Alternative Forages for Dairy Heifers

Matt Akins, UW Madison Dairy Science, msakins@wisc.edu
and Elizabeth Remick, Huawei Su, Lingyan Li, Abbey Grisham, Wayne Coblentz

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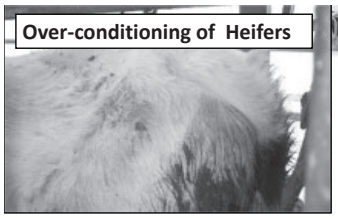
Extension UNIVERSITY OF WISCONSIN-MADISON

USDA

Over-conditioning of Heifers



Bodyweight, lbs	Energy Requirement, TDN, %	Corn Silage (72% TDN)	Alfalfa Silage (60% TDN)	Cutter Forage (48% TDN)
		--------- % of Dietary DM ----------		
300	68.0	50	50	Grain
600	66.0	50	50	0
900	63.3	43	43	15
1200	62.3	39	39	22

Pat Hoffman, UW Emeritus

Heifer Management Goals:

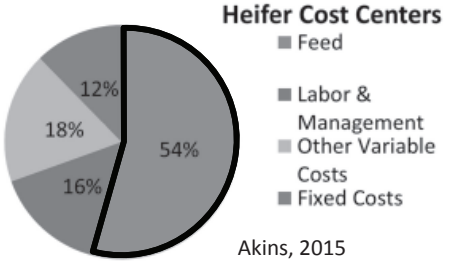
- **Optimal growth** for breeding by 13 months to calve between 22 and 24 months of age
- Minimize nutrient excretion
- **Control costs**

Options to control energy intake

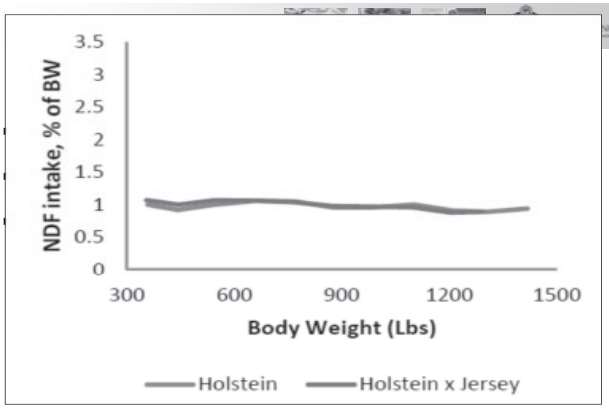
- Limit feeding – facilities/management
- Harvest later maturity grasses/legumes
- Use lower energy/high NDF forages:
  - Cereal grain forages
  - Warm season grasses
  - Straw/stover

Heifer rearing expenses can make up 20-25% of dairy farm expenses

$1800-2200 expenses birth to calving



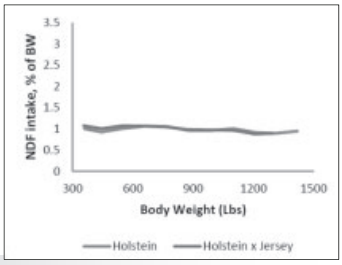
Akins, 2015
Wisconsin Heifer
Cost of Production Survey



Data from over 9000 daily pen intakes Hoffman, 2008

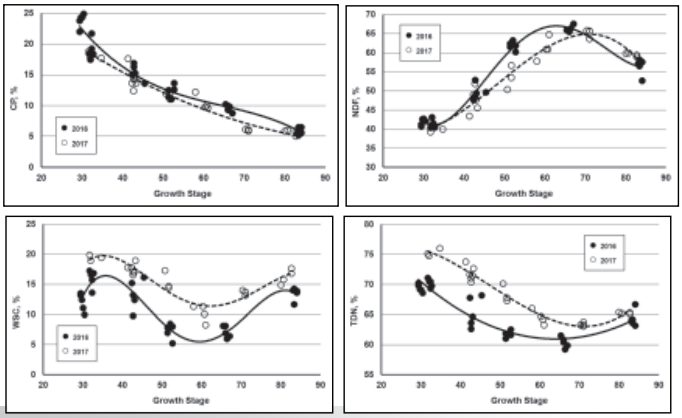
Use of Diet NDF to Control Intake

- 500 kg heifer will eat 5 kg NDF
  - 45% diet NDF
    - 11.1 kg DMI
  - 50% diet NDF
    - 10 kg DMI



Effects of Growth Stage on Nutritive Value of Triticale

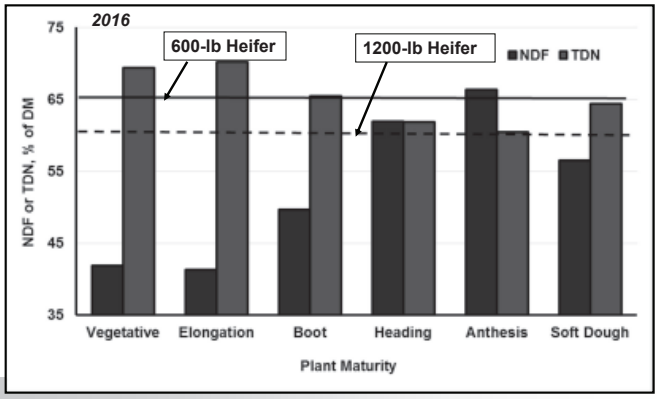
20-29 Tillering
30-39 Elongation
40-49 Boot
50-59 Heading
60-69 Flowering
70-79 Milk
80-89 Dough
90-99 Ripening



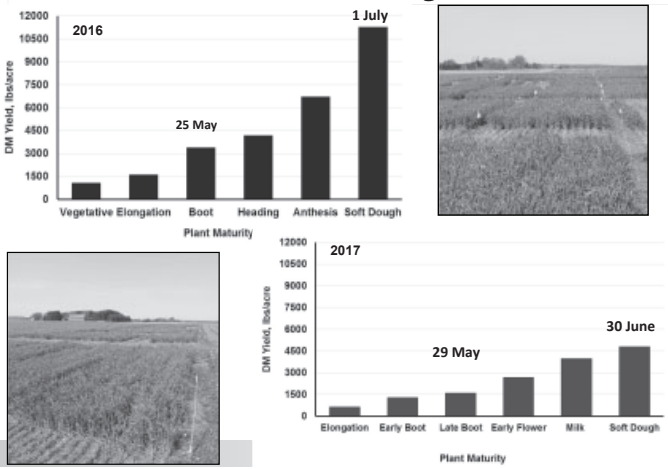
Cereal Grain Forage Use in Dairy Systems

- *Planted in fall, usually after corn silage or soybeans*
- *Harvested in the spring as silage*
- *contrast and consequences:*
  - *Boot-stage harvest*
    - *Dairy cow quality feed*
    - *Double-crop corn or soybeans*
  - *Soft-dough harvest*
    - *2 to 3 times better yield*
    - *Difficult to double-crop*
- *Recent increase in popularity related (in part) to facilitation of manure distribution, and for providing winter ground cover*

Effects of Growth Stage on Harvest Management Decisions



Triticale Forage



Warm season grasses and Roughages

Yield responses for eastern gamagrass grown at MARS South (2007-2009).

Harvest Date	DM Yield 2007	2008	2009
	kg DM /hectare		
1 June	982	598	183
15 June	2236	1767	675
1 July	3358	3906	2641
15 July	4841	5276	4524
1 Aug	5646	6283	4433
15 Aug	5683	7715	5969

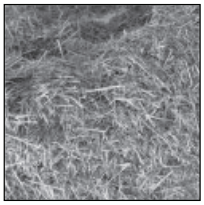
Composition of Diets

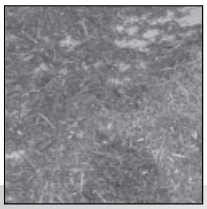
Item	Diet: Control	EGG	Wheat Straw	Corn Fodder
Ingredient, % DM				
Corn Silage	55.8	26.7	25.2	32.6
Alfalfa Haylage	44.2	47.2	53.5	52.5
EGG	0	26.2	0	0
Wheat Straw	0	0	21.3	0
Corn Fodder	0	0	0	14.9
Nutrients, % DM				
NDF	43.3	50.9	53.3	50.4
CP	13.9	13.7	13.6	13.8
TDN	66.8	58.9	59.7	59.1

Nutritive value for eastern gamagrass grown at MARS South (2007-2009).

Harvest Date	NDF	CP	K
	% of DM		
1 June	66.7	22.2	1.7
15 June	67.2	17.9	1.9
1 July	72.8	12.5	1.7
15 July	74.7	10.2	1.5
1 Aug	76.6	9.0	1.3
15 Aug	77.3	7.9	1.1

Diets





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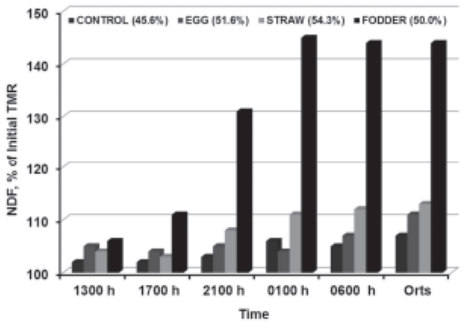
Assessment of Various Alternative Forages

- 118-day feeding trial
- 128 Holstein heifers
- 4 diets, 16 pens
- Over-stocking at the feedbunk (133%), but not in the freestalls

Coblentz et al. (2015)

Sorting Behaviors



Coblentz et al. (2015)

Greater than 100% indicates discrimination

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Intake and Performance

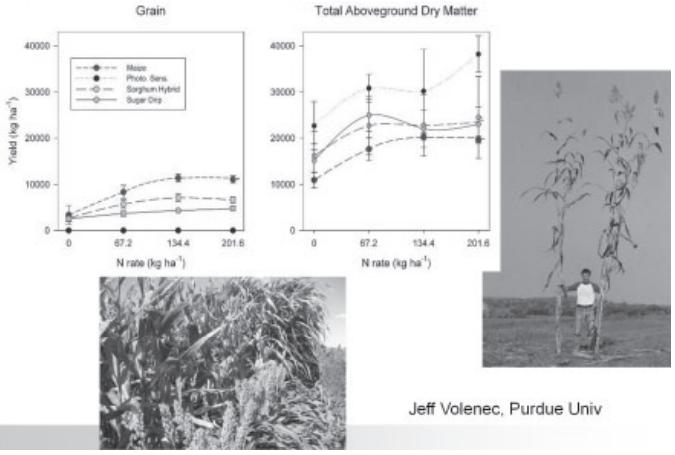
Item	Control	EGG	Wheat Straw	Corn Fodder
	---------- Diet ----------			
Intake, lbs/d				
DM	**24.4**	**23.3**	**20.9**	**22.1**
NDF	**10.6**	**11.8**	**11.1**	**11.2**
NDF, % BW	**0.89**	**1.02**	**0.97**	**0.96**
TDN	**16.3**	**13.7**	**12.5**	**13.2**
Performance				
Gain, lbs	**309**	**258**	**209**	**256**
ADG, lbs/d	**2.56**	**2.16**	**1.74**	**2.14**
Feed:Gain, lbs/lbs	**9.6**	**10.8**	**12.1**	**10.5**

Coblentz et al. (2015)

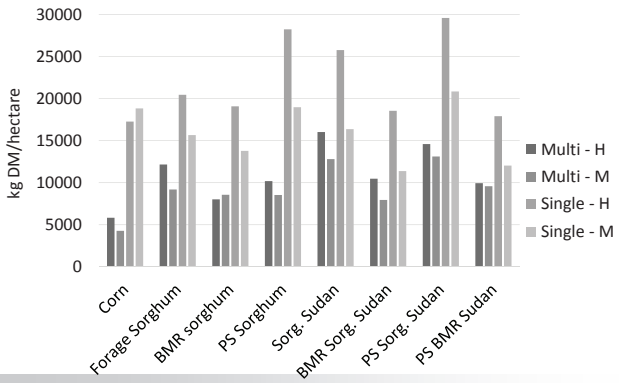
Sorghum Research in WI

- Plots at Marshfield (poorly drained soil) and Hancock (irrigated sandy soil) Research Stations:
  - Single vs Multiple harvest management
    - Forage sorghum, Sorghum-sudangrass, Sudangrass
      - Conventional, BMR, Photoperiod-sensitive
    - 130 kg N/hectare
    - 15" row spacing
    - 88,000 seeds/hectare – forage sorghum
    - 18 kg/hectare – sorghum-sudangrass
    - 13 kg/hectare - sudangrass

Forage Sorghum



Sorghum Growth in Central WI (2015-2016)



Sorghum Types

- Forage sorghum
- Sorghum sudangrass
- Sudangrass

Possible traits:

Brown mid-rib

Dry stalk

Male sterile

Photoperiod sensitive

Dwarf

NDF (%DM) values of sorghums and whole plant corn

	2015		2016	
Forage	Multiple	Single	Multiple	Single
Whole plant corn	65.5	50.4	62.3	43.4
PS forage sorghum	64.3	60.8*	60.9	62.2*
PS sorghum-sudan	65.6	60.4*	63.0	62.9*
Forage sorghum	64.3	54.7	62.7	58.6*
Sorghum-sudan	65.0	54.0	63.5	59.0*
BMR forage sorghum	62.9	51.2	58.5	52.9*
BMR sorghum-sudan	63.5	59.1*	62.0	55.5*
PS BMR sudangrass	62.4	55.9*	59.4	59.0*

TDN (%DM) values of sorghums and whole plant corn

	2015		2016	
Forage	Multiple	Single	Multiple	Single
Whole plant corn	**65.9**	**65.8**	**65.6**	**67.4**
PS forage sorghum	**63.8**	**59.8**	**63.8**	**58.3**
PS sorghum-sudan	**62.4**	**56.0**	**62.2**	**54.7**
Forage sorghum	**65.6**	**60.8**	**63.2**	**59.3**
Sorghum-sudan	**63.4**	**57.3**	**61.6**	**55.5**
BMR forage sorghum	**67.3**	**62.5**	**67.2**	**65.0**
BMR sorghum-sudan	**66.2**	**62.7**	**66.2**	**63.1**
PS BMR sudangrass	**66.3**	**62.8**	**66.0**	**61.6**

Intakes and growth for bred/pregnant heifers fed diets with or without sorghum-sudangrass silage

				Contrast (P =)	
	Control	Conv-SS	Photo-SS	1	2
DMI, kg/d	10.9	9.3	9.0	<0.01	0.26
NDF, kg/d	5.2	5.2	5.0	0.20	0.22
NDF, % of BW	1.04	1.04	1.01	0.58	0.13
TDN, kg/d	6.7	5.7	5.4	<0.01	0.05
Daily gain, kg/d	1.11	0.89	0.94	0.02	0.45

Contrast 1 = Comparison of Control vs. mean of Conv-SS and Photo-SS
Contrast 2 = Comparison of Conv-SS and Photo-SS

Use of sorghum forages in heifer diets

- 72 Holstein heifers (16-18 months of age)
  - 450 kg average initial weight
  - Blocked by weight (low, medium, high) with 3 pens/block
  - 3 treatments
    - Control diet – diluted with low quality grass hay
    - Conventional Sorghum-sudangrass silage based diet
    - Photosensitive Sorghum-sudangrass silage based diet

Use of alfalfa stemlage in bred heifer diets

Su et. al, 2017

- **11% CP**
- **65% NDF**
- **42% TDN**

Use of sorghum forages in heifer diets

Ingredients, % of DM	**Control**	**Conv-SS**	**Photo-SS**
Chopped grass hay	26	-	-
Sorghum-sudangrass silage	-	48	48
Alfalfa silage	56	45	45
Corn silage	18	5	5
NDF, % DM	47.9	55.4	55.2
CP, % DM	14.3	12.8	13.1
TDN, % DM	61.1	61.1	59.3

Item	Diet		
	CON	STM	STW
Corn silage	55.6	34.7	29.9
Alfalfa haylage	44.4	33.2	38.8
Alfalfa stemlage	-	32.1	-
Straw	-	-	31.3
Nutrients			
CP, %	13.1	12.6	12.6
NDF, %	39.7	46.4	43.7
ADF, %	27.8	34.8	29.9
TDN, %	67.4	60.1	62.7

Item	Diet			SEM	Contrast	
	CON	STM	STW		1	2
Intakes, kg/d						
DM	11.3	10.3	10.4	0.16	0.01	0.61
NDF	4.4	4.7	4.4	0.08	0.20	0.11
TDN	7.7	6.3	6.7	0.09	<0.01	0.03
Growth over 56-d trial						
BW gain, kg	74	54	58	4.1	0.02	0.49
ADG, kg/d	1.32	0.96	1.04	0.074	0.02	0.49
Heart girth change, cm	10.1	7.1	6.8	1.07	0.07	0.86
BCS change	0.19	0.01	-0.01	0.07	0.09	0.95
Feed:gain, kg/kg	8.6	11.0	10.3	0.72	0.08	0.54

Mooving Forward.

DAIRY SCIENCE AT WISCONSIN

Thank You!

Questions?

Conclusions

- Use of NDF to control ad-libitum intakes has worked
  - ~45- 50% NDF; 60% TDN (2.35 Mcal ME/kg) working for freestall housed heifers
    - Energy needs will vary depending on housing/weather

Conclusions

- Variety of forages/roughages can be used successfully in heifer diets
  - Depends on:
  - Soils and climate
  - Crop rotation
  - Storage capability