Integrating Crops and Beef Cattle

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Why Consider Crops and Cattle Integration?

Diversification Helps Mitigate Risk

A Way to Add a Profit Center for the Next Generation

More Utilization of the Acres Already Being Taxed or Paid For

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Adding grazing lands (perennial pasture) is not always feasible. It can be high risk due to drought, land payments, interest, and taxes. Depending on rainfall, land prices, and cattle value, the cattle may not pay the expenses.

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Be creative
Think outside the Box
There is no "one right way" to integrate crops and livestock

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Increasing Utilization per Acre – What are some Options?




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By using crop residues, by-products, silages, and some annual forage grazing we are able to run 10x the number of mama cows our perennial acres would support in a traditional setting, labor is actually our rate limiting step

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Possible Semi-Confinement Systems Spring-Born Herd

Birth to 2 months of age – Confinement Lot – TMR

2-4 months of age – annual forages

4-5 months of age – perennial forage/other annual forages

5-6 months of age – confinement – TMR

6-9 months of age – confinement weaned calf diet/or annual forages

Dry bred cows – cornstalks/annual forages or TMR

Late pregnancy and start of calving – confinement - TMR

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Feeding Production Pairs in Confinement – What does it Take?

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Where do I feed the TMR?

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Diet formulation and delivery and management for confinement periods are critical

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Considerations when Feeding in Confinement

- **Increasing the nutrient density of the diet and limit feeding can help reduce diet costs**
- **Bunk space needs to be at least 2 ft per cow and 1 ft per calf**
- **When feeding residues, the diet works better if it contains wet feeds, such as silage, wet distillers, sugar beet pulp, Sweet Bran, wet corn gluten feed, maybe some molasses (or add water)**
- **Cow and calf both need feed and water – don't forget to account for the calf's feed intake**

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Nutritional Requirements of the Pair can get you in Trouble

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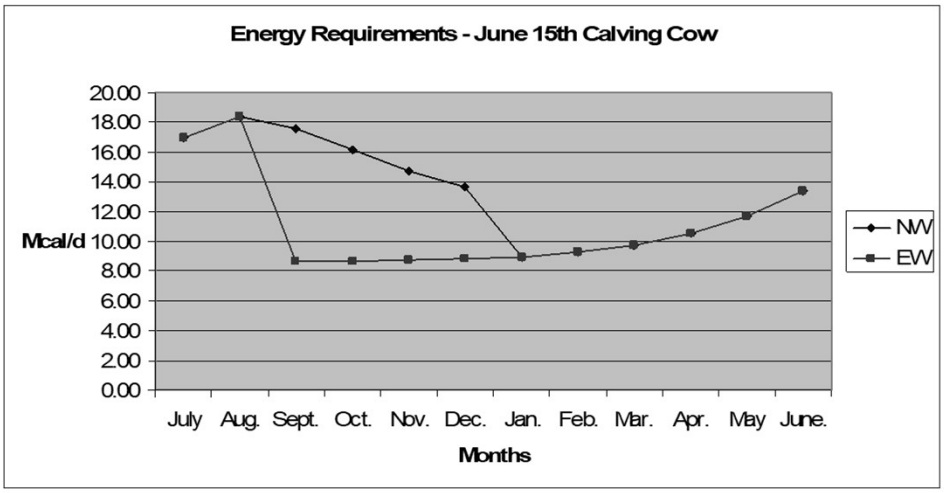

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Mature Cows

Nutrients available

Basal Metabolism

Lactation

Reproduction

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15 month old Heifers

Nutrients available

Basal Metabolism

Growth

Reproduction

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Lactating 2 year old cow

Nutrients available

Basal Metabolism

Growth

Lactation

Reproduction

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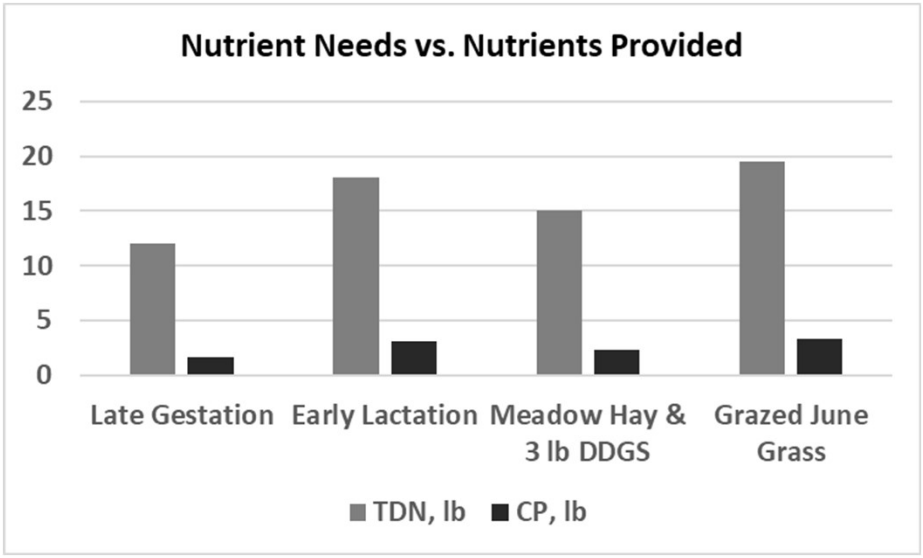
Mature Cow



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Lactating Heifer Diet Prior to Breeding

- Wet Distillers 14 lb
- Hay/residue mix 15 lb
- Corn Silage 33 lb
- Mineral 0.25 lb

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What about feeding the nursing calf?

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How much forage does a nursing calf eat?

	Body Weight, lb	Forage Intake, % BW	Milk Intake, %BW	Forage Intake lb OM/d	Milk Intake lb OM/d
3 month old calf (90 days)	**228**	**1.1**	**1.1**	**2.4**	**2.5**
4 month old calf (120 days)	**344**	**1.2**	**0.73**	**4.0**	**2.5**
5 month old calf (150 days)	**510**	**1.1**	**0.30**	**5.6**	**1.6**

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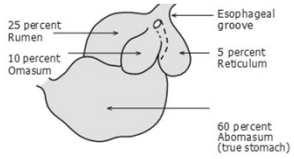
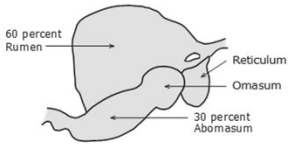
Rumen Development in the Calf



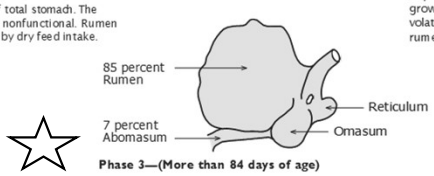
Phase 1—Non-ruminant (birth to 21 days of age)

Abomasum is 60 percent of total stomach. The rumen is undeveloped and nonfunctional. Rumen development is stimulated by dry feed intake.



Phase 2—(22 to 56-84 days of age)

Dry feed intake, especially grain (starter) stimulates growth of the rumen microorganisms which produce volatile fatty acids. These acids stimulate growth of rumen tissue



Phase 3—(More than 84 days of age)

At this stage, the calf can be considered a ruminant.

Source: *Raising Dairy Replacements* (1991)

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Lactation Diet for Pairs

	% DM	% AS IS	lb as is per cow	$/ton	$/ day at 78.4 lb
Ground Residue	**37**	**19.5**	**15.2**	**80**	**0.608**
WDGS	**17**	**22**	**17**	**75**	**0.638**
Triticale silage	**22.7**	**29.1**	**23**	**40**	**0.460**
Corn Silage	**22.7**	**29.1**	**23**	**50**	**0.575**
Mineral	**0.6**	**0.3**	**0.25**	**750**	**.094**
Total			**78.4**		**2.38**
Yardage					**0.30**

Fed at 35.23 lb DM the diet provides 22.8 lb of TDN and 4.02 lb of CP. It is 45% DM. 2.3% BW of 1500 lb pair

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Figuring Cow vs. Calf intake out of Pair diet

- **So the pair is eating 35 lb on a dry matter basis. Let's assume the 300 lb calf is eating 4.5 lb of dry matter (1.5% BW on DM basis).**
- **So then my cow is getting 30.5 lb of DM. The diet we put together was 64.8% TDN. So 30.5*.648 = 19.8 lb of TDN and 3.5 lb of CP.**
- **According to the NRC that meets her needs.**
- **If we balance for her needs, and don't account for calf intake then that is only 16.8 lb TDN and in about a month you notice the BCS loss**

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- **Lactation diets need to be very energy dense especially compared to gestation diets**
- **Wet distillers isn't available to everyone, but is a great source of protein, energy, and phosphorus**
- **Whatever we replace it with, has to make up those shortages**

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Minerals and Vitamins for Confinement

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Distillers is high in sulfur which is an antagonist to copper

Confined lactating cows need a healthy dose of magnesium in the mineral

Cows who rarely have the opportunity to graze green grass are likely short on Vitamin A

Commercially available mineral packages may not have an appropriate amount or availability of certain minerals or vitamins

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Feeding in the evening can shift around 75% of the calves to be born between 5 am and 5 pm. This is very beneficial for the calf who has a better chance of warming up and drying off, but is a Godsend for the people working off farm jobs or farming as well as calving. Works best with limited or no grazing.

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Annual Forages as an Option for Pairs in a Semi-Confinement System

- **$12/ac triticale seed**
- **$25/ac water (drought conditions)**
- **$12/ac planting costs**
- **$5/ac to spread manure**

- **110 pair for 35 days**
- **$0.91/d/pair**

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The beauty of silage is quality, moisture, fairly inexpensive, and a lot of tonnage vs. grazing

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Cornstalk Residue Grazing

- **Cornstalk grazing can reduce annual cow costs**
  $30/acre and an acre lasts a cow 60 days, that's $0.50/d
- **Research has shown dry pregnant cows (BCS 5 or 6) can be maintained without protein or energy supplement**
- **Pairs need both protein and energy supplement for lactation and growth**

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	Dry matter, lb	As is, lb	$/ton	$/d
WDGS	2.5	7	80	0.28
Ground residue	18.0	21	60	0.64
Triticale silage	8.1	23	40	0.46
Mineral	0.23	0.25	750	0.10
Total	28.8	51.26		1.47
With yardage $.30				1.77

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Grazing			Confinement		
$/d	days		$/d	days	
1.57	60	Hay/sup calving	2.68	170	Confine lact
2.00	155	Pasture lease	0.91	40	Graze annuals
1.18	90	Weaned winter hay	0.50	60	Graze stalks
1.43	60	Pre calving	1.77	95	Late gest diet
1.63	365		1.89	365	

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So that is an annual feed cost difference of 690.15 – 596.20 or $93.95/cow/year to run 200 cows instead of 20

Hidden cost of pasture lease is wear and tear on a pick up to go check cows, hauling cows in a semi if trailing is too far

Hidden benefit of semi-confinement is reduced time to go check, likelihood of them being out when you have time commitments for off farm income or farming operations

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Why Consider a Fall-born Herd?

- **In a limited perennial forage system, more harvested feed costs are incurred for both spring and fall born calves**
- **In a confined setting, there is generally less illness/labor in Aug/Sept. born calves than spring-born the first two months**

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Why Consider a Fall-born Herd?

- **Fall-born calves can be marketed as stockers for pasture in April and May when prices tend to be higher and in the "off" season from spring-born calves**
- **Easier to hit the cull cow highs with weaned cows**
- **Replacement cows usually cheaper**

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Downside to a Fall Herd

- **Calves may endure extreme cold most of the nursing phase**
- **August/September calving, although less labor intensive, can conflict with farming operations such as silage harvest**
- **Having both fall and spring born calves is always labor intensive**
- **Breeding can occur in winter storms, poor nutrition**
- **Lactation coupled with extreme cold is a high nutrient demand**
- **Two diets for gestating and lactating cows if there is both fall and spring herds**

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Considerations for Fall Calving Herds

- **Environmental heat stress in the newborn can be deadly – shade and electrolytes may be necessary**
- **Nutrient quality and quantity during breeding needs to be carefully monitored**
- **Breeding rates, cost of feed, and cow depreciation are key factors**

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Possible Semi-Confinement Systems Fall-Born Herd (Aug/Sept)

- **Calving on Perennial or Annual pasture or turned out of lot as calved**
- **Oct-Nov. – annual forage after silage?**
- **Dec. to Feb. – cornstalks with supplement or TMR**
- **March – possible weaning – grow ration until May**
- **Dry cows on winter range or TMR**
- **May – August – TMR or annual forages or perennial pasture**

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What about Calf Health?

Clean pens
Age segregation
Good nutrition & vaccinations for cows
Good vaccination program
Adequate feed opportunities for calves
Shelter out of wind and wet

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Forage Chains in Integrated Systems

- **Fall planted small grains – spring grazed or harvested as hay or silage**
- **Late spring short day corn – silage then back to fall small grain**
- **Or Late spring summer annual such as sorghum sudan for grazing or harvest**
- **Cover crops after grain/silage**

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Balancing Farm Work and Cattle Work

Spring calving and spring planting
Branding and small grain silage harvest
Summer farming, daily TMR feeding
Fall preconditioning, fall harvest
Winter feeding, no vacation

Fall calving and fall harvest
Winter branding, frozen facilities
Spring weaning and spring planting
Extra winter chores with caring for young pairs

Spring herd, fall herd, farming, off farm income = no rest for the weary

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Do you have to develop and calve out heifers?

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Think outside the box. What about reducing the labor of calving heifers by buying bred cows or pairs?

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Currently, cattle prices are high and to step into an unestablished business could be pricey.

Another option could be to take in cattle and get paid for feed and care. Lease options are something else to think about. HAVE A CONTRACT

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What about stocker yearlings or finishing cattle?

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Response to protein and energy supplements fed to steer calves grazing corn residue

Treatment	Control	Corn	Corn/mol /urea	DDGS	SoyPass/ SBM	SEM	*P*-value
Initial BW, lb	517	517	517	517	517	3.5	0.10
Ending BW, lb	506[a]	539[b]	559[c]	629[d]	640[d]	4.8	0.03
ADG, lb	- 0.18[a]	0.31[b]	0.53[c]	1.32[d]	1.47[d]	0.07	0.03
Suppl. DMI, lb/d	-	3.7	3.3	3.1	3.5	-	-
TDN, %	-	83	78	104	90	-	-
TDN intake lb/d	-	3.1	2.4	3.1	3.1	-	-
RDP balance (g/day)	-144	-253	7.0	-161	-1.0	-	-
MP balance	-110	-36	93	41	257	-	-

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Meta-analysis of Winter Supplementation

(Gillespie-Lewis et al., 2015)

	Low Gain (0.5 lb/d)	High gain (1.5 lb/d)	SEM	*P*-value
Winter Backgrounding phase (144 days)				
Initial BW, lb	499	497	11.3	0.28
Average Daily Gain, lb/d	0.61	1.39	0.09	< 0.01
Ending BW, lb	585	695	20.7	< 0.01
Summer Grazing phase (138 days)				
Average Daily Gain, lb/d	1.34	1.06	0.09	0.01
Ending BW, lb	768	840	16.8	0.02
Compensation, %	37			
Finishing Phase (115 days)				
Average Daily Gain, lb/d	3.98	4.15	0.24	0.06
Total Dry matter intake, lb	3252	3201	114.8	0.71
Feed:gain (efficiency)	7.04	6.83	--	0.19
Final BW, lb	1230	1307	21.8	< 0.01

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- **Final Body weight was greater after finishing for cattle supplemented for a higher rate of winter gain**
- **Overall profitability was greater for the calves supplemented for greater winter gain regardless of DDGS pricing (80% of $3.00/bu corn vs. 110% of $7.00 bu/corn)**

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	DM, lb	As is, lb
WDGS	3.85	11
Oat hay	4.68	5.5
Trit silage	4.8	12
mineral	0.14	0.15
Total	13.5	28.7

Diet DM is 47%, provides 9.3 lb TDN and 2.1 lb CP

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How you choose to integrate livestock into a farming operation is entirely up to you and depends on your resources. Cows or yearling, one is not easier than the other, they just have different challenges. One advantage of cows is they are considered an asset that depreciates for tax purposes

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Using equipment for both farming and cattle production can spread out costs and depreciation

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Using bulls for both spring and fall herds spreads costs of bulls over two herds, makes bull management easier

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Years of Study[1]	Cropping System[2]	Crop	Grazed Yield	Ungrazed Yield	SEM	P value
93-95	Irrigated Corn-Soybean[3] Rotation	Soybeans	54.6667	55	3.3747	0.7418
93-95	Dryland Strip Cropping[4]	Soybeans	39.3333	42.6667	17.5431	0.8289
93-95	Dryland Strip Cropping[4]	Grain Sorghum	106.33	107	17.5431	0.8289
93-95	Dryland Strip Cropping[4]	Corn	184.67	174.67	17.5431	0.8289
93-95	Irrigated Continuous Corn[5]	Corn	185.33	181.67	27.3272	0.5766
96-11	Fall Grazed Corn-Soybean[6]	Soybeans	62.4	60.4	2.1056	0.001
96-11	Fall Grazed Corn-Soybean[6]	Corn	208.9	205.8	7.8359	0.1808
96-11	Spring Grazed Corn-Soybean[6]	Soybeans	61.7	60.4	2.0156	0.001
96-11	Spring Grazed Corn-Soybean[6]	Corn	207.2	205.8	7.8359	0.1808

[1] Starting and ending year that the study was conducted
[2] Type of cropping system that the field was managed in.
[3] Center pivot irrigation, corn residue grazed and soybean yields reflect impact of grazing on yields.
[4] This field was in a strip cropping study in a rotation where residue from all crops was grazed. Corn followed soybeans, grain sorghum followed corn, and soybeans followed grain sorghum.
[5] Was maintained in a continuous corn system.
[6] Fields are from linear move irrigation field and maintained in corn followed by soybean rotation for 14 years.

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Impact of Spring Corn Residue Grazing on Soil Physical Properties and Crop Yield

Table 1. Percentage of residue cover and surface roughness present after corn residue was not grazed (NG), grazed in the spring at a normal stocking density (NSD) or spring grazed using a high stocking density (HSD).

	NG	NSD	HSD	SEM	NG vs NSD	NSD vs HSD
Residue cover[1], %	87.9	37.7	17.7	2.8	<0.01	<0.01
Surface roughness[2], %	1.6	9.5	14.9	0.78	<0.01	<0.01

[1] Residue cover measured in year 2, 21-days post removal of calves.

[2] Surface roughness was measured using a 20-foot-long chain which decreased in length with increased surface roughness. It is expressed as the percent change in chain length.

Grabau et al. 2022 NE Beef Report

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spring at a normal stocking density (NSD) with 3 steers/acre for 45 days or at a high stocking density (HSD) with 9 calves/acre for 15 days.

Item	NG	NSD	HSD	SEM	*P*-value NG vs NSD	*P*-value NSD vs HSD
Bulk density, g/cm³						
21 days						
0–2 in	0.85	1.02	0.99	0.041	<0.01	0.45
2–4 in	1.16	1.25	1.25	0.028	<0.01	0.92
49 days						
0–2 in	0.88	1.01	1.02	0.036	<0.01	0.80
2–4 in	1.18	1.27	1.27	0.016	<0.01	0.86
Penetration resistance, MPa						
21 days						
0–2 in	0.50	1.53	1.64	0.12	<0.01	0.29
2–4 in	0.71	1.36	1.58	0.07	<0.01	0.02
49 days						
0–2 in	0.52	1.67	1.76	0.11	<0.01	0.37
2–4 in	0.73	1.45	1.64	0.12	<0.01	0.08
Moisture content, %						
21 days						
0–2 in	23.8	19.7	17.1	0.89	<0.01	<0.01
2–4 in	23.0	22.2	22.0	0.59	0.35	0.81
49 days						
0–2 in	25.2	19.5	18.0	0.86	<0.01	0.20
2–4 in	24.1	22.0	21.9	0.37	<0.01	0.78

[1] Cattle were pulled off treatments at the end of March. Soil samples were taken 21- and 49-days post removal of calves and were taken in rows in which no equipment had travelled.

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Table 3. Soybean emergence and yield when planted after corn residue was either not grazed (NG), grazed in early spring prior to soybean planting[1] at a normal stocking density (NSD) with 3 steers/acre for 45 days or at a high stocking density (HSD) with 9 calves/acre for 15 days.

Item	NG	NSD	HSD	SEM	NG vs NSD	NSD vs HSD
Emergence[2], plants/ac	102,311	107,340	109,267	3,754	0.34	0.70
Soybean yield, bu/ac	72.9	75.7	77.4	0.61	<0.01	0.06

[1] Cattle were pulled off treatments at the end of March and soybeans were planted approximately 30 days later.

[2]Emergence counts were taken 30 days post-planting.

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Conclusion

When stocking at the recommended rate, stocking density does not have major impacts on soil physical properties and subsequent crop yield. The results indicate that, regardless of stocking density, grazing corn residue in the spring may cause minor compaction; however, it is below the threshold to reduce the subsequent soybean yield. This study was conducted to create a worst-case scenario (grazing in muddy conditions) and yet there was still soybean yield improvement with grazing. Thus, producers should not be concerned about grazing cattle on residue in the spring causing compaction. However, winter grazing would still be considered ideal as there is less surface roughness to contend with at planting and less trampling loss of residue.

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Summary Points

Integrating crops and livestock increases diversity which mitigates some risk

Think outside the box to make the integration your own and what works for you, be open to change

Confinement feeding requires a balanced diet that is solely the responsibility of the manager

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Thank you!

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