2012-2013 SWATH GRAZING TRIAL PLOT REPORT FOR CLEARWATER COUNTY

CLEARWATER COUNTY AGRICULTURAL SERVICE BOARD

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SYNOPSIS

Clearwater County Agricultural Service Board set up twelve trial plots specifically for swath grazing in order to track yield, nutritional quality, degradation in the swath, waste, and palatability.

Samples from each plot were taken in September, November and February. Tests were carried out for feed quality and palatability. It was found that quality and palatability do not necessarily go hand-in hand. For example sunflowers tested very well nutritionally but the cows did not want to eat them. Although the plots differed in feed value, they were all able satisfy the nutritional demand of cows in mid and late pregnancy .The palatability test showed the cows preferred the corn and Bunker Triticale the most and sunflowers the least. Barley mix plots were ranked higher than oat mix plots . Millet was found to be one of the least palatable crops but interestingly the cows would go back and clean up the millet better than the oat plots.

Feed quality degraded to a greater degree between November and February than between September and November. In the short term (September to November) Triticale and Barley/Canola plots ranked well for both Protein and Energy and in the long term (September to February) Millet and Triticale proved to have held their value the best.

The results should also prove useful in regard to the use of crops for silage and greenfeed . Degradation would not be an issue for either one of these practices but the information on nutritional value from the first clippings will be entirely relevant.

The cows will be turned out again in March/April to clean up the aftermath and then a test will be carried out on how much waste was left from each plot.

Acknowledgements

Several individuals have been involved in this project and I would like to thank them for their contributions to this trial .

Firstly I would like to thank Barry Yaremcio (Beef and Forage Specialist ,Alberta Agriculture) who has been involved with tabulating results and advising on the feed test analysis. His input has been very important to the success of this report.

I would also like to thank all those who donated seed for the trial plots. Thanks to Hugh Godwin and Shambani Farm for the Millet seed, Ellis Agriculture Ltd for the Sunflower seed, John Follis for the Canola seed, Wood Seed Farm for the Forage Pea seed, and Bert and Bert farms for the Corn seed.

Finally I would like to thank Mark Bertagnolli for donating his land and time to the swath grazing trial plot project.

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INTRODUCTION

The practice of swath grazing has been gaining popularity in Clearwater County as farmers strive to reduce input and labour costs in an effort to improve profitability. Typically crops used for swath grazing purposes in Clearwater County have been oats and barley but considerable interest has been shown in the use of other crops in an attempt to improve forage yield, feed quality palatability and utilization; as well as to reduce degradation and waste.

Limiting factors in choosing suitable crops for Clearwater County are a short growing season, significant amounts of Fall and Winter moisture, predominantly grey wooded soil, lower than average heat units and a large wildlife population.

The Agricultural Service Board decided to run trial plots to compare different crops and combination of crops to test their suitability for swath grazing and other forms of forage production in the Clearwater County area.

The Board looked at forage yield, feed quality, swath degradation, cost per acre comparison, palatability and waste in order to assess which crops would be most successful.

DESCRIPTION OF CLEARWATER COUNTY

Clearwater County is located in west central Alberta. Jasper and Banff National Parks border its western edge. Other bordering municipalities include Yellowhead County, Brazeau County, County of Wetaskiwin, Ponoka County, Lacombe County, Red Deer County , Mountain View County and the Municipal District of Bighorn.(See Diagram 1). The total land mass of the County is 4,527,101 acres. Only 19% or 846,781 acres are suitable for agricultural use. Of this, more than 75% is used as improved pasture or native range, supporting the livestock industry. Less than 25% is used for the production of perennial forage and annual crops.

Diagram 1. Counties within Alberta

The County is challenged by a short growing season of about 85-95 frost free days due to elevations of 1000m above sea level.

The average temperature for the May to September period is 11.9 C. Hottest months are normally July and August with an average daytime temperature of 20C.

Annual precipitation ranges between 500 and 550mm. The wettest month is typically July which averages around 200mm.

Soils range from pockets of Black Chernozemics along the east central portion of the County to Dark Grey to Grey Luvisols across the central portions with Brunisols toward the western portions. Therefore although producers on the eastern side of the County may be lucky enough to be farming black soils, typically most of the agricultural land in Clearwater County is Grey Wooded with less than 10% organic matter.

Statistics Canada reported in the 2011 census that the majority (45%) of farms in Clearwater County are beef cattle farms. There are 34,026 cows on 594 farms in Clearwater County.

SWATH GRAZING—AN OVERVIEW

Feed, feeding, cow management and manure disposal can account for two thirds or more of the total cost of production in a cow-calf operation. Systems that can extend the grazing season and reduce these costs are of great interest to cow-calf producers. One of the more popular systems is swath grazing.

Swath grazing is the practice of swathing annual forage at the soft to mid dough stage and leaving the crop in the field to be fed to livestock during the fall and winter. Some producers are experimenting with perennial crop regrowth for swath grazing. However, winterkill could be a problem because swath grazing may leave the perennial crop with insufficient snow cover.

Diagram 2 Winding up the Portable Electric Fence

Research indicates that swath grazing can reduce total daily feeding cost per cow by 41 to 48% (Dr. Vern Baron, 2012). There is no need to start a tractor to feed cows and the costs associated with baling, stacking, storing or covering feed are eliminated. Cost savings are also significant for manure management as manure is deposited evenly throughout the field improving overall fertility and soil quality. Barry Yaremcio Beef and Forage Specialist with Alberta Agriculture values the manure at $0.35/head/day.

The use of electric fence is essential to control access to feed and reduce waste. Cattle will tend to consume the higher quality forage first, leaving the straw for last. Once the heads are cleaned off the forage, energy and protein levels are greatly reduced. Using an electric fence to provide new feed on a regular basis reduces wastage, sorting and trampling of feed. Jim Stone of Olds College (2005) emphasizes the importance of a good ground for the electric fence as winter soils tend to be very dry and this limits grounding ability. To be effective Stone advises a fence should test between 4,000 and 6,000 volts. The most critical time for a fence is at turnout in the education phase. If the cows do not get a jolt right away when they test the fence they will not respect it later on. The cows should be trained to an electric fence prior to turnout to the swath grazing area.

Studies have shown that dry cows can be wintered on snow as their water source, however if there is not enough snow then cows will require access to a fresh water source. A lack of water will dramatically reduce feed intake within two or three days. Therefore it is recommended that cows on swath grazing have a fresh water supply at all times as adequate snow amounts cannot be guaranteed.

It is important to monitor animal condition while swath grazing. Timid or young cows may only be able to consume the straw component of the swath due to older more aggressive cows choosing the higher quality portions of the feed. Feed tests are important to ensure the cows requirements are being met. A supply of other feedstuff may be necessary to supplement the swath grazing if required.

A challenge for producers in Clearwater County may be wildlife. Deer and elk can consume considerable amounts of forage in a short period of time. Wildlife can also pack the snow down over the swaths causing them to freeze solid and making them inaccessible to the cattle.

Diagram 3. Deer Eating Corn

DATES AND RATES

The site chosen for the swath grazing trial plots was a field on the Mark Bertagnolli Farm on HWY 22 South between Rocky Mountain House and Caroline. The field lies 6.5km south on HWY 22 on the West side of the highway on the corner of TWP-RD 38-2 .

Soil tests were carried out on the field and were found to be marginal in Nitrogen (N) and Potassium (K), deficient in Phosphorous (P) and adequate for Sulpher (S). (See Appendix A).

The previous crop was an oat barley mix that had been swath grazed for the first time the previous winter.

The field was cultivated at the end of May but then conditions became very wet with rainfall every day. 12 plots were selected (see Table 1)

The corn and sunflower plots were seeded on June, 7 and received 100lbs N, 60lbs P and 30lbs K per acre. They emerged on June, 17 2012.

The remaining plots were fertilized with 65lbs N, 45lbs P and 27.5lbs K on June, 13 , based on soil analysis results. Pre seed burn off to control weeds and volunteer barley with 1L/acre Vantage Plus Max was carried out on June, 12. The plots were cultivated on June, 20 and seeded June, 22. Plots were seeded with a John Deere 9350 hoe drill with direct seed openers. Most plots were seeded heavy intentionally as this is a recognized practice when using forage for swath grazing. However the drill itself also proved to be seeding heavier than its settings suggested and so alterations were made from plot to plot. The Spring was cool and wet. All plots emerged June, 29 except the millet plots which emerged July ,6 2012. The plots were hit with three hail storms and several heavy rains.

Plots were swathed on September, 10 2012.

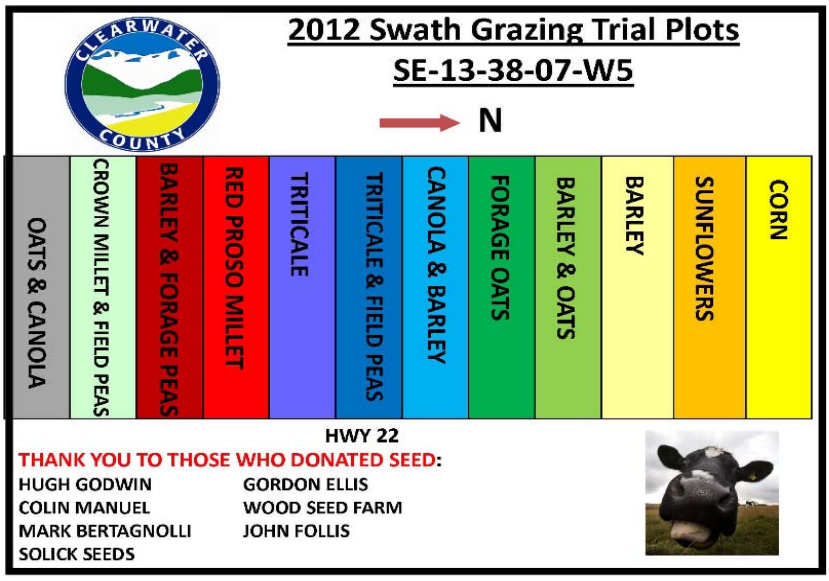

Table 1. 2012 Swath Grazing Trial Plots

CORN

The corn variety selected was a 80-85 day super leafy silage corn. Because this was the first year that corn was seeded and weeds and volunteer grain could be an issue it was decided to go with Maizex Roundup ready corn. (Donated by Mark and Anne-Marie Bertagnolli). The plot was fertilized with 100lbs N, 60lbs P and 30lbs K per acre. Soil was well cultivated at the end of May to bury any visible organic matter. This aids in the warming of the soil and therefore earlier emergence. Due to wet conditions it was impossible to cultivate again at the beginning of June to work up the weeds that had started to germinate.

Diagram 4 Corn Plot

The plot was seeded when soil temperature reached 10 degrees C and as soon as equipment was able to get back on the field. Seeding occurred on June, 7 at a rate of 32,000 seeds per acre with 29" between rows and 6-8" between seeds. Seeding depth was 1 1/2" to protect seed from any late June frost that may occur.

The plot was sprayed with glyphosate (1L Vantage/acre) to remove weeds on June, 8. Corn is a poor weed competitor in early stages of growth. As the corn had not yet started to emerge spraying one day after seeding was not a concern.

Corn emerged on June, 17. June conditions were cool and wet. At the 7 leaf stage (July, 20) the corn was sprayed again with Vantage to clean up a second flush of weeds. The first hail storm hit on July, 23. Corn was battered but rebounded well. A second hailstorm hit at the end of July . A third hailstorm (toonie size) hit on August, 4. The corn showed some broken stalks and shredded leaves.

The corn was measured on September, 10 and was 6 1/2 to 7 feet high with 2-3 cobs per plant which were 7-10 inches long. The corn was not swathed but remained standing for grazing.

25 acres of corn should feed 200 cows for 30 days based on an average of 250 cow days per acre.

SUNFLOWERS

Diagram 4. Sunflower Plot Shortly Before Swathing

Sunflowers were also hit by the three hail storms but overall the sunflowers held up very well and recovered quickly. There is not much information on grazing sunflowers. It was expected that cattle may waste too much in a standing sunflower field and swath grazing would be more beneficial. The sunflower head contains the most feed value, followed by the top, middle and bottom thirds of the stalk. Sunflower seeds are a high source of energy and a good source of protein. Research at this time suggests to swath the sunflowers soon after flowering as protein and energy levels decline rapidly after flowering.

The selected variety was 63M80 and was donated by Ellis Agriculture Ltd. (Gordon Ellis). The plot was fertilized with 100lbs N, 60lbs, P and 40lbs K on June, 4. Seeding took place on June, 7 2012. The seeding rate was 40,000 seeds/acre at 1 ½ inches depth in 29" rows with 5.2" between seeds. The sunflowers were seeded with the corn planter which was adjusted accordingly.

The plot was sprayed with glyphosate for weeds on June, 8 2012. Sunflowers emerged on June, 17 2012. By the middle of July the sunflower plot had a dense weed canopy of lambs quarter, hemp nettle and some quack grass. However there is no post emergent herbicide registered for use in sunflowers. The sunflowers competed well with the weeds.

Sunflowers were swathed on September, 10 when they were 5-6ft tall. They were in full flower with succulent heads, but no seed development. The stalks were very fibrous and the crop was thick and dense.

Diagram 5. The Dense Sunflower Swath

BARLEY

Sundre barley is a top yielding, six row, smooth awned conventional barley with class leading grain and forage yields. It has one of the highest forage yields, outperforming AC Lacombe and Vivar by a margin of 12%. Sundre barley also exhibits a high level of competitiveness, making it ideal in a multiple grain forage blend or for grazing.

The recommended seed rate was 145lbs per acre. The actual rate was 195lbs per acre at a depth of 1". (Purchased from Hallett Seed Farm) The barley plot exhibited high levels of net blotch due to the wet and windy growing season.

Diagram 6: Barley Plot

BARLEY/OATS MIX

Sundre barley was used in this plot along with Mustang Oats. AC Mustang is one of the highest yielding cultivars in Alberta (yields about 10% more than Cascade). AC Mustang is equal to Cascade in lodging resistance. It also has a higher test weight, higher percentage of plump kernels, and a lower percentage of thin kernels than Cascade. The recommended seeding rate was 70lbs/acre barley and 30lbs/acre oats. Actual seeding rate was 100lbs/acre barley and 40lbs/acre oats.

At swathing the barley was in the soft dough stage and the oats in the late milk which was ideal. The oats were very green and leafy and about 42-44" tall (about 10" taller than the barley). The barley was between 32 and 34" tall and leaves seemed to show less browning from net blotch than the monocrop barley. The barley was in the soft dough stage. Barley tends to have higher digestibility than oats at comparable physiological development or stage of maturity.

Diagram 7: Barley/ Oat Plot

FORAGE OATS

Diagram 8: Forage Oat Plot

CDC Baler is a high-yielding forage oat variety. Released in 1999 by the Crop Development Centre at Saskatchewan, it is a popular variety of pasture oat in Saskatchewan and Alberta. Tall, with very good lodging resistance, CDC Baler makes an excellent greenfeed oat variety. (Beef Cattle Research Council).

The recommended seeding rate was 110lbs per acre. Actual seeding rate was 165lbs per acre at a depth of 1 inch. (Seed purchased from Solick Seed Farm) Although the crop was seeded heavy it did not lodge and produced a very thick , dark green and leafy crop. Oats were swathed at the late milk stage at 4 foot tall. Very limited effects from net blotch

CANOLA/BARLEY

Sundre barley and Canola 72-35RR were seeded in this plot. The recommended seeding rate for this plot was 2lbs canola and 50lbs barley/ acre. The actual seed rate was 2.3lbs canola and 58lbs barley at ¾" depth. (Canola donated by John Follis).

The plot was swathed when the barley was about 32" tall and in the soft dough stage. Leaves showed some browning from leaf disease. The canola was 3 1/2 to 4 ft tall and in the early to mid pod stage with some flowering.

Diagram 9: Canola/Barley Plot

Canola should be cut at the early to mid pod stage when Protein should average around 14 to 15% and Total Digestible Nutrients (TDN) 58 to 60 % (dry matter basis). Quality and palatability will decline as the plant matures.

TRITICALE/FORAGE PEAS

This plot was seeded with Taza spring Triticale and Forage Peas variety 4010. Taza is an awnletted (reduced awn expression) standard height triticale line intended for use as a feed grain conserved forage, swath grazing crop and potentially for industrial use. This line has good lodging resistance, and high kernel weight (Purchased from Solick seed farm).

Diagram 10: Triticale and Forage Pea Plot

The forage peas were donated by Wood Seed Farm. The suggested seeding rate was 120lbs Triticale /acre and 35lbs peas /acre.

Actual seeding rate was 110lbs Triticale/acre and 35lbs peas/acre. The Triticale didn't seem to be affected by leaf disease.

The plot was swathed when the triticale was in the very early milk , 4 ft tall, dense and silvery green. The crop was 4 ft high. It was realized that the triticale plots should have been sown earlier to allow it to reach the soft to mid stage by swathing time. The peas were in mid pod and 31/2 to 4 ft tall. A few still had some white flowers.

TRITICALE

Bunker Triticale was used in this plot. Bunker is an awnletted (reduced awn expression) standard height spring triticale line intended for use as a feed grain and conserved forage. (purchased from Solick Seed Farm). Triticale is proving to be an interesting choice for swath grazing. It can meet the yield of corn while doing so for the input costs of barley or oats.

The recommended seeding rate was140 to 150lbs/ acre and the actual seeding rate was 170lbs/acre.

On September, 10 the triticale was barely in the milk stage and so it was decided to leave the crop for 2 weeks to see if the heads would fill. The crop was swathed on September, 28 with very little change in maturity. Triticale needs to be seeded in late May early June. At the time of swathing the triticale was just over 4 ft tall (slightly taller than Taza) and had a leafy dense silvery green canopy.

Diagram 11: Triticale Trial Plot

RED PROSO MILLET

Millet is an annual warm season grass. There are several different types of millet, but the three most commonly grown in Western Canada are Crown (proso), Siberian (foxtail) and German (foxtail).

The foxtail millets are taller, later maturing, and well suited to forage production. Proso millet is usually grown for grain, but can be successfully used as forage. Crown is generally regarded as forage-type proso millet. Millet is best suited for swath grazing. Yields and quality tend to be comparable to spring cereals used for the same purpose. It is reported to resist weathering in the swath.

Diagram 12: Red Proso Millet

The recommended seeding rate was 30lbs millet per acre at 1/2 to 3/4" deep. The actual seed rate was 33lbs per acre at 1" deep. The seed was donated by Hugh Godwin. The millet was cut at 63 days post emergence (recommended time is 60 days) and was in full head. The swath was very dense and the leaves and seed were turning red.

BARLEY AND FORAGE PEAS

Sundre barley and CDC Leroy Forage peas (purchased from Solick seeds) were planted in this plot. Mixing forage peas, with cereals can result in improvements to the nutrient values over cereals seeded alone. Pea grain can provide up to 25% protein and 86% TDN. Peas have an input cost advantage over cereals due to a lower nitrogen fertilizer requirement. However, this advantage is at least partially offset by higher seed and herbicide costs. On the downside, pea swaths are particularly attractive to deer and other wildlife. This feature can be a major source of feed loss, and wildlife in the fields may pull down electric fences. Another disadvantage to monocrop peas is the potential for the wind to scatter the swaths due to their light and bulky nature.

Spring cereal-pea mixtures can yield less than spring cereals seeded alone. This result is more pronounced with barley than with oats. The yield of the mixture is generally greater than that of peas alone. When peas are a high proportion of the mixture, fibre concentration decreases. The seeding rate was 120lbs barley and 35lbs peas. At time of swathing the barley was 32" tall and in the soft dough. Browning of leaves from Net Blotch was evident but some top leaves remained green. Forage peas were still showing purple flowers and were in the early pod stage and 38-40"tall.

Diagram 13: Barley/Pea Plot

CROWN MILLET/ FORAGE PEAS

Diagram 14: Millet and Peas Plot

Crown Millet was used in this plot along with the 4010 Forage Peas.

The millet was donated by Colin and Felicity Manuel and the peas by Wood Seed Farm. The recommended rate was Millet at 20lbs/ acre and peas at 30lbs/ acre. The actual seeding rate was Millet at 35lbs/ acre and peas at 27lbs/acre at 3/4" deep.

This plot was slightly further ahead than the other millet plot partly due to the shallower seeding depth.

As with the other millet crop the swath was very dense and was cut at 63 day post emergence. The peas were showing some white flowers and in early to mid pod. Both crops were at comparable heights of 3 1/2 to 4 ft tall.

MUSTANG OATS AND CANOLA

This plot was seeded at a rate of 100lbs oats per acre and 2.5lbs canola per acre. On swathing day the oats were 4-41/2 feet tall and in the late milk. They were very green and leafy. The canola was about 32" tall and in the early pod and still flowering.

Diagram 15: Oats and Canola Plot

TABLE 2: SEEDING INFORMATION

PLOT	CROP	ACTUAL SEED RATE	RECOMMENDED SEED RATE/ACRE	SETTING ON DRILL	DEPTH	SEED DATE
1	CORN	32,000 SEEDS PER ACRE	32,000 SEEDS PER ACRE	6-8" BETWEEN SEEDS. 29" BE-TWEEN ROWS	1 1/2"	June, 7 2012
2	SUNFLOWERS	40,000 SEEDS PER ACRE	40,000 SEEDS /ACRE	5.2" BETWEEN SEEDS. 29" BE-TWEEN ROWS	1 1/2"	June, 7 2012
3	SUNDRE BARLEY	195LBS/ACRE	145LBS BARLEY	42 (HEAVY)	1"	June, 22 2012
4	SUNDRE BARLEY/ MUSTANG OATS	100 BARLEY/40LBS OATS	70LBS BARLEY/ 30LBS OATS	38 (HEAVY)	1"	June, 22 2012
5	FORAGE OATS	165LBS /ACRE	110LBS/ACRE	44 (HEAVY)	1"	June, 22 2012
6	CANOLA 72-35RR /SUNDRE Barley	58LBS BARLEY/ 2.3LBS CANOLA	50LBS BARLEY/ 2.0LBS CANOLA	14 (GOOD)	3/4"	June, 22 2012
7	TAZA TRITICALE / FIELD PEAS	110LBS TRIT/ 35LBS PEAS	120LBS TRIT/ 35LBS PEAS	24 (LIGHT)	1"	June, 22 2012
8	BUNKER TRITICA-LE	170LBS /ACRE	140 - 150LBS /ACRE	32 (HEAVY)	1"	June, 22 2012
9	RED PROSO MILLET	33LBS/ACRE	30LBS/ACRE	3 (GOOD)	1"	June, 22 2012
10	SUNDRE BARLEY/ FORAGE PEAS	120LBS BARLEY/ 35LBS PEAS	No recommendation	32	1"	June, 22 2012
11	CROWN MILLET/ FIELD PEAS	35LB MILLET/ 27LB PEAS	20lbs millet/30lbs peas	5	1/2"	June, 22 2012
12	MUSTANG OATS/ CANOLA	100LBS OATS/ 2.5LBS CANOLA	No recommendation	32	1/2"	June, 22 2012

FORAGE CLIPPINGS

On September, 10 the forage clippings were taken from each plot and sent to the laboratory in Red Deer for analysis. After the yield samples had been weighed the forage was chopped and mixed thoroughly and sent for analysis.

Diagram 16: Collecting samples

Diagram 17: Swathing the plots

After the samples had been collected from the plots, they were swathed with an IH 4000 swather with a 16 1/2 Ft. header. Each swath was about 1 acre

Subsequent samples were taken on November, 13 2012 and February ,21 2013 to determine how each plot degraded over time.

Samples were chopped and bagged and sent to the laboratory by courier the same day they were collected.

Forage yield results are shown in Table 3. Tables 4 and 5 show the initial feed value results for all plots taken in September.

Tables 6 to 17 show the comparison of feed test results for each plot taken in September, November and February.

Diagram 18: Collecting Samples in Winter

FORAGE YIELD

On September 10, 2012 the first clippings were taken from the test plots. In order to ascertain yield a quadrant was used that measured 0.25m^2 The quadrant was placed in two different areas on each plot and the amount of forage from each sample was weighed and an average taken of the two results.

As the corn and sunflowers were sown in rows with 29"spacings the quadrant yield results were adjusted accordingly.

The final results were then converted to dry matter and adjusted for a final figure of tonnes per acre. See Table 3.

TABLE 3: FORAGE YIELD RESULTS

CROP	SAMPLE 1	SAMPLE 2	AVERAGE	DM/sample	DM/ACRE	adjusted
CORN	2.9LBS	4.5LBS	3.7LBS	.53lbs	3.8T	2.63T
SUNFLOWER	5.9LBS	4.8LBS	5.4LBS	.93lbs	6.7T	4.6T
BARLEY	1.4LBS	1.4LBS	1.4LBS	.40lbs	2.9T	
BARLEY & OATS	1.8LBS	2.2LBS	2.0LBS	.43lbs	3.1T	
FORAGE OATS	2.8LBS	3.0LBS	2.9LBS	.57lbs	4.2T	
CANOLA & BARLEY	2.6LBS	3.0LBS	2.8LBS	.59lbs	4.3T	
TRITICALE & FIELD PEAS	2.5LBS	3.0LBS	2.75LBS	.60lbs	4.3T	
TRITICALE	2.4LBS	2.2LBS	2.3LBS	.60lbs	4.4T	
RED PROSO MILLET	2.4LBS	3.1LBS	2.75LBS	.49lbs	3.5T	
BARLEY & FORAGE PEAS	2.2LBS	2.4LBS	2.3LBS	.59lbs	4.3T	
CROWN MILLET & FIELD PEAS	2.5LBS	3.4LBS	2.95LBS	.54lbs	3.9T	
OATS & CANOLA	3.4LBS	3.0LBS	3.2LBS	.56lbs	4.1T	

Table 3 compares the forage yield from the different crops. When converted to dry matter it can be seen that the sunflowers had the highest yield followed by the Triticale. The corn showed the lowest yield but this could be due to management practices such as timing of herbicide. Another corn crop on the same farm that had been sprayed two weeks earlier and seeded one week earlier showed almost double the yield of the trial plot.

FEED TEST RESULTS

TABLE 4: CROP NUTRITIONAL VALUE RESULTS SEPTEMBER 10, 2012

CROP	MOISTURE%	PROTEIN% DM	ADF %	NDF %	TDN %	DE(Mcal/kg)
CORN	85.70%	11.70%	32.7	56.2	64.6	2.85
SUNFLOWER	82.80%	11.00%	41.6	47.9	58.4	2.57
BARLEY	71.50%	15.90%	38.3	56.1	60.7	2.68
BARLEY/OATS	78.50%	13.10%	39.6	60.9	59.8	2.64
FORAGE OATS	80.40%	10.90%	38.5	63.5	60.5	2.67
CANOLA/BARLEY	78.80%	15.30%	38.6	54.3	60.4	2.67
TRITICALE/ FIELD PEAS	78.30%	13.30%	38.9	55.5	60.3	2.66
TRITICALE	74.00%	11.00%	38.3	57.4	60.7	2.68
RED PROSO MILLET	82.20%	15.10%	37.1	60	61.5	2.71
BARLEY/FORAGE PEAS	74.60%	14.40%	32.5	52.1	64.8	2.86
CROWN MILLET/FIELD PEAS	81.70%	16.20%	36.1	53.9	62.2	2.75
OATS/CANOLA	82.40%	11.90%	41.2	61.3	58.7	2.59

TABLE 5: FURTHER CROP NUTRITIONAL VALUE RESULTS

CROP	Rel.feed value	Dry Matter Intake	Ca% DM	P% DM	K% DM	Mg% DM	Na%DM	SALT %DM
CORN	105	2.14	0.3	0.25	1.82	0.22	0.01	0.03
SUNFLOWER	110	2.5	1.18	0.26	2.3	0.55	0.01	0.03
BARLEY	98	2.14	0.74	0.27	2.23	0.18	0.09	0.23
BARLEY/OATS	89	1.97	0.31	0.23	2.16	0.12	0.1	0.26
FORAGE OATS	86	1.89	0.29	0.25	1.78	0.13	0.05	0.13
CANOLA/BARLEY	101	2.21	0.92	0.36	2.71	0.17	0.04	0.1
TRITICALE/ FIELD PEAS	98	2.16	0.49	0.28	2.33	0.14	0.01	0.03
TRITICALE	96	2.09	0.29	0.24	1.79	0.12	0.01	0.03
RED PROSO MILLET	93	2.00	0.33	0.38	2.97	0.38	0.01	0.03
BARLEY/FORAGE PEAS	114	2.3	0.59	0.3	2.01	0.17	0.05	0.13
CROWN MILLET/FIELD PEAS	105	2.23	0.64	0.39	2.1	0.33	0.01	0.03
OATS/CANOLA	86	1.96	0.46	0.26	2.64	0.18	0.11	0.28

TABLE6: CORN ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	85.7	11.7	32.7	56.2	64.6	2.85	105
NOVEMBER -13-12	64.9	9.0	29.3	55.9	67.0	2.95	110
Change%	-24.20	-23.0			+3.80		
FEBRUARY-21-12	34.8	8.3	33.9	59.8	63.7	2.81	97
Change%	-59.40	-29.00			-1.40		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.14	0.3	0.25	1.82	0.22	0.01	0.03
NOVEMBER -13-12	2.15	0.22	0.21	0.71	0.17	0.01	0.03
FEBRUARY-21-12	2.01	0.13	0.23	1.21	0.13	0.03	0.08

TABLE 7: SUNFLOWER ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	82.8	11.0	41.6	56.2	58.4	2.57	110
NOVEMBER -13-12	60.9	10.7	46.1	55.9	55.2	2.43	92
Change %	-26.40	-2.70			-5.40		
FEBRUARY-21-12	30.0	5.50	60.0	59.8	45.5	2.01	55
Change%	-63.70	-50.0			-22.0		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.50	1.18	0.26	2.30	0.55	0.01	0.03
NOVEMBER -13-12	2.24	1.30	0.37	2.41	0.61	0.01	0.03
FEBRUARY-21-12	1.68	0.69	0.19	1.03	0.38	0.02	0.05

TABLE 8: BARLEY ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	71.5	15.9	38.3	56.1	60.7	2.68	98
NOVEMBER -13-12	57.4	14.2	38.8	61.6	60.4	2.66	89
Change%	-19.70	-10.70			-0.50		
FEBRUARY-21-12	40.2	8.4	45.8	70.4	55.5	2.45	70
Change%	-43.70	-47.10			-8.5		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.14	0.74	0.27	2.23	0.18	0.09	0.23
NOVEMBER -13-12	1.95	0.62	0.32	2.01	0.17	0.02	0.04
FEBRUARY-21-12	1.70	0.46	0.30	1.30	0.14	0.09	0.22

TABLE 9: BARLEY /OAT ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	78.5	13.1	39.6	60.9	59.8	2.64	89
NOVEMBER -13-12	58.1	12.2	39.5	61.4	59.8	2.64	88
Change%	-25.9	-6.80			0.0		
FEBRUARY-21-12	39.9	7.0	50.7	75.1	52.0	2.29	61
Change%	-49.10	-46.50			-13.0		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	1.97	0.31	0.23	2.16	0.12	0.10	0.26
NOVEMBER -13-12	1.95	0.47	0.30	1.82	0.16	0.05	0.13
FEBRUARY-21-12	1.60	0.35	0.28	1.69	0.12	0.13	0.33

TABLE 10: FORAGE OATS ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	80.4	10.9	38.5	63.5	60.5	2.67	86
NOVEMBER -13-12	66.7	10.1	45.2	70.0	55.8	2.46	71
Change%	-17.0	-7.3			-7.7		
FEBRUARY-21-12	35.5	8.7	47.4	70.9	54.3	2.39	68
Change%	-55.8	-20.1			-10.0		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	1.89	0.29	0.25	1.78	0.13	0.27	0.69
NOVEMBER -13-12	1.71	0.36	0.28	1.97	0.15	0.24	0.61
FEBRUARY-21-12	1.69	0.38	0.28	2.58	0.14	0.23	0.57

TABLE 11: TRITICALE/FIELD PEAS ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	78.3	13.3	38.9	55.5	60.3	2.66	98
NOVEMBER -13-12	54.4	12.7	42.1	61.8	58.0	2.56	84
Change%	-30.5	-4.50			-3.80		
FEBRUARY-21-12	30.2	9.4	44.9	66.3	56.0	2.47	76
Change%	-61.0	-29.30			-7.10		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.16	0.49	0.28	2.33	0.14	0.01	0.03
NOVEMBER -13-12	1.94	0.62	0.31	1.73	0.16	0.01	0.03
FEBRUARY-21-12	1.81	0.31	0.32	1.34	0.12	0.03	0.08

TABLE 12: TRITICALE ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	74.0	11.0	38.3	57.4	60.7	2.68	96
NOVEMBER -13-12	57.0	10.8	35.7	53.0	62.5	2.76	107
Change%	-22.90	-1.80			+3.00		
FEBRUARY-21-12	36.9	8.6	49.0	69.4	53.2	2.34	68
Change%	-37.50	-21.80			-12.30		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.09	0.29	0.24	1.79	0.12	0.01	0.03
NOVEMBER -13-12	2.26	0.41	0.29	1.55	0.18	0.01	0.03
FEBRUARY-21-12	1.73	0.31	0.26	1.42	0.13	0.03	0.08

TABLE 13: BARLEY/CANOLA ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	78.8	15.3	38.6	54.3	60.4	2.67	101
NOVEMBER -13-12	44.4	14.8	31.6	49.9	65.3	2.88	120
Change%	-43.60	-3.20			+8.20		
FEBRUARY-21-12	21.9	7.2	54.6	75.5	49.2	2.17	57
Change%	-72.20	-52.90			-18.50		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.21	0.92	0.36	2.71	0.17	0.04	0.10
NOVEMBER -13-12	2.40	0.86	0.37	2.01	0.19	0.02	0.05
FEBRUARY-21-12	1.59	0.54	0.25	0.76	0.10	0.09	0.22

TABLE 14: BARLEY/FORAGE PEAS ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	74.6	14.4	32.5	52.1	64.8	2.86	114
NOVEMBER -13-12	58.0	13.8	37.3	58.4	61.4	2.71	95
Change%	-22.20	-4.10			-5.20		
FEBRUARY-21-12	51.3	10.0	46.2	67.2	55.1	2.43	73
Change%	-31.20	-30.50			-14.90		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.30	0.59	0.30	2.01	0.17	0.05	0.13
NOVEMBER -13-12	2.05	0.67	0.34	1.34	0.16	0.02	0.04
FEBRUARY-21-12	1.78	0.58	0.27	1.65	0.17	0.13	0.33

TABLE 15: RED PROSO MILLET ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	82.2	15.1	37.1	60.0	61.5	2.71	93
NOVEMBER -13-12	71.3	13.0	41.0	66.0	58.8	2.59	80
Change%	-13.20	-13.90			-4.40		
FEBRUARY-21-12	46.8	11.9	42.6	70.4	57.7	2.54	74
Change%	-43.0	-21.20			-6.10		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.00	0.33	0.38	2.97	0.38	0.01	0.03
NOVEMBER -13-12	1.82	0.43	0.37	1.93	0.31	0.01	0.03
FEBRUARY-21-12	1.71	0.44	0.26	2.01	0.45	0.03	0.08

TABLE 16: PEAS/MILLET ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	81.7	16.2	36.1	53.9	62.2	2.75	105
NOVEMBER -13-12	45.5	12.7	37.8	61.4	61.0	2.69	90
Change %	-44.30	-21.60			-1.90		
FEBRUARY-21-12	34.7	8.3	47.2	71.4	54.4	2.40	68
Change%	-57.50	-48.70			-12.50		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	2.23	0.64	0.39	2.10	0.33	0.01	0.03
NOVEMBER -13-12	1.95	0.67	0.37	2.35	0.42	0.01	0.03
FEBRUARY-21-12	1.68	0.46	0.35	2.58	0.35	0.02	0.05

TABLE 17: OATS/CANOLA ANALYSIS COMPARISON

	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN%	DE (Mcal/ Kg)	Rel. Feed Value
SEPTEMBER-10-12	82.4	11.9	41.2	61.3	58.7	2.59	86
NOVEMBER -13-12	45.2	8.3	43.8	69.1	56.8	2.51	74
Change%	-45.10	-30.20			-3.20		
FEBRUARY-21-12	40.1	5.6	54.0	75.8	49.7	2.19	58
Change%	-51.30	-52.90			-15.30		
	DM INTAKE	Ca%	P%	K%	Mg%	Na%	Salt%
SEPTEMBER-10-12	1.96	0.46	0.26	2.64	0.18	0.11	0.28
NOVEMBER -13-12	1.74	0.39	0.30	1.90	0.19	0.06	0.16
FEBRUARY-21-12	1.58	0.44	0.23	1.16	0.12	0.15	0.38

DISCUSSIONS FOR FEED QUALITY

STAGE OF PRODUCTION	Protein required (Dry Matter)	TDN required (dry matter)
Mid-pregnancy	7%	55%
Late-Pregnancy	9%	60%
After Calving	11%	65%

Table 18: Requirements for Stage of Production

Table 18 shows a cows requirement for protein and energy at different stages of production. All the plots are able to meet the requirements for protein and energy for mid to late pregnancy in September and November. Results on pages 22 to 27 indicate that overall swath quality degrades (due to weather damage) the most from November to February. Unfortunately by February, most of the crops in the plots would require protein and energy supplementation to meet the requirements of cows in late pregnancy. For example the oat/canola mix has a protein and energy content only slightly better than straw.

Most producers in Clearwater County calve from February onwards. Most plots however do not have the forage quality required to meet the requirements of a lactating cow. The lack of protein and energy will result in poor milk production and cows losing weight if not supplemented with grain and a source of protein. Cows that consume snow to meet water requirements consume less "water" compared to those drinking from a well. This could also reduce milk production.

It has also been found that the logistics of swath grazing cows and calves can be problematic, as the calves will walk under or through the wire and the cows try to follow. They end up breaking the wire which allows the stock free access over the whole field. Another problem with swath grazing in the Spring is that as the field thaws, too much of the swath is wasted from trampling and spoiling in the mud.

Mineral and trace mineral levels in the swath grazing material can be vastly different between the crops and at different stages of development. As a crop matures, calcium levels drop and phosphorous increases. The biggest concern is to maintain a calcium to phosphorous ratio of at least 2:1. With this years' plots, the range is from 1:1 to 5:1. Crops that are not able to satisfy the ratio such as corn or forage oats, will be needed to be supplemented with calcium in the form of limestone. It can be mixed in the salt and offered free-choice. Magnesium levels are also deficient in most of the plots. The addition of calcium and magnesium could prevent could prevent the occurrence of winter tetany or downer cows.

Another concern is the amount of salt (sodium) in the swath grazed crops. Free choice or voluntary salt intake declines when salt concentration in the diet is greater than 0.251% (0.1% sodium) (Barry Yaremcio, 2012). Producers in Clearwater County have experienced reduced free choice salt and mineral intake when on swath grazing. In this year's results, the barley, barley/oats, forage oats plots have higher salt levels so mineral intake may be reduced. If the salt level is high in the swath, it may be necessary to add flavoring agents to the salt/mineral mix such as dried molasses, dried distillers grains, or wheat shorts to improve free choice consumption. High sodium water, which is common in this area, will further reduce free choice salt and mineral intake.

In Clearwater County the soils are generally deficient in copper, manganese , zinc and selenium which are needed for healthy animals, reproductive efficiency and growth. Vitamin precursors found in green (live) forages are oxidized 60 to 90 days after cutting and supplementation by injection or feeding should be considered. (Barry Yaremcio, 2013)

Neutral Detergent Fibre (NDF) can also be a concern in swath grazing plots. 10 out of the 12 plots showed NDF levels higher than 54%. NDF is the most difficult part of the forage for cows to digest. As levels increase, feed intake is reduced. The highest NDF value this year is from the oat/canola plot at 75.8%. This could result in reduced intake from 32 pounds dry matter to 23 pounds a day. This would create severe nutritional deficiencies even though the cows appear to be "full". Fibre in a plant is highest at the lower stem. Increased waste can occur with higher fibre levels because the cows refuse to eat the entire plant.

The feed results were analyzed for each crop for the three different time periods. They were then ranked in order of quality degradation for both Protein and Energy. Rankings were tabulated for September to November degradation and September to February degradation. Ranking number 1 shows the least amount of deterioration in the swath and ranking number 10, the most. (See Tables 18-21)

WILDLIFE PROBLEMS ON TRIAL PLOTS

Wildlife that seem to be prevalent in Clearwater County in regards to crop damage are Mule Deer, White Tail Deer, Elk and Moose. All these ungulates can cause severe damage to swath grazing in the winter months. Several mule deer were observed on the trial plots during the season and were observed for eating habits.

Plots of preference for the deer were corn and the plots that contained peas. After that they seemed to like the plots which contained oats and barley. Interestingly, although the Bunker Triticale was found to be most palatable to the cattle the deer seemed to leave it alone along with the millet.

The deer picked through the Taza Triticale/Peas plot and it was considered that this may be the reason why the cattle found the Bunker Triticale more palatable than Taza as it had not been defecated on by the wildlife.

There are certain options for managing wildlife on swath grazing. These include allowing hunting on fields as soon as the season opens up, using propane fired cannons to scare them away, and the use of 3D fencing.

The severity of the winter and the amount of native feed available will influence where wildlife will look for feed. If wildlife are too much of a problem it may not be feasible to use swath grazing as a method of winter feeding.

Table 18: Protein degradation Ranking from September 10th to November 13th

	PROTEIN DEGRADATION	
RANK	CROP	
1	Bunker Triticale	-1.8
2	Sunflower	-2.7
3	Barley/canola	-3.2
4	Barley/peas	-4.10
5	Trit/peas	-4.50
6	Barley/oats	-6.8
7	Forage Oats	-7.3
8	Barley	-10.7
9	Red proso Millet	-13.9
10	Millet/peas	-21.60
11	Corn	-23.00
12	Oats/canola	-30.20

Table 19: Protein degradation Ranking From September 10th to February 21st

	PROTEIN DEGRADATION	
RANK	CROP	
1	Forage Oats	-20.10%
2	Red proso Millet	-21.20%
3	Bunker Triticale	-21.80%
4	Corn	-29.00%
5	Trit/peas	-29.30%
6	Barley/peas	-31.20%
7	Barley/oats	-46.50%
8	Barley	-47.10%
9	Millet/peas	-48.70%
10	Sunflower	-50.00%
11	Oats/canola	-52.90%
12	Barley/canola	-52.90%

Table 20: TDN degradation Ranking from September 10th to November 13th

	TDN DEGRADATION	
RANK	CROP	
1	Canola/ barley	+8.20
2	Corn	+3.8
3	Triticale	+3.00
4	Barley/Oats	0.0
5	Barley	-0.50
6	Millet/peas	-1.90
7	Oats/canola	-3.20
8	Triticale/peas	-3.80
9	Red proso Millet	-4.40
10	Barley/peas	-5.20
11	Sunflower	-5.40
12	Forage Oats	-7.7

Table 21: TDN degradation Ranking from September 10th to February 21st.

	TDN DEGRADATION	
RANK	CROP	
1	Corn	-1.40%
2	Red proso Millet	-6.10%
3	Triticale/peas	-7.10%
4	Barley	-8.50%
5	Forage Oats	-10.00%
6	Triticale	-12.30%
7	Millet/peas	-12.50%
8	Barley/Oats	-13.00%
9	Barley/peas	-14.90%
10	Oats/canola	-15.30%
11	Canola/ barley	-18.50%
12	Sunflower	-22.00%

CONCLUSIONS ON DEGRADATION

The results for degradation in the swath proved very interesting. Some crops degraded quickly in the first two months and then held their quality while others held their quality well in the first two months and proceeded to degrade severely later on.

The crops were ranked in order of degradation for both protein and energy from September to November (Tables 18 and 20) and September to February (See Tables 19 and 21) . These results could be an important tool in deciding which crops to swath graze early and which can be left longer and fed later. For example Red Proso Millet can be seen to be ranked lower than other crops for degradation in the first two months but after that millet would seem to hold its quality well while other crops deteriorate quickly. So a farmer who grows millet and canola/barley would be wise to feed his canola/barley first and hold his millet grazing for the end of the season. Tritcale seems to hold its value well over the short and long term. Overall it can be seen that the worst deterioration occurred after November. The changes in nutritive value are larger between November and February than between September and November. The main shift in nutritive values occurs in digestibility with Acid Detergent Fibre (ADF) and Neutral Detergent Fibre (NDF) values increasing from September to February.

Some crops hold their energy value better than their protein such as is seen in the corn plot. And others such as the barley/peas hold their protein levels better than their energy values. It may be important when choosing which crops to grow for swath grazing to understand how different crops hold their feed value and which are able to meet livestock requirements at different stages of production.

PALATABILITY TEST

PALATABILITY

The cows were turned out onto swath grazing plots on November 17, 2012. They were allowed free access to all plots. The cows were observed for two hours on the first day and two hours each subsequent day after the wire was moved forward.

On day one the cows headed straight for the corn. The cows are used to corn and it was their obvious favorite on turn out. The cows walked over the other plots to get to the corn. (See Diagram 19). The cows stripped off the cobs first. Some stayed to eat the leaves while others moved on into the other swaths.

Diagram 19: Cows Congregating on the Corn

After the cows had stripped the cobs off the corn their next preferred plot was the Bunker Triticale. They showed obvious preference for the Bunker over the Taza Triticale even though the Taza had been mixed with peas. At each subsequent fence moving the cows would fight to get to the Bunker Triticale, even seeming to prefer it to the corn. (Diagram 20)

Diagram 20: Cows eating Triticale.

As can be seen from Diagram 20 that Millet was not a crop of choice. After the Triticale the cows liked any of the plots with barley or a barley mix. They seemed to find the barley/canola the most palatable of the mixes, closely followed by barley/peas. They also would pick the canola out of the oat/canola mix which was interesting. They definitely preferred the canola to the oats. The barley/oats seemed to be the least palatable of the barley mixes and the forage oats which looked so lush and green were not popular at all. The oat and oat mix crops showed a lot of waste. When the cows moved on to these plots they would pick the heads off and move on. They wasted a lot and didn't come back to clean it up.

The sunflowers were the least favorite. The stems were very coarse and fibrous. Some cows would eat the heads and leaves but overall there was a lot of waste on the sunflower plot. After sunflower the millet plots proved to be least palatable. However, interestingly the cows would go back and clean up the millet plots quite well compared to any of the oat plots.

PALATABILITY TEST RESULTS

Table 24 shows the palatability ranking for the plots based on observation of cows eating habits. The crops are ranked from high to low with Corn and Triticale proving to be most popular and Sunflowers, the least.

TABLE 24: CROPS RANKED IN ORDER OF PREFERENCE

- Corn and Bunker Triticale
- Taza Triticale/Peas and Barley mix plots
- Barley/Oats
- Oat Mix Plots
- Forage Oats
- Crown Millet/Peas
- Red Proso Millet
- Sunflowers

Further Analysis

Table 25 shows comparison of crops between September and November. The table shows animal grazing days per acre as well as Protein and TDN values in lbs per acre. Also shown are rankings for palatability and waste. Finally the chart shows the crop's ability to meet nutritional requirement for different stages of pregnancy.

As can be seen from Table 25 sunflowers had the highest number of grazing days per acre and highest quantities for protein and energy. However as can be seen this crop ranked lowest for palatability and had the largest amount of waste. Basically this is a very good example of a situation where even though feed results are high if the cows won't eat it there is no point in seeding it. Red Proso Millet is an interesting crop. It yielded as well as corn and was able to meet a cows requirement in mid and late pregnancy but ranked low in palatability. However on reviewing the waste left behind it was found that the cows actually cleaned up the millet quite well when their crops of choice were eaten. The cows cleaned up the millet better than the oat plots and so in a situation where millet is the only crop available to the cows it may prove to be a satisfactory choice for swath grazing purposes. Triticale ranked well across the board and looks to be a very promising swath grazing crop for Clearwater County.

Table 25: Chart Showing Nutrients per Acre, Palatability and Suitability to Stages of Production

	ANIMAL DAYS GRAZING/AC	LBS TDN PER ACRE	LBS PROTEIN PER ACRE	PALATABILITY TEST	WASTE	MID PREG	LATE PREG	LACTATING
CORN	193	5410	980	**2**	**2**	✓	✓	✓
SUNFLOWERS	369	8624	1624	**10**	**10**	✓	✓	☒
BARLEY	160	3880	1016	**4**	**4**	✓	✓	☒
BARLEY/OATS	171		895	**5**	**6**	✓	✓	☒
FORAGE OATS	231	5600	1009	**7**	**8**	✓	✓	x
CANOLA/ BARLEY	237	5724	1450	**4**	**4**	✓	✓	✓
TRIT/PEAS	237	5715	1260	**3**	**3**	✓	✓	☒
TRITICALE	242	5886	1067	**1**	**1**	✓	✓	☒
RED MILLET	193	4744	1165	**9**	**5**	✓	✓	☒
BARLEY/PEAS	237	6141	1365	**4**	**4**	✓	✓	✓
C MILLET/ PEAS	215	5346	1392	**8**	**4**	✓	✓	☒
OATS/ CANOLA	226	5304	1075	**6**	**9**	✓	✓	☒

COST COMPARISON

When considering which crops to plant one needs to take into account cost of production. Table 26 shows the costs that were directly associated with the trial plots.

Table 26: *C*osts of Different Crops per Acre

	Cultivation	Seeding	Fertilizer	Seed	Herbicide	TOTAL
	$	$	$	$	$	$
CORN	20	25	115	75	10	245
SUNFLOWERS	20	25	115	60	5	225
BARLEY	20	18	85	25	5	153
BARLEY/OATS	20	18	85	24	5	152
FORAGE OATS	20	18	85	22	5	150
CANOLA/BARLEY	20	18	85	25	5	153
TRIT/PEAS	20	18	85	25	5	153
TRITICALE	20	18	85	25	5	153
RED MILLET	20	18	85	14	5	142
BARLEY/PEAS	20	18	85	25	5	153
C MILLET/PEAS	20	18	85	22	5	150
OATS/CANOLA	20	18	85	25	5	153

Table 26 shows that corn and sunflowers plots cost the most to seed. This is partly due to their high fertilizer demand and partly due to the high seed cost. The crop that shows the least financial input was the Red Proso Millet.

Each producer will need to work out their own cost of production as fertilizer requirement will vary as will seed cost depending on availability and supply from year to year.

However it is important to take into account costs associated with growing different crops. Corn and millet are two very good examples of crops that provide the same tonnage, provide adequate nutrition and share the same animal grazing days per acre. However corn can cost up to $100 more an acre to seed than millet which translates to almost double the cost per head per grazing day obtained (See Table 27).

Other costs to consider that are not reflected in the trial plot data are seed treatment, in crop herbicide, cost of swathing and cost of electric fencing equipment.

Table 27: Comparison of Corn and Millet for Net Benefit per Acre

COST OF PRODUCTION		NET BENEFIT PER ACRE
CORN 7714 LBS/DM/ACRE		CORN -193 GRAZING DAYS/ ACRE
FERTILIZER	$115	$190 PER ACRE INPUT COSTS
SEED	$75	
TOTAL	$190	= $0.98/HEAD/DAY
RED PROSO MILLET 7714LBS/ DM/ACRE		RED PROSO MILLET 193 GRAZING DAYS/ACRE
FERTILIZER	$85	$99 PER ACRE INPUT COSTS
SEED	$14	=$0.51/HEAD/DAY
TOTAL	$99	

Waste Residue after Spring Grazing

Cattle were turned back out onto the plots at the end of April to clean up the residue. On May 15th the cows were removed from the trial plots and measurements were taken for waste residue. As the swather used had a 16ft header the recorded areas were measured in 16x3ft blocks. The total amount of residue was collected, bagged and weighed from each block and the results recorded. A visual assessment of the waste was taken as well as photos of different plots.

Diagram 21. Collecting residue from trial plots

Diagram 22. Sunflower crop residue

Diagram 23. Corn crop residue

Table 28. Results from Gathering Waste Residue from Trial Plots

SWATH GRAZING WASTE- MAY 15 2013		
CROP	WASTE (LBS)per 16ft x 3ft area	WASTE (KGS) PER 4.5M2
Triticale	1.65	0.75
Corn	1.87	0.85
Triticale & Field Peas	2.20	1.00
Crown Millet& Field Peas	2.42	1.10
Red Proso Millet	2.64	1.20
Canola & Barley	2.75	1.25
Barley	2.86	1.30
Sunflowers	3.08	1.40
Barley& Forage Peas	3.52	1.60
Barley & Oats	3.85	1.75
Forage Oats	4.07	1.85
Oats& Canola	4.40	2.00

Conclusion

As can be seen from diagram 28 the amounts of waste varied between plots. The plots with the least amount of waste contained Triticale and Corn. Interestingly the plots that ranked next in line were the Millet plots. Although these plots proved to be not as palatable as others the cows cleaned them up later better than expected. Any plots with oats proved to show the greatest amount of waste. This coincides with the data recorded for palatability. Although the visual assessment of the sunflower plot looked like there was a lot of waste it could be seen that the heads and leaves of the sunflowers had been consumed leaving only the stalks.

CONCLUSION

The trial plots proved to be a very successful exercise in gaining information on suitability of different crops for swath grazing in Clearwater County. Each of the twelve plots proved to provide adequate nutrition to maintain a cow in early, mid and late pregnancy from September to November. Feed quality from November to February however declined enough that it would not be beneficial to retain cows on most swath grazing plots from February onward without supplementation.

There are other factors beside nutritional quality to take into account when choosing a crop for swath grazing. Palatability should be examined as high feed value and palatability do not always go hand-in-hand as was shown by the sunflower plot.

Other plots showed more waste than others such as the plots containing oats. Although these plots tested well nutritionally there was a lot of waste making this choice not as profitable as some others.

Feed testing will be an important tool in managing swath grazing to decide how much supplementation may be required. It would be necessary to feed a trace mineral salt with selenium on most of the trial plots. In order for cows to consume mineral while on crops with high sodium content it may be necessary to sweeten the mix with molasses or some other additive.

It is important to monitor cow condition when feeding on swath grazing and be prepared to supplement with grain or high energy pellets (>78% TDN) if condition score begins to drop. Other factors like good fencing, water supply and damage from wildlife should also be taken into account.

Although different crops will suit different operations for different reasons it has to be noted that the Bunker Triticale out performed the other crops in yield, level of degradation in the swath, palatability and waste and was of a high enough quality to sustain a cow up to late pregnancy while doing so at the same cost of production as oats or barley. All other crops performed well in different areas but Bunker triticale seemed to be the one plot that performed well in all areas.

When reviewing this data it is important to remember that this information pertains to these particular trial plots, on this particular piece of ground, grazed by this particular herd. Results elsewhere and in different situations could differ dramatically. Conclusions drawn from these trial plots will not necessarily be repeatable year to year let alone elsewhere in the County.

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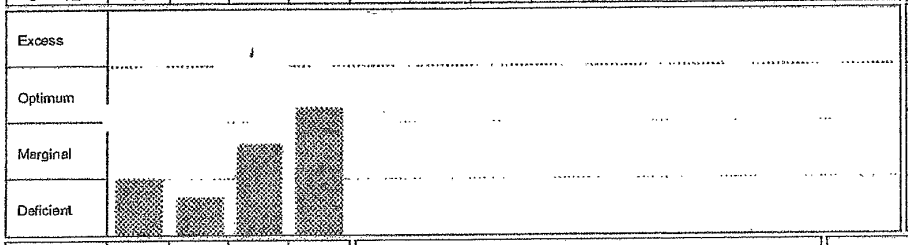
Appendix A

FARM SOIL ANALYSIS

Bill To:	Clearwater County	Grower Name:	Mark Bertagnolli	Lot Number:	870239
Report To:	Clearwater County	Client's Sample Id:		Report Number:	1737031
	Box 550	Field Id:	Trial Plots	Date Received:	May 15, 2012
	4340-47 Avenue	Acres:	10	Disposal Date:	Jun 14, 2012
	Rocky Mountain House, AB., Canada	Legal Location:	SE 13 38 7 W5	Report Date:	May 17, 2012
	T4T 1A4	Last Crop:	Barley - Feed	Arrival Condition:	
Agreement:	99360				

Nutrient Available (lbs/ac)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	16	10	122	11									
6" - 12"	17			6									



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.3	0.28	4.6	4051664
6.4	0.28		4051665

Alkaline	*Very Toxic*	*High*
Neutral	*Toxic*	*Normal*
Acidic	*Caution*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	65	20	243	35
Estimated lbs/acre	80	20	243	43

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS n/a

Ca n/a Mg n/a Na n/a K n/a

TEC n/a Na n/a

Lime n/a Buffer pH n/a Est. N Release n/a C:N Ratio n/a

*Nitrate-N **Sulfate-S n/a = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	Yield	N	P_2O_5	K_2O	S
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

The crop is not provided.
Call to request a crop-specific recommendation.

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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Diagram 21: Ag. Service Staff and Farmer Mark Bertagnolli Assessing Visual Quality Before Swathing