Internet]. Manitoba Agriculture, 2016. Available from https://www.gov.mb.ca/agriculture/business-and-economics/financial-management/pubs/cop-beef-cowcalf.pdf

[5]Guidelines for estimating silage production costs in Manitoba [Internet]. Manitoba Agriculture, 2017. Available from https://www.gov.mb.ca/agriculture/business-and-economics/financial-management/pubs/cop-forage-cereal-silage.pdf

Swath Grazing Plan

Oats, millet and barley will be grazed starting in the fall after the perennial pastures and second cut. Start with the crop closest to the yard. Use portable wind breaks as necessary.

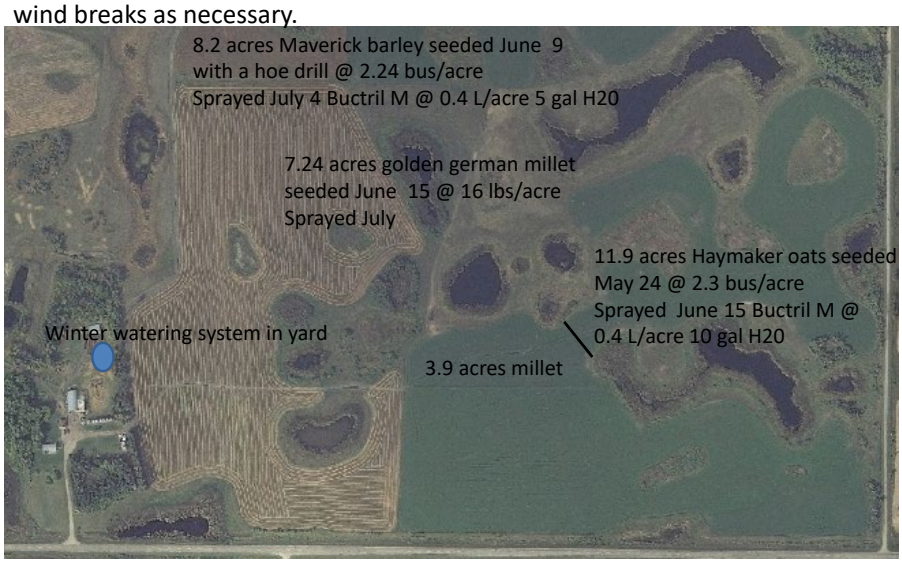

Fig. 9.10.1 MBFI swath grazing plan for 2016 on fields 9, 11 and 13, Brookdale Farm; photo by Manitoba Agriculture.

Fig. 9.10.2 Cattle swath grazed the oats in mid-Oct. on field 13; photo by Manitoba Agriculture.

Fig. 9.10.3 In late October the ground was very wet and excessive trampling occurred while swath grazing the barley on field 9; photo by MBFI.

Fig. 9.10.4 Standing corn, Brookdale Farm; photo by Manitoba Agriculture.

Fig. 9.10.5 Thank-you to our corn sponsors: Pickseed, Brett-Young, Dow, Pride and DuPont/Pioneer; photo by Manitoba Agriculture.

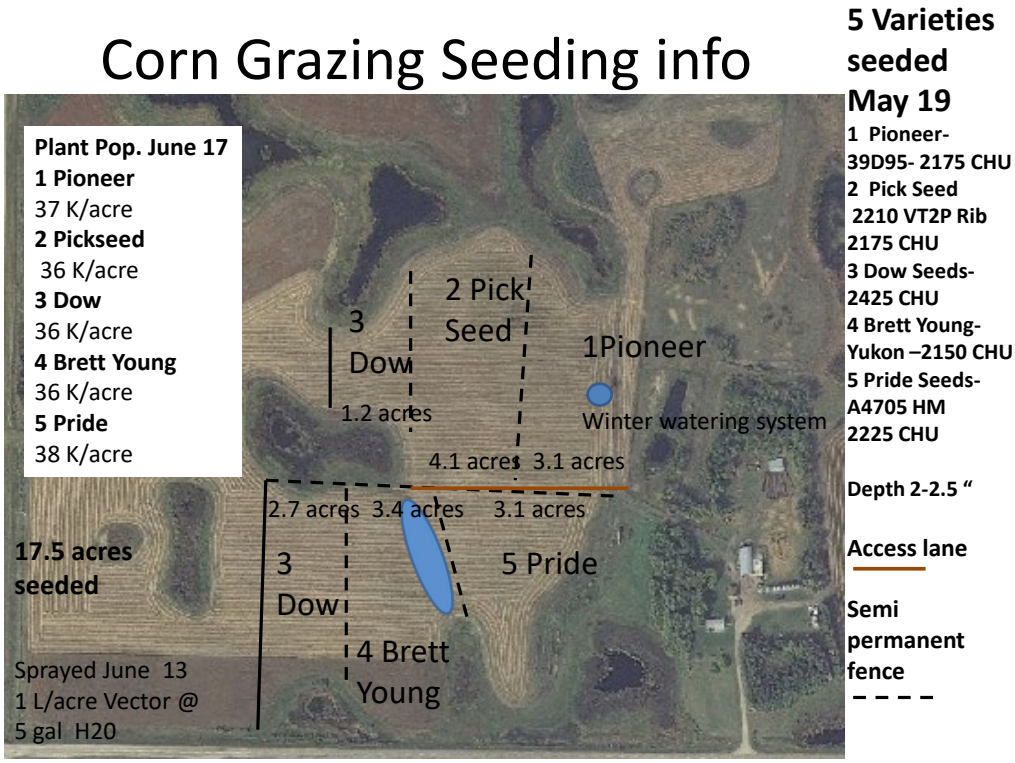

Fig. 9.10.6 2016 Corn variety plot at the MBFI Brookdale farm on field 4.

Fig. 9.10.7 The corn growth was affected by late and/or poor weed control along the shelterbelt on field 4; photo Manitoba Agriculture.

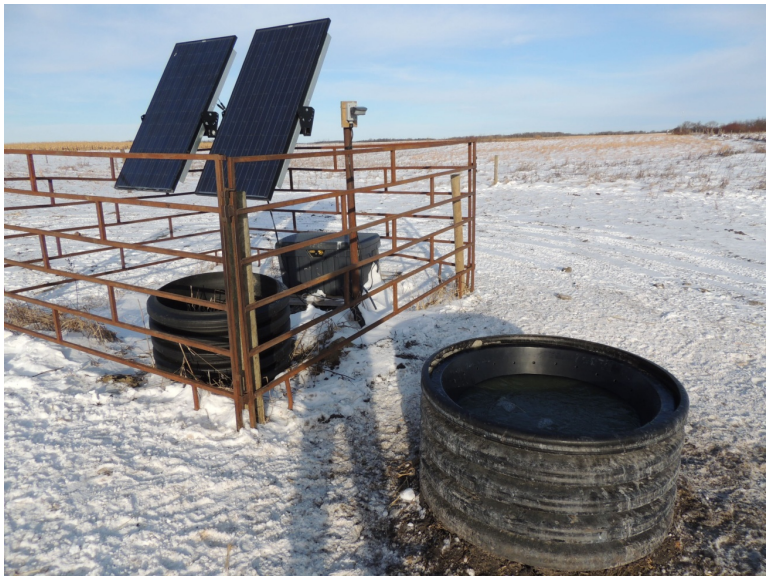

Fig. 9.10.9 Cattle supplemented while grazing corn; residue remaining is moderate; field 4 Brookdale Farm, December; photo by Manitoba Agriculture.

Fig. 9.10.10 The alternate solar-powered watering system located in the corn grazing area; it worked well. The water came from a dugout; photo Manitoba Agriculture.

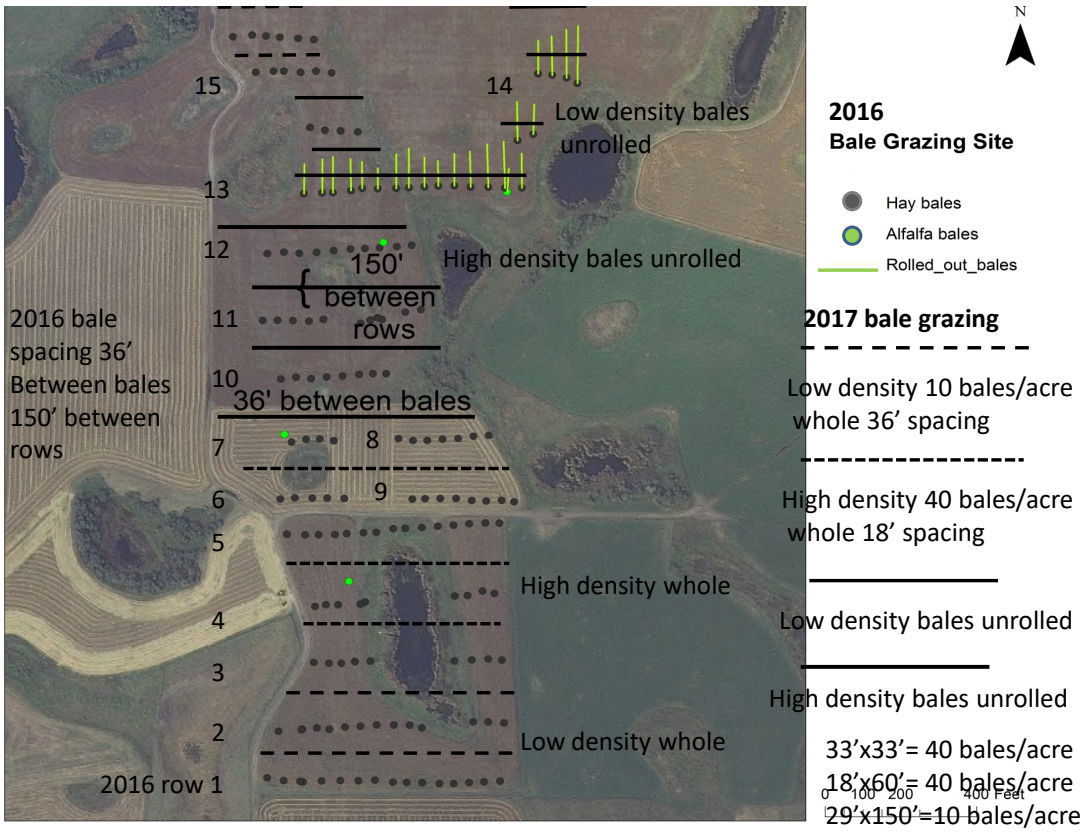

Fig. 9.10.11 2016/17 bale grazing plan: 10 or 40 bales/ac fed whole or unrolled on fields 7, 8 and 9; photo by Manitoba Agriculture.

Fig. 9.10.12 Bale grazing residue from the winter of 2016 affected the barley growth in early July on field 9; photo by Manitoba Agriculture.

Fig. 9.10.13 Aerial photo of the winter bale grazing sites on fields 7, 8 and 9 of Brookdale Farm, May 2016; photo by Assiniboine Community College.

Fig. 9.10.14 Higher density bale placement of 40 bales/ac (99 bales/ha) on field 9 Brookdale Farm, December 2016; photo by Manitoba Agriculture.

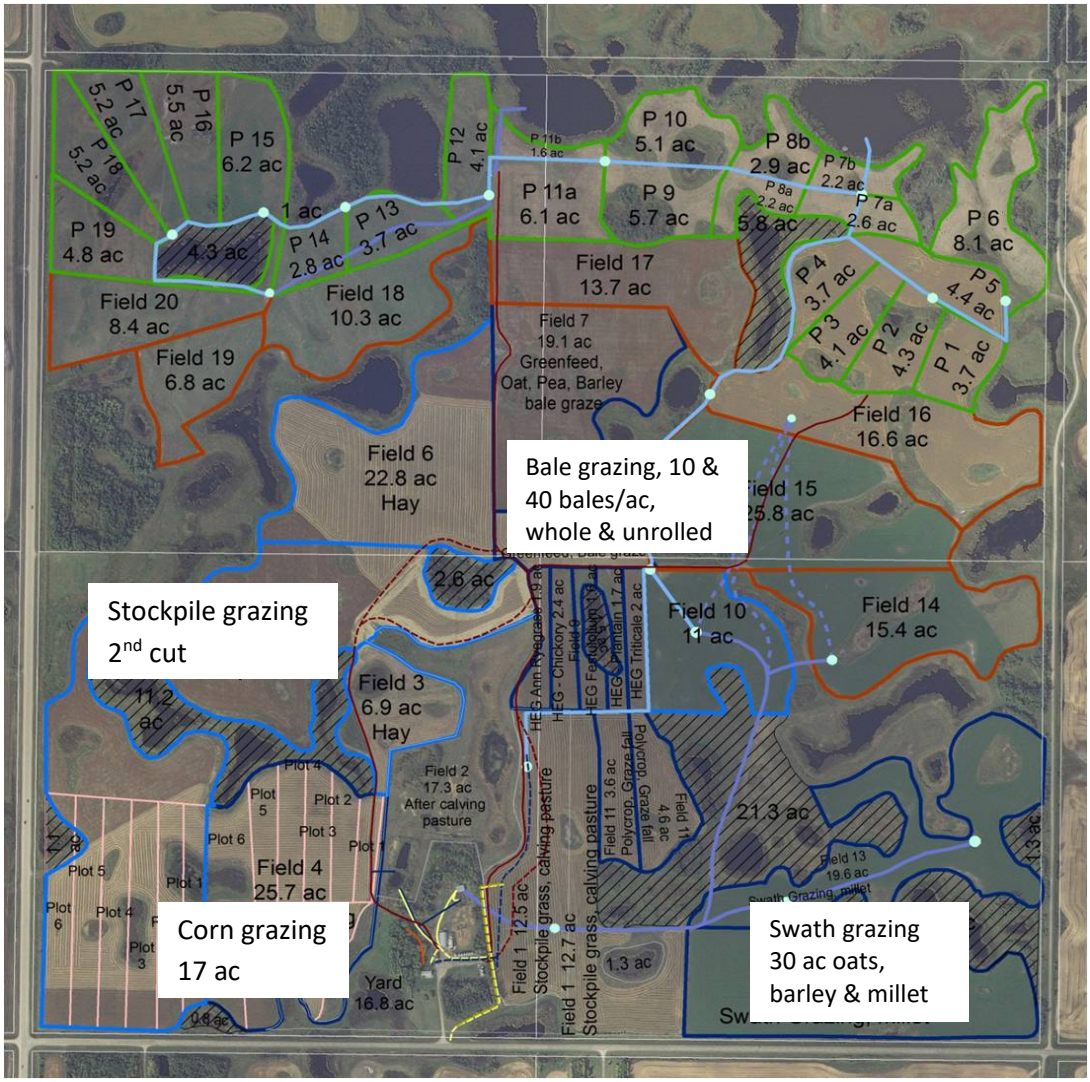

Fig. 9.10.15 Winter grazing includes, stockpiled forage, swath, corn and bale grazing starting in October until the end of May; photo/figure by Manitoba Agriculture and MBFI.