Troubleshooting Milk Quality Problems in the Parlor

Jamie Cantrell

What is PI?

- PI = Preliminary Incubation
- PI is a bacteria that prefers temperatures between 50-60 degrees Fahrenheit
- The bacteria lives through pasteurization and limits the shelf life of milk, before the expiration date

How to test for PI

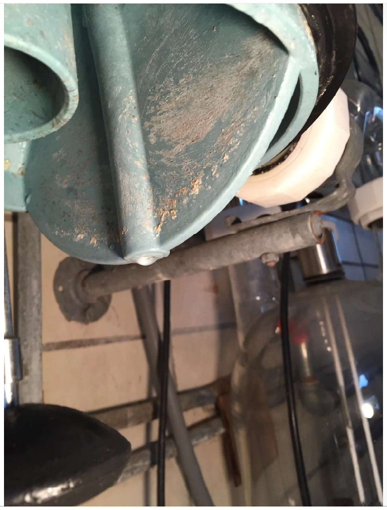
- Certified lab incubates the sample for 18 hours at 56 degrees Fahrenheit
  - Once complete, a Standard Plate Count (SPC) test will be conducted
  - Personally, I prefer to run a SPC before the PI is run to compare and eliminate other problems
  - A high PI count is not high unless it is double the SPC

Producer fast find result

SCC(X 1000)	SPC(X 1000)	PI COUNT(X 1000)
1300	0	58
1400	100	99
1400	140	130
1300	150	140
1400 S	0	0
1400	120	120
1400	0	0
1000	0	0
1200	190	170
1200	0	0
1200	0	0
970	31	28
1100 C	0	0
1249		

Where does PI come from?

- First, PI is not the result of the cow
- PI's are the results of:
  - Poor sanitation
  - Poor cooling
  - Poor cow prep
  - Milking wet cows
- *Interesting factor:*
  - The PI spores are air born, they can float around in the milking system , if you smell soured milk, you are smelling PI's



PI and LP Basic 101

- Items needed to clean a milking system
  - Water
  - Detergent or chemicals
  - Physical contact
  - Temperature of the wash water

} It takes all four together to work correctly!

- Air temperature is also a factor
  - Dirty equipment > 50-60 degree temperature = the bacteria growth rate will double every 20 minutes
    - In one hour a 10,000 doubles 3 times, and becomes 80,000.
    - In the second hour it becomes 640,000
    - In the third hour it becomes 5,120,000
  - A milk tank that is not cooling correctly will have the same effect

Where to look for PI and LP problems

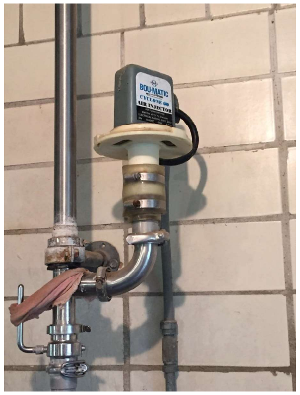
- Fresh cow pails
- Traps
- Vacuum reserve tank
- Udder prep
- Milking wet cows
- Washcloths
  - Not washed and dried properly
  - It requires 120 degrees for at least 12 minutes to kill the bacteria
  - Washing does not kill the germs, it requires heat from drying

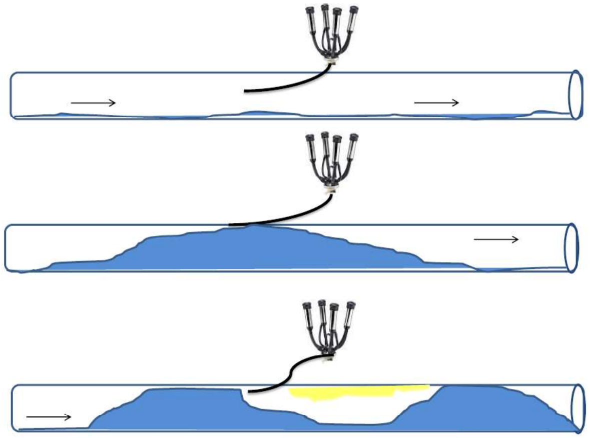
Milk tanks – poor cooling

- Tanks are designed to cool the milk in four milking's
- Tanks that are filled in two milking's are working double the capacity
  - The tank cools slower than it should
  - Recommend to add pre-cooling
- Tanks that don't automatically agitate every 20 minutes, will tend to have problems
  - The probe or temp sensor is at the bottom of the tank
    - Cool goes down ⇩ and heat goes up ⇧
    - The probe reads that the milk is cool enough and doesn't start the compressor and the milk at the top can be 60 degrees

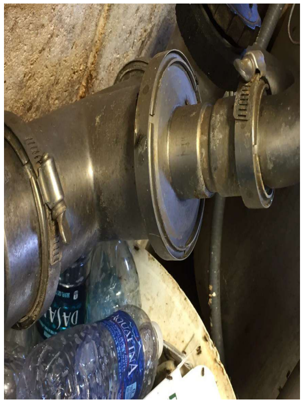
Ice in a tank insulates the next milking from cooling

Milk lines

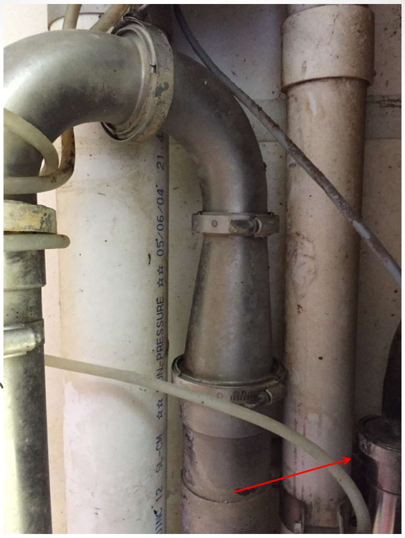




Dead ends



Objects in wash line



Diverters

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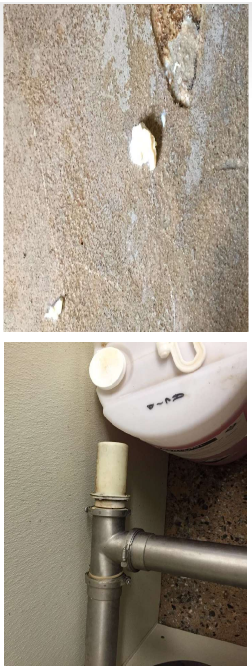
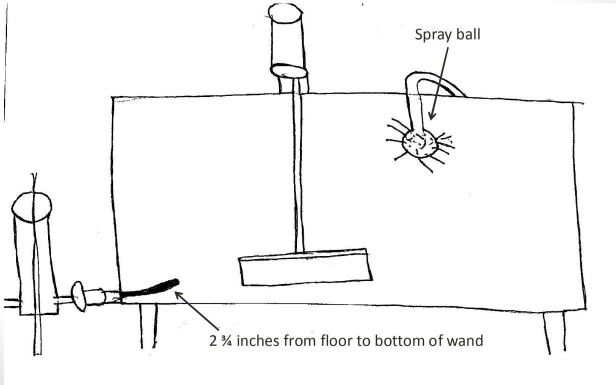


Dead ends

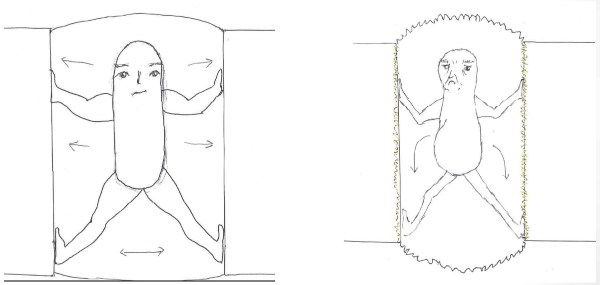
Objects in wash line

Tank washer and spray balls

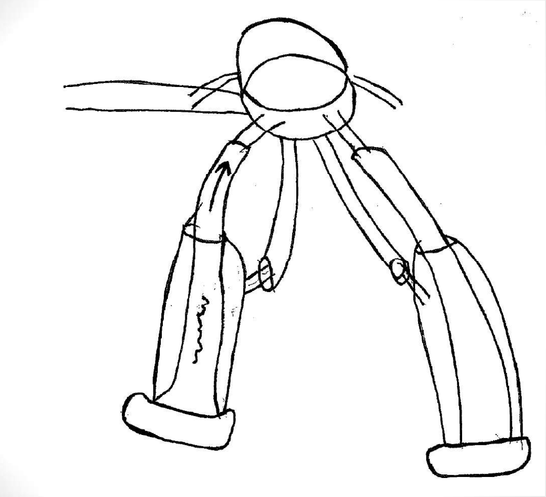


Pulsator line and cracked inflations

Old rubber parts…rubber has memory



Foreign air supply



- If hauler takes a sample from the valve, it will result in a high count
- Received one good count and then received a bad count
  - Possible build up and the hot water is sterilizing
  - Bad count results when a build up chunk breaks off in the milk
- Producer with two tanks
  - One tank is high and the other is not
    - *Usually is an issue with that tank*
  - If both tanks are high
    - *Issue with the pipeline*

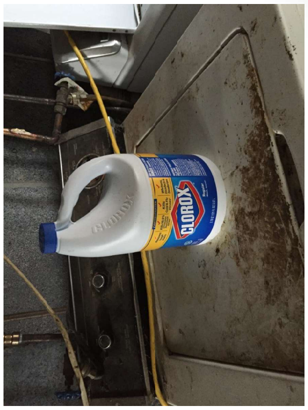
- What is the heaviest organ in your body?
  - This can be a water temperature problem.
    - If the swing line is dirty, it is a water temperature problem
    - Water temperature is the hottest as it leaves the vat and is the coolest when it returns
    - The fat will redeposit as it cools
- Milking around the clock? Should stop 3 times to wash
- If system is down for more than 20 minutes, rinse and sanitize before milking resumes
- When milk is left by hauler and more milk is added, it is the same as if you didn't wash the tank

Other Points

Sanitize before you milk

Should not be done more than 20 minutes prior to milking

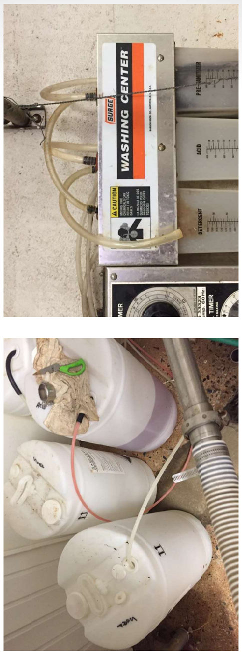
Chlorine is a gas and it leaches into the atmosphere

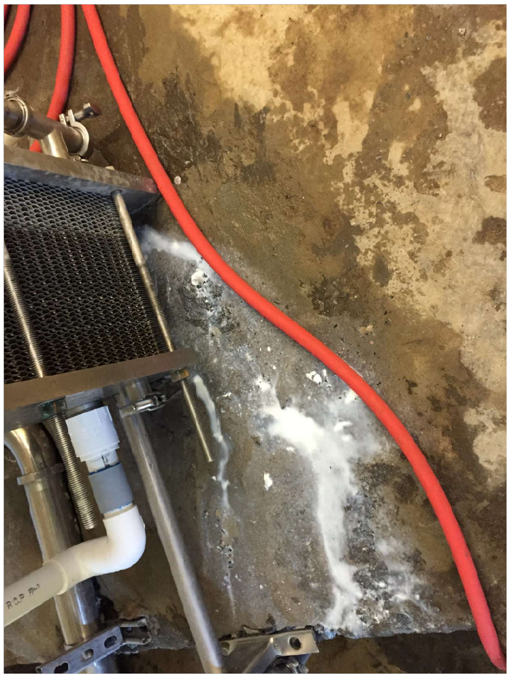


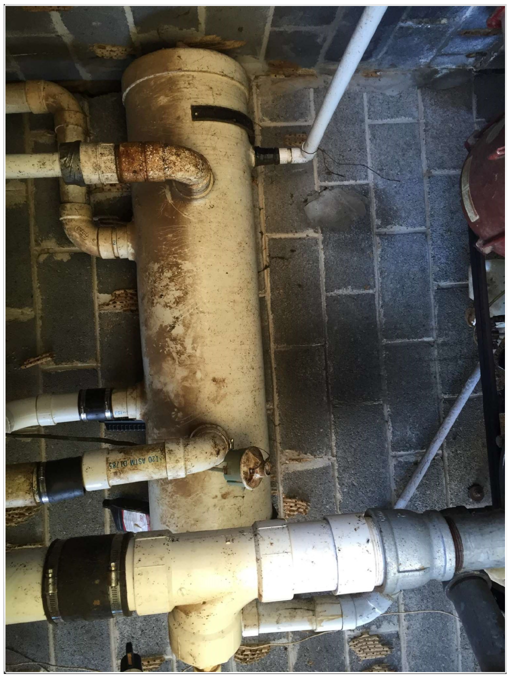
Milk filter and plate coolers

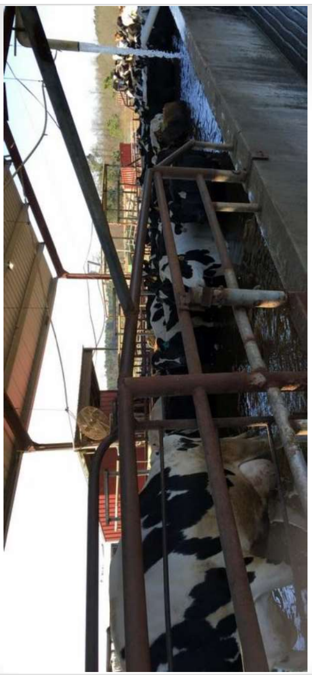
Tank filter – 800 cows

Mechanical breakdowns

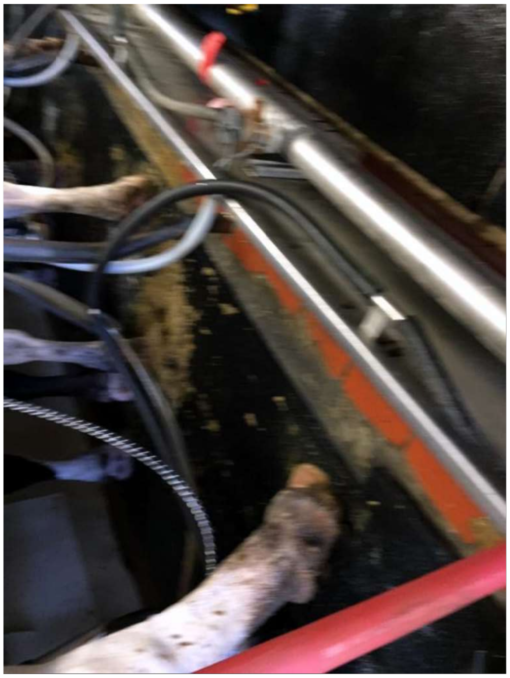


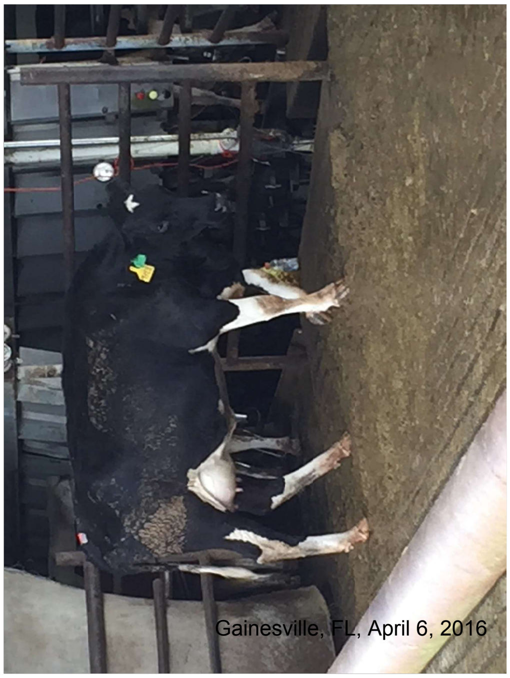






Questions ?





NOTES

Warm-Season Perennial Grass Management in Florida

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University of Florida, IFAS
Range Cattle Research and Education Center, Ona

2016 Florida Dairy Production Conference

75TH anniversary 1941-2016 UF/IFAS RANGE CATTLE RESEARCH & EDUCATION CENTER

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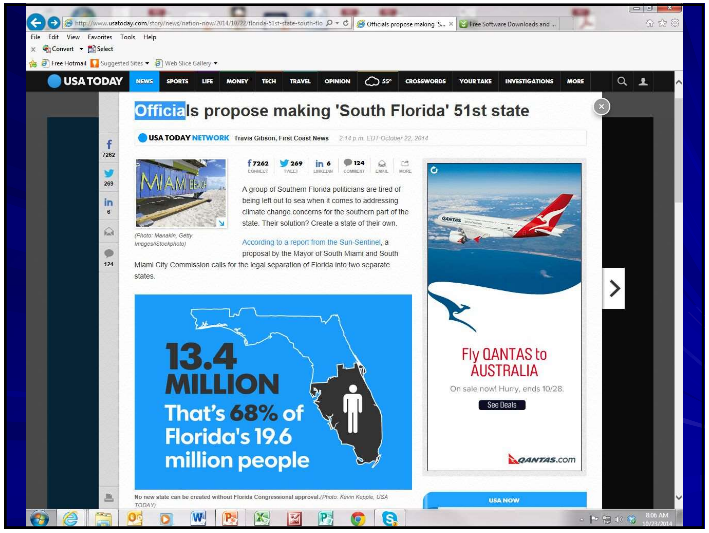

Officials propose making 'South Florida' 51st state

USA TODAY NETWORK Travis Gibson, First Coast News 2:14 p.m. EDT October 22, 2014

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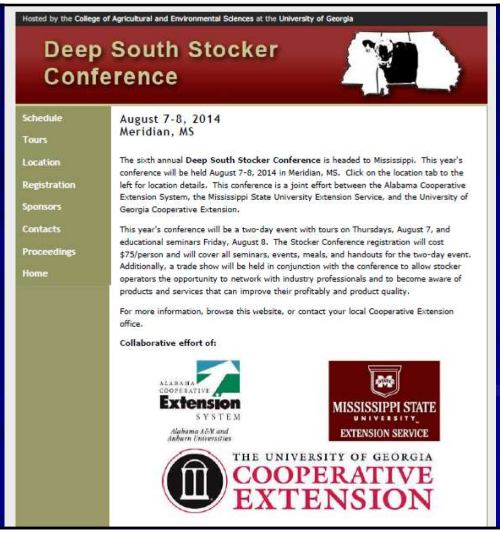
(Photo: Manakin, Getty Images/iStockphoto)

A group of Southern Florida politicians are tired of being left out to sea when it comes to addressing climate change concerns for the southern part of the state. Their solution? Create a state of their own.

According to a report from the Sun-Sentinel, a proposal by the Mayor of South Miami and South Miami City Commission calls for the legal separation of Florida into two separate states.

13.4 MILLION That's 68% of Florida's 19.6 million people

No new state can be created without Florida Congressional approval.(Photo: Kevin Kepple, USA TODAY)


Hosted by the College of Agricultural and Environmental Sciences at the University of Georgia

Deep South Stocker Conference

August 7-8, 2014
Meridian, MS

The sixth annual **Deep South Stocker Conference** is headed to Mississippi. This year's conference will be held August 7-8, 2014 in Meridian, MS. Click on the location tab to the left for location details. This conference is a joint effort between the Alabama Cooperative Extension System, the Mississippi State University Extension Service, and the University of Georgia Cooperative Extension.

This year's conference will be a two-day event with tours on Thursdays, August 7, and educational seminars Friday, August 8. The Stocker Conference registration will cost $75/person and will cover all seminars, events, meals, and handouts for the two-day event. Additionally, a trade show will be held in conjunction with the conference to allow stocker operators the opportunity to network with industry professionals and to become aware of products and services that can improve their profitably and product quality.

For more information, browse this website, or contact your local Cooperative Extension office.

Collaborative effort of:

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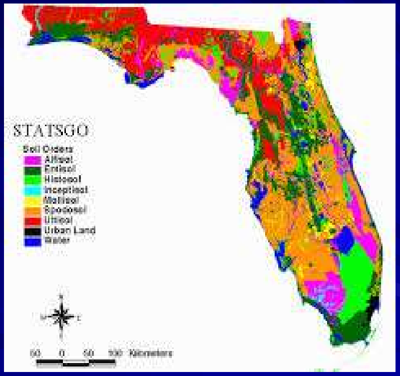
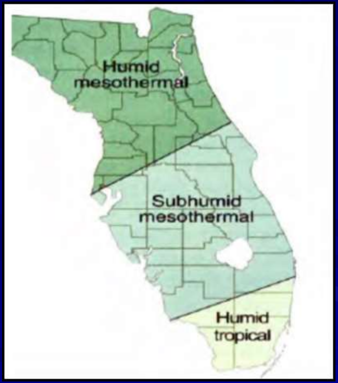




Stargrass x Bermudagrass – South Florida

Species	Herbage Yield lb DM/acre/yr
Jiggs	14200a
Florona	14200a
Tifton 85	13000b
Okeechobee	11500c

Forage Species – Summer Harvest

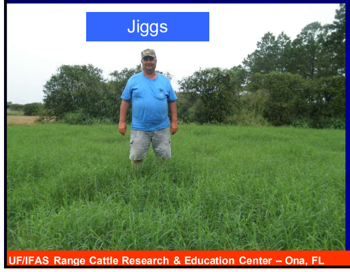
Response Variable	Forages					
	Bahiagrass	Stargrass	Mulato	Limpograss	Jiggs	Tifton 85
HA, lb/ac	2600c	3670b	3200b	3870b	4600a	2970b
CP, %	14.9	12.0	12.6	12.5	11.6	10.2
NDF, %	63.6	71.7	63.2	65.7	72.2	58.0
IVTD, %	56.3b	61.7ab	67.0a	60.1b	58.4b	63.9a
NDFD, %	53.2b	50.0b	52.9b	44.1c	43.3c	57.0a

Adapted from Vendramini et al. (2010)

Forage Species – Fall Harvest

Response Variable	Forages		
	Jiggs	Tifton 85	Florakirk
HA, lb/ac	2870a	1140b	2040a
CP, %	11.4	13.1	11.7
NDF, %	69.2	67.7	67.1
IVTD, %	63.3	66.6	63.0
NDFD, %	51.5b	60.0a	55.5b

Adapted from Vendramini et al. (2010)



Mulato II trials in North-Central Florida

Mulato II trials in North-Central Florida

Species	Yield Year 1 (lb/ac)	Yield Year 2 (lb/ac)	CP (%)	IVDOM (%)
Mulato II	5,400	10,500	10.2	67
Tifton 85	4,900	10,900	10.7	56
Pearl Millet	6,300	5,200	11.4	65
Sorghum-Sudan	3,800	5,000	9.6	66

Vendramini et al. (2012)

On-farm study Dairy Check-off 2014

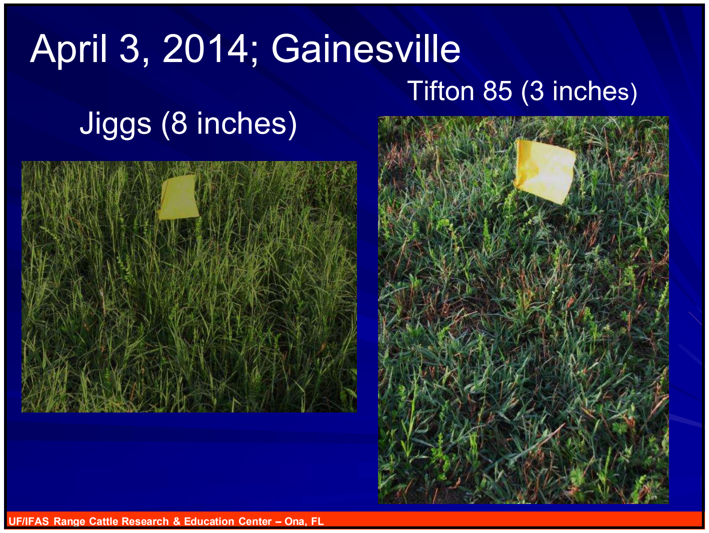
- Mulato outyielded Tifton 85 due to greater late-season production; Mulato had greater digestibility than Tifton 85

Grass	Yield (tons/acre)	Digestibility (%)
Mulato	4.8	65
Tifton 85	4.0	56

Jiggs x Tifton 85

Jiggs x Tifton 85

- Jiggs was much easier to establish than either Mulato or Tifton 85 on three cooperating dairies in North Florida/South Georgia
- Jiggs began growth in spring earlier than Tifton 85 in Gainesville



April 3, 2014; Gainesville

Jiggs (8 inches)

Tifton 85 (3 inches)

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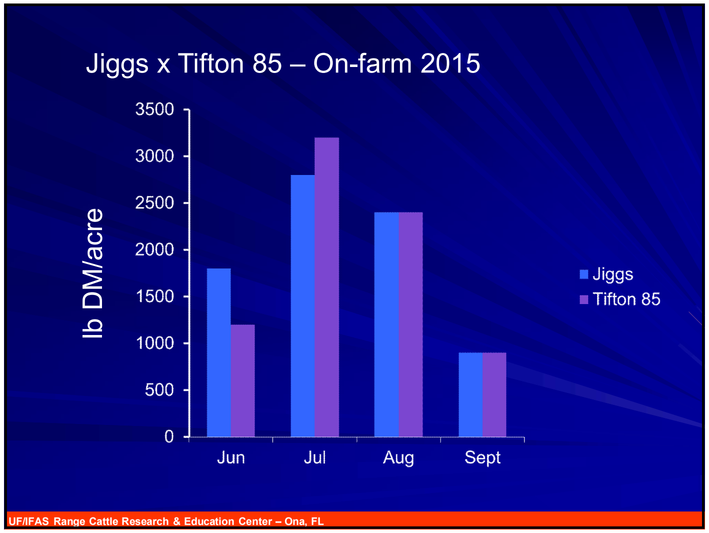

Jiggs x Tifton 85 – On-farm 2015

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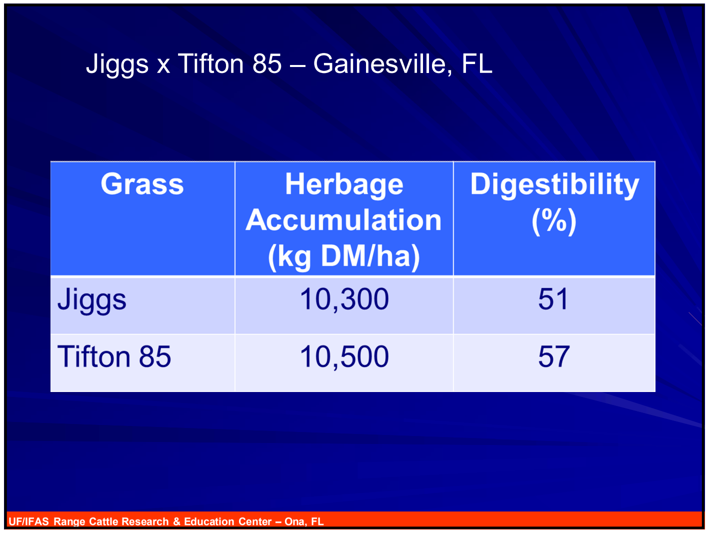

Jiggs x Tifton 85 – Gainesville, FL

Grass	Herbage Accumulation (kg DM/ha)	Digestibility (%)
Jiggs	10,300	51
Tifton 85	10,500	57

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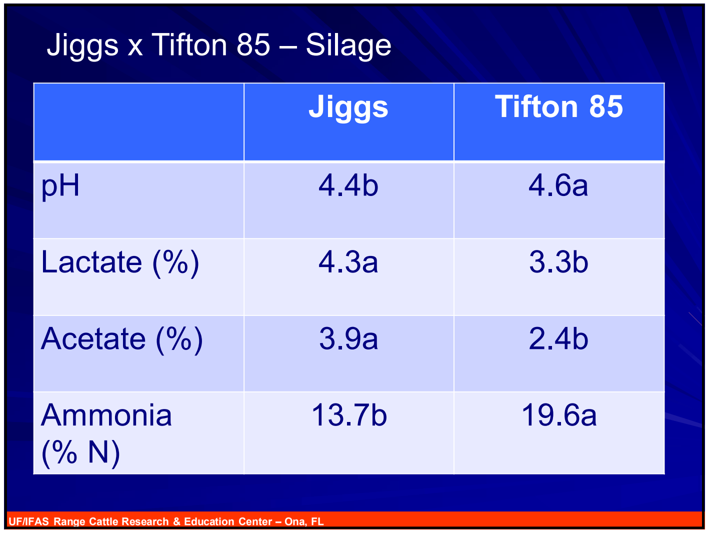

Jiggs x Tifton 85 – Silage

	Jiggs	Tifton 85
pH	4.4b	4.6a
Lactate (%)	4.3a	3.3b
Acetate (%)	3.9a	2.4b
Ammonia (% N)	13.7b	19.6a

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Bermudagrass Fertilization

May 2014

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Bermudagrass Fertilization

June 2014

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Bermudagrass Fertilization

K_2O application level	Frequency†	Ground Cover†
lb/A	%	
0	37	31
40	76	73
80	86	86
SE	2.7	2.7
Orthogonal Contrast	L***,Q***	L***,Q***

Silveira et al. (2013)

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Bermudagrass Fertilization

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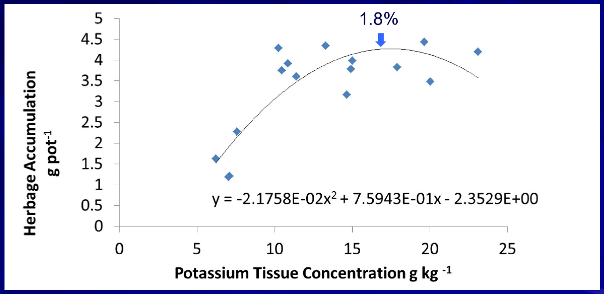
Bermudagrass Fertilization

Potash fertilizer rate (lb/acre/harvest)	Jiggs	Tifton 85
	lb DM/acre	
0	2200	2100
20	2000	2000
40	1700	1700

Bermudagrass Fertilization

Potash fertilizer rate (lb/acre/harvest)	Tissue K (%)	Yield (tons/acre thru September 3)
0	1.4	3.09
20	1.8	3.66
40	1.9	3.84

Bermudagrass Fertilization



Stubble height

- ❑ Bermudagrass is historically considered “persistent” under defoliation; however, an interaction of defoliation intensity x frequency x fertilization plays a major role on persistence of bermudagrass fields
- ❑ “There are only two pastures in Florida, bahiagrass and the one that will be bahiagrass”

Stubble height

Stubble height (inches)	Regrowth interval (days)			PC
	14	21	28	
	g/m^2			
3	8.2	13.3	6.5	Q
6	42.8	34.5	48.2	NS
9	40.2	45.4	68.5	L
PC	L, Q	L	L, Q	

Liu et al. (2010)

Summary

- ❑ Production of Tifton 85 and Mulato II in South Florida is limited due to poorly drained soils
- ❑ Jiggs is well adapted to South Florida with greater Spring and Fall growth than Stargrass and Tifton 85
- ❑ Mulato II has greater nutritive value than Tifton 85 or Jiggs but it is not perennial in North Florida

Summary

- ❑ Jiggs has faster establishment and greater forage production than Tifton 85 in the Spring in North Florida. However, Tifton 85 has greater digestibility.
- ❑ Adequate potassium fertilization and taller stubble heights are essential to maintain the productivity of bermudagrass fields

Thanks!
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NOTES

Current strategies to increase nutritive value of corn silage

Luiz Ferraretto[1] and Randy Shaver[2]

[1]Department of Animal Sciences, University of Florida
[2]Department of Dairy Science, University of Wisconsin – Madison

Introduction

High quality whole-plant corn silage (**WPCS**) contributes greatly to supplying the energy, starch and forage NDF needs of high-producing dairy cows, reducing purchased feed costs from expensive grain and byproduct supplements, and generating milk revenues for dairy producers throughout the world. The purpose of this paper is to review selected recent developments and strategies that may influence the nutritive of WPCS.

Corn silage harvest practices

Meta-Analysis

Ferraretto and Shaver (2012) performed a meta-analysis to determine the impact of dry matter (**DM**) content, kernel processing (**PROC**) and theoretical length of cut (**TLOC**) of WPCS on intake, digestion and milk production by dairy cows. The dataset was comprised of 106 treatment means from 24 peer-reviewed journal articles from 2000 to 2011. Categories for DM content at silo removal and PROC and TLOC at harvest were: ≤ 28% (**VLDM**), >28% to 32% (**LDM**), >32% to 36% (**MDM**), >36% to 40% (**HDM**), and >40% (**VHDM**) DM; 1 to 3 or 4 to 8 mm roll clearance or unprocessed; 0.48 to 0.64, 0.93 to 1.11, 1.27 to 1.59, 1.90 to 1.95, 2.54 to 2.86, and ≥ 3.20 cm TLOC. Data were analyzed using Proc Mixed in SAS with WPCS treatments as Fixed effects and trial as a Random effect.

Milk yield was decreased by 2 kg/d per cow for VHDM. Fat-corrected milk (**FCM**) yield decreased as DM content increased. Total-tract digestibility of dietary starch (**TTSD**) was reduced for VHDM compared to HDM and LDM. Processing (1 to 3 mm) increased TTSD compared to 4 to 8 mm PROC and unprocessed WPCS. Milk yield tended to be 1.8 kg/cow/d greater, on average, for PROC (1 to 3 mm) and unprocessed WPCS than 4 to 8 mm PROC. The TLOC of WPCS had minimal impact on any of the parameters evaluated. Starch digestibility and lactation performance were reduced for dairy cows fed diets containing WPCS with >40% DM or WPCS with insufficient kernel processing.

An interaction was observed between DM content and kernel processing for TTSD. Kernel processing increased TTSD for diets containing WPCS with 32% to 40% DM. Also, an interaction was observed between TLOC and kernel processing for TTSD. Kernel processing increased diet TTSD when TLOC was 0.93 to 2.86 cm. Kernel processing WPCS to improve starch digestibility was effective across a wide range of DM contents and TLOC, but did not overcome adverse effects of very high DM content on TTSD and was ineffective at very long TLOC.

Corn Shredlage

Vanderwerff et al. (2015) evaluated in a feeding trial: 1) the response to corn shredlage (**SHRD**) in a brown midrib (**BMR**) WPCS hybrid, and 2) whether the greater TLOC setting on the SPFH for the harvest of SHRD increased the peNDF content of the WPCS.

A BMR WPCS hybrid (F2F627; Mycogen Seeds) was harvested in September 2013 with a Claas 940 SPFH equipped with either a Claas conventional processor or a SHRD processor on the same day at 50% kernel milk line stage of maturity. The conventional processor was set for a 2-mm roll gap and 40% roll speed differential with the SPFH set for a 19-mm TLOC for harvest of the conventionally-processed corn silage (**KP**). Harvest of the SHRD was done with the SHRD processor set at a 2-mm roll gap and 32% roll speed differential with the SPFH set for a 26-mm TLOC. The KP and SHRD were stored in separate silo bags until the bags were opened to begin the feeding trial in January, 2014.

Mid-lactation Holstein cows were used in a 16-week continuous-lactation experiment in our university dairy herd with 15 replicated pens of 8 cows each. The respective treatment TMR contained 45% (DM basis) from either SHRD or KP. Both TMR treatments (SHRD and KP) contained 10% alfalfa silage and 45% (DM basis) of the same concentrate mix comprised of dry ground shelled corn, corn gluten feed, solvent and expeller soybean meal, rumen-inert fat, minerals, vitamins, and monensin. Additionally, a third treatment TMR (**KPH**) was included in the experiment to focus on the peNDF question. This ration was formulated with 35% KP, 10%

alfalfa silage, 10% chopped hay, and 45% (DM basis) of the same concentrate ingredients adjusted in proportions in the mix to balance dietary crude protein and starch concentrations across the three treatments.

The SHRD and KP were similar in average DM (39%) content and pH (3.9). Corn silage processing scores on feed-out samples averaged 72% for SHRD and 68% for KP with less variation observed for SHRD over the duration of the experiment. The sample range (difference between maximum and minimum samples) was 10%-units for SHRD and 21%-units for KP. For SHRD, all processing scores were above 65%. However, for KP 43% of the samples obtained on a weekly basis throughout the feeding trial were at or below a processing score of 65%.

The proportion of coarse stover particles was greater for SHRD than KP for samples collected during feed-out from the silo bags throughout the feeding trial (18% versus 7% as-fed particles retained on the top screen of the shaker box). For the TMR fed throughout the trial, the proportion of as-fed particles on the top screen of the shaker box was greater for SHRD than KP or KPH. Our measurements of weigh-backs during the trial indicated minimal sorting and no differences in sorting among the three treatments.

Averaged over the treatment period, milk yield was 1.5 kg/day per cow greater for SHRD than KP in 6 out of the 14 weeks, with the SHRD cows averaging 51.3 kg/d; feed efficiency was similar for the two treatments. Milk yield was 3.4 kg/d per cow lower and feed efficiency was reduced for KPH compared to KP.

Milk fat content was greater for KPH (3.7%) than KP or SHRD (3.3%). Rumination activity measured using the SCR rumination collars averaged 8.4 hours per day and was not different among the treatments. Using milk fat content and rumination activity data to assess peNDF suggests that the peNDF content of SHRD was not improved despite its longer TLOC and increased percentage of as-fed particles on the top screen of the shaker box compared to KP. Milk fat yield was not statistically different among the treatments, but was numerically greatest for KPH and lowest for KP. Similar to the milk yield differences, milk protein and lactose yields were greatest for SHRD and lowest for KPH. Body condition score (3.1 on average) and body-weight change (0.6 kg/d per cow on average) were similar among the three treatments.

Total-tract DM and organic matter (**OM**) digestibility were greater for cows fed KP and SHRD than for cows fed KPH. Total-tract NDF digestibility (**TTNDFD**) tended to be greatest for KPH and lowest for SHRD. Lower TTNDFD for SHRD may be related to increased dietary starch content for SHRD compared to KPH and increased kernel processing and ruminal starch digestibility for SHRD compared to KP and KPH. The ruminal in situ starch digestibility was greater for SHRD than KP (88.3 vs. 76.0%, respectively). Total-tract starch digestibility was greater for SHRD than KP. Differences in total-tract starch digestibility between SHRD and KP were, however, biologically small (0.5%-units) and starch digestibility was near 100% for all treatments. Small differences in total-tract starch digestibility along with much larger differences ruminally may be explained by post-ruminal compensatory digestion of starch. Nearly complete digestion of starch in the total-tract may be explained by the nearly 6 month lag between ensiling and the midpoint of the feeding trial.

Silage Fermentation

Hoffman et al. (2011) reported that ensiling high-moisture corn (**HMC**) for 240 d reduced zein protein subunits that cross-link starch granules, and suggested that the starch-protein matrix was degraded by proteolytic activity over an extended ensiling period. A reduction in zein protein over the ensiling period for HMC was observed when measured by high-performance liquid chromatography (Hoffman et al., 2011). Ammonia-N content increased, however, as high-performance liquid chromatography zein protein subunits in HMC decreased (Hoffman et al., 2011), and ammonia-N was used in combination with mean particle size for modeling the effects of corn maturity, moisture content and extent of silage fermentation on ruminal and total-tract starch digestibilities for HMC at feed out (Hoffman et al., 2012a, b). Ferraretto et al. (2014), using a data set comprised of 6,131 HMC samples (55 to 80% DM) obtained from a commercial feed analysis laboratory, reported that ammonia-N was positively related to ruminal in vitro starch digestibility at7 h (**ivStarchD**; $R^2 = 0.61$) and combined, ammonia-N, DM, soluble-CP and pH provided a good prediction of ivStarchD (adjusted $R^2 = 0.70$).

In WPCS fermented for 0, 45, 90, 180, 270, and 360 d, ammonia-N and soluble-CP contents and ivStarch increased over time and soluble CP, but not ammonia-N, was highly correlated with ivStarchD ($R^2 = 0.78$ versus 0.24; Der Bedrosian et al., 2012). Young et al. (2012) and Windle et al. (2014) reported that increases in WPCS ammonia-N and soluble-CP contents were accompanied by increases in ivStarchD in response to increased time of ensiling and exogenous protease addition.

Ferraretto et al. (2015b) evaluated the interaction between hybrid type and ensiling time on a study where 8 WPCS hybrids (4 BMR and 4 leafy) were ensiled for 0, 30, 120 and 240 d. Fermentation profile, ammonia-N and soluble-CP contents, and ivStarchD were similar for the 2 hybrid types and there was no hybrid type × time of ensiling interaction detected. Increases in WPCS ammonia-N and soluble-CP contents were accompanied by increases in ivStarchD in response to increased time of ensiling. Positive relationships between ivStarchD and ammonia-N ($R^2 = 0.67$) and soluble-CP ($R^2 = 0.55$) were observed. Ammonia-N and soluble-CP were both good indicators of ivStarchD in WPCS in this study. It appears that ammonia-N and soluble-CP can be used in models to predict starch digestibility for WPCS as has been done for HMC, however, more research is needed especially with regard to combining the particle size of the kernels in WPCS along with these N measures into predictive models.

The effects of ensiling time and exogenous protease addition on fermentation profile, N fractions and ivStarchD in WPCS of various hybrids, maturities and chop lengths were evaluated by Ferraretto et al. (2015a). Extended time in storage increased ammonia-N, soluble CP and ivStarchD in WPCS of various hybrids, maturities and chop lengths. However, contrary to our hypothesis, extended ensiling time did not attenuate the negative effects of kernel vitreousness and maturity at harvest on ivStarchD. Exogenous protease attenuated but did not overcome negative effects of maturity on WPCS ivStarchD.

Corn silage hybrid types

Ferraretto and Shaver (2015) performed a meta-analysis to evaluate the effects of WPCS hybrid type on digestion, rumen fermentation and lactation performance by dairy cows using a dataset of 162 treatment means from 48 peer-reviewed articles published 1995-2014. Categories for hybrids differing in grain and stalk characteristics, respectively, were: conventional dent (**CONG**), nutridense (**ND**), high oil (**OIL**), and waxy (**WAXY**); conventional, dual-purpose, isogenic or low-normal fiber digestibility (**CONS**), brown midrib (**BMR**), high fiber digestibility (**HFD**), and leafy (**LFY**). Genetically-modified (**GM**) hybrids were compared with their genetically similar non-biotech counterpart (**ISO**). Data were analyzed using Proc Mixed in SAS with hybrid as fixed and trial as random effects.

Silage nutrient composition was similar, except for lower CP and ether extract for CONG than ND and OIL. Milk fat content and yield and protein content were lowest for OIL. Intake, milk production and total tract nutrient digestibilities were unaffected by grain hybrid type. Except for lower lignin for BMR, and a trend for lower starch for HFD than CONS, silage nutrient composition was similar among hybrids of different stalk type.

Dry matter intake, milk yield, and protein yield were 1.1, 1.5, and 0.05 kg/d per cow, respectively, greater for BMR than CONS and LFY on average. Total tract NDF digestibility was greater and starch digestibility reduced for BMR and HFD compared to CON or LFY. No differences in lactation performance were observed for GM compared to ISO. Research does not suggest any cause for concern about feeding WPCS produced from genetically-modified seed corn when the traits make agronomic and economic sense to the grower.

Except for negative effects of OIL on milk fat and protein percentages, differences were minimal among WPCS hybrids differing in grain type. Except for positive effects of BMR on DMI and milk and protein yields, differences were minimal among WPCS hybrids differing in stalk type. However, reduced ruminal and total tract starch digestibilities for BMR merit further study.

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NOTES

Economic evaluation of dairy cow stocking density

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- Southeast Milk Inc., Milk Check-off Program
  - Partial funding

Stocking density

- Cows / stall
- Feed bunk space / cow
- Total area / cow
- Shade / cow

Transition cows
Lactating cows

USDA-NAHMS Dairy Survey 2007

Percentage of freestall operations by current , maximum, and average number of cows per stall

	Percent Operations					
	Density					
	Current		Maximum		Average	
Cows per Stall	**Percent**	**Std. Error**	**Percent**	**Std. Error**	**Percent**	**Std. Error**
Less than 0.95	38.9	(4.2)	13.4	(3.5)	34.9	(4.1)
0.95 to 0.99	7.4	(1.9)	3.1	(1.1)	8.1	(2.0)
1.00 to 1.04	12.6	(2.7)	25.7	(3.7)	16.2	(3.1)
1.05 to 1.09	10.7	(2.3)	9.3	(2.2)	12.0	(2.5)
1.10 or more	30.4	(3.7)	48.5	(4.2)	28.8	(3.7)
Total	100.0		100.0		100.0	

57%

N = 2500 dairy farms

USDA-NAHMS (2010)

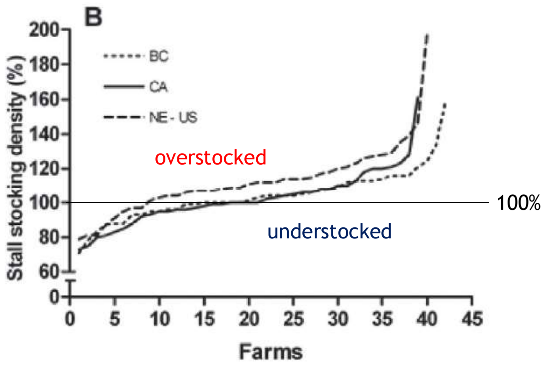
Wisconsin survey 1999

- 4-row barns: 111% stocking density
- 6-row barns: 104% stocking density

Bewley et al., 2001

Stall stocking density

British Columbia (BC; n = 42), California (CA; n = 39), northeastern United States (NE-US; n = 40).



Basic concepts

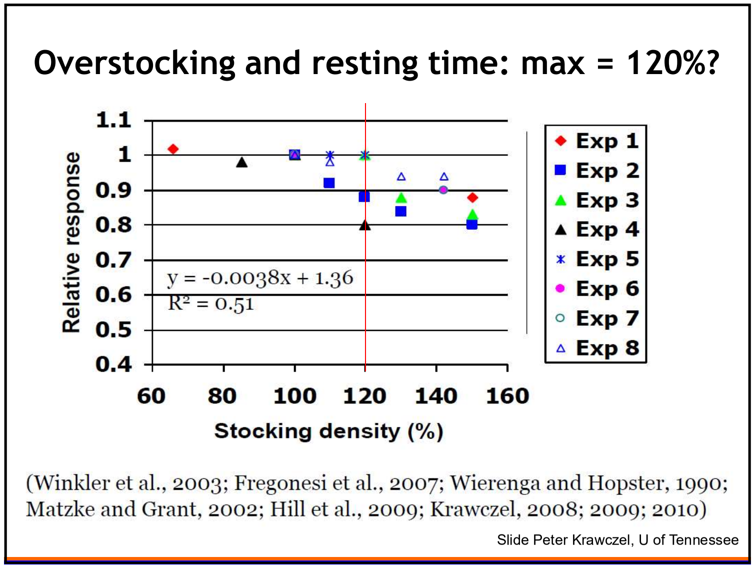
- Overstocking reduces cow’s ability to practice natural behaviors (Wechsler, 2007)
- Response to overstocking depends on facilities and grouping (P. Krawczel)
- Overstocking improves economic returns on investments in facilities (Bewley et al., 2001)
- How much overstocking is most profitable?

Typical time budget for lactating dairy cow

- Basic behavioral needs:
  - 3 to 5 h/d eating
  - 10 to 14 h/d lying (resting)
  - 2 to 3 h/d standing/walking in alley (grooming, agonistic, estrous activity)
  - ~0.5 h/d drinking
  - 20.5 to 21.5 h/d total needed
  - 2.5 to 3.5 h “milking”

\+ 24 hours / day

Slide Peter Krawczel, U of Tennessee



Overstocking and resting time: max = 120%?

(Winkler et al., 2003; Fregonesi et al., 2007; Wierenga and Hopster, 1990; Matzke and Grant, 2002; Hill et al., 2009; Krawczel, 2008; 2009; 2010)

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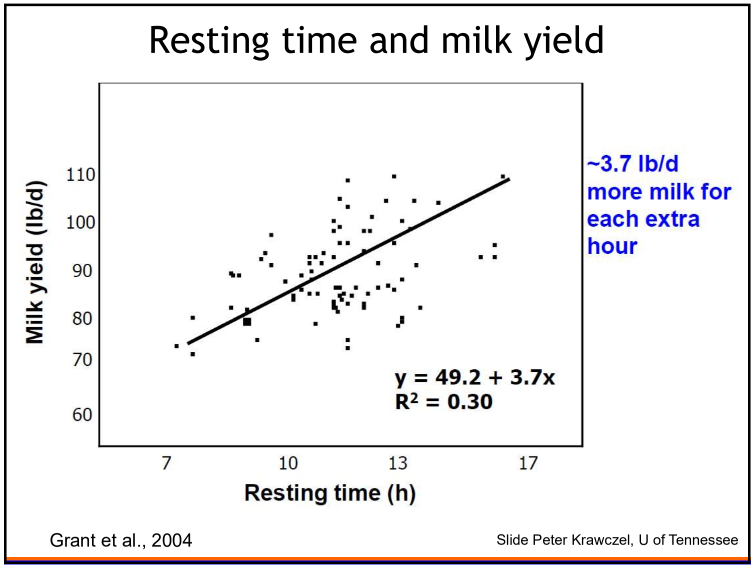
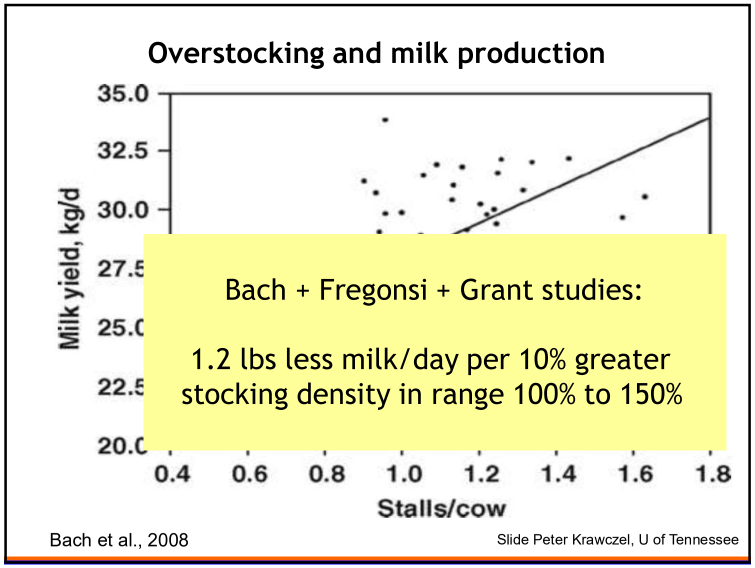


Resting time and milk yield

~3.7 lb/d more milk for each extra hour

Grant et al., 2004

Slide Peter Krawczel, U of Tennessee



Overstocking and milk production

Bach + Fregonsi + Grant studies:

1.2 lbs less milk/day per 10% greater stocking density in range 100% to 150%

Bach et al., 2008

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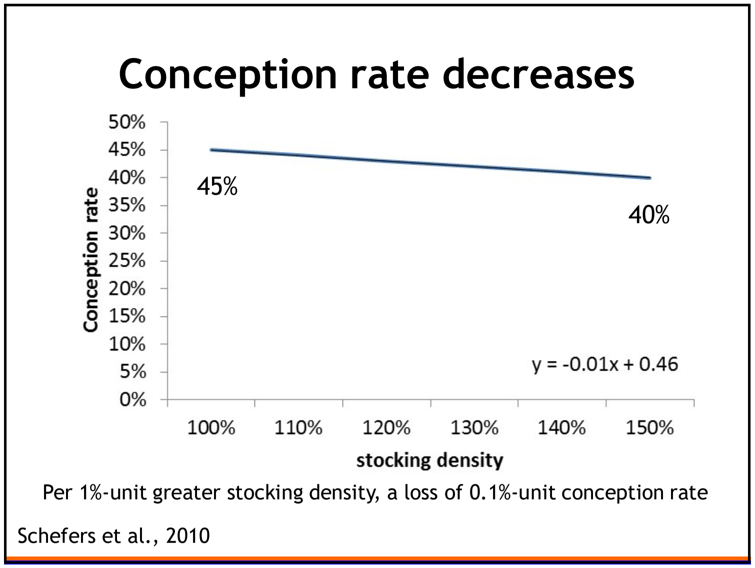


Conception rate decreases

Per 1%-unit greater stocking density, a loss of 0.1%-unit conception rate

Schefers et al., 2010

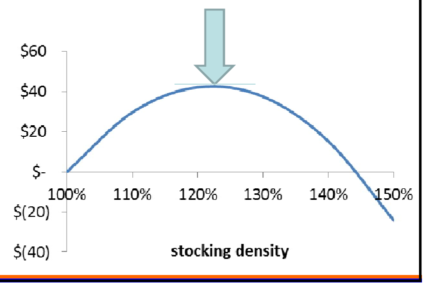
Economics

Approach

- Stall stocking density = cows / stall
- Includes effects of stocking density on:
  - Milk production
  - Fertility
- Calculate changes in herd measures
  - Herd budget model
  - Vary stocking density 100% ➔ 150%
  - Measure profit/stall/year

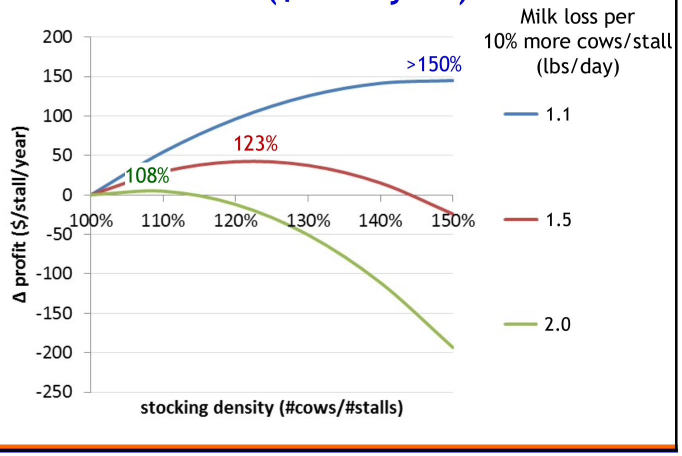
Marginal economics

- Marginal profit = profit from the additional cow - decrease in profit from all other cows already in the pen
- Add cows to pen until marginal profit/stall = $0



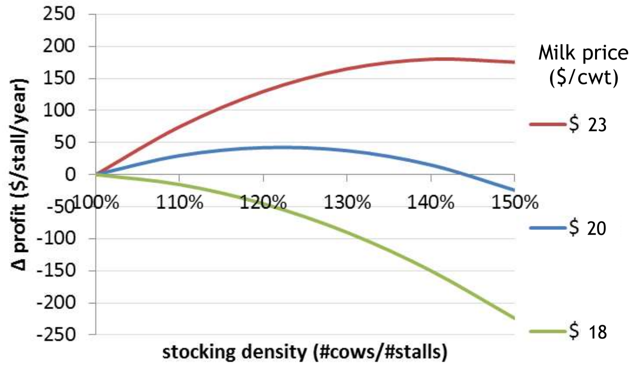
Effect of milk loss

Δ Profit ($/stall/year)



Effect of milk price

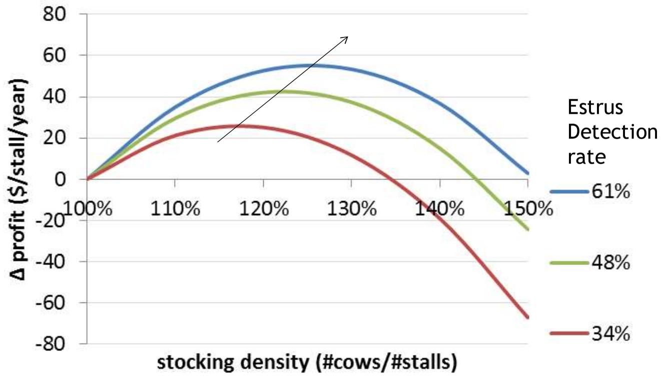
Δ Profit ($/stall/year)



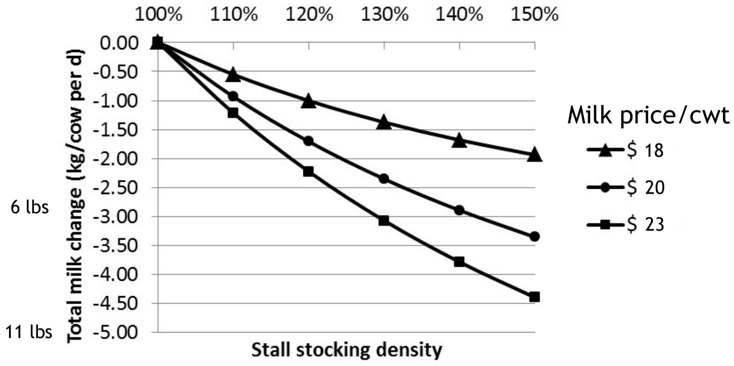
Milk loss 1.5 lbs/day per 10% overstocking

Reproduction has smaller effect

Δ Profit ($/stall/year)

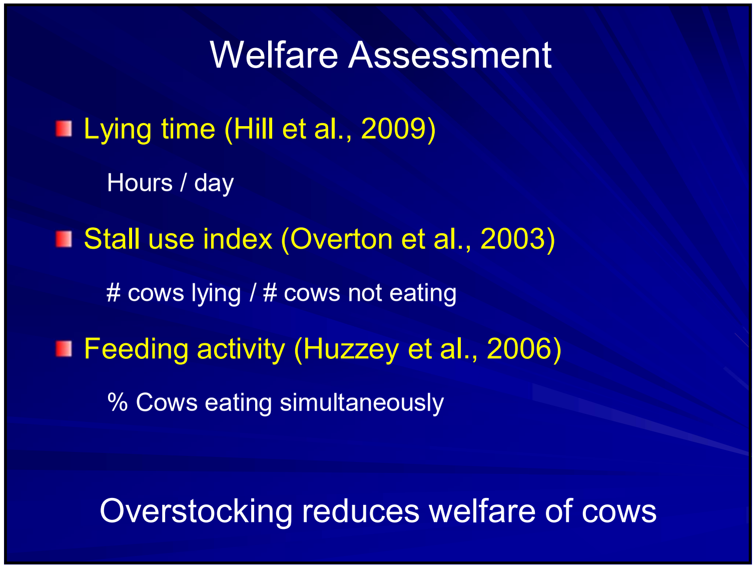


How much ➔ milk yield for =profit?



… In this case, the farmer's decision to overstock by over 30% resulted in very large milk checks due to milk prices even though his milk per cow remained level. I've learned that overstocking is not necessarily a bad thing when it comes to profitability.

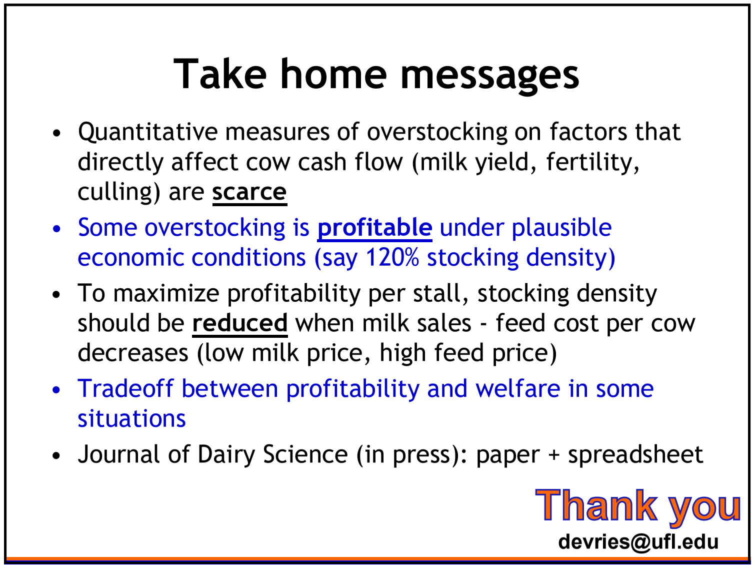
Email exchange with dairy consultant
April 2015



Welfare Assessment

- Lying time (Hill et al., 2009)
  - Hours / day
- Stall use index (Overton et al., 2003)
  - # cows lying / # cows not eating
- Feeding activity (Huzzey et al., 2006)
  - % Cows eating simultaneously

Overstocking reduces welfare of cows



Take home messages

- Quantitative measures of overstocking on factors that directly affect cow cash flow (milk yield, fertility, culling) are **scarce**
- Some overstocking is **profitable** under plausible economic conditions (say 120% stocking density)
- To maximize profitability per stall, stocking density should be **reduced** when milk sales - feed cost per cow decreases (low milk price, high feed price)
- Tradeoff between profitability and welfare in some situations
- Journal of Dairy Science (in press): paper + spreadsheet

Thank you

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NOTES