MBFI extensive wintering project

2017 INT 11

Extended grazing and extensive wintering project

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MBFI Location(s):	Brookdale Farm
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Start Date:	2015 Status: In progress

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 winterfeeding, 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 regularly be 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 economical 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 2017/2018.

Objectives

The project objectives are to determine the soil nutrient status and change over time after stockpile, bale, swath and corn grazing. To determine the affect 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

Project Design and Methods

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 were taken before the cattle were wintered at this site using GPS coordinates to mark each sampling location. Two composite samples per field will be collected for 0 to 6, 6 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 0 to 6 and 6 to 24" samples will be analyzed for nitrogen (N), phosphorus (P), potassium (K), sulphur (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.

Swath grazing

There was 8 acres of oats and 12 acres of spring and winter triticale grown for a total of 20 acres of annual crop grown for swath grazing. The oats was seeded on May 23 at a rate of 2.5 bu/ac and the triticale was seeded on June 1 at 1 bushel each spring and winter triticale.

The residual N ranged from 40 to 49 lb to 2', 14 to 39 ppm P and 280 to 449 ppm K from 0 to 6". Sixty pounds of N and 21 lb of actual P205 was broadcast in the spring. Both crops were sprayed with a broadleaf herbicide June 27- Frontline Xcel 0.5 l/acre + 0.23 l/acre MCPA.

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 prior to a frost can help manage nitrate accumulation if the crop was not heavily fertilized and was actively growing.

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 decreases the risk of grain overload by forcing the cattle to eat more than just the cobs. The yield and quality of the standing corn will be evaluated using three samples of 1/1000 of an acre per variety.

The corn varieties were planted on a 28" row spacing on May 18 and 19 with a hoe drill 2 to 2.5" deep. The corn was fertilized with 60 lb/ac N and 21 lb/ac of P2O5 in the spring. The 2016 fall soil test measured 103 lb/ac N to 2', 22 ppm P and 345 ppm K at 0 to 6". Due to cloddy soil and poor emergence the plant stand was not uniform. Seeding rates ranged from 27 000- 40 000 plants/ac. Half of the stand was re-seeded June 23 at 30 000 seeds/ac. The field was sprayed with glyphosate @ 0.625 l/ac and banvel 0.094 l/ac on July 2 and 14.

Canamaize was seeded with a hoe drill on May 19 on a 14" row spacing at a plant population of 65,000/ac. It was sprayed on June 26 with Accent at a rate of 13.5 g/ac and Banvel herbicide @ 100 ml/ac.

The cow grazing days/ac (CGD/ac) calculation is based on a 1300 lb cow consuming 2.5% of her body weight in dry matter (DM) basis and includes 20% waste or residue. 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 percent residue is a reasonable amount of residue to target based on producer and personal experience.

Bale grazing

Most of the bales were placed for the bale grazing in late December and early January at a high bale density of 40 bales/ac based on nutrient importing, average densities and to uniformly cover the field. The bales will be grazed whole versus unrolled to compare nutrient dispersion and to try to more uniformly spread the nutrients out.

A 1250 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 percent 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.

Results and Discussion

Swath grazing

The oats and triticale were cut with the disc-bine on August 16 and 25 in the soft and early dough stage respectively. Fifty cows and 50 calves swath grazed the oats from November 1 to 8 and the triticale November 10 to 29 for a total of 28 d. The paddock size ranged from 1.1 to 3.5 acres. The time the cattle spent on each paddock ranged from one to three days with an average of 2 days. On average, the cattle were supplemented with 16.7 lb/hd/d of first cut hay. 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 triticale followed by the oats as reflected in the yields. The triticale produced 5258 lb DM/ac, followed by the oats at 2838 lb DM/ac. This produced an average of 135 and 71 CGD/ac for the triticale and oats respectively. The idea behind seeding a combination of winter and spring triticale is the winter triticale would regrow in the fall after being cut and provide a higher quality feed when grazed. Part of the reason for the low yield on the oats was a high cutting height of 12 inches. The triticale had the highest CP and the oats had the highest total digestible nutrients (TDN, an estimate of energy) and relative feed value (RFV). Four yield measurements were taken for each crop and a composite sample was taken for nutritive analysis.

Table 1. Swath grazing feed quality, sampled on Sept. 14, 2016

2016 Swath Grazing	DM, %	CP, %	TDN, %	RFV	DM Yield, tonnes	CGD/ac
Oats	78.8	5.3	60.9	94	1.26	71
Triticale	62.9	7.3	54.4	84	2.39	135

Hybrid Corn grazing

The five corn varieties grown for extended grazing at the Brookdale Farm were sampled on Nov. 9, 2017 for yield and feed quality. All five varieties had poor emergence, uneven plant stands and had some visible blackbird damage by the fall.

Fifty cows started grazing the hybrid corn on Dec.4 until they were taken off on Jan. 11, 2018 for a total of 39 days. The cattle were supplemented with an average of 25.7 lb/hd/d of first cut alfalfa grass hay 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 five days averaging 2.1 days, the paddocks were 0.13 to 1.7 acres in size and averaged 0.9 acres. 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. The extra hay fed increased the cost and may have contributed to higher corn residue levels.

In 2017 across the five varieties the CP ranged from 7.4 to 8.5%, the TDN ranged from 67.6 to 78.3% and DM was 36-66.4%. The CP, TDN and DM averaged 7.9%, 73.7% and 50.3% respectively. The average DM yield of the corn was 3.5 tonne/ac (2.1- 5.3 range) producing 199 CGD/ac with a range of 119-298 CGD/ac.

The cows average daily gain on the corn grazing at 1.8 lb/hd/d was the highest of all the extended grazing practises.

Table 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

Canamaize corn grazing

The 50 cows & 50 calves started grazing the canamaize corn Nov.29 to Dec. 4 for a total of 6 days. The cattle were moved 3 times and fed 28.5 lb/hd/d of hay. The canamaize didn't compete very well where the weed control was poor and the yields were greatly reduced. The cattle did consume the canamaize very well resulting in less residue visually.

Bale grazing

Fifty cows started grazing the bales at Brookdale Farm from Jan. 11 until April 4, 2018 for a total of 84 days. The cows were moved on average every 4 days but ranged from 2 to 9 days. The cows were fed mostly alfalfa/grass first cut hay and some greenfeed at a ratio of 80:20 for a total of 50 lb/hd/d. This is equal to 3.5% of body weight on an 'as-fed' basis at the start of the bale grazing and on average provided 44 lb of dry matter equal to 3.1% of body weight.

Table 3. Feed quality of bales grazed at Brookdale

2016 Feed Test	DM, %	CP, %	TDN, %	RFV
1st cut alfalfa/grass	89	15.4	52	93
Oat greenfeed	86.4	11.3	52.1	85

Economics

Due to the poor corn yields and the high feed supplementation levels the total cost/hd/day was the highest for the canamaize at $4.17/hd/day followed by the hybrid corn at $3.92. The swath grazing cost of $ 2.74/hd/day is less than but comparable to traditional feeding. Although trampling and waste was considerably less in 2017 due to drier conditions vs 2016 the lower yields kept the cost of the swath grazing higher.

Including all costs (tractor, labour, supplemented feed and actual feed) the bale grazing was the most economical method of extended grazing at $1.60/hd/d which was less than last years cost of $1.85/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 1300 lb cow. Using the MB Ag COP value as a base cost, would result in the bale grazing saving $1.28/cow/d. Grazing 100 cows for 200 days would save $25,600 in one year. Although the corn and swath feed costs were high in 2017, other benefits of extended 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 and triticale) were used. For each fence move, 1.5 hours of labour was allocated to that activity, which covers setting up the fence and checking the cattle. The per head cost for swath, and canamaize corn grazing includes cows and calves converted to a 1300 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 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 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					
1-Nov-17	29-Nov17	28	16.7	Cows	1359	1353	2.5	2.8	-0.2
				Calves	550	587			1.3
				Canamaize Corn Grazing					
29-Nov-17	4-Dec-18	6	28.5	Cows					
				Hybrid Corn Grazing					
4-Dec-17	11-Jan-18	39	25.7	Cow	1320	1384	2.8	3	1.8
				Bale Grazing					
11-Jan-18	04-Apr-18	84	50	Cows	1384	1451	3	3	0.8

Table 5. 2017/18 Costs associated with each extended grazing type

Method	Feed	Supplement Feed	Labour	Tractor	Total
Swath Grazing	$2.40	$0.18	$0.19	$0.18	$2.74
Canamaize corn	$2.88	$0.71	$0.21	$0.37	$4.17
Hybrid Corn Grazing	$2.53	$0. 64	$0.36	$0.39	$3.92
Bale Grazing	$1.25		$0.15	$0.20	$1.60
MB Ag Cow/Calf COP[4]	$1.31				$2.88

On May 7, 2018, 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.

Summary

The cows followed a similar trend as last year and lost weight on the swath grazing although not as much (-0.2 vs -1.4 lb/hd/day), but gained body condition. The calves gained 1.3 lb/hd/d while swath grazing while still on the cow (down from 2.18 lb last year). The cows had the highest ADG on corn grazing of 1.8 lb/hd/d. Overall cow BCS change was more in 2017/18 going up 0.3 on the swath and 0.2 on the corn grazing. From the start of swath grazing in November to the end of bale grazing at the beginning of April the average cow BCS increased 0.5 to finish at three.

When growing corn optimal fertility and good weed control is important to achieve high yields which is critical to offset the higher cost of production.

In a three-year study the Western Beef Development Center 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 during bale grazing while maintaining cow body condition.

Acknowledgements

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

References

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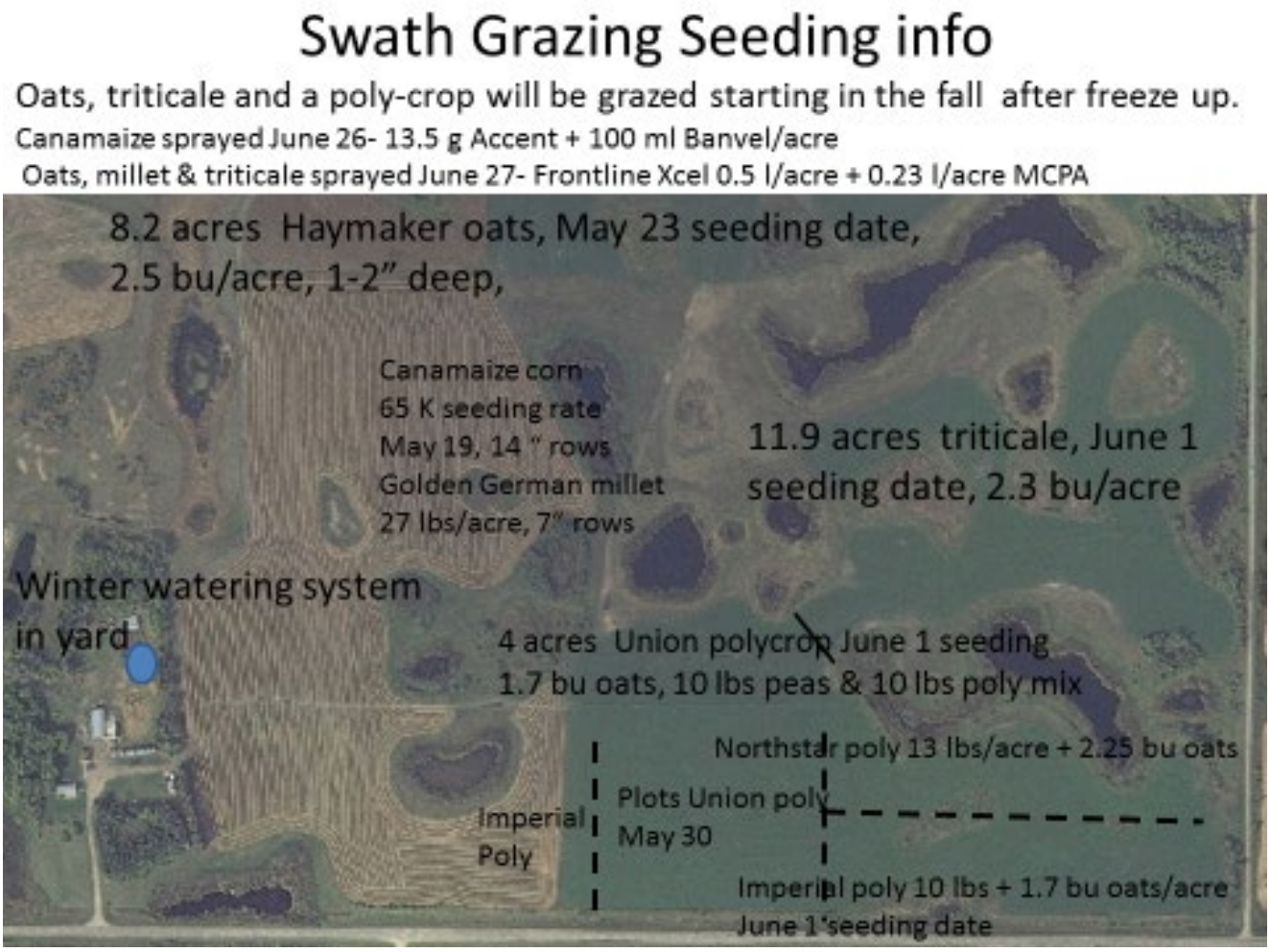

Figure 1. MBFI Swath grazing plan for 2017 on fields 9, 11, 12 & 13

Fig. 2. Cattle swath grazed the oats in early November on field 9; photo by MB Ag.

Fig. 3 Triticale swaths with winter triticale regrowth on Sept. 22 2017, photo by Mb Ag.

Fig. 4. In late October in 2016 the ground was very wet and excessive trampling occurred while swath grazing the barley on field 9; photo by MBFI.

Fig. 5. Very good crop of corn in 2016 , Brookdale Farm; photo by MB Ag.

Fig. 6. Thank-you to our corn sponsors: Pickseed, Brett-Young, Dow, Pride and Pioneer; photo by MB Ag.

Fig. 7. 2017 Corn variety plot at the MBFI Brookdale farm on field 4.

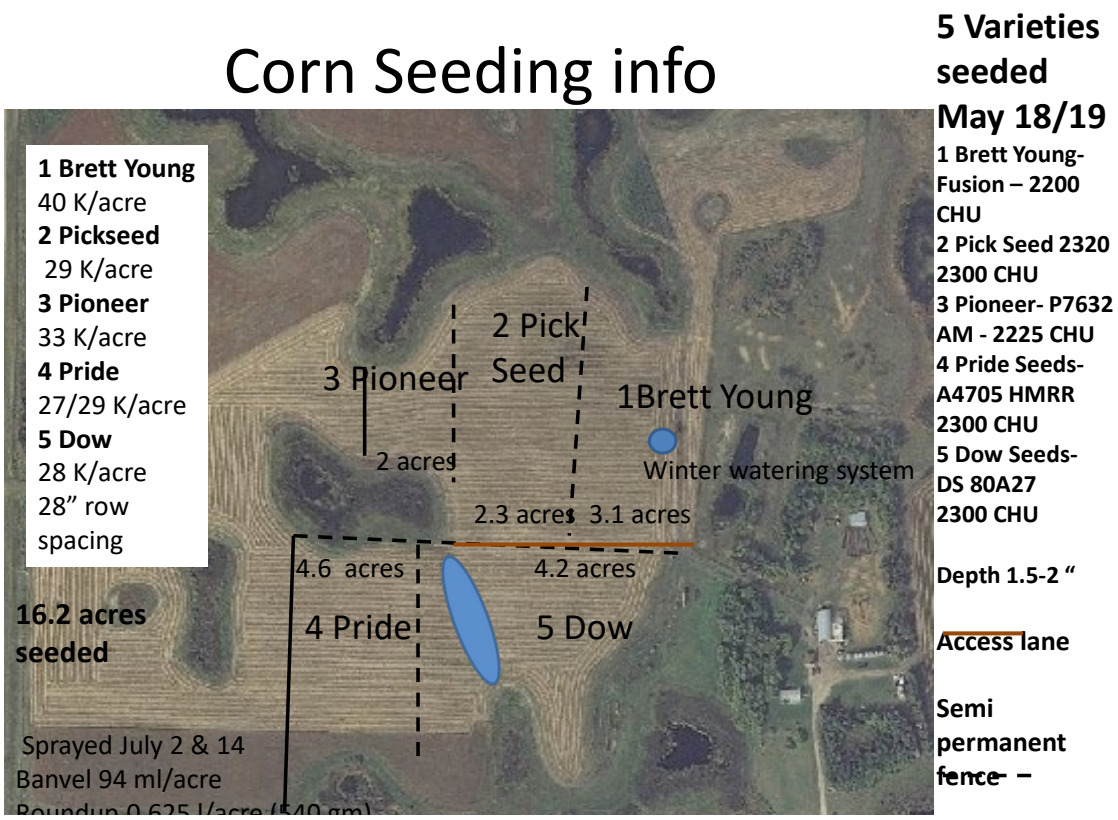

Fig. 8. The corn growth was affected by late or poor weed control in 2016 along the shelterbelt on field 4; photo MB Ag.

Fig. 9. Cattle are supplemented with hay while grazing corn in December 2017 on field 4 to help minimize grain overload; photo by MB Ag. Corn residue is minimal.

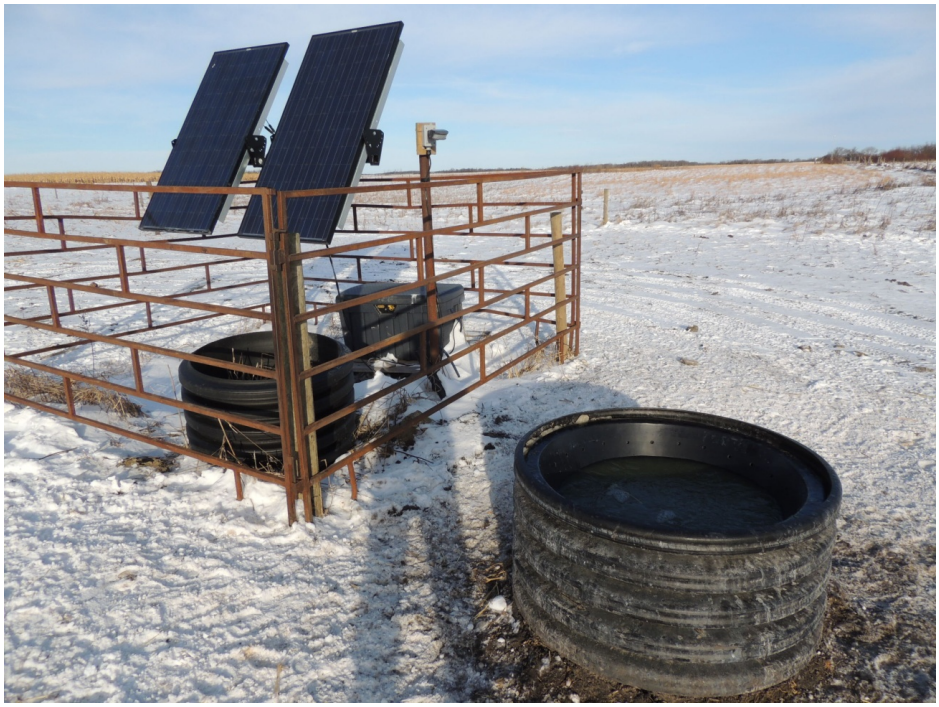

Fig. 10. The alternate solar-powered watering system located in the corn grazing area; it worked well. The water came from a dugout; photo MB Ag.

Fig. 11. Cattle grazing corn on field 4 Brookdale Farm, December 21; photo by MB Ag.

Fig. 12 & 13. When the bales were fed unrolled vs whole at Johnson better residue and nutrient dispersion resulted in a 81% higher grass production or 979 lb dry matter/acre ; photo by MB Ag.

Fig. 14. Bale grazing residue of bales fed whole at Johnson Farm on May 29, 2017

Fig. 15. Aerial photo of the winter bale grazing sites on fields 7, 8 and 9 of Brookdale Farm, May 2016; photo by ACC.

Fig. 16. Higher density bale placement of 40 bales/ac (99 bales/ha) on field 9 Brookdale Farm, December 2016; photo by MB Ag.

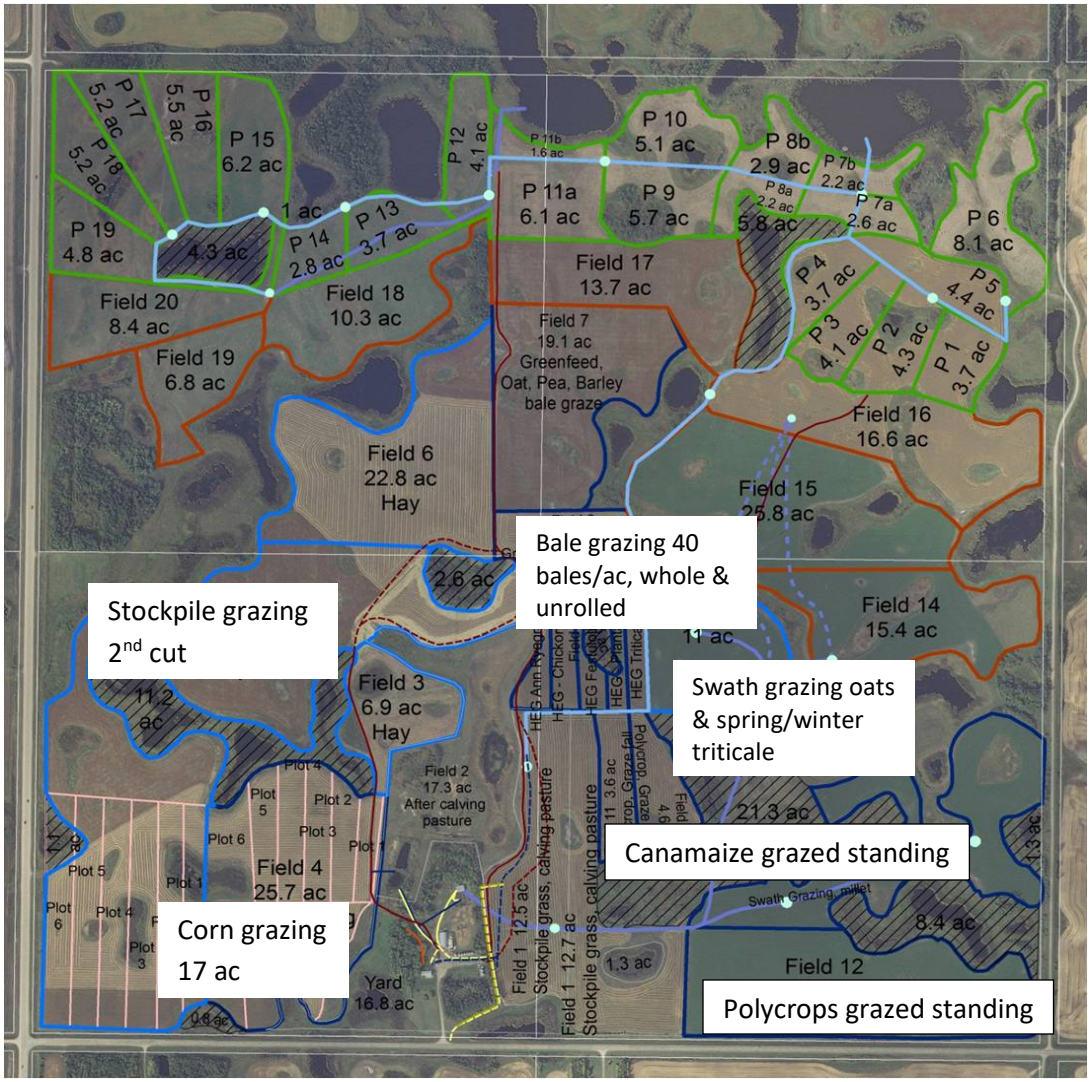

Fig. 17. Winter grazing includes: stockpiled forage, swath, corn and bale grazing starting in October until the end of May; photo/figure by MB Ag and MBFI.