

Corn and Barley Silage Options in Saskatchewan; How do they fit into a ration and are they good value?

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With assistance from Zhi Yuan Niu, Saman Abeysekara, Marlene Fehr, and Jana Moats, in consultation with John McKinnon and Tim Mutsvangwa.

Presented by David Christensen

Silage Yields and Cost

- The Alberta Corn Committee reports yields at Outlook with irrigation for about 15 cultivars each year. <http://www.albertacorn.com/index.htm>
- Average long term yield is 6.6T DM, 20.8T as fed
- Yield 2010 averaged 5.8T (5.1 to 6.5).
- Barley silage with irrigation averages 4 to 4.5 T of Dry matter
- On dry land the University average is 2 to 3 tonnes dry matter (7.6 tonnes as fed).

Cost to Produce Corn and Barley Silage

- **The cost will vary with the farm.** See page 58
- Manitoba has a cost calculation spreadsheet.
- <http://www.gov.mb.ca/agriculture/financial/farm/pdf/copcerealsilagecosts2009.pdf>
- In 2009 the Manitoba barley silage cost was \$36.58 per wet ton and \$28.26 for corn.
- Based on 6 tons wet for barley and 12.5 for corn. Low corn yield but well matured.

Barley Silage Options

- **Variety yields vary by about 15 %, within Crop Production Areas (CPA), but the variety selected must be adapted to your CPA.**
- **Rosser yields well in all CPA, is smooth awned, but prone to leaf diseases.**
- **Cowboy does best in the north (CPA 3,4), is rough awned, disease prone and lodges.**
- **Sundre, highest yield, Does best in the south, smooth awn, prone to some diseases. No research at the U of S.**

Feeding Value and Stage of Maturity of Annual Cereal Forages

- **Barley** harvested as silage. TDN and protein reach peak at mid dough stage. Yield may increase to late dough. The recommended stage is later than US mid-west due to our longer day length and lower temperatures.
- **Oat**. Highest quality at milk stage, digestibility declines as oat matures.
- **Corn**. Harvest anytime after dent stage when the white line is at mid kernel. Starch should be over 20-25% in silage.
- **Wheat**, similar to barley.
- **Rye and triticale**. Highest quality at flower stage. Quality and palatability decline with maturity.

Barley at Firm-dough, Mid Dough and Milk Stages



Rosser and Cowboy Composition, 2008

	dry matter basis	
	Rosser	Cowboy
Crude Protein,%	13.4	11.7
Soluble protein, % of CP	57	51
Undegraded Protein, % of CP	21	25
ADF, %	29.2	35.4
NDF,%	46.8	55.3
Lignin, %	4.0	5.5
Crude Fat, %	3.0	2.4
Ash, %	8.5	9.9
Starch, %	21.7	16.5
Sugar, %	2.1	2.7
TDN, %	64.5	57.1
NEL, Mcal/kg	1.48	2.78

Cowboy and Rosser Barley Silages with Canola Meal or WDDG

	Rosser & WDDGS	Rosser & Canola meal	Cowboy & WDDGS	Cowboy & Canola meal
DM intake, kg/d	29.1	28.5	28.2	27.9
Milk yield, kg/d	39.5	39.4	38.7	37.6
3.5% FCM ⁴ yield, kg/d	39.6	39.1	38.9	37.9
Fat, %	3.54	3.49	3.61	3.58
Fat yield, kg/d	1.39	1.35	1.37	1.33
Protein, %	3.34	3.34	3.4	3.36
Protein yield, kg/d	1.3	1.3	1.3	1.25
no significant differences				

Projects to Provide Ration Formulation Information, CPM and AMTS Ration Models

- Led by Peiqiang Yu with SADF and other support
- **Corn silage quality**, up to 55 quality measures
 - 16 samples from 2010
 - 31 plots and fields in 2011
 - At CHU target, at ensiling, and when winter grazed
 - Similar data collected in 2012, and???
- **Protein and Carbohydrate analysis** using the CNCPS 6.1 Model of about 100 feeds per year.
 - Protein solubility is very important and must be known and balanced with carbohydrates to maximize rumen fermentation. Samples supplied by the feed industry.

Crop Heat Units (CHU)

- Calculated from day temp over 10C. Night over 4.4C
- 33 CHU areas in Sask. Shows daily and Cumulative CHU

<http://www.farmzone.com/index.php?product=farmzone&pagecontent=saskatchewan>

- Know corn variety CHU target
 - But, corn development varies with soil moisture and temp.
 - Cloud cover
 - Latitude
- How to judge corn maturity, white line ???
- Is the starch content over 20% ???

**This Corn had been exposed to its target CHU.
But with Delayed Germination
Note the milk on the knife blade**



	Variation in Silage Composition			
	Corn, USA	Corn	Corn	Barley silage
	DairyOne	Sask, CVAS	Sask, CVAS	Sask, CVAS
	10 year Ave	2009	2010	2010
Number of samples	191,500	16	16	95
Dry Matter	33.8	36.7	31.2	36.0
Crude Protein	8.23	9.2	9.49	11.2
Soluble CP, % of CP	53.4	43.0	49.1	60.6
ADF, % in DM	26.1	29.7	31.9	30.8
NDF, % in DM	44.1	49.0	55.0	52.7
Lignin, %DM	3.36	3.34	3.47	4.30
Sugar, % DM	2.12	3.00	1.75	2.56
Starch, %DM	31.3	22.2	15.4	17.4
TDN, % DM	70.4	67.0	65.3	63.7
NEL, Mcal/kg DM	1.59	1.45	1.50	1.45

Effect of Change in Protein Solubility			
Feed	Amount	Increase in	Lost milk
	kg DM/day	% Solubility	kg milk
Alfalfa hay	6.5	30 to 60	3.2
Alfalfa Silage	6.5	40 to 75	2.2
Barley silage	7.7	40 to 75	1.7
Canola meal	2	15 to 29	0.9
SBM	2	8 to 21	1.2
Wheat mill run	2	15 to 30	0.4

Feed Costs and Value, Various Cost Sources

	August, 2011	Spartan	CPM-Dairy	
Feed	Cost, as fed	Value	Value	
Page 64	\$/tonne	\$/tonne	\$/tonne	
Alfalfa hay	120	116	94	
Alfalfa silage	40	60	30	
Barley silage	38	39	60	
Corn silage	40	44	38	
Barley grain	210	207	210	
Corn grain	296	223	280	
Wheat grain	242	245	243	
Wheat mill run	159	148	180	
WDDGS	210	219	185	
CDDGS	237	200	168	
Canola meal	222	235	235	Cost and value are 91% correlated, with some exceptions
Canola bio-diese	277	284	225	
SBM, 48%	391	298	300	
Pea grain	218	240	310	
Spartan, traditional least cost program				
CPM Dairy, Optimizer program, feed composition, rumen model, and milk yield and composition.				

Take Home Messages

- **Corn silage may yield over 6 tonnes of silage dry matter on irrigation, with sufficient CHU. This compares to 4.5 to 5 tonnes for barley. Under poor conditions both crops may have low yields.**
- **Care must be taken in selecting corn and barley cultivars for crop production area. Corn cultivars may differ by 20% in yield and barley 10-15%.**
- **Corn silage is a risk vs benefit decision. Costs must be calculated on individual farms.**
- **Dairy ration formulation depends not only on high quality forage, but also on detailed feed information and ration models such as CPM and AMTS. NIR feed analysis may be satisfactory (\$23/sample).**
- **Feed prices are 91% explained by nutrient content. Some are better value than others.**

Milk Yield and Composition

Component	Lacombe	Rosser	Corn
Milk yield, kg/day	35.5a	35.6a	32.2b
Milk fat, %	3.53	3.70	3.69
Milk fat, kg/day	1.24ab	1.36a	1.18b
3.5% FCM, kg/d	35.5ab	37.4a	33.1b
Milk protein, %	3.37	3.33	3.32
Milk protein, kg/d	1.19a	1.17a	1.06b

Univ of Sask, 2004

Effect of Barley Variety and Stage of Maturity on Milk Yield

	<u>Heartland</u>		<u>Virden</u>		Harrington	Duke
	Early	Late	Early	Late		
Milk yield kg/day	26.4	28.4	26.6	28.9	26.5	28.2
Milk fat %	3.94	3.55	3.90	3.76	3.70	3.57
3.5% FCM, kg	27.7	28.5	28.1	30.0	27.2	28.6
Milk Protein %	3.27	3.36	3.25	3.30	3.30	3.32
Body weight change, g/d	+135	+243	-237	+427		

Nutritive Value of Cereal Silages, Variety and Stage of Maturity

(100% Dry Matter Basis)

Trial 1	Dry Matter %	Protein %	ADF %	NDF %	TDN %	Intake % Body Weight
Harrington:						
Flowering	31	13.5	35.00	59	58	1.6
Stiff Dough	35	11.7	30	50	60	1.8
Virden:						
Flowering	34	11.8	37	59	61	1.7
Stiff Dough	35	10.6	29	46	63	2.0
Heartland:						
Flowering	39	12.5	30	50	64	2.0
Stiff Dough	36	10.5	24	40	66	2.0
Alfalfa Hay:						
Low ADF	91	17.8	34	46	59	2.4
High ADF	91	17.6	38	49	59	1.9