COVER CROPS FOR COW CHOW

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- NDSU B.S. Crop and Weed Sciences, Minor Soil Science

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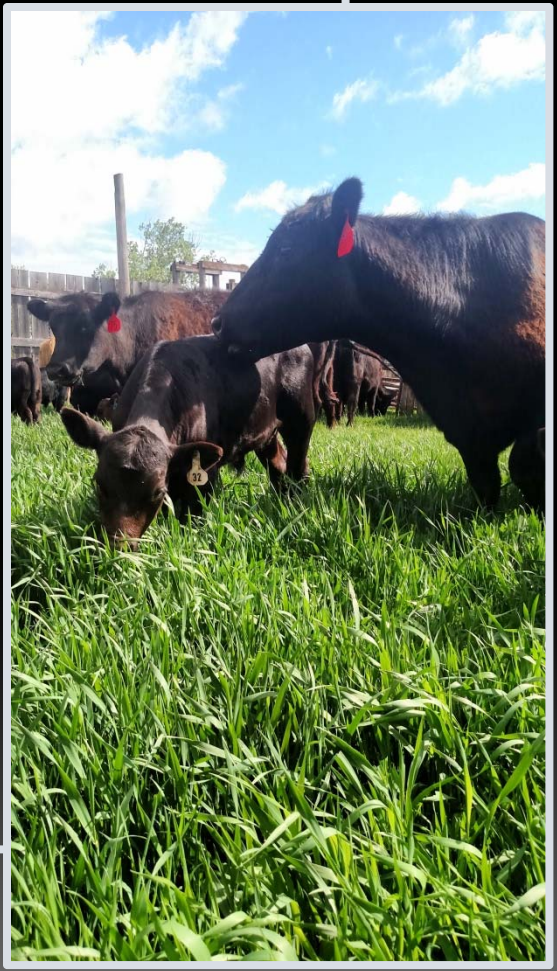
Why Are We Here?

- Is what we are doing working well?
- Losing less or building soil?
- It is in our minds, is it in our field?



Conservation/Regenerative Agriculture

1. Minimal soil disturbance
2. Cover crops
3. Diverse crop rotation
4. **Animal impact**

Animal Impact

- Cows - Pull, Trample, Tug, Tear
- Plant Roots – put more effort into repairing themselves and leak more root exudates
  - Pushes more carbon into the soil for microbial assistance
  - Accelerates soil building

Farm Overview

- Zero-till: wheat, canola, field peas
- Custom grazing and cow/calf operation
- Seven years of cover crops
  - Graze cattle in fall or spring
- Goals:
  - Capture carbon, build SOM
  - Provide forage for cattle
  - Improve fertility
  - Earn a profit

Soil Profile

Zero-till 2015

2012 Cover Crop

- Dual cropping after wheat harvest

Dual Crop

- Cash crop: HRSW seeded April 11th
  - Harvested July 29th
- Cover crop: radishes and turnips
  - August 2nd – Broadcasted seed at 2 lbs/acre and urea at 35 lbs/acre (16 lbs/acre actual N)
  - Harrowed twice to create seed to soil contact
  - Rained that evening
- Grazed from Sept 30 to Nov 3
  - 34 days

Growth on August 18th – 16 days

September 7th – 36 days

September 23rd – 52 days

October 14th – 14 days grazing

Residue to Cover Surface

Herd Split Into Two Groups

Cover Crop

- 12 Cow/calf pairs
- 10 Heifers
- No Supplements

Control Group

- 11 Cow/calf pairs
- 6 Bred Heifers
- Fed Hay

ADG Results

- Grazing period: 34 days
  - Sept 30 - Nov 3
  - 40 acres
  - 2.3 acres/pair

Cover Crop

- Steer Calves: 2.48 lbs/day
- Heifer Calves: 2.08 lbs/day
- Heifers: 1.27 lbs/day
- Cows: 1.59 lbs/day

Control Group

- Steer Calves: 1.78 lbs/day
- Heifer Calves: 2.30 lbs/day
- Bred Heifers: 3.91 lbs/day
- Cows: 4.06 lbs/day

  - Steers beginning weight: 537 lbs
  - Heifers beginning weight: 484 lbs

Field is Covered

- January 23, 2013

Increased Earthworm Activity

2013 Cover Crop

- 35 acres of breakout hayland
- N Building mix: Radish, Turnip, Pea, Lentil, Soybean, clover, millet, oats, sunflower
- July 19th – broadcasted seed at 30 lbs/acre
- Grazed from Sept 28 to November 10

August 2nd – 14 days

August 30th – 42 days

September 14th – 57 days

September 29th – 1 day grazing

Soil is Covered – End of Grazing

Results

- 20 Steers beginning weight 790 lbs
  - Grazing period: 43 days (Sept 28 – Nov 10)
  - 35 acres
  - 1.75 acres/hd
- ADG: 2.18 lbs/day
- RFV 163.28

RFV

Analyses (%)	10/1/2013
Moisture, %	5.85
Dry Matter, 100 C, %	94.15
Ash, %	18.32
Crude Protein, %	11.20
Acid Detergent Fiber, %	26.11
Neutral Detergent Fiber , %	42.05
Calclum, %	1.7598
Phosphorus, %	0.1868
RFV (Relative Feed Value)	163.28

2014 Cover Crop

- Same 35 acres as previous year
- Radish, Sudan grass, Sunn hemp
- July 6 – Drilled seed 1” deep at 20 lbs/acre
- Grazed from September 8th to Oct 18th
- RFV 121.36

Establishment – July 6th

July 31st – 25 Days

August 8th – 33 Days

Sept 8th – Start of Grazing – 64 Days

October 5th – 27 Days Grazing

End of Grazing – Nov 16th

ADG Results

- 53 Steers and 35 Heifers
  - Grazing period: 41 days (Sept 8 – Oct 18)
  - 35 acres
  - 0.4 acres/hd
- Steers: 1.45 lbs/day
  - beginning weight: 634 lbs
- Heifers: 1.50 lbs/day
  - beginning weight: 696 lbs
- RFV: 121.36
- **Produced 2.75 Tons Dry Matter/acre**
- ADG: 0.80 lbs/day on native pasture during summer

RFV

Analyses (%)	10/8/2014
Moisture, % (as-is)	85.80
Dry Matter, 60 C, %	14.20
Dry Matter, 100 C, %	95.99
Ash, %	13.65
Crude Protein, %	9.71
Acid Detergent Fiber, %	33.07
Neutral Detergent Fiber , %	53.83
Calcium, %	0.9718
Phosphorus, %	0.2217
RFV (Relative Feed Value)	121.36

2015 Full Season Cover Crop

- Full Season Cover Crop
- Planted May 5th
- Turnip, Sugarbeet, Forage Barley, Forage Pea, Millet
- No-till seeded

June 16th

July 13th

4-legged Cover Crop Choppers

- 135 HD on 40 acres
- Grazed July 31- Aug 23
  - 24 Days
- Consumed 1.7 Acres/Day

Soil Remains Covered

- Seeded into undisturbed residue following grazing

May 28, 2017

- Native pasture intensive grazing

May 29, 2017

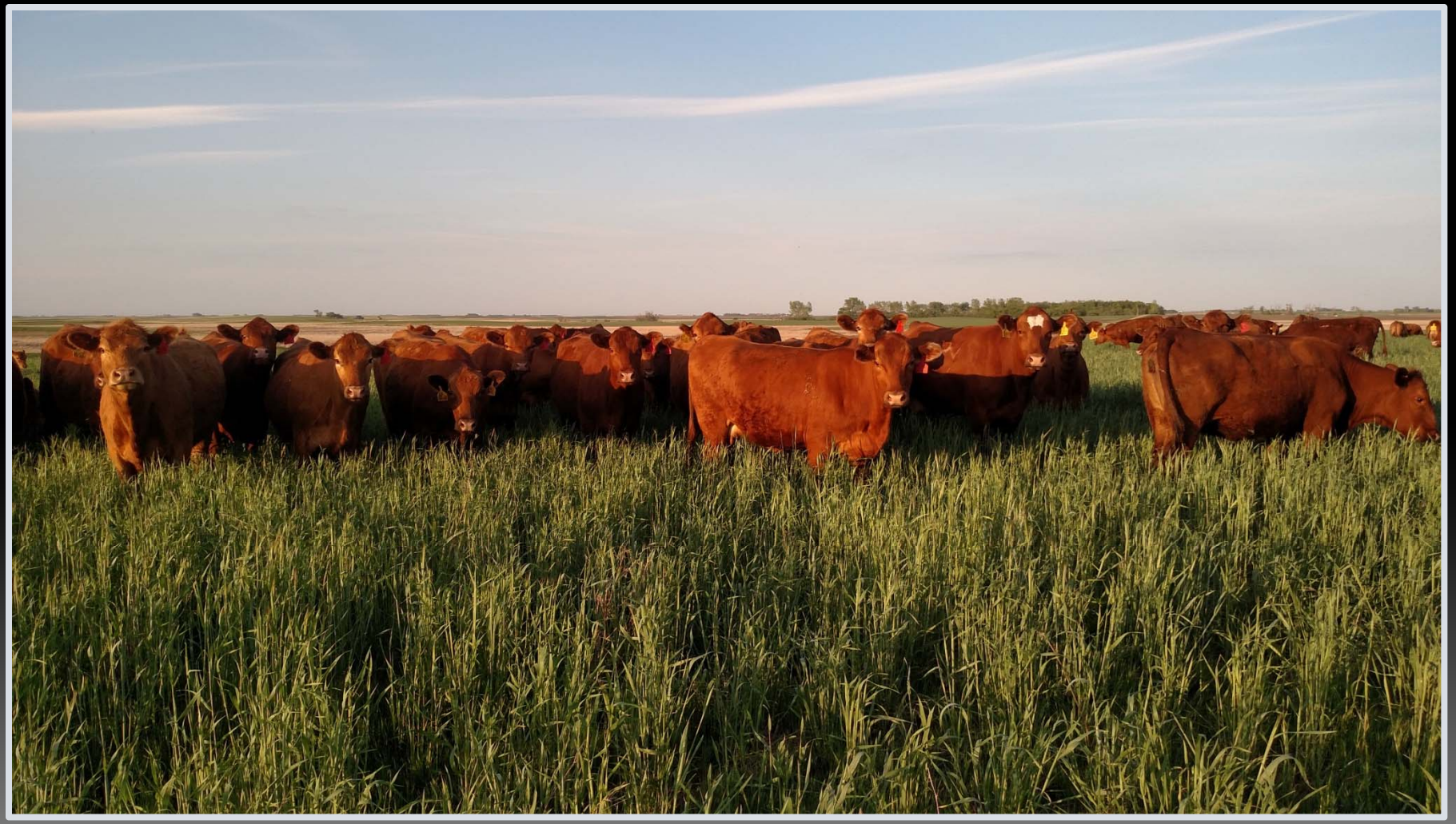
- Following day

August 5, 2017

- Regrowth after about two months

May 31, 2017

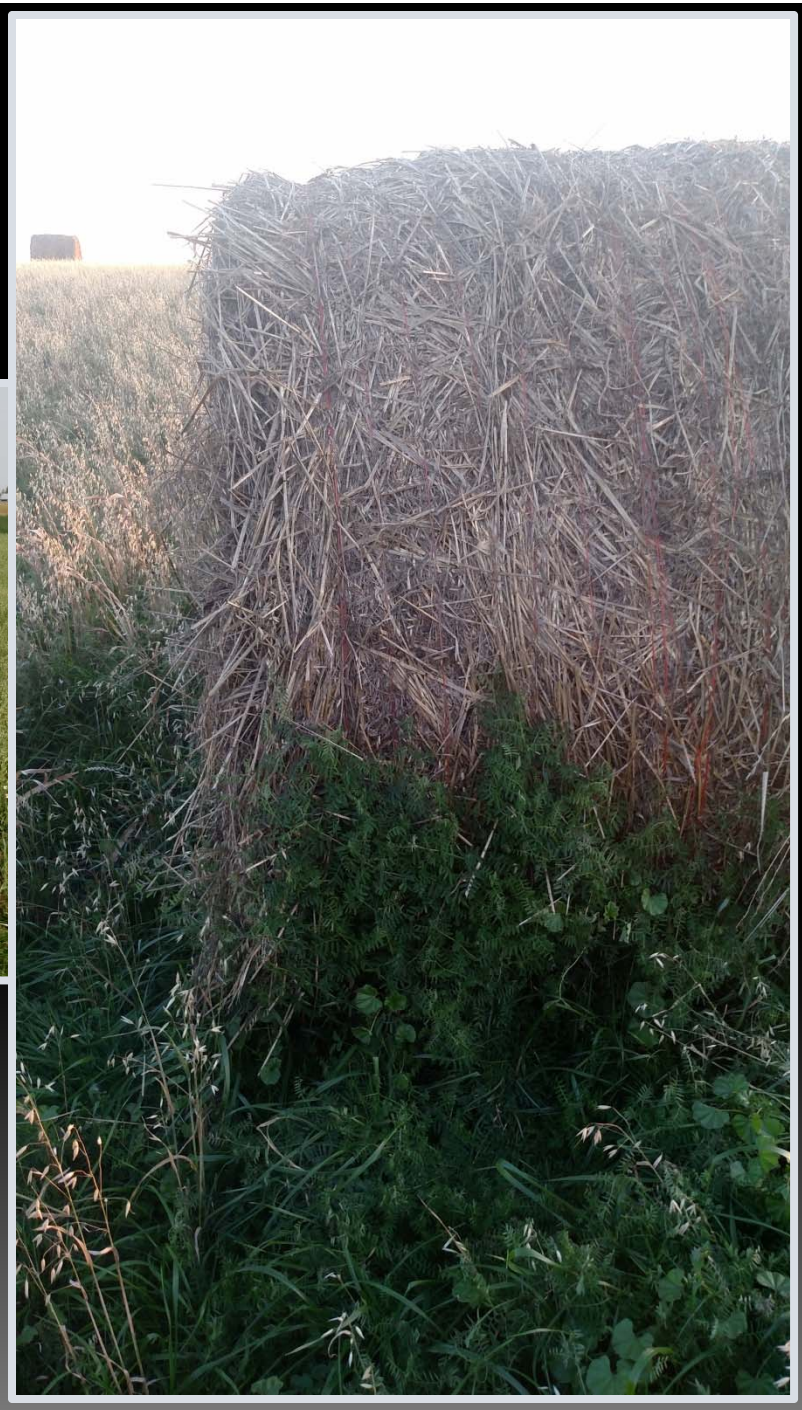
- Spring grazing winter rye



August 24, 2017

- Forage crop seeded into rye residue

Fall Regrowth



Cover Crop Analysis	2017
Moisture	14.0%
Dry Matter	86.0%
Crude Protein	12.5%
ADF	34.2%
aNDF	46.9%
TDN	58.1%
RFV	123.57
RFQ	136.83

October 7, 2017

October 16, 2017

Build the Right Herd

- Forage-based
- Smaller frame + rapid growth = more efficient

Calving Pen For Spring 2018

- Rye seeded Oct 2nd into pea stubble
- Calving to start May 5th

Soil

Health

Improvement

Tools

Soil Benefits

Soil Benefits

Soil Benefits

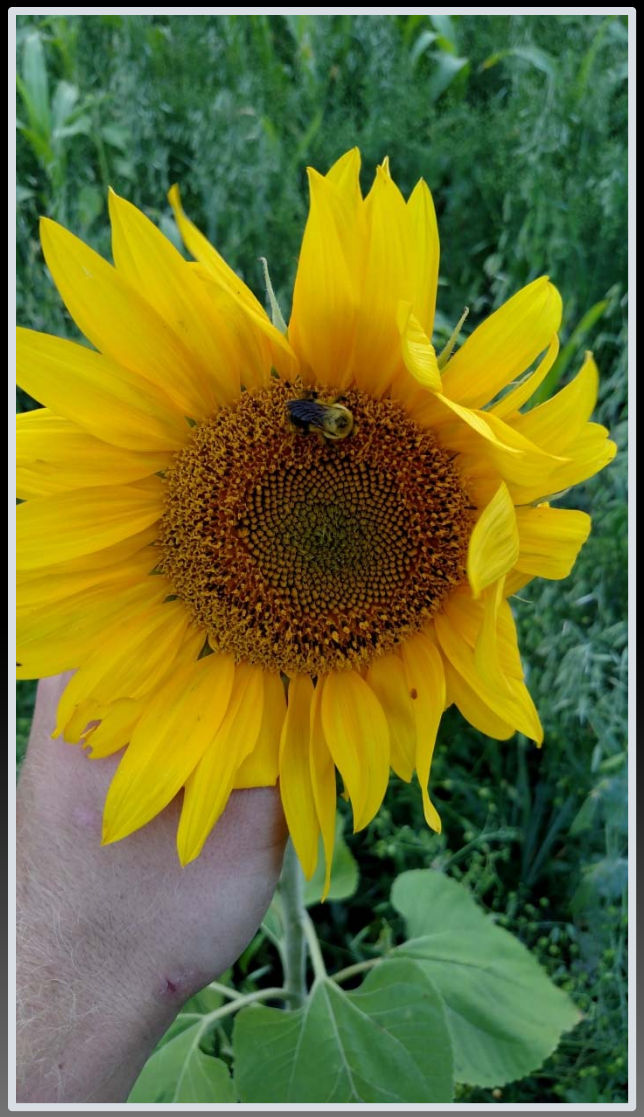
Soil Benefits

Underground Herd

Building Soil

% Soil Organic Matter			
	2014	2015	2017
Field 1	3.7	3.7	4.0
Field 2	3.8	3.6	4.1
Field 3	5.0	5.7	5.3

Managing Ecosystems, Not Fields



Considerations

- Moisture
- Equipment
- Termination (seed production)
- Toxins in forage
- Insects
- Disease
- Fencing
- Herbicide history
- Residue Breakdown
- Insurance
- Cost

Fencing

Fence Alarm

Portable Water

Hauling Water

CC Recommendations

- 1 Grass, 1 brassica, 1 legume in a cover crop mix
  - Start small, keep it simple
- Plant 50% legumes in mix if trying to achieve N fixation
  - Make sure to inoculate legumes
- Radish and turnip are frost tolerant – survive down to 16° F
- Don’t plant only radish and turnip

Grazing Recommendations

- Cattle will acclimate to cover crop
- Diversity prevents upset stomach/bloat
  - Plant less than 35% brassicas in mix
- Graze about 45-50 days after planting for best weight gain
- Grazing calves has been most profitable
- Planting after Aug 15 should eliminate seed production (North Dakota)

What I have Learned

- Start grazing earlier rather than later
- Leave more residue than you think you can handle – its not going to waste
- Cut back on recommended seeding rates
- Add more animal impact

Where to Plant

- After small grains harvest is most economical
- Inter-seeding
- Fly rye onto corn
- After corn silage
- Prevent Plant ground
- After hay crop
- CRP breakout
- Anywhere there is space

Summary

- We are decision makers
- It's not about perfection, its about direction
- You don't have to believe in what I do, but believe in why I am doing it
- Treat problems rather than symptoms

No piece of steel can benefit the soil like the roots of a good cover crop.

Questions for Me?

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Cost Of Gain – Dual Radish/Turnip

- Cover Crop

Expense	$/acre	40 acres		Total lbs gained	lbs
Seed	$ 11.00	$ 440.00		Cows	649
Broadcast seed	$ 8.00	$ 320.00		Heifers	263
Harrowing	$ 4.00	$ 160.00		Yearling steers	506
Urea	$ -	$ -		Yearling heifers	424
Land rent	$ -	$ -		**Total**	**1842**
Labor	$ -	$ -			
Total	**$ 23.00**	**$ 920.00**		**Cost of Gain $/lb**	**$ 0.50**

- Feedlot – Hay

Expense			Total lbs. gained	lbs.
Feed	$ 1,200.00		Cows	1518
($50/1400 lb. bale)			Bred Heifers	798
Manure handling	$ 100.00		Yearling steers	424
Fuel	$ 100.00		Yearling heifers	313
Labor	$ -		**Total**	**3053**
Total	$ 1,400.00		**Cost of Gain $/lb.**	**$ 0.46**

Cost Of Gain – N Mix

Expense	$/acre	35 acres
Seed	$ 20.00	$ 700.00
Broadcast seed	$ 9.00	$ 315.00
Harrowing	$ 2.50	$ 87.50
Urea	$ -	$ -
Land rent	$ -	$ -
Labor	$ -	$ -
Total	**$ 31.50**	**$ 1,102.50**

Total lbs. gained	lbs.
Steers	1875
Total	**1875**
Cost of Gain $/lb	**$ 0.59**

- Nitrogen credit not included

Cost Of Gain – Sudan/Radishes

Expense	**$/acre**	**35 acres**		**Total lbs gained**	**lbs**
Seed	$ 30.00	$1,050.00		Steers	3151
Custom seeding	$ 15.00	$ 525.00		Heifers	2258
Hay	$ -	$1,470.00			
($42/1150 lb. bale)					
Fuel	$ 2.85	$ 100.00			
Land rent	$ -	$ -		**Total**	**5408**
Labor	$ -	$ -			
Total	**$ 47.85**	**$3,145.00**		**Cost of Gain $/lb**	**$ 0.58**

Full Season Cover Crop

Full Season Cover Crop 2015		
Summer and fall grazed		
	$/Acre	**Total**
Acres	1	40
Land rent	$ 40.00	$ 1,600.00
Seed	$ 28.00	$ 1,120.00
Custom App	$ 16.00	$ 640.00
Fertilizer	$ -	$ -
Tillage	$ -	$ -
Herbicide	$ -	$ -
Fencing	$ -	$ -
Labor	$ -	$ -
Total	$ 84.00	$ 3,360.00

Cost of Gain	
2	ADG LBS/day
31	Days
135	HD
8370	LBS Gained
1.3	Acres/day
$ 0.40	**COG/LB**

- Produce more biomass
- Legumes fixing Nitrogen

COG

Cover Crop Input	
$/acre	
$ 13.00	Seed
$ 5.00	Application & Fuel
$ -	Labor
276	Acres
$4,968.00	Total

Cost of Gain	
1.75	ADG LBS/day
45	Days
135	HD
10631	LBS Gained
6.1	Acres/day
$ 0.47	COG/LB

Feeding Hay Input	
600	Beginning weight (LBS)
2.75	% body weight consumed
16.5	LBS DM consumed/day
135	HD
45	Days
100238	LBS DM consumed
1400	LBS DM/bale
88	bales
$ 38.00	$/bale
$ -	Fuel, Labor, Manure etc.
$ 3,325.34	Total

Cost of Gain	
1.25	ADG LBS/day
135	HD
45	Days
7594	Total LBS gained
$ 0.44	COG/LB