MBFI Extensive Wintering Project

2018 INT 11

Extended Grazing and Extensive Wintering Project

Project Lead:	**Shawn Cabak**, Production Extension Specialist – Livestock, Manitoba Agriculture
MBFI Location(s):	Brookdale Farm
Collaborating Partners:	Mitchell Timmerman, Agri-Ecosystems Specialist - Nutrient Management, Manitoba Agriculture;
Start Date:	2015 Status: In progress

Introduction

Extended grazing using stockpiled (2nd or 3rd cut), 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 feeding 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 fall and winter of 2018/2019.

Objectives

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

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 12 acres of spring and winter triticale grown for swath grazing. The triticale was seeded with the JD 0-till drill on May 18 at 0.9 bushel each spring and winter triticale.

The residual N was 40 lb to 2 feet, 9 ppm P and 263 ppm K from 0 to 6". Sixty pounds of N and 21 lb of actual P205 was broadcast in the spring. The triticale was sprayed with a broadleaf herbicide on June 11- Buctril M @ 0.4 l/acre.

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.

Five corn varieties were planted on a 30" row spacing on May 15 at a depth of 2 to 2.5" using a JD 7000 corn planter. The corn was fertilized with 90 lb/ac N and 32 lb/ac of P2O5 in the spring. The 2017 fall soil test measured 43 lb/ac N to 2 feet, 20 ppm P and 345 ppm K at 0 to 6". Due to dry soil conditions emergence was not as uniform as desired. The seeding rate averaged 36500 plants/ac. The field was sprayed with Vector (glyphosate) @ 1 l/ac on May 29 and Vector 0.7 + bromoxynil @ 0.5 l/ac on June 13. The bromoxynil caused leaf scorching injury on the corn.

Canamaize was seeded with the corn planter on May 22 on a 15" row spacing at a plant population of 72,000/ac. It was sprayed on June 14 with Accent.

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

The bales were placed for the bale grazing in mid December at a bale density of 40 bales/ac based on nutrient importing, average densities and to uniformly cover the field.

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 is close to $500/ac at current prices but would vary year to year depending on the price of fertilizer.

Results and Discussion

Weather

The hay, pasture and annual crop production was significantly affected by the dry growing conditions in 2018 at Brookdale. From May 1 to Sept. 30 the precipitation was 65 % of normal and corn heat units were 109 % of normal for Brandon and for MBFI/Forrest the precipitation was 57% and the CHU's were 113% to August 26. The 1st cut alfalfa hay at Brookdale yielded 40 % of the previous year (0.7 ton/acre) and the 2nd cut was 38%.

Stockpiled grazing

Grazing stockpiled forages or 2nd cut hay fields provides very palatable and nutritious forage in the fall when calf demands are higher and pastures are nearing the end of their production. The cattle started grazing the 2nd cut hay fields September 19 to October 16 for a total of 27 days. The forage quality was very good testing 17.5 % crude protein and 66.4% TDN. Grazing alfalfa after or close to a killing frost minimizes the risk of winter injury. Alfalfa/grass hay stands are better for fall grazing due to a lower bloat risk and grasses maintain their leaves better after a killing frost compared to alfalfa. The main cost of grazing hay fields is the cost of the perimeter fencing.

Swath grazing

The triticale was cut with the disc-bine on August 10 in the soft dough stage. Fifty cows and 50 calves swath grazed the triticale from October 26-November 5 for a total of 10 days. The paddock size was 6 acres. The time the cattle spent on each paddock ranged from 4-6 days. On average, the cattle were supplemented with 21.6 lb/pair/d of first cut hay and greenfeed. 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.

The triticale yielded 0.795 tonne DM/ac producing 45 CGD/ac. 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. Three yield measurements and a composite sample was taken for nutritive analysis.

Table 1. Swath grazing feed quality, sampled on Sept. 14, 2017

2017 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

2018 Swath grazing feed quality, sampled on October 18, 2018						
Triticale	86.2	7.6	64.2		0.795	45

2018 Stockpiled forage grazing sampled October 3, 2018						
2nd cut av.	25.3	17.5	66.4			

Hybrid Corn grazing

The five corn varieties grown for extended grazing at the Brookdale Farm were sampled on Nov. 16, 2018 for yield and feed quality. All five varieties had some uneven emergence due to dry conditions but filled in uniformly afterwards.

Fifty cow/calf pairs started grazing the hybrid corn on November 19 – February 5 for a total of 78 days. The calves were weaned on Dec. 5 and removed from the corn. The cattle were supplemented with an average of 15.3 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 two to six days averaging 3.1 days, the paddocks were 0.6-1.2 acres in size and averaged 0.84 acres. Hay was fed prior to moving the cows to a new corn paddock to help minimize grain overload and provide extra protein. Cattle should be adapted to grazing corn to allow the rumen to adjust to the grain corn in the diet.

In 2018 across the five varieties the CP ranged from 5.6 to 8.3%, the TDN ranged from 72 to 76.8% and DM was 51.6-64.9%. The CP, TDN and DM averaged 6.7%, 75.2% and 59% respectively. The average DM

yield of the corn was 3.69 tonne/ac (2.9- 4.25 range) producing 208 CGD/ac with a range of 164-240 CGD/ac.

The cows average daily gain on the corn grazing at 0.58 lb/hd/d was the 2nd 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
Corn results harvested Nov.16/18, all values are averaged								
Pioneer P7958	2275	34.7 K	6.4	74.9	51.6	5.62	2.9	164
Pride AS1037	2375	33.3 K	8.3	76.0	54.3	6.27	3.4	192
Pickseed 2320	2300	27.7 K	7.2	76.3	61.9	6.13	3.8	214
Dow DS 79C	2300	33 K	5.6	76.8	64.9	6.55	4.25	240
Brett Young Fusion	2200	32.7 K	5.9	72.0	62.4	6.60	4.12	232

[z]CHU = corn heat units

Canamaize corn grazing

The 50 cows & 50 calves started grazing the canamaize corn Nov.5 to Nov.19 for a total of 14 days. The cattle were moved 6 times and fed 19.7 lb/pair/d of hay. The canamaize didn't compete very well where the weed control was poor and the yields were 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 February 5 until April 28, 2019 for a total of 84 days. The cows were moved on average every 3-5 days but ranged from 1 to 10 days. The cows were fed mostly alfalfa/grass first cut hay, greenfeed and some 2017 2nd cut for a total of 48.1 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 41 lb of dry matter equal to 3.0% of body weight.

Table 3. Feed quality of bales grazed at Brookdale

Feed Test	DM, %	CP, %	TDN, %	RFV
1st cut alfalfa/grass 2017	86.6	16.1	58.8	112
Alfalfa 2nd cut 2017	83.8	18.3	61	126
1st cut alfalfa/grass 2018	86.3	17.4	64.3	132
Wheat greenfeed	83.2	12.8	70.2	151

Economics

Grazing the 2nd cut was the most economical form of extended grazing at 27 cents/cow/day followed by corn at $2.44, swath at $2.64 and bale at $3.11. Grazing hay fields in the fall is one of the most economical methods of extended grazing considering the only cost is for fencing. In comparison Manitoba Agriculture's cost of production for feeding a beef cow traditionally is $3.51/day.

Including all costs (tractor, labour, supplemented feed and actual feed) the bale grazing was the most economical method of extended grazing last year at $1.60/hd/d but was significantly higher this year due to higher feed cost.

Earlier fall grazing will generally be less expensive when temperatures are warmer and there is less weather related feed losses caused by snow, ice or weathering. 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.

Manitoba Agriculture's cost of production (COP) for a cow-calf operation[4] provides a guideline of $2.14/cow/d for winter feed, plus $1.51/d yardage; for a cost of $3.65/cow/d based on a 1350 lb cow or $3.51/1300 lb cow. Using the MB Ag COP value as a base cost, would result in the corn grazing saving $1.12/cow/d. Grazing 100 cows for 200 days would save $22,400 in one year. 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 $312.48.00/ac for corn and $185.78/ac for the triticale (average of oats & barley) was 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 $0.05/lb.

In the past, the level of corn residue has ranged from 15 to 25%. The level of residue generally increases the later the corn is grazed into the winter as the palatability decreases. 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
				2nd Cut					
19-Sept-18	16-Oct-18	27		Cows	1349		3		
				Swath Grazing					
26-Oct-18	05-Nov-18	10	15.2	Cows					
				Canamaize Corn Grazing					
05-Nov-18	19-Nov-18	14	13.9	Cows	1325				
				Hybrid Corn Grazing					
19-Nov-18	05-Feb-19	78	15.3	Cow		1368		2.8	0.58
				Bale Grazing					
05-Feb-19	28-Apr-19	84		Cows	1368	1459	2.8	2.9	2.07

Table 5. 2018/19 Costs associated with each extended grazing type/1300 lb cow					
Method	Feed	Supplement Feed	Labour	Tractor	Total
2nd cut					$0.27
Swath Grazing	$1.57	$0.76	$0.084	$0.22	$2.64
Canamaize corn	$2.83	$0.69	$0.18	$0.18	$3.88
Hybrid Corn Grazing	$1.36	$0. 77	$0.19	$0.35	$2.44
Bale Grazing	$2.41		$0.19	$0.63	$3.11
MB Ag Cow/Calf COP[4]	$2.06				$3.51

Last year, the corn grazing residue ranged from 18 to 28% and averaged 22%. In 2019 the residue was measured on May 2 and ranged from 26.9-51.8% and averaged 40.6%. The corn varieties that were grazed earlier had lower residue versus the varieties grazed later in the winter. The triticale swath grazing and canamaize had 35.7 and 34.9 % residue, respectively. Due to fencing issues on the hybrid corn livestock control wasn't ideal which affected movement and resulted in higher residue levels.

Summary

The dry conditions during the 2018 growing season affected the yields of the perennial and annual crops grown at MBFI. Since the cost of growing annual crops isn't yield dependent the overall extended grazing cost for swath and corn grazing was higher as a result of the lower yields.

When comparing the corn and bale grazing the cows had a higher ADG on the bale at 2.07 lb/hd/day versus the corn of 0.58 lb/hd/day. Part of the higher ADG can be attributed to the cows stage of gestation as the cows would have been close to calving during the bale grazing. The BCS changed very little though out the extended grazing starting at a 3 in September and ending at 2.9 at the end of April. Since the cattle are weighed only once, ADG will be impacted by shrink or gut fill and the time of weighing. Last year the cows had the highest ADG on corn grazing of 1.8 lb/hd/d.

In the winter of 2018/19, grazing the 2nd cut was the most economical form of extended grazing at 27 cents/cow/day followed by corn at $2.44, swath at $2.64 and bale at $3.11. Grazing hay fields in the fall is one of the most economical methods of extended grazing considering the only cost is for fencing. In comparison Manitoba Agriculture's cost of production for feeding a beef cow traditionally is $3.51/day.

Using the MB Ag COP value as a base cost, would result in the corn grazing saving $1.12/cow/d. Grazing 100 cows for 200 days would save $22,400 in one year. Other benefits of extended grazing include lower yardage cost, no manure removal cost and the nutrients stay on the land.

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 economically kept out of confined areas all winter long in Manitoba. The cattle were fed on the landscape at a cost saving and maintained cow body condition.

Acknowledgements

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

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

Figure 1. MBFI cattle grazing 2nd cut on September 26 2018

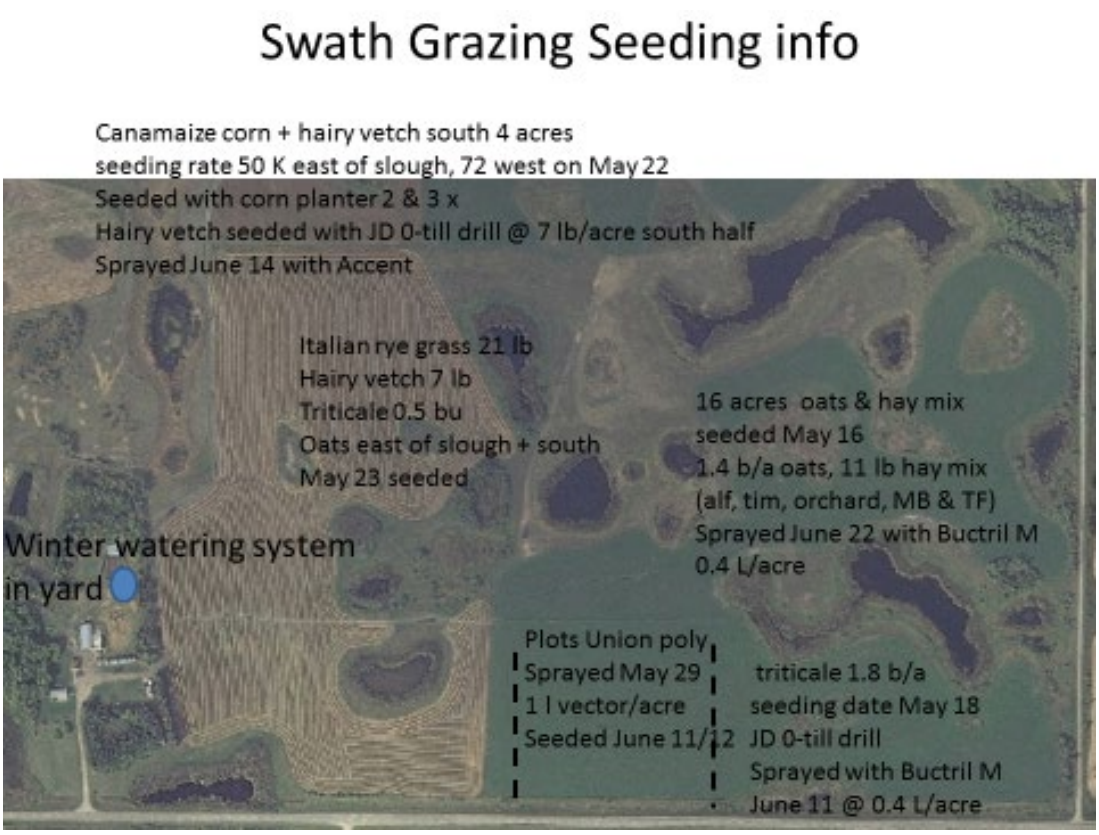

Figure 1.5 MBFI grazing plan for 2018

Fig. 2. Cattle swath grazed the oats in early November 2017 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.

Figure 5.5 Corn crop was impacted by dry condtions in 2018.

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

Fig. 7. The corn growth was affected by late or poor weed control in 2016 along the shelterbelt on field 4; photo MB Ag.

Fig. 8. 2018 Corn variety plot at the MBFI Brookdale farm on field 7.

Hybrid Corn field 7

1 Pickseed 2320

2 Pride AS1037

3 Dow DS79C

4 Brett Young Fusion

5 Pioneer 7958

36500 plants/acre
2” seeding depth
30” row spacing

Seeded May 15 with JD 7000 corn planter

Sprayed May 29
1 L Vector (glyphos)/acre
Sprayed June 13 0.7 L/ac vector & 0.5 L bromoxyn

Fig. 8.1 Excess residue after hybrid corn grazing in winter of 2019, fencing issues resulted in less than ideal livestock control while grazing

Fig. 8.2 Bale grazing residue spring 2019

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.

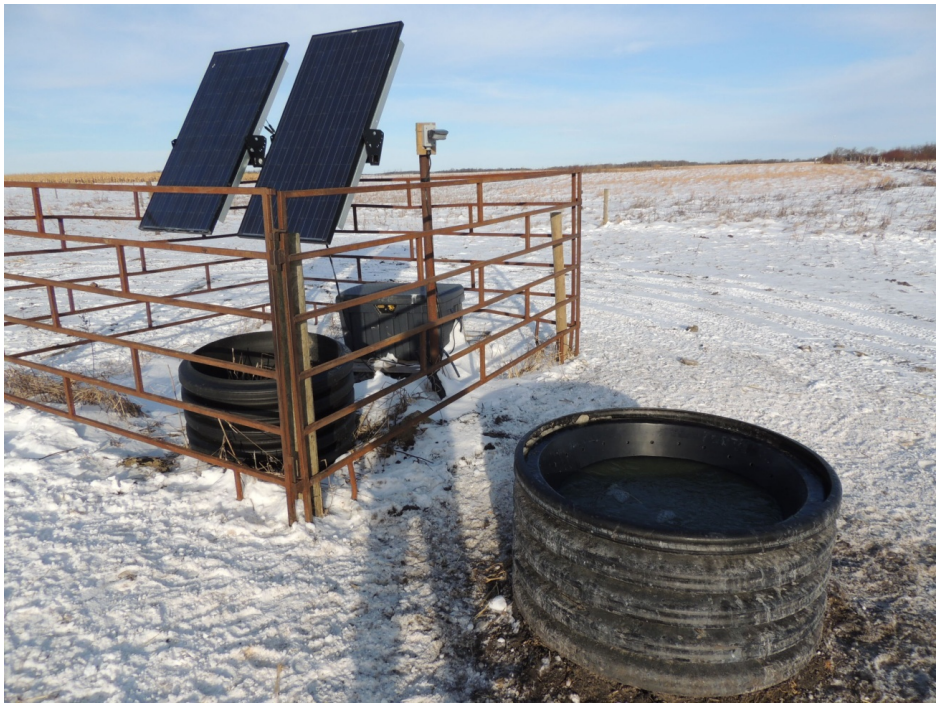

Fig. 10. The alternate solar-powered watering system located in the corn grazing area in 2018 that worked well. The water came from a dugout; photo MB Ag.

Fig. 11. Cattle grazing corn on field 4 Brookdale Farm, December 21 2017; photo by MB Ag.

Fig. 11.1 MBFI cows grazing Canamaize in November 2018 leaving little residue

Figure 11.2 MBFI cows grazing hybrid corn in January 2019

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 in summer 2017; 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.

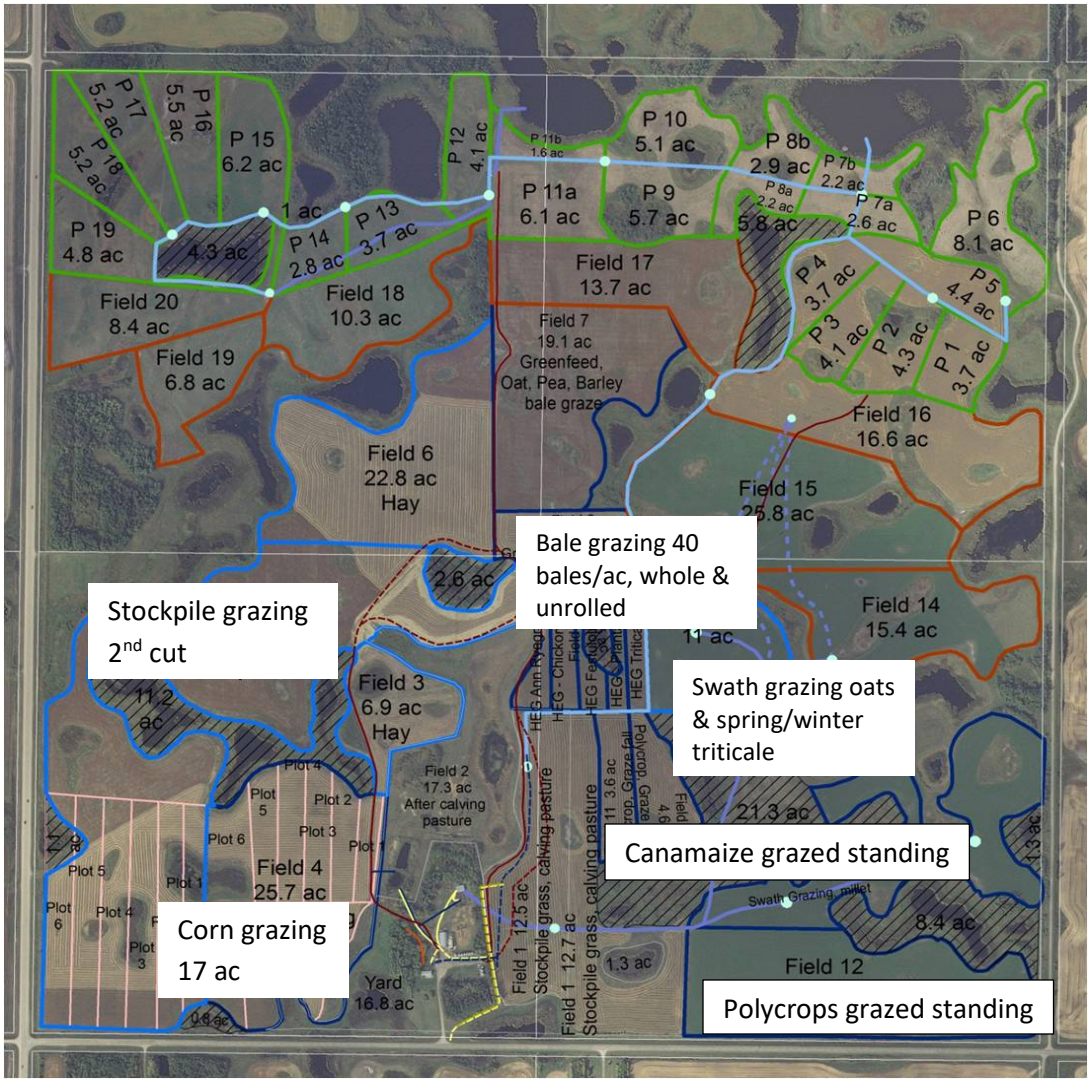

Fig. 17. Winter grazing includes: stockpiled forage, swath, corn and bale grazing starting in October until the end of May; photo/figure by MB Ag and MBFI.