Extensive Winter Grazing Systems For Beef Cattle

H.A. (Bart) Lardner

Professor

@DrBart_Beef

Department of Animal and Poultry Science

University of Saskatchewan

Outline

- Applied Cow-Calf & Forage Systems
  - Perennial & Annual Forages
  - Bale Grazing
  - Stockpile Grazing
  - Swath Grazing
  - Crop Residues
  - Whole Plant Corn Grazing
- Considerations

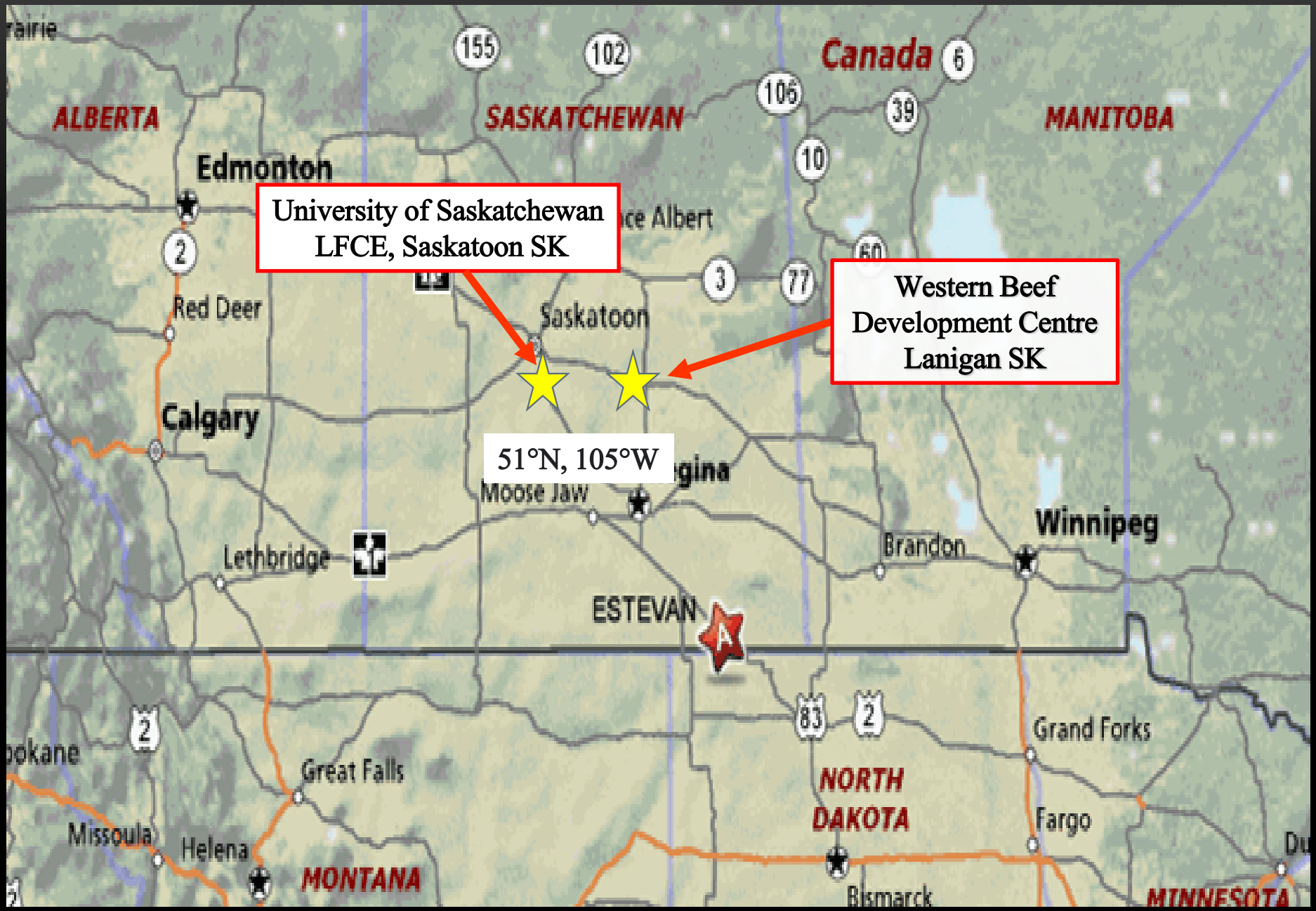
WesternBeef
DEVELOPMENT CENTRE

25 years at WBDC

2018 to LFCE

Livestock & Forage Centre of Excellence
Forage and Cow-Calf Unit
University of Saskatchewan

University of Saskatchewan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LFCE, Saskatoon SK
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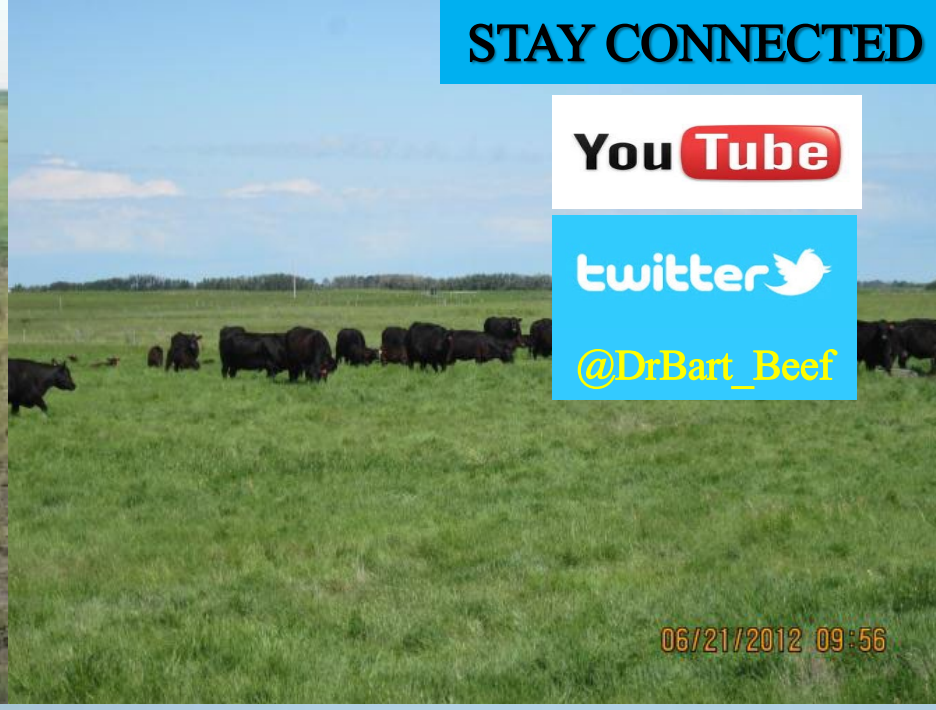

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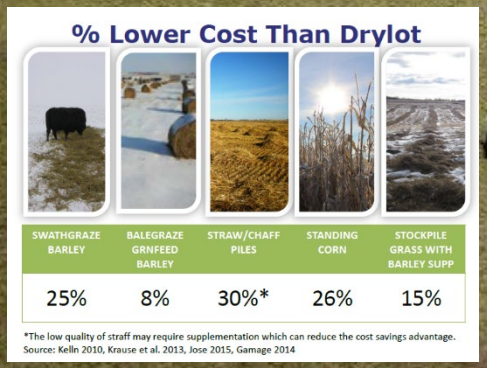
APPLIED BEEF & FORAGE RESEARCH

Economic Analyses Of Grazing Systems



Conduct Economic Analyses
- Forage/Grazing systems
- Calving systems
- Breeding systems

Take Feed to Cattle

OR

Take Cattle to Feed

PERENNIAL GRASSES AND LEGUMES

Grasses

- Crested wheatgrass (*Agropyron cristatum*)
- Smooth bromegrass (*Bromus inermis* L.)
- Kentucky bluegrass (*Poa pratensis* L.)
- Orchardgrass (*Dactylis glomerata* L.)
- Fescues (*Festuca spp.*)

Legumes

- Alfalfa (*Medicago sativa; M. falcata*)
- Vetches (*Astragalus spp.*)
- Clovers (*Melilotus spp.*) (*Trifolium spp*)
- Sainfoin (*Onobrychis viciaefolia*)

ANNUAL FORAGE VARIETIES


Red proso millet

- Cool season annual cereals
  - oat, barley, rye, triticale
- Warm season annual crops
  - sorghum, corn
  - millet (red proso, foxtail, golden German)
- Fall cereals
  - Fall rye, winter wheat, winter triticale

Increase Use of Forages In Winter Systems

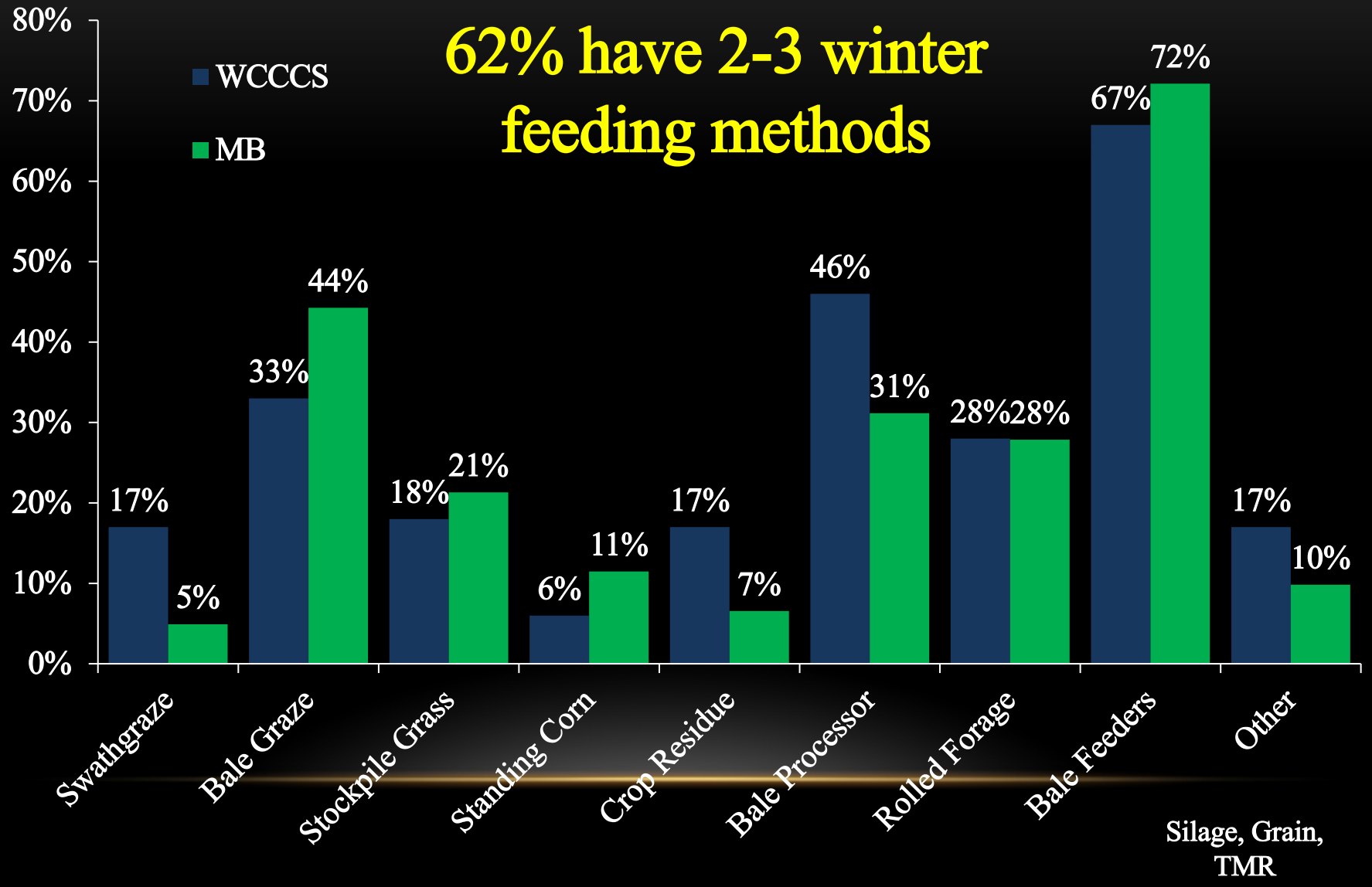
Forages are "Foundation of Beef Industry"

Target to graze as many days a year…….

Extensive Systems

- Graze Stockpiled Perennials
- Graze Swathed or Standing Annuals
  - Cool season
  - Warm season
- Grazing Crop Residues
  - Cereal, pulse and oilseed crops
  - Straw, chaff, screenings or combinations
- Bale Grazing

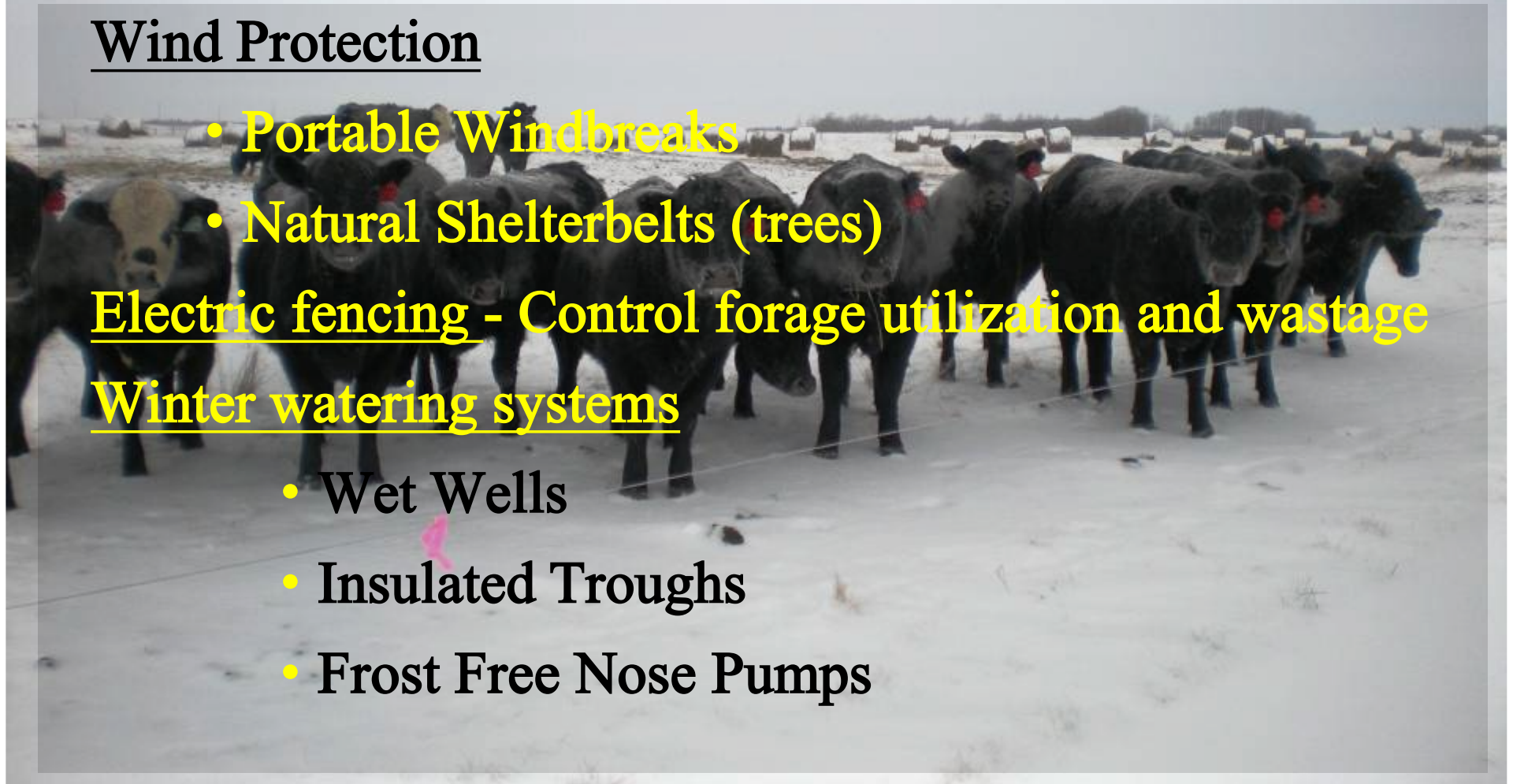
Winter Feeding Systems



Extensive Grazing Management

- Beef Cow Management
- Extended Grazing Options

Extensive Grazing Factors to Consider!



Wind Protection

- Portable Windbreaks
- Natural Shelterbelts (trees)

Electric fencing - Control forage utilization and wastage

Winter watering systems

- Wet Wells
- Insulated Troughs
- Frost Free Nose Pumps

Body Condition Management

- Scale 1 to 9 in United States
- Scale 1 to 5 in Canada
- Management
  - Helps measure available energy reserves
  - Important factor affecting reproduction
  - Allows for feeding flexibility

Benefits - Winter Grazing

What you want to see…….


What you don't want to see…….
November 13 2006
Be prepared – Plan B!

Bale Grazing

Set feed out in fall

Nutrients on bale graze site

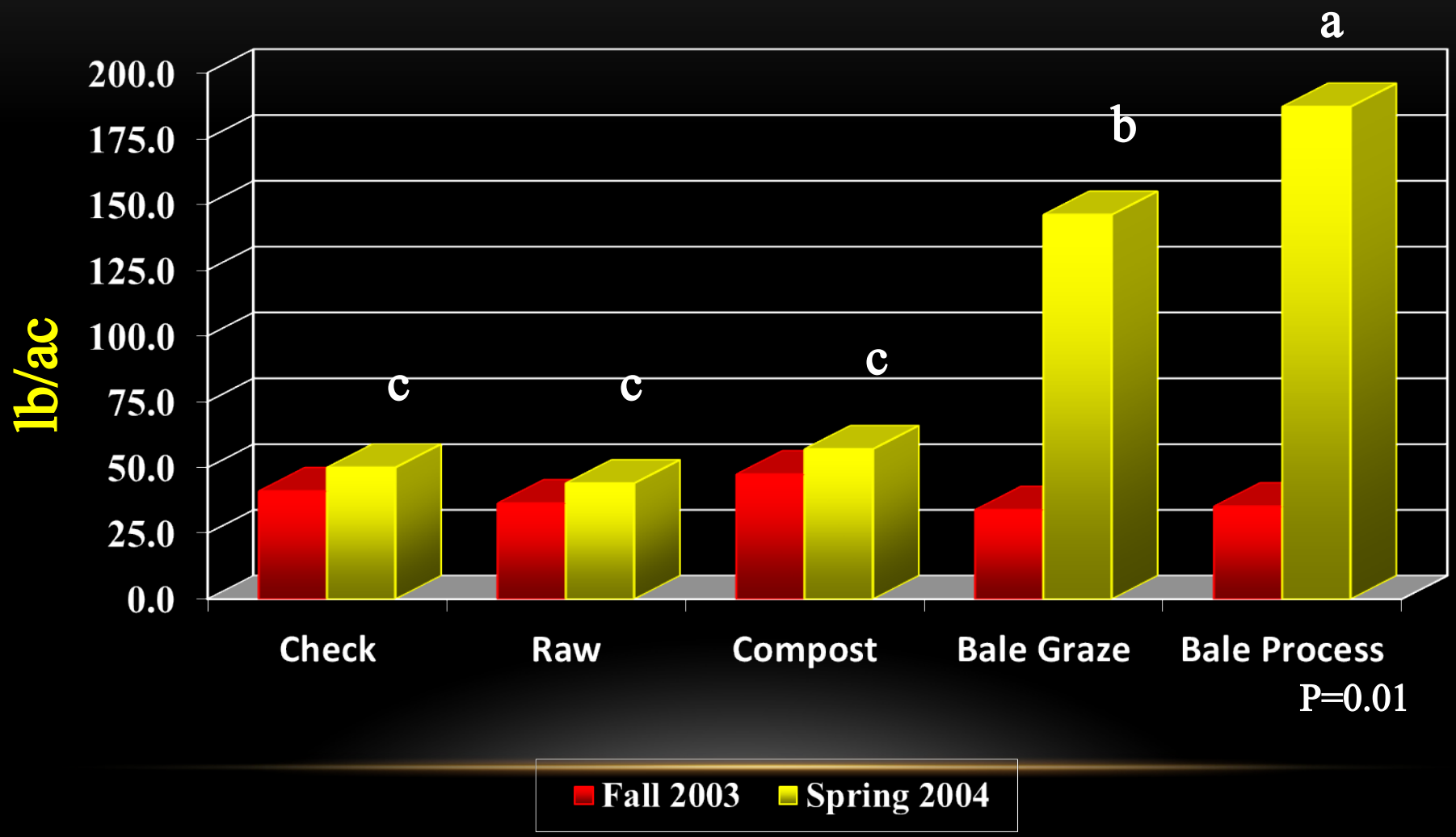
Lower costs

Applied solid manure and compost on perennial grass pasture site

Rates

- **30 ton/acre manure**
- **10 ton/acre compost**
- **Control – NO manure**

Soil nitrogen (NO_3 + NH_4) in the 0-6 inch depth



Jungnitsch et al. 2011

FORAGE YIELD ON TREATMENT AREAS (LB/AC)

	July 15	Sept 26	Total
Co			
Ma			
Compost	2210	547	2757c
Bale Graze	2424	1295	3719b
Bale Process	2726	1987	4713a

Biomass ↑ 270% - cattle wintering sites

Biomass ↑ 60% - manure applied sites

NUTRIENT CYCLING

In a 1400 lb hay bale:
~ 30 lb N ~ 5 lb $P_2 0_5$
~ 25 lb $K_2 0$ ~ 3 lb S

Only ~ **10%** of **nitrogen** consumed is retained in cattle, rest is excreted, mainly in **urine**

About **20%** of **phosphorus** consumed is retained in cattle, rest is excreted, almost all in **dung**

PASTURE FEEDING
NUTRIENT CYCLING EFFICIENCY

- N = 34 %
- P = 22 %

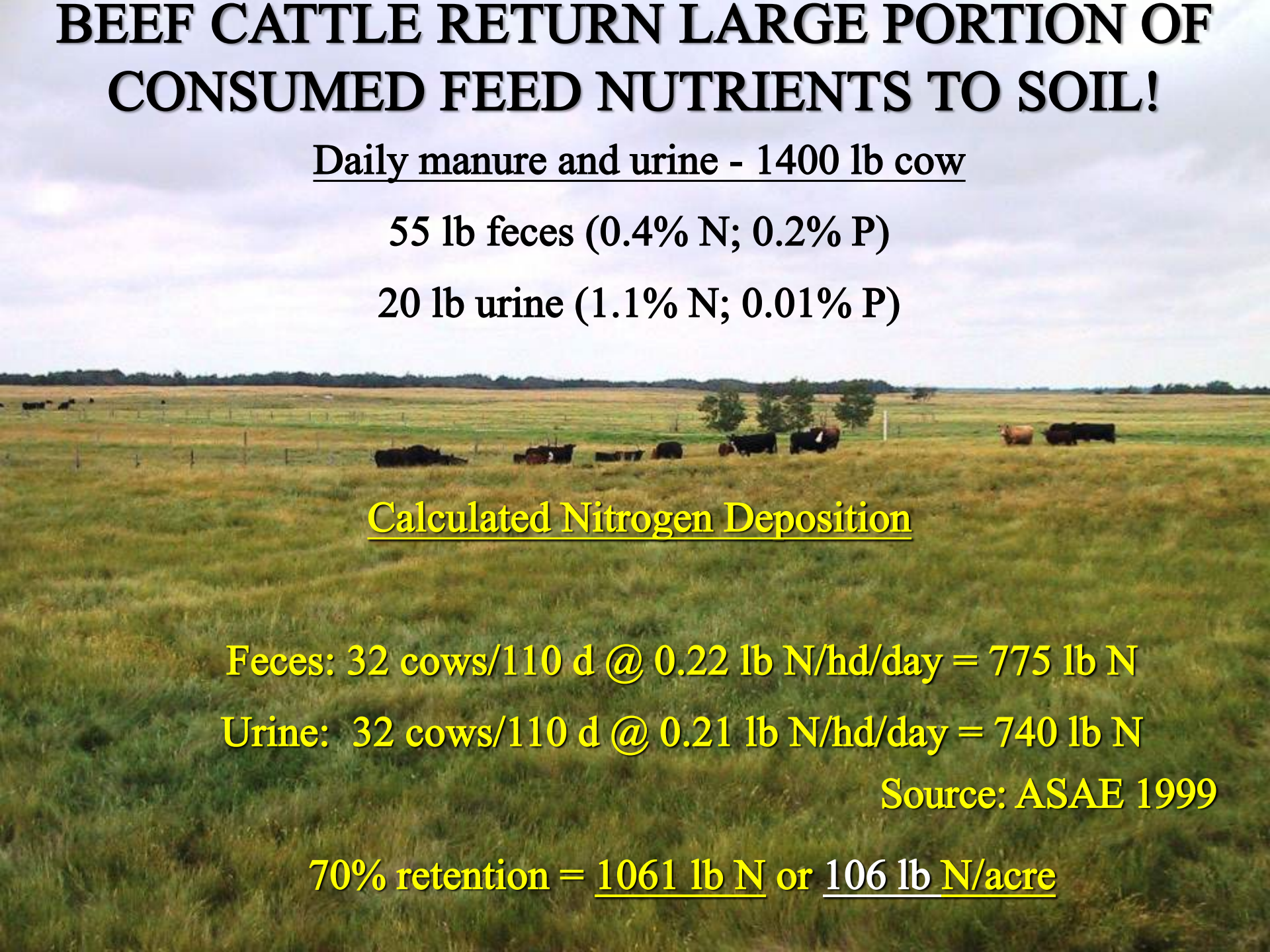
Jungnitsch et al. 2011 Agric. Eco. Eniv.

DRYLOT FEEDING
NUTRIENT CYCLING EFFICIENCY

- N = 7 %
- P = 4 %

Jungnitsch et al. 2011 Ag. Eco. Eniv.

BEEF CATTLE RETURN LARGE PORTION OF CONSUMED FEED NUTRIENTS TO SOIL!



Daily manure and urine - 1400 lb cow

55 lb feces (0.4% N; 0.2% P)

20 lb urine (1.1% N; 0.01% P)

Calculated Nitrogen Deposition

Feces: 32 cows/110 d @ 0.22 lb N/hd/day = 775 lb N

Urine: 32 cows/110 d @ 0.21 lb N/hd/day = 740 lb N

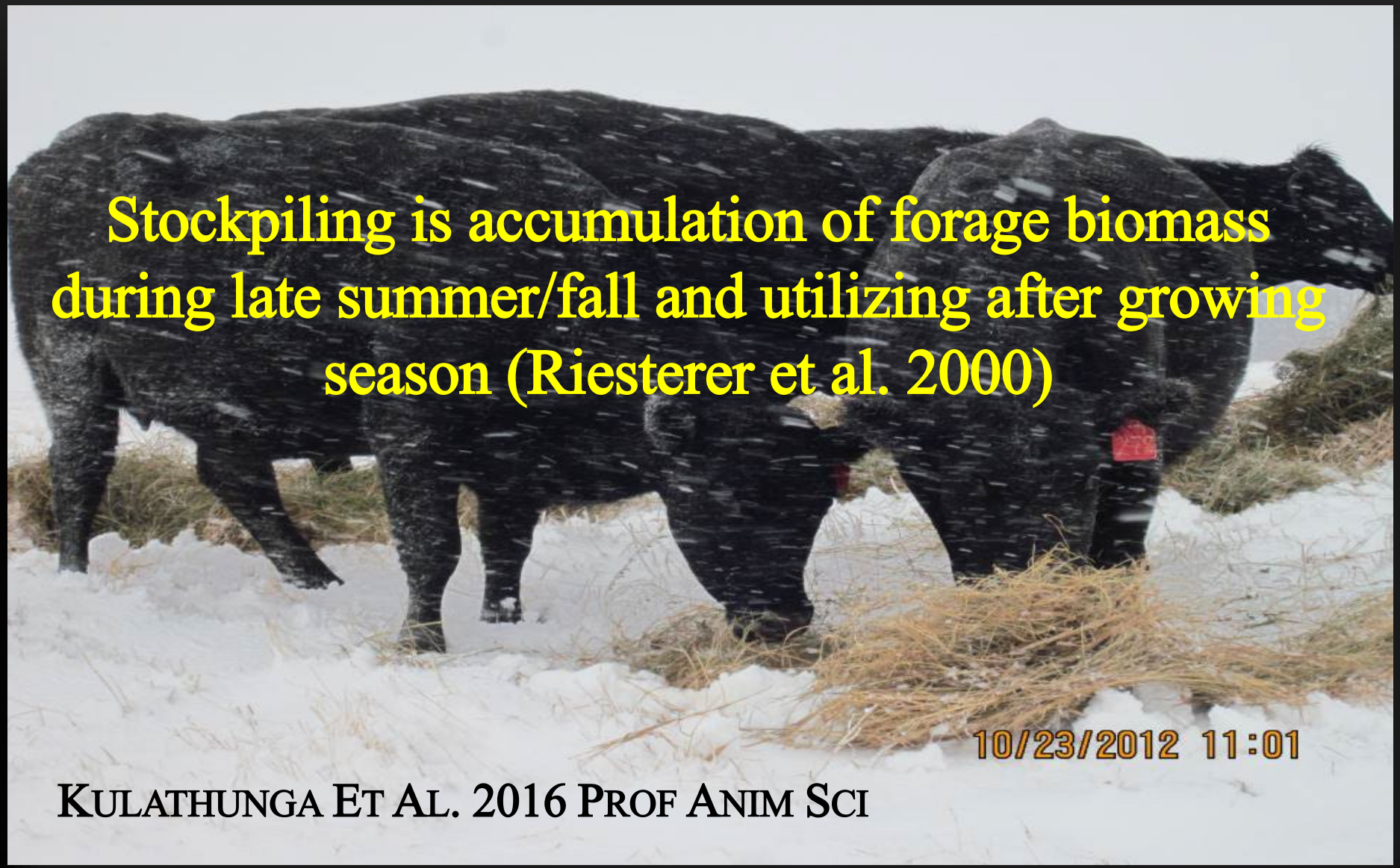
Source: ASAE 1999

70% retention = 1061 lb N or 106 lb N/acre

Bale Grazing Summary

- Bale grazing allows urine and fecal nutrients deposited directly on wintering site (Jungnitsch et al. 2011; Kelln et al. 2012)
- In a 3-yr study, bale grazing had no effect on cow reproductive performance and was 8% lower cost compared to traditional drylot system (Kelln et al. 2011)

Stockpiled Forages



Kulathunga Et Al. 2016 Prof Anim Sci

Site and Systems

3-year study

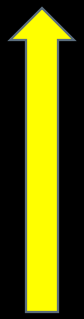
- WBDC Termuende Research Ranch, Lanigan SK
- 60 acre site - meadow bromegrass-alfalfa
- Field sub-divided into 6, 10-acre paddocks
  1. Stockpiled Forage Grazing (SPF)
     - Cows grazed windrowed forage in field paddocks
  2. Drylot Feeding Hay Bales (DL)
     - Cows housed in drylot pens fed round bale forage

Cow Performance

Effect of stockpile system on cow performance over 3 year				
	System			
Item[z]	Stockpile	Drylot	SEM	*P*-value
Body weight change (lb)	24	32	6.4	0.23
Average daily gain (lb/d)	1.1	1.3	0.52	0.26
Rump fat change (mm)	0.9	0.8	0.40	0.83

Effect on Soil Nutrients

Soil Nutrients	Treatments SPF	DL	SEM	*P* value
NO_3-N (kg/ha)	11.9	7.6	0.94	**0.02**
NH_4-N (kg/ha)				0.65
NO_3+ NH_3 (kg/ha)	20.0	18.3	0.90	0.20
K (kg/ha)	694.3	715.0	34.59	0.68
P (kg/ha)	33.2	43.1	4.29	0.06



56 % increase in NO_3-N on SPF paddocks

Economic Analysis

Grazing stockpiled forages over 3 yr

- Resulted in 15% lower cost/cow/d

Stockpiled grazing was cost effective for winter period of 46 d……yet as weather grew colder ---

Additional supplement cost increased - reduced advantage of stockpile field grazing

Swath Grazing

- Annual cereals cut at correct stage in windrows to graze fall/winter or following spring (Aasen et al. 2004)

- Swath grazing required 38% less labour than traditional (straw plus barley silage) feeding (McCartney et al. 2004)
- Essential to monitor cow body condition along with provision of water and shelter

Validating Stage of Maturity At Harvest For Barley, Oat and Triticale for Swath Grazing

Why Is This Important?

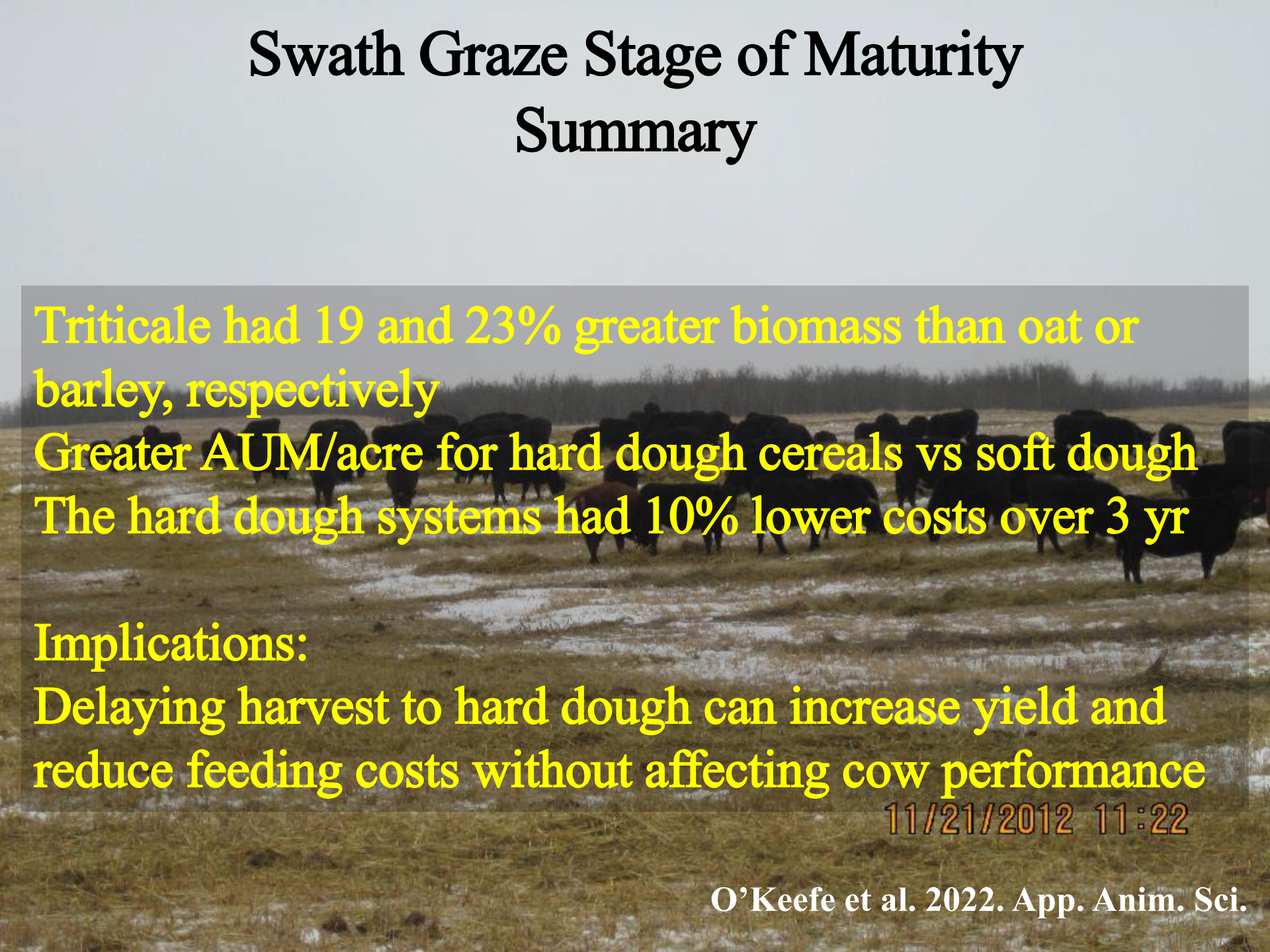
3-yr Study

120 Beef Cows Assign to 1 of 6 replicated (N=2) grazing systems

1. 'Taza' triticale harvest at (i) soft dough; (ii) hard dough
2. 'CDC SO1' oat harvest at (i) late milk; (ii) hard dough
3. 'Maverick' barley harvest at (i) soft dough; (ii) hard dough

O'Keefe et al. 2022. App. Anim. Sci.

Swath Graze Stage of Maturity Summary



Triticale had 19 and 23% greater biomass than oat or barley, respectively

Greater AUM/acre for hard dough cereals vs soft dough

The hard dough systems had 10% lower costs over 3 yr

Implications:

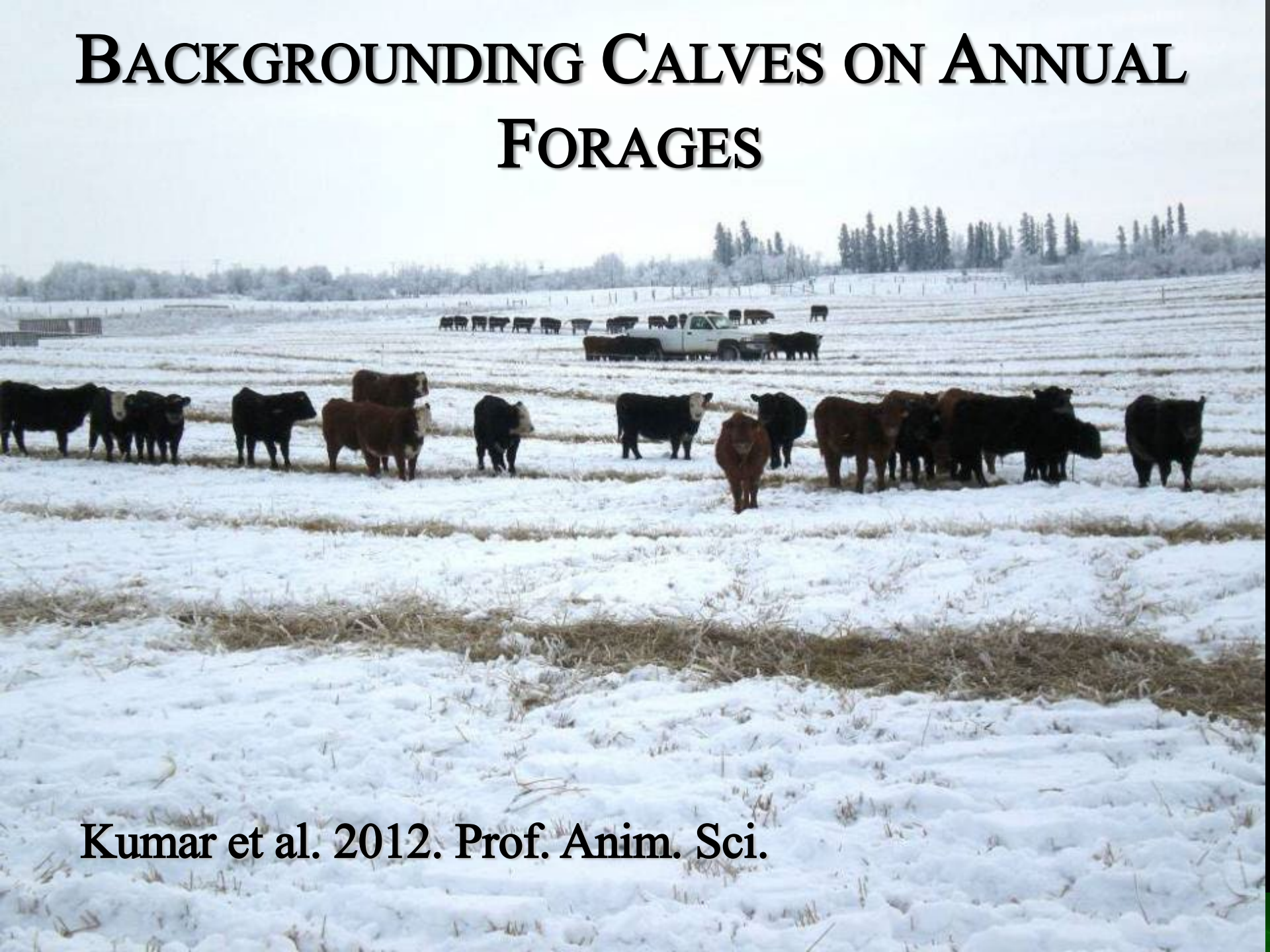
Delaying harvest to hard dough can increase yield and reduce feeding costs without affecting cow performance

O'Keefe et al. 2022. App. Anim. Sci.

Extensive Backgrounding Programs

High COG in Drylot

Backgrounding Calves on Annual Forages



Kumar et al. 2012. Prof. Anim. Sci.

BACKGROUNDING PHASE

3 YEAR STUDY

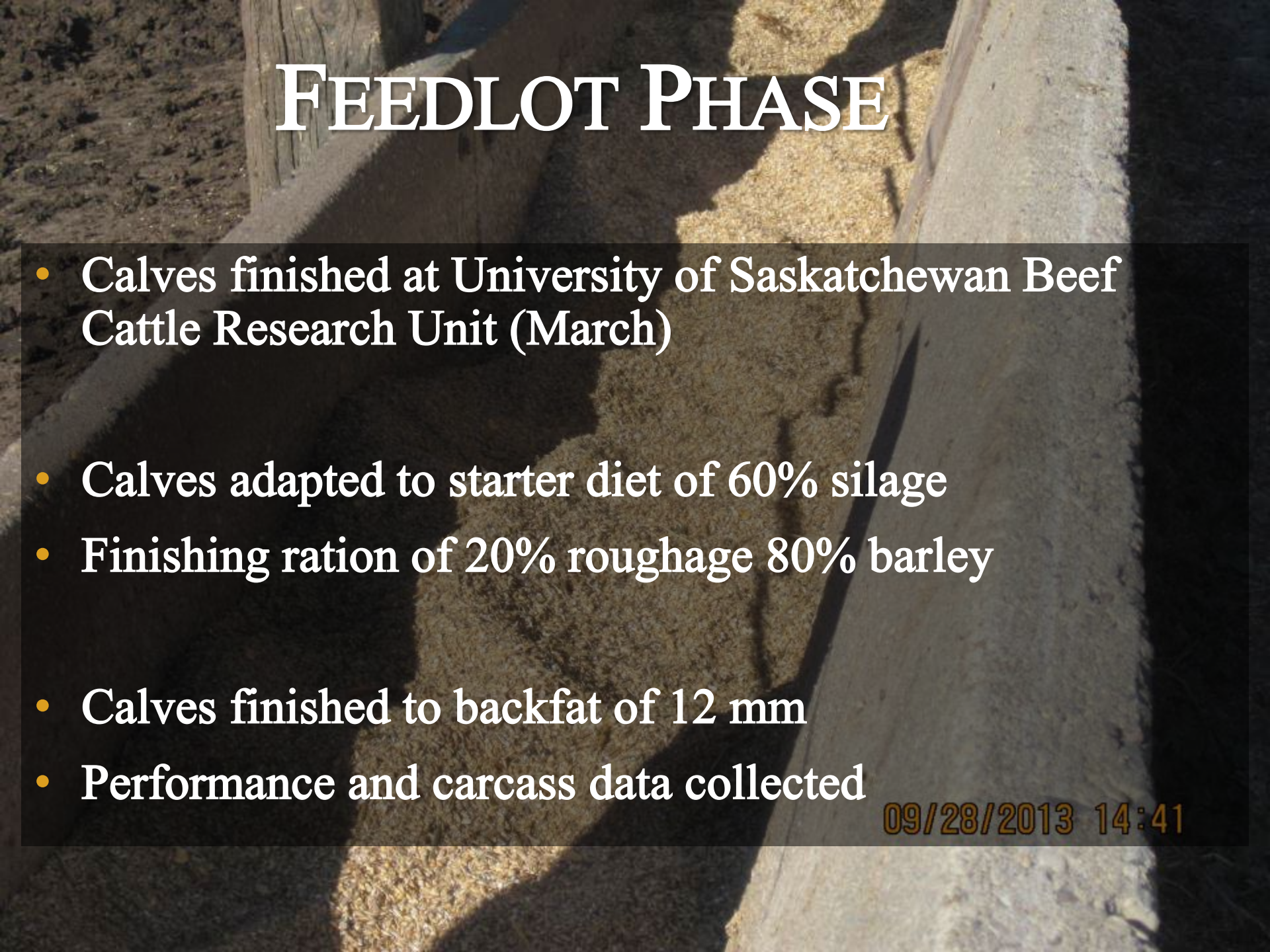
- 360 fall-weaned calves allocated to 1 of 3 replicated (n=2) backgrounding systems (October)

  1. Swath graze Golden German millet
  2. Swath graze Ranger barley
  3. Drylot processed grass-legume diet

- Field allocated forage every 3 days
- Supplement at 5 lb/d (0.6% BW)

Feedlot Phase

- Calves finished at University of Saskatchewan Beef Cattle Research Unit (March)
- Calves adapted to starter diet of 60% silage
- Finishing ration of 20% roughage 80% barley
- Calves finished to backfat of 12 mm
- Performance and carcass data collected



BACKGROUND PERFORMANCE

BARLEY	456	635	1.8
MILLET	456	593	1.3
DRYLOT	458	639	1.8
P-value	0.99	0.01	0.01

Kumar et al. 2012. Prof. Anim. Sci.

Steer Feedlot Performance

Final Live Weight and ADG

BARLEY	714	1327	3.59
MILLET	676	1314	3.64
DRYLOT	707	1325	3.55
P-value	0.01	0.74	0.59

Kumar et al. 2012. Prof. Anim. Sci.

Table 7. Effect of [illegible] cost of gain in background over 3 yr

Ite[illegible]	[illegible]ule
Feed c[illegible]	0.040
Yarda[illegible]	0.001
Tot[illegible]	01
Cost of gain, $/kg	.160 0.001

[a,b]Means within a [illegible]

[1]BAR = swathed barley grazing; MILL = [illegible]ed millet grazing; DL = drylot pen feeding.

Cost of gain to background calves on barley swath graze was 41 and 43% lower than on millet swath graze or drylot, respectively

Kumar et al. 2012. Prof. Anim. Sci.

Residue Grazing Studies at WBDC

Cereal, pulse, oilseed, cool and warm season crops

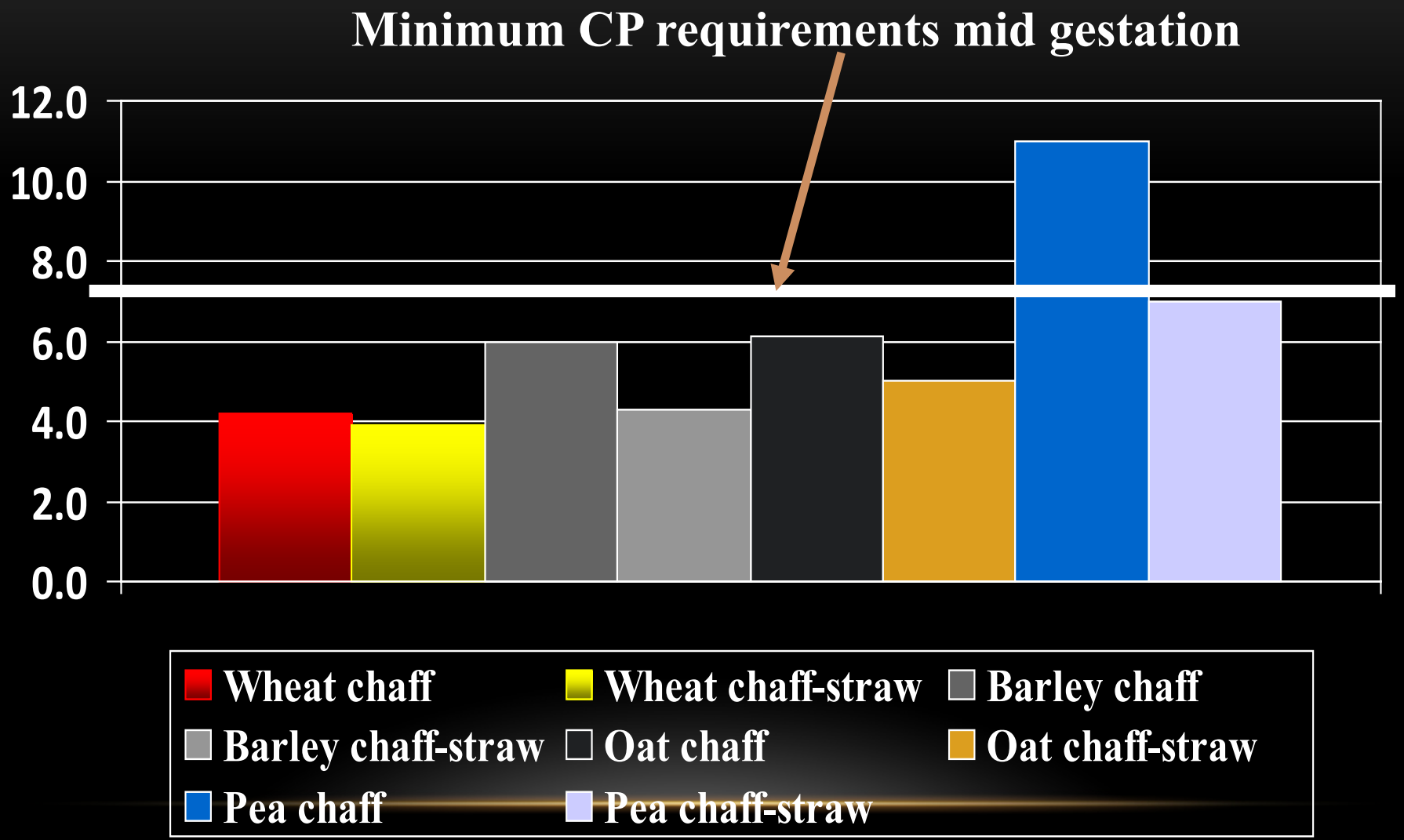
- Straw, chaff, husk, hulls, off-grains post-harvest
- Feed test - provide supplement

Barley residue studies

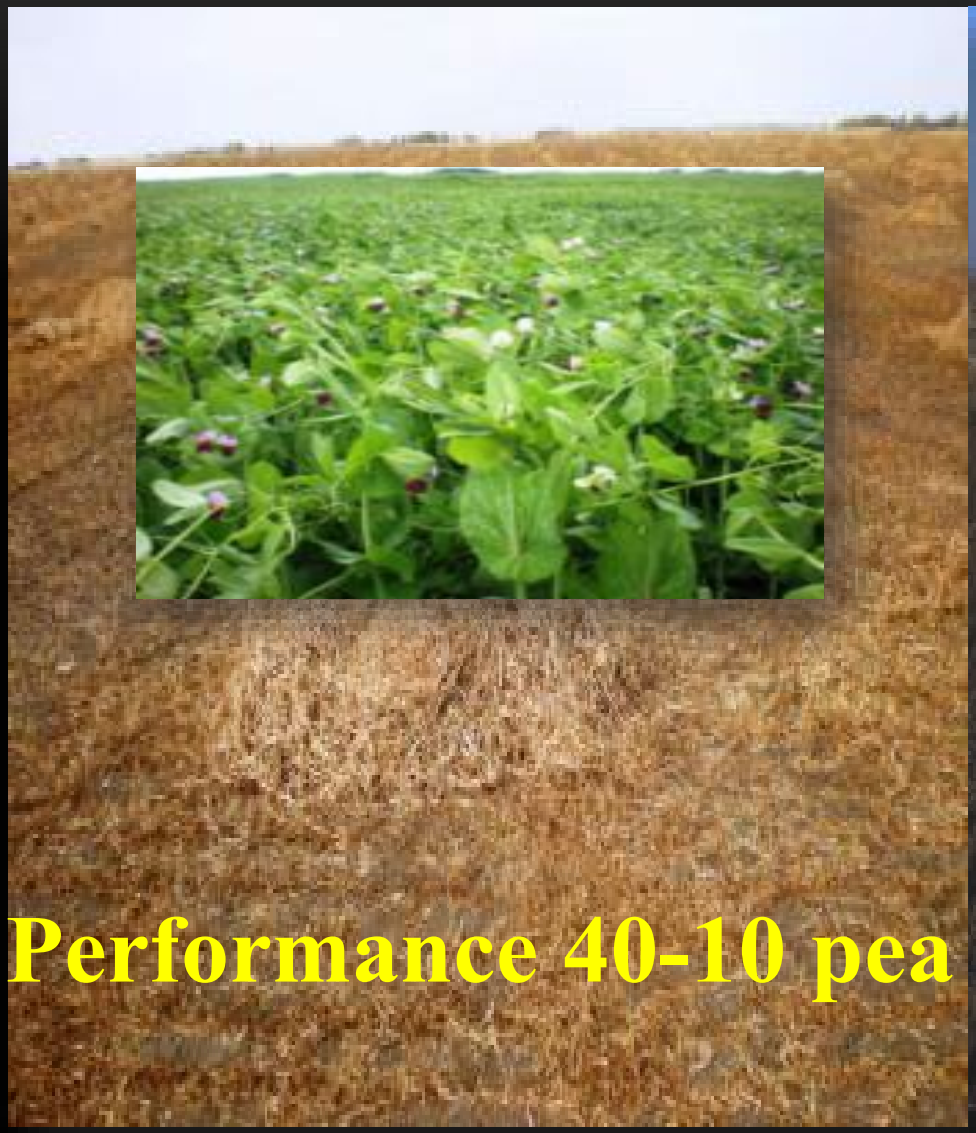
(Kelln et al. 2011; Van De Kerckhove et al. 2011)

Oat and pea residues (Krause et al. 2013)

Average Chaff and Chaff Straw Crude Protein Values



Grazing Pea and Oat Residues

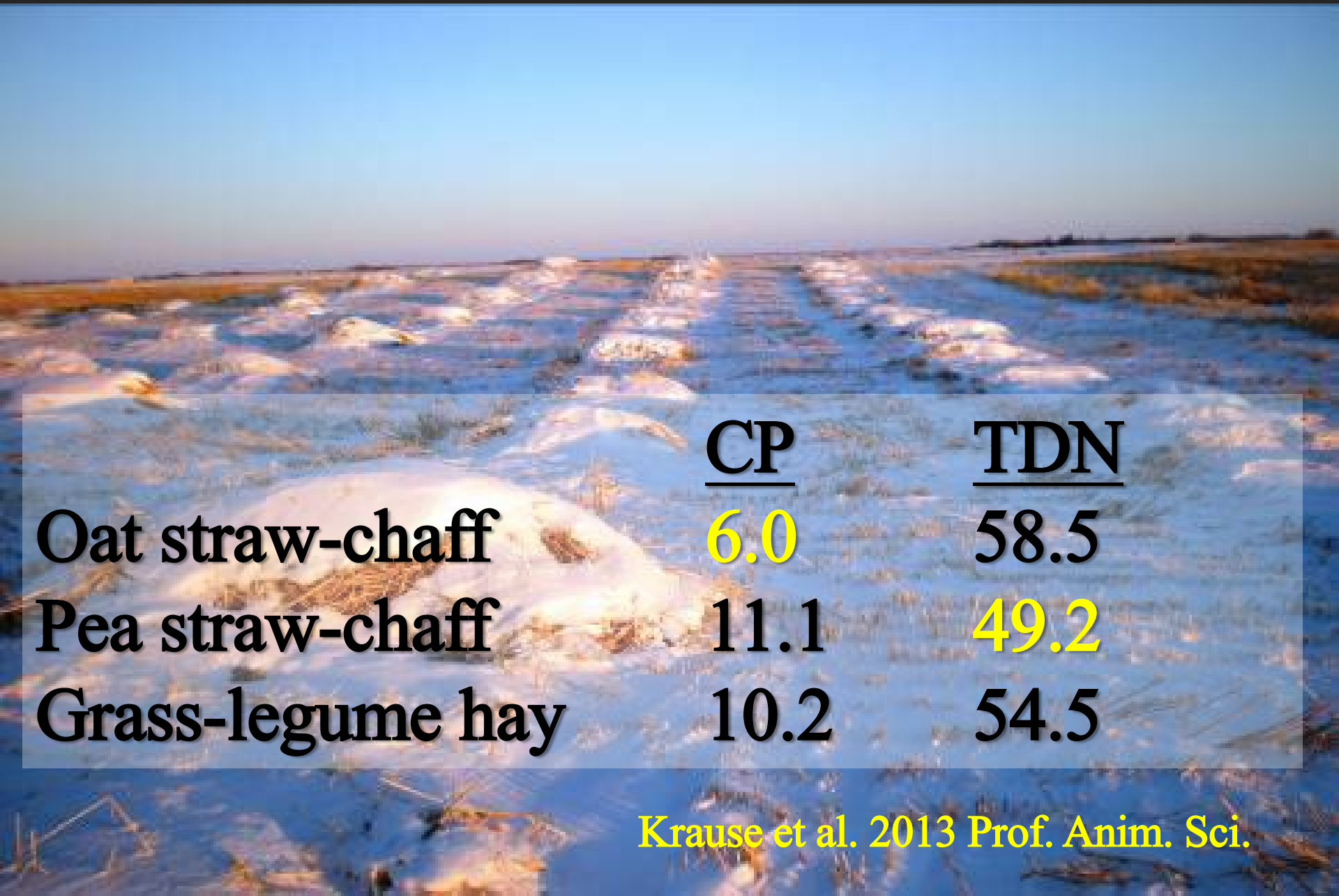


Performance 40-10 pea

Baler oat

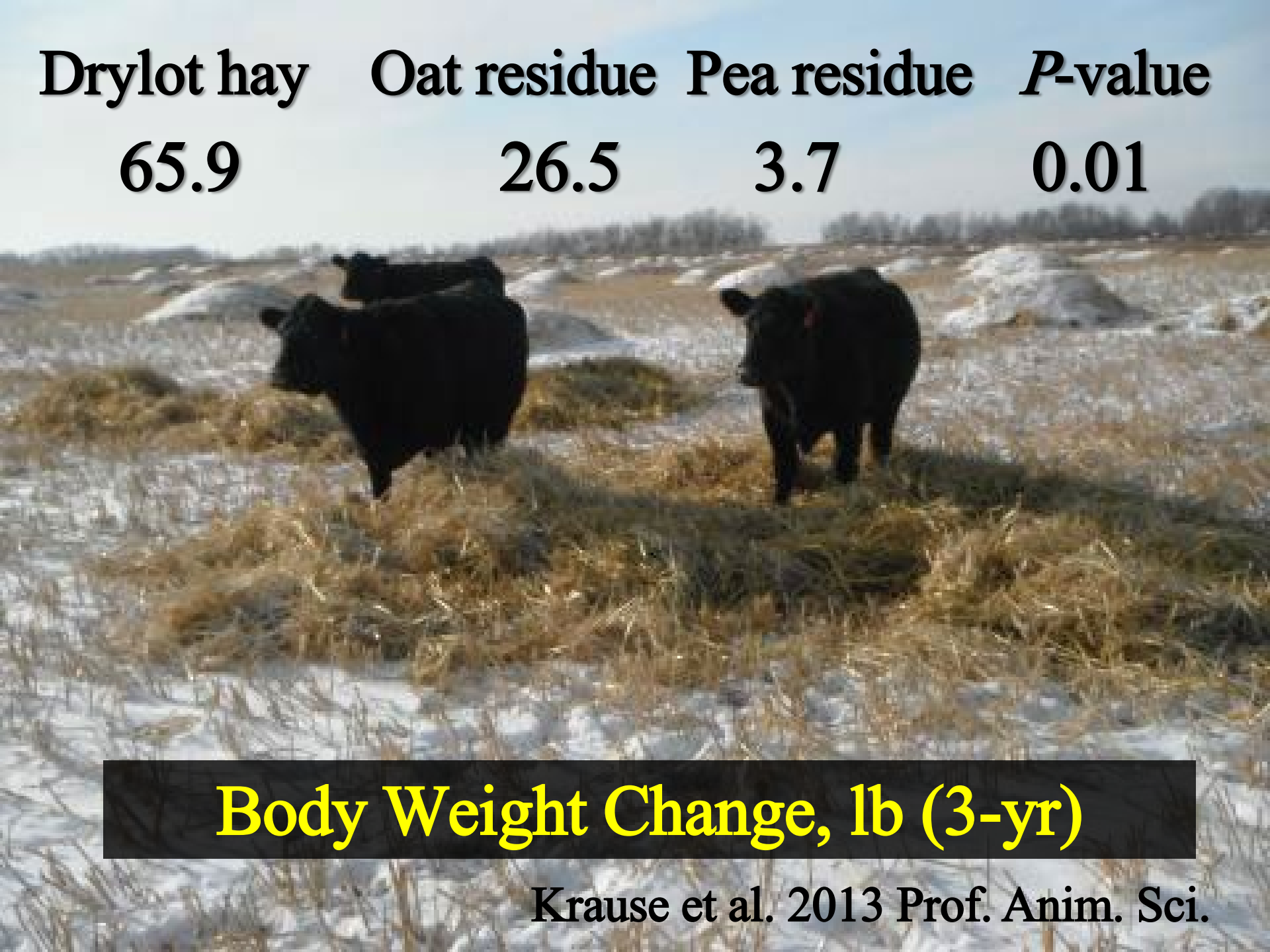
Krause et al. 2013. Prof. Anim. Sci.

Nutritive Value Straw-Chaff



	CP	TDN
Oat straw-chaff	6.0	58.5
Pea straw-chaff	11.1	49.2
Grass-legume hay	10.2	54.5

Krause et al. 2013 Prof. Anim. Sci.



Krause et al. 2013 Prof. Anim. Sci.

Table 6. Economic analysis of winter feeding systems over 3 yr ($/cow per day)

Grazing Oat or Pea residues was 42 and 34% lower cost than Drylot, respectively

Yardage cost	0.34	0.30	0.32	0.016	0.23
Total cost	2.13[a]	1.36[b]	1.53[b]	0.110	<0.01

[1]DL = drylot pen feeding with brome-alfalfa hay; OAT = grazing oat residue in field paddocks; PEA = grazing pea residue in field paddocks.

[ab]Means ($n = 9$) within a row with different superscripts differ ($P < 0.05$).

Krause et al. 2013 Prof. Anim. Sci.

GRAZING RESIDUE SUPPLEMENT STRATEGY

70 dry pregnant cows

Measure bodyweight, body condition and rib fat

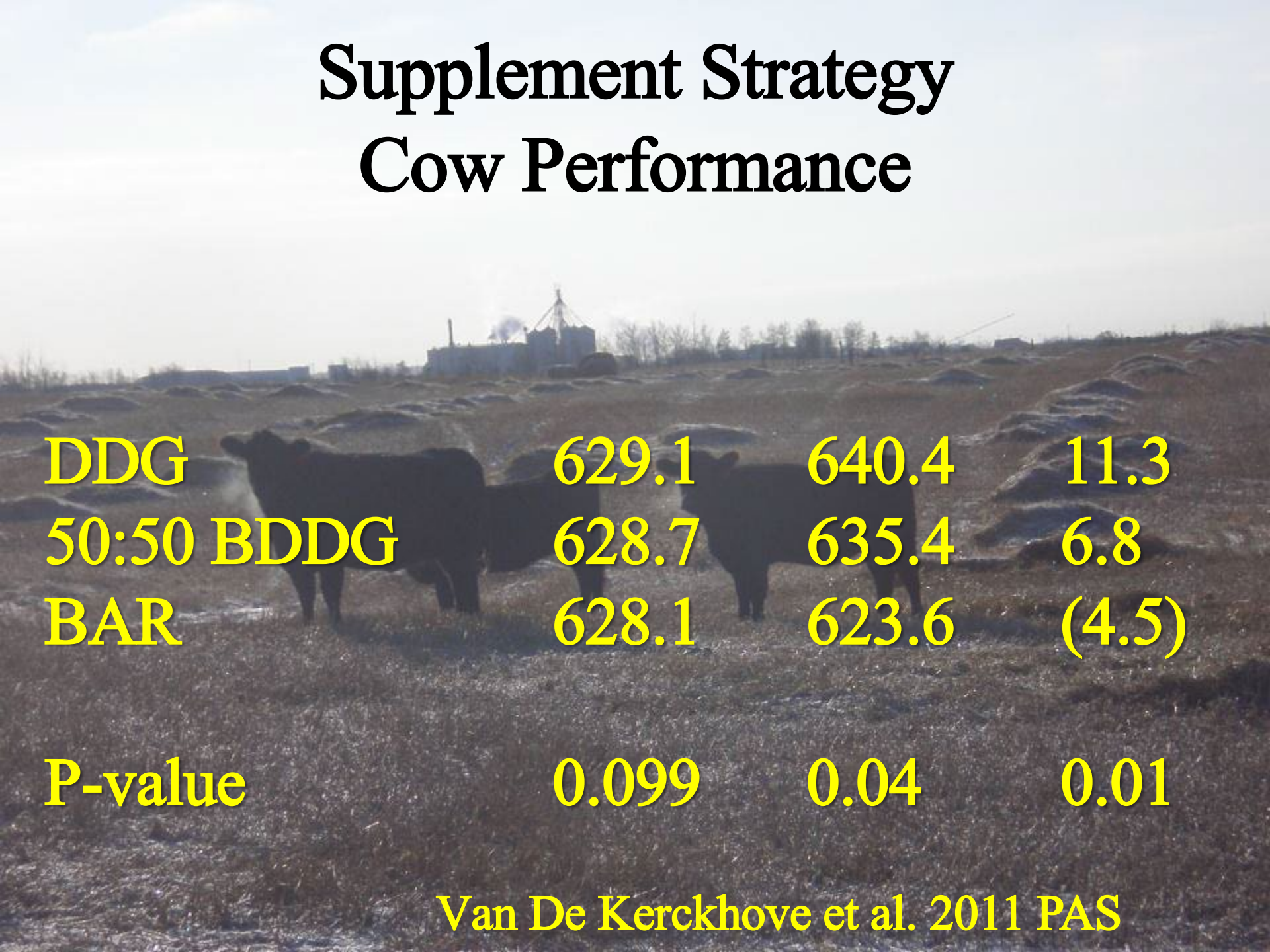
- Supplement strategies
  1. 100% barley grain
  2. 100% wheat-corn blend DDGS
  3. 50% DDGS:50% barley grain
  - Supplements fed at 0.7% BW

Straw-chaff quality (DM)

	Start	End
TDN, %	35.6	32.8
CP, %	7.0	6.2

Van De Kerckhove et al. 2011 PAS

Supplement Strategy
Cow Performance



DDG	629.1	640.4	11.3
50:50 BDDG	628.7	635.4	6.8
BAR	628.1	623.6	(4.5)
P-value	0.099	0.04	0.01

Van De Kerckhove et al. 2011 PAS

Grazing Corn Research At University of Saskatchewan

WHERE DOES CORN FIT IN GRAZING SYSTEM?

Nutritive value of whole plant corn can meet/exceed beef cow requirements

- Growing weaned calves??

Choose variety – stage of maturity at frost

Graze Whole Plant Management Considerations

Limit graze area – animals forced to consume both high - [cobs] and low-quality [stalk, husk, leaves] structures of the corn plant

Allow enough for 3 to 4 days [longer if managed for residue]

Animals prefer cobs and leaves first: leave stalk and stover last (3 day vs 9 day allotment)

Naïve cows

Good trace mineral program

Evaluating New Corn Hybrids For Grazing

5 corn varieties (6 acre/variety)

- 3 Pioneer (P7443R, P7535R, P7213R)
- 1 Hyland (HL SR06)
- 1 Monsanto (DKC 27-54)
- CHU ranged from 2050 to 2250
- Seeded June 1 2011
- Grazed November 19 - February 28 (101 d)

Dry matter yield and nutritive value

Item	1	2	3	4	5	Average
DMY, ton/acre	4.8	5.7	4.1	4.2	5.6	5.0
CP, %						
Whole plant	7.8	7.7	6.4	8.1	7.0	7.4
Leaves	7.4	13.1	12.0	13.6	13.0	11.8
Cob	12.3	10.9	11.4	12.9	11.2	11.7
TDN, %						
Whole plant	69.7	70.8	68.6	69.2	68.7	69.4
Leaves	49.7	60.6	60.5	59.7	55.1	57.1

Grazing Corn Varieties (2011-2012)

Item	Yield (t/ac)	Grazing (day)	Paddock Size (acre)	Cow Days/acre	$/Hd/Day
1	4.75	1894	6.2	305	$0.70
2	5.74	1755	6.8	258	$0.82
3	4.04	2070	6.5	318	$0.69
4	4.13	810	5.6	145	$1.40
5	5.64	1066	5.2	205	$1.02

Grazing results of corn varieties (2011-2012)

Item	Yield (t/ac)	Grazing (day)	Paddock Size (acre)	Cow Days/acre	$/Hd/Day
1	4.75				$0.70
2	5			258	$0.82
3			5	318	$0.69
4	4.13	810	5.6	145	$1.40
5	5.64	1068	5.2	205	$1.02

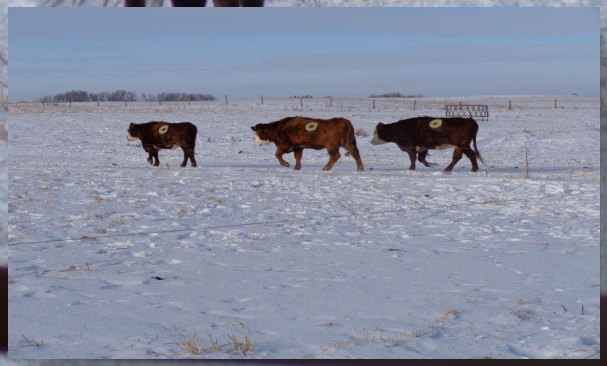
Grazing Costs
$/cow/day
$0.70 to $1.40

CONCERNS WHEN GRAZING CORN???

Excessive cob intake (effect on rumen pH)

- Digestive disturbances/grain overload/founder
- Adapt for 7 to 10 d before exposure to corn field
- Addition of extra roughage (hay/forage bales)
- Limit daily corn graze time

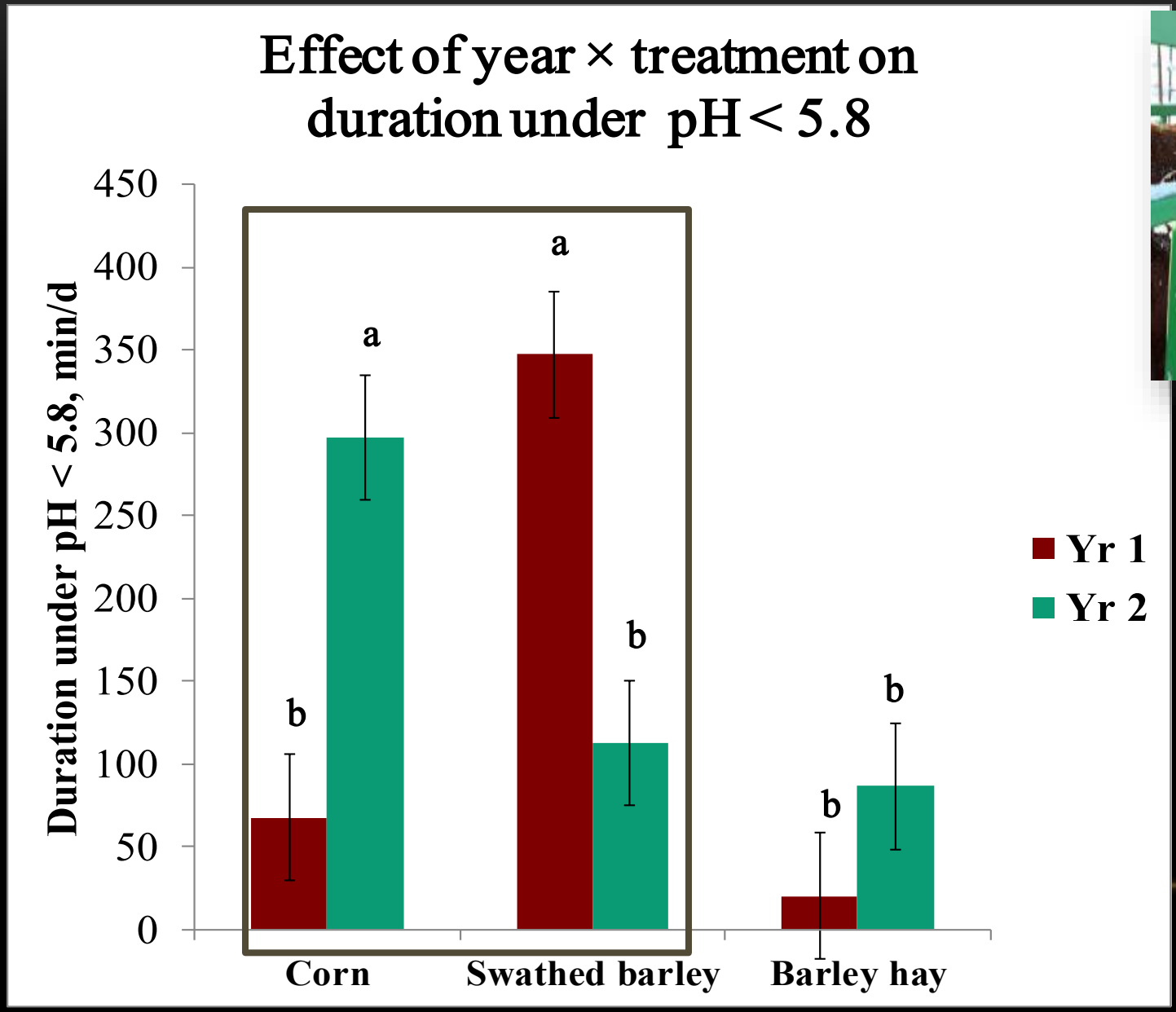
METABOLISM STUDY - 3×3 LATIN SQUARE



INDWELLING RUMEN PH METERS
JOSE ET AL. 2020 APP. ANIM. SCI.

Ruminal pH

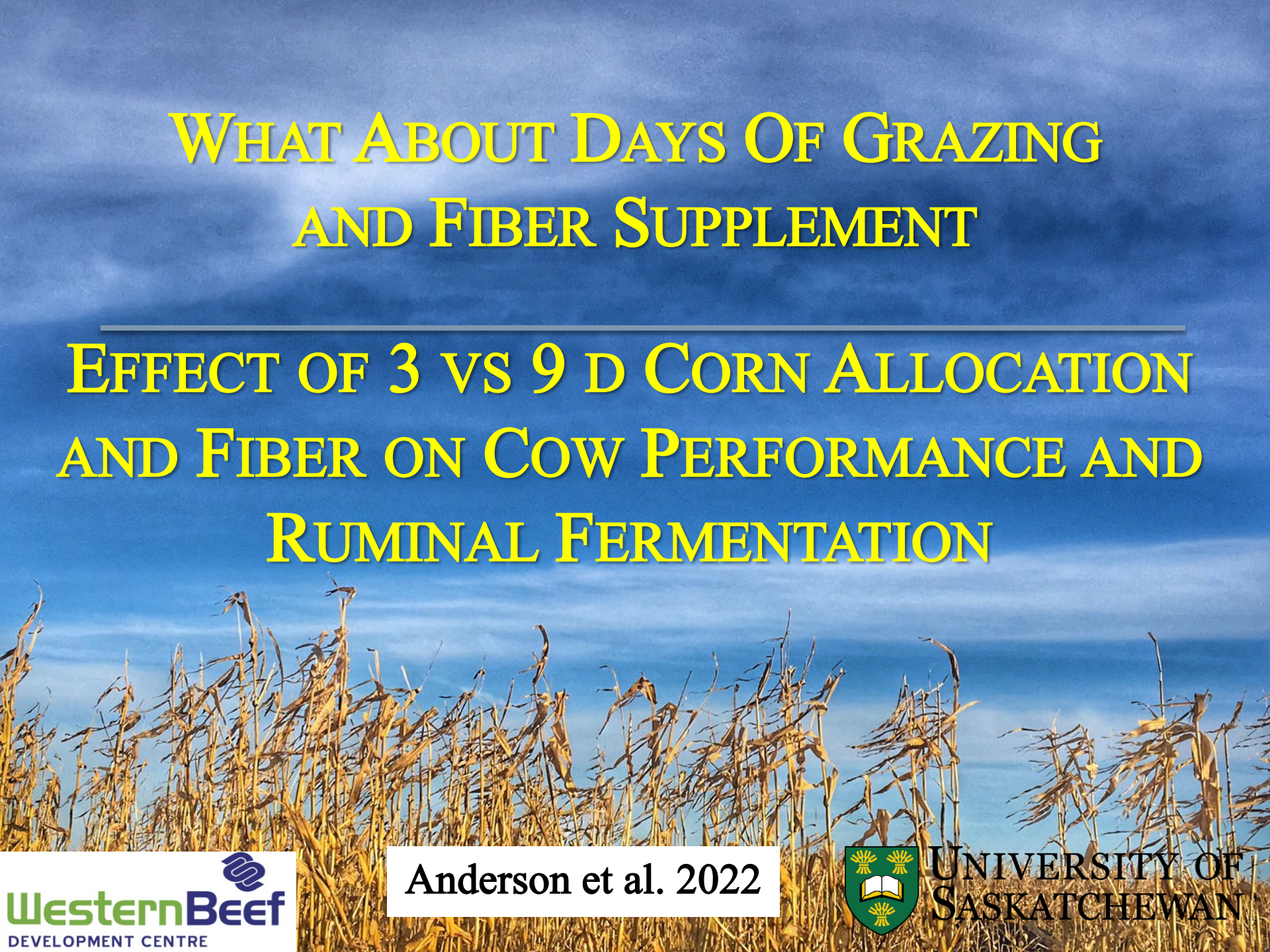
JOSE ET AL. 2020 APP ANIM SCI



$P < 0.001$

What About Days Of Grazing and Fiber Supplement

Effect of 3 vs 9 d Corn Allocation and Fiber on Cow Performance and Ruminal Fermentation



Anderson et al. 2022

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Does Providing Many vs Fewer Days Of Grazing Impact Rumen pH

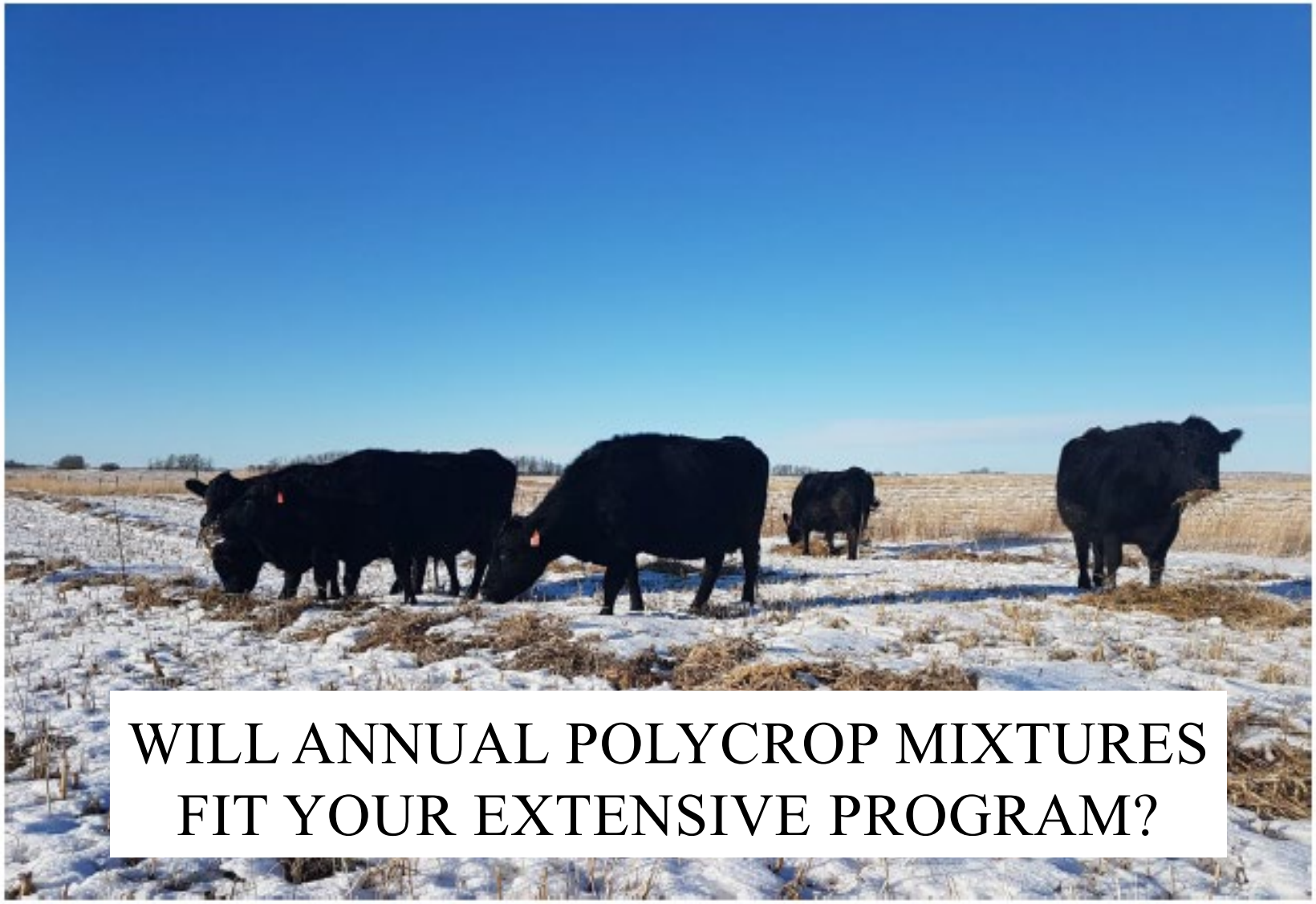
Does Providing Fiber Mitigate Rumen pH Levels

RUMINAL FERMENTATION

What effect does forage allocation and fiber have on ruminal fermentation?

Duration pH<5.8 (minutes)
start
mid
end
120.00
100.00
80.00
60.00
40.00
20.00
0.00
9DF
3DF
9DNF
3DNF

Winter Extensive Grazing Systems



Grazing Cover Crops

Soil Health, Graze Capacity and Cost

Growing Multiple Species Together
Suggested Increased Biodiversity
Increase biomass
Increase 'Soil Health'
Reduce Inputs

Annual legumes - hairy vetch (30%), crimson clover (10%)

Cool season - Italian ryegrass (25%)

Warm season - sorghum (15%), millet

Brassicas - Winfred turnip-kale (10%), Graza/Hunter turnip (10%)

Pulse - forage pea

Drieschner et al. 2020

Grazing Complex Mixtures At Clavet Saskatchewan




Forage Treatments

- Haymaker Forage Oat
- Four Spp Simple Mixture (oat, pea, brassica, vetch)
- Eight Spp Complex Mixture (oat, barley, pea, brassica, vetch, teff, Chicory, Millet)

Biomass/Quality
Cow Performance, Economics
Soil Characteristics, Enteric Emissions

Robinson et al. 2022

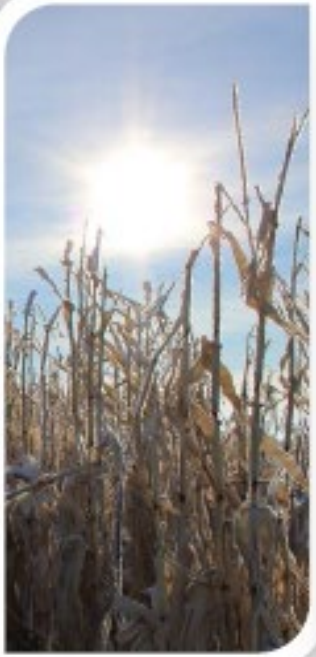
Grazing Complex Mixtures In Saskatchewan Summary

Growing Multiple Species Together – Lanigan Saskatchewan Suggests Increased Biodiversity…

- Increased biomass
- Increase 'Soil Health'
- Improved Soil Organic Carbon – Greater Root Biomass

Drieschner et al. 2019

% Lower Cost Than Drylot



SWATHGRAZE BARLEY	BALEGRAZE GRNFEED BARLEY	STRAW/CHAFF PILES	STANDING CORN	STOCKPILE GRASS WITH BARLEY SUPP
25%	8%	30%*	26%	15%

*The low quality of straff may require supplementation which can reduce the cost savings advantage.

Source: Kelln 2010, Krause et al. 2013, Jose 2015, Gamage 2014

CONSIDERATIONS

- Capture manure nutrients with extensive systems…
- Naïve cows - may take 1 or 2 winters to adapt
- Provide adequate wind protection and water source!
- RESIDUE GRAZING MAY NEED SUPPLEMENT
- Not all systems may work – have Plan B!

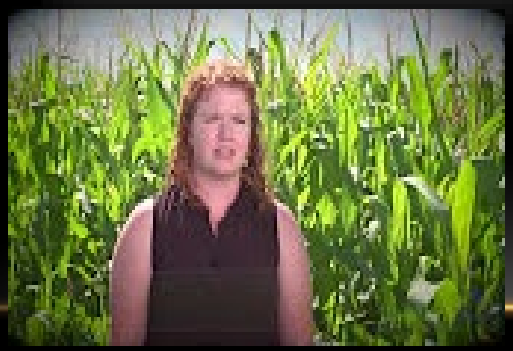
YouTube

HTTP://WESTERNBEEF.ORG

Harvest swath grazed annuals

VIDEOS

Winter grazing cows on standing corn



Refining corn graze recommendations

@DrBart_Beef

Managing Cattle Winter Extensive Grazing

Wind Protection

- Portable windbreaks
- Natural Shelterbelts (trees)

Electric fencing – control forage utilization and wastage

Winter watering systems

- Wet Wells
- Insulated Troughs
- Frost Free Nose Pumps