



# Effect of Digestible Fibre Content of Barley Silage on Feed Intake and Milk Production of Lactating Dairy Cows in Comparison with Corn Silage

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**Ministry of Agriculture Strategic Feed Research Chair Program:  
Feeds Research & Development**

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- ❖ Sask. Ministry of Agriculture Strategic Research Chair (Dr. Yu): **Feed Research & Development**
- ❖ ADF fund-2014-0281
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- ❖ Sask Forage Network (SNK)

# Research Background



Maximizing Dry Matter  
Intake (DMI)

+ Milk yield

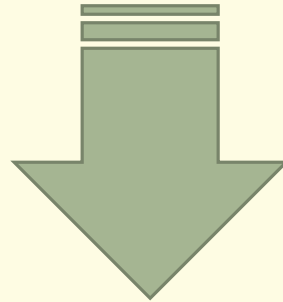
+ Energy demands

during early lactation

# Research Background Cont'd



## Forage Quality

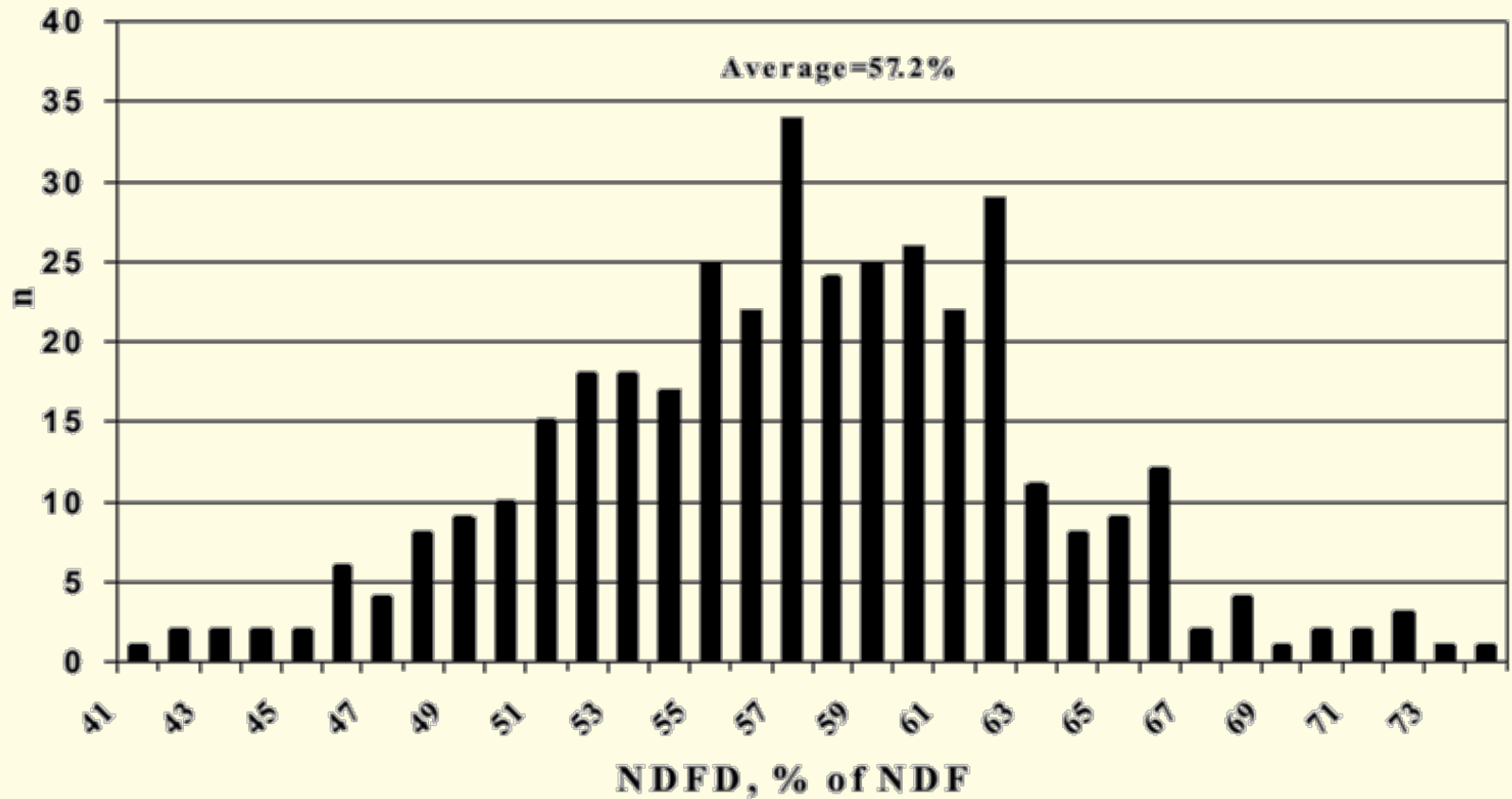


- Lower indigestible fiber content (Lignin)
- Greater rate and extent of digestion.

# Research Background Cont'd

Dry matter intake (DMI) can be predicted based on the dietary fibre content (NDF%) of forage, as there is a negative relationship between DMI and fibre content (NDF%)

# Research Background Cont'd



# Research Background Cont'd

## ➤ In vitro Evaluation of Fiber Digestibility (IVFD):

- Is the most popular method in use today to evaluate forage digestibility
  - Relative ranking by NDFD
  - Allocation of forages to cow groups
  - Adjust forage energy values

# Research Background Cont'd

- Effects of feeding forages with higher in vitro fiber digestibility on milk production have been extensively investigated for **corn silage**.
- Contrarily, impacts of in vitro fiber digestibility on animal performance had not been extensively studied for **barley silage**.



# Research Background Cont'd

Whole-crop barley silage (*Hordeum vulgare*)

% NDF	Conlon	CDC Copeland	CDC Cowboy	Falcon	Legacy	AC Metcalfe	Xena
30h NDFD	30.5bc	31.1b	37.0a	31.6b	27.6d	30.8b	28.8cd

Data from Dr McKinnon project

# Objectives

To compare barley silages with highest, intermediate and lowest digestible fiber (NDFD) with corn silage variety (P7213R; identified as best corn variety in Dr Yu previous feed corn research)

- Dairy production performance
- Feeding Behavior
- Total tract digestibility

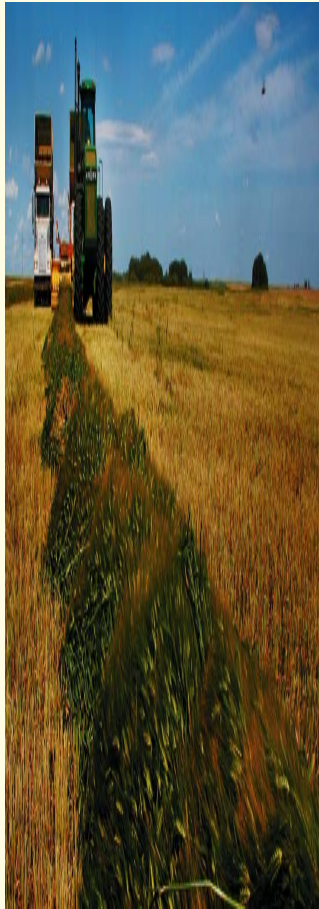
# Experimental design

- ▶ Four multiparous Holstein cows were used in a 4×4 Latin square design
  - ▶  $BW = 703 \pm 78$  kg
  - ▶  $DIM = 101 \pm 25$
- ▶ Cows were fed diets that contained
  - ▶ 49% barley-based concentrate + 51% forage (DM basis)

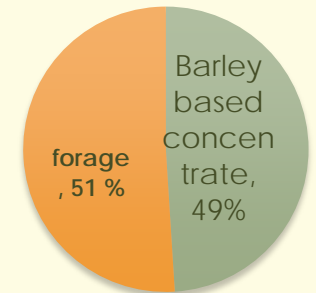


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# Experimental **treatments**



- Forage consisted of 10% alfalfa hay and 41% silage
  - The four whole plant silage treatments consisted of:
    - T1 = corn silage (P7213R),
    - T2 = CDC Cowboy barley silage,
    - T3 = CDC Copeland barley silage,
    - T4 = Xena barley silage.



# Experimental **measurements**

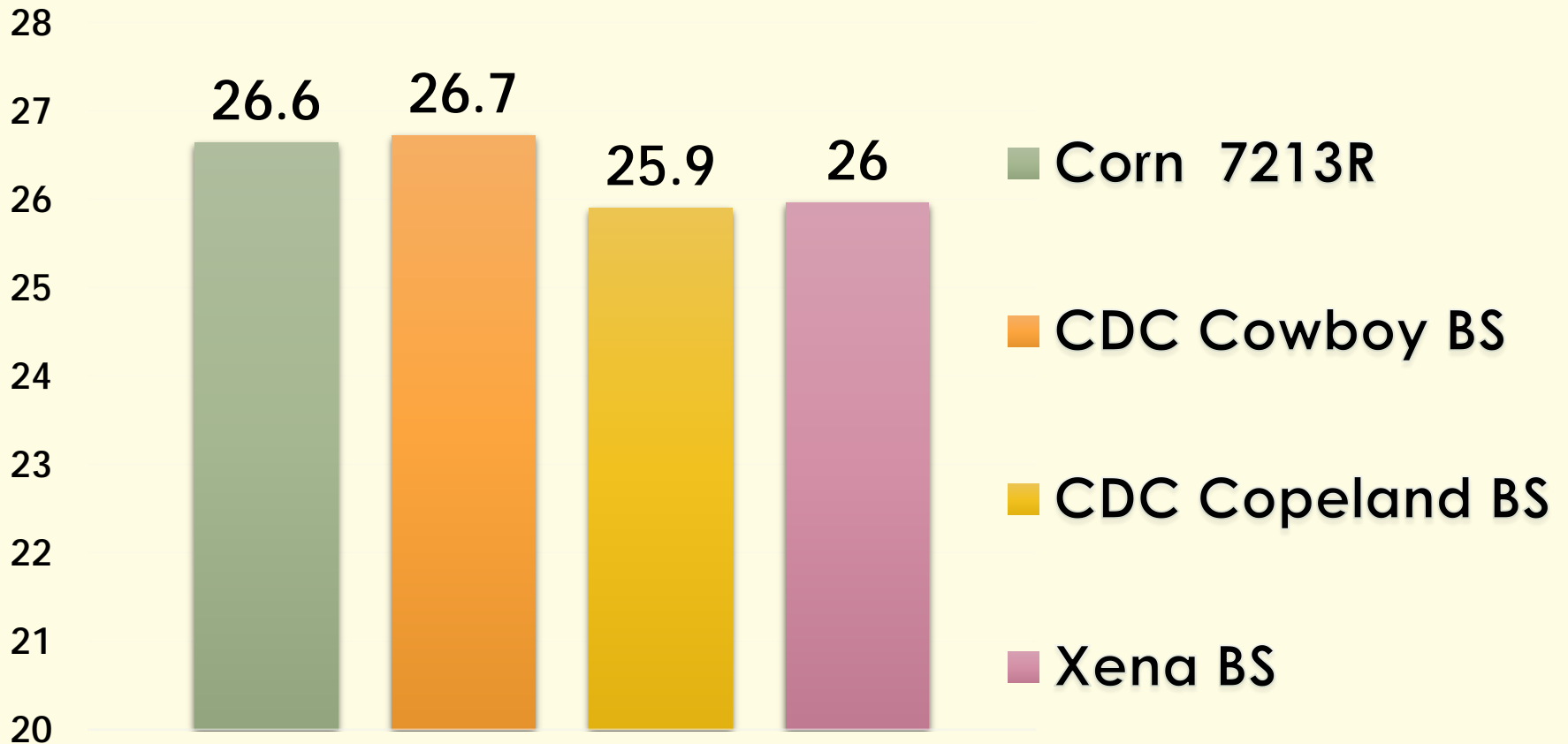
- Feed intake
- Body weight change
- Milk yield & composition
- Feeding behavior
- Total tract nutrient digestibility

# Results

# Final body weight & Body Weight gain

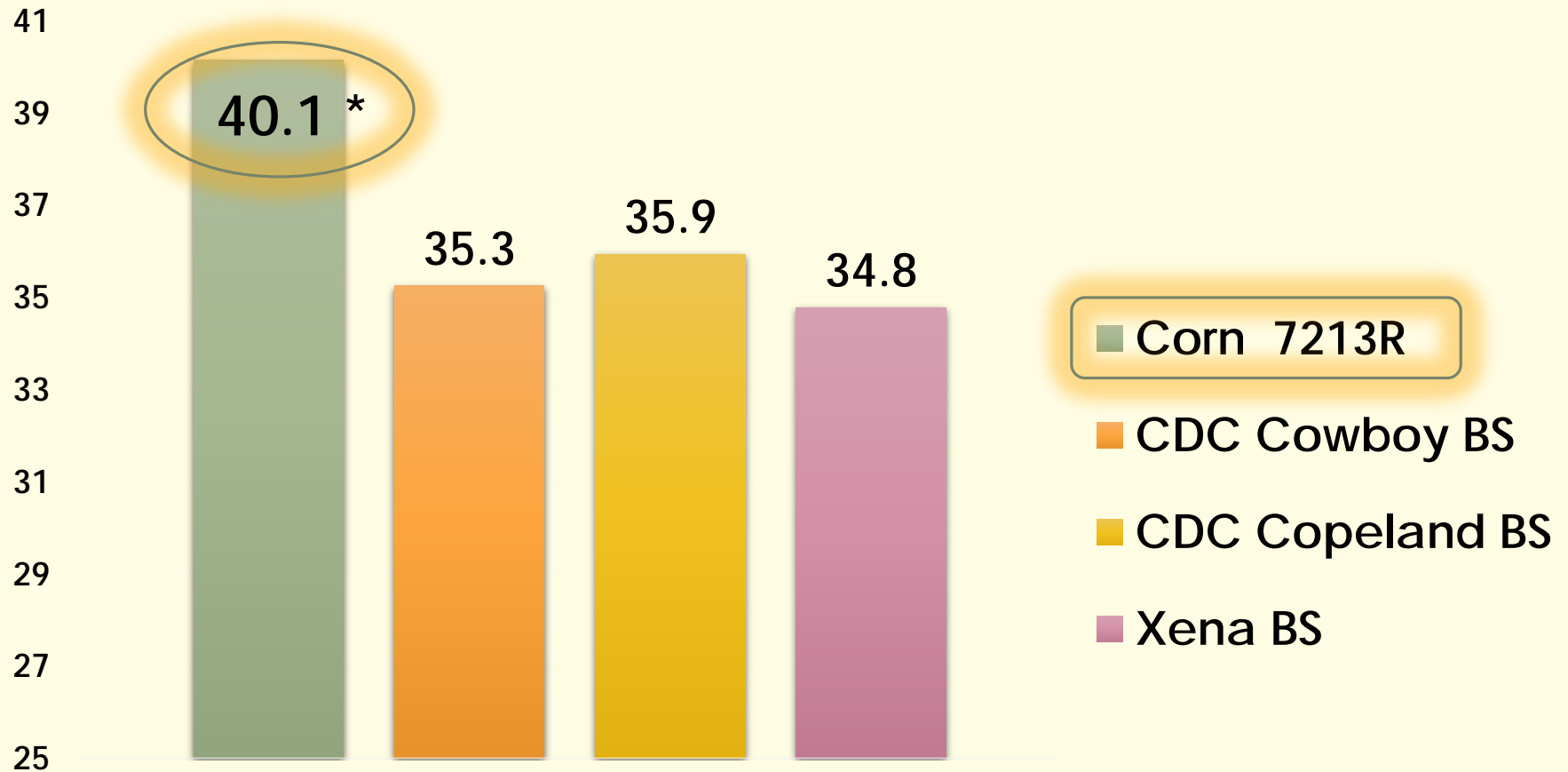
	<b>T1</b> Corn 7213R	<b>T2</b> CDC Cowboy	<b>T3</b> CDC Copeland	<b>T4</b> Xena	sig
Final Body weight (BW)	699	705	706	699	<b>NS</b>
WG (kg/cow/d)	+0.44	+0.29	+0.35	+0.08	<b>NS</b>

# Dry Matter Intake Kg/d



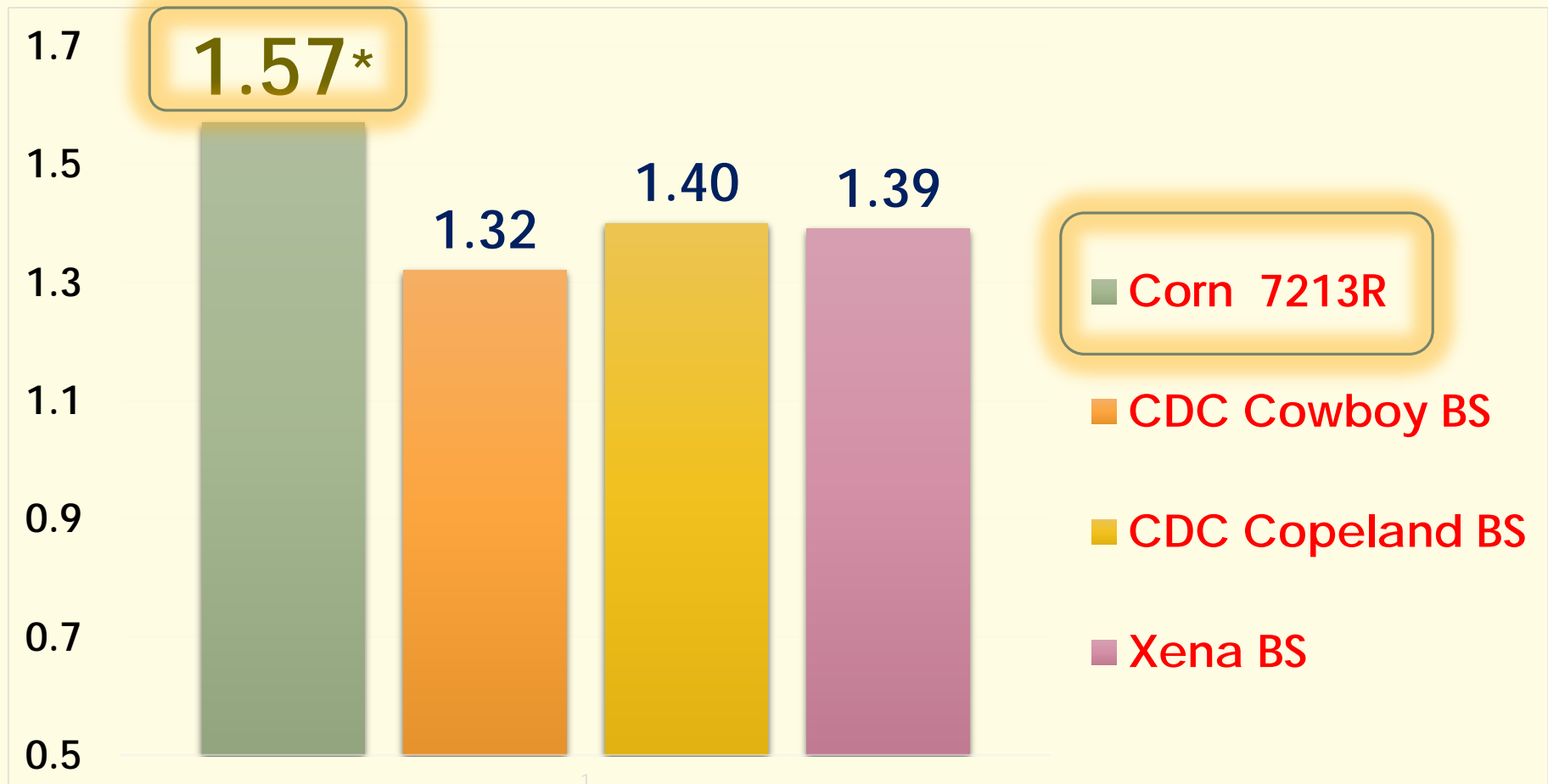


# Milk yield kg/cow/d



# Feed Efficiency

(Ratio of ECM yield to DM intake)



# Milk components (yield kg/cow/d)

Kg/d	Corn 7213R	CDC Cowboy	CDC Copeland	Xena	Sig
Protein	1.17*	1.02	1.06	1.02	0.06
Fat	1.51	1.33	1.35	1.36	0.35
Other solids	2.22*	1.85	2.00	1.90	0.02

# Total tract nutrients digestibility

- DM **digestibility** : NS
- CP **digestibility** : NS

%DM	Corn 7213R	CDC Cowboy	CDC Copeland	Xena	Sig
<b>NDF</b>	50.9 <b>b</b>	52.1 <b>b</b>	59.0 <b>a</b>	46.9 <b>c</b>	*

# Feeding Behavior

- No significant effect on Feeding Behavior
  - Eating time (min/d)
  - Ruminating time (min/d)
  - Total chewing activity (min/d)

# Implications

- ▶ Feeding barley silage with higher in vitro NDF digestibility **does not necessarily** correspond with greater in dairy cow performance and or feeding behavior
- ▶ New corn variety silage 7213R has potential to produce more **milk and greater feed efficiency** compared with barley silage

# Upcoming feed study

- Dairy Performance trials with feeding silage with much greater in vitro NDF/DM digestibility through adding feed additive to see whether it correspond with greater dairy cow performance

# Acknowledgment

➤ **Supervisor: Dr. Peiqiang Yu**

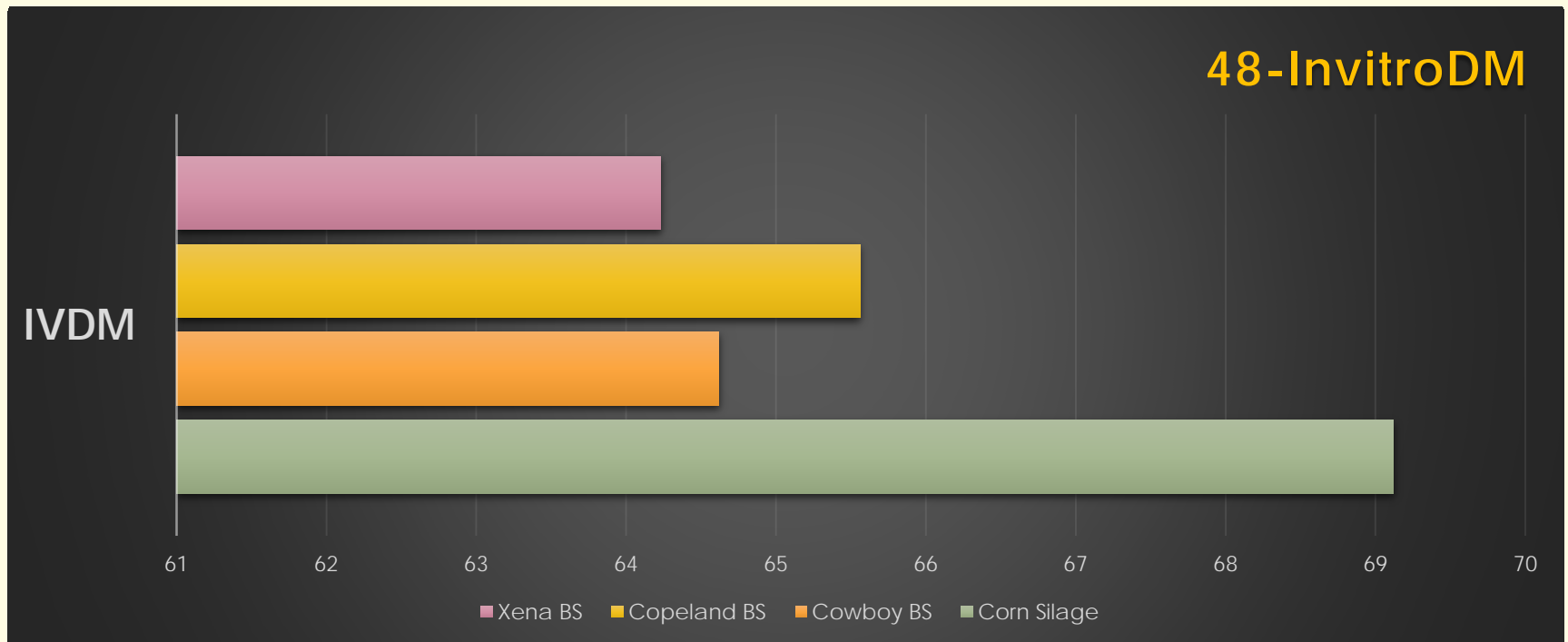
➤ **Committee Members:**

- **Dr. David Christensen**
- **Dr. John McKinnon**
- **Dr. Wenzhu Yang (AAFC Scientist)**
- **Dr. Biligetu**
- **Dr. Tim Mutsvangwa (chair)**





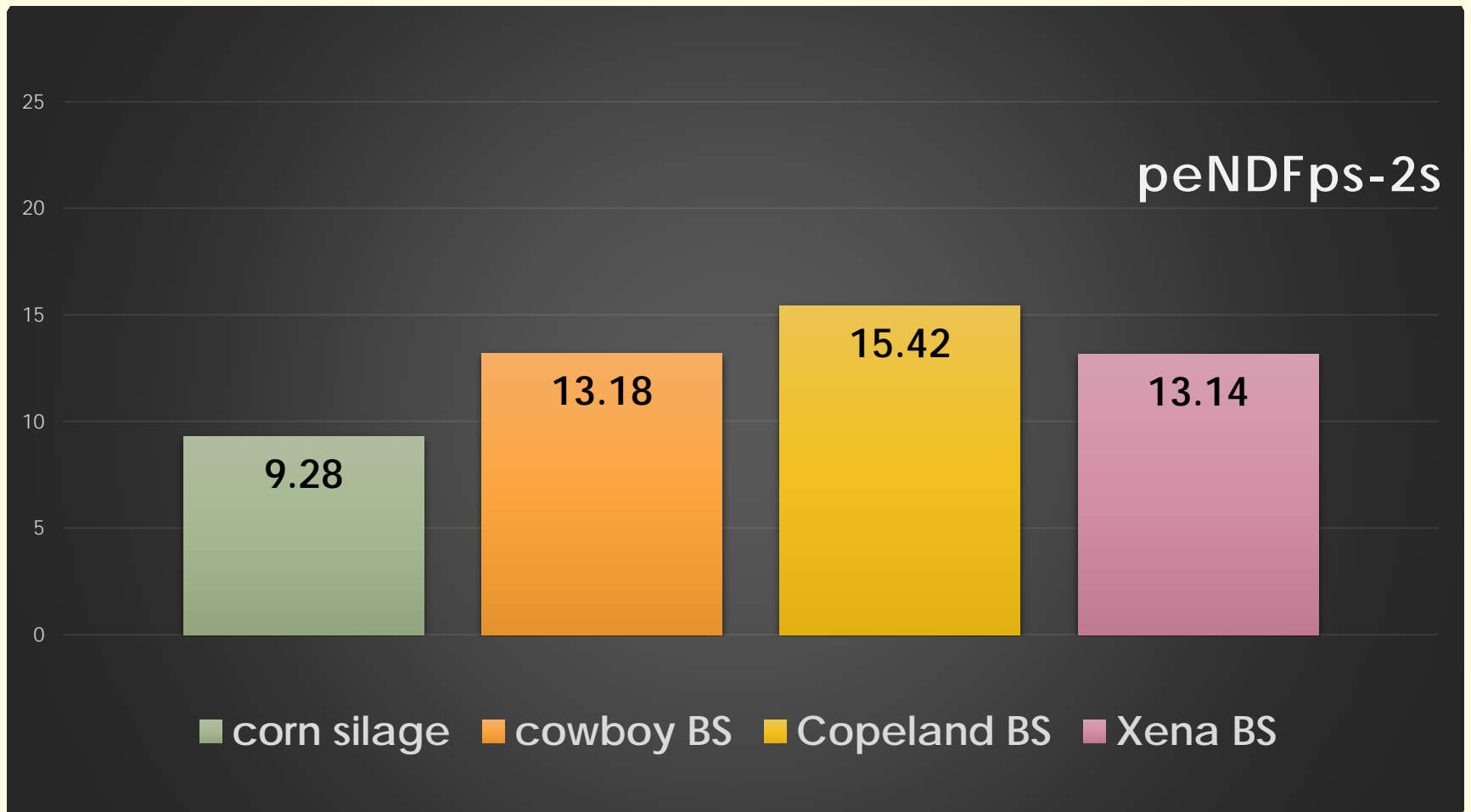
# Correlation between Milk yield and 48h-IVDMD of silage



$$Y(\text{Milk Yield}) = -35.9157 + \text{IVDM}_{48\text{h}} * 1.0996$$

(  $P = 0.0020$  )

# Physical effective fiber for TMR



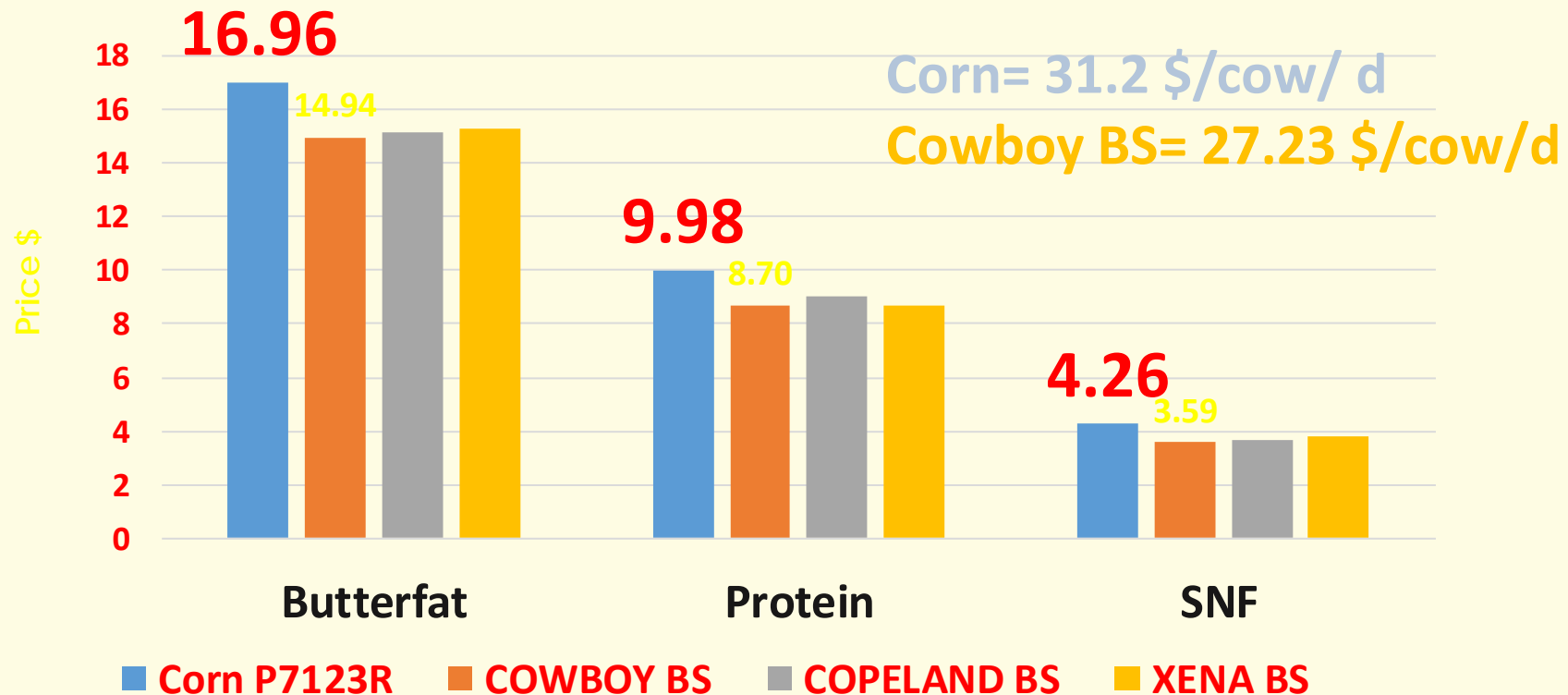
# Chemical Composition of Silage (g/kg DM)

	Corn 7213R	CDC Cowboy	CDC Copeland	Xena
Ingredient				
DM	320.5	308.6	301.6	308.4
Ash	52.5	74.3	62.9	67.9
Starch	283.7	86.9	151.8	140.4
CP	87.9	108.4	114.4	111.6
NDF	377.5	523.7	475.2	472.5
ADF	240.6	339.0	309.8	289.8

# Experimental design

- **Barley forage varieties** were seeded in mid of May 2104 and harvest in end of July 2014 when plant reached mid-dough stage
- **Corn forage (Pioneer 7213R)** was seeded in mid of May and harvested in end of September 2014 when plant reached to CHU 2100

# Weighted of milk Components + \$\$\$



# Milk Composition

	Corn 7213R	CDC Cowboy	CDC Copeland	Xena	Sig
Fat (%)	3.46	3.70	3.71	3.89	NS
Protein (%)	2.91	2.89	2.93	2.93	NS
Solids-not-fat %	8.31	8.26	8.35	8.35	NS
MUN (mmol/L)	12.69	12.83	13.03	12.95	NS