Sorghum/Soybean Forage Mixture - Is It a Good Alternative to Corn Silage in the Northeast?

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We are full-time farmers with a 600 ewe commercial sheep flock utilizing rotational grazing. We have a 275 acre farm with 140 tillable acres and the majority of the balance in pasture. Since our soils are highly erodable, most of our tillable land is in a strip-crop system with sizes varying from 2 acres to 6 acres in size. We produce all of the forage necessary for our livestock and are looking for a good alternative to corn in our annual crop/alfalfa rotations that will reduce erosion and have good yield potential.

We have a relatively short growing season for annual crops in the northeast. We have wet springs and falls which make it hard to get corn planted early in the spring, equally difficult to get it harvested in the fall, and almost impossible to get a reasonable cover crop established after harvest. Sorghum/Soybean forage mixtures have been introduced as an alternative annual forage crop to corn. Forage quantity and quality are of major importance to livestock farmers but we need to look at alternatives that will reduce erosion, reduce dependence on herbicides, and still maintain adequate production and forage quality. Sorghum/Soybean forage mixtures can be seeded as late as July 1, are seeded in narrow rows (grain drill), do not need herbicides, and can easily be followed with a fall cover crop.

The soils on our farm were formed from glacial deposits over limestone bedrock. In many places on our farm the bedrock forms ledges that stick out of the soil or the soil is so shallow that the tillage implements ride right out of the ground as you pass over a ledge. This has made us very aware of the effects of erosion. The soils in the strips used were primarily Wassaic silt loam (3 to 8 % slopes), Nellis loam (3 to 8 % slopes), Farmington silt loam (3 to 8 % slopes), and Lansing silt loam (3 to 8 % slopes). These soil types are very similar agriculturally except for the distance to bedrock. The areas that are shallow to bedrock are generally wet in the early spring and tend to be drouthy in the summer.

The strips used in this project were all "second year" fields. Each was in sod in1992 that was plowed in the spring of 1993 for a crop of corn silage. Manure was applied in the winter of 1993/1994 to all of the strips. None of the strips had a cover crop for the winter of 1993/1994. These conditions also apply for neighbor's strips of corn used as a comparison to the sorghum/soybeans.

Cultural Practices of Sorghum/Soybean Forage Mixture

Five strips were chosen to be planted to "Sweet Double SS" forage mixture marketed by SeedWay of Hall, NY. Soil samples were taken from each of the strips on April 24, 1994 and sent to the Cornell Nutrient Analysis Laboratories (results on page 9). Sheep manure had been applied the previous fall at about 20 Tons per acre. On June 3 fertilizer was applied using a rented bulk spreader at the rate of 110 pounds (18-18-18) per acre to arrive at an application of 20-20-20 per acre. In the afternoon all the strips were chisel plowed to incorporate the fertilizer. On June 4, 1994 all five strips were disced. Each strip had stones picked by hand into a front end loader and removed from the field since it would be mowed later. Then they were disced lightly to remove tire tracks and smooth the soil. Drilling was done with a conventional grain drill and then followed by a roller-packer to firm the seedbed. Stone picking, final tillage, and planting were done on a strip by strip basis to fit between showers so exact dates can be determined from the chart on page 10. Strips 12E and 12G were rolled twice by hooking the roller-packer to the rear of the discs after stone picking and prior to drilling. This seemed to affect germination as these two strips germinated in 6 days while the other three strips took 8 days to germinate.

Growth was monitored by measuring the height of the crop periodically during the summer. These measurements are on page 10. The sorghum started to head out on August 8, 1994, 55 days after germination. Some lodging of the crop also began around this time. I began mowing the crop on August 16, 1994 (strip 14D) with a "disc mower". On August 17, 1994 a major "tropical storm" passed by and dumped 2.6" of rain on us in 12 hours followed by .8" of rain in 6 hours on August 21, 1994. On August 22 mowing resumed but a major breakdown on the disc mower forced me to finish mowing the crop with a NH 489 haybine. To reduce the amount of crop in each swath I crowded the previous swath of forage and was able to reduce the amount mown to only 7 feet at a time. The mower was set to lay a 5' swath of forage so the 6' pickup head of the chopper would be able to pick it up but still allow maximum wilting. Mowing was finished on August 26, 1994. I only mowed one strip per day to try to have the proper amount of forage at the right dry matter for one person to chop each day. Forage chopping was started on August 26,1994 and finished on September 4, 1994.

Winter Rye was established on the Sorghum/Soybean strips during the last week of September with a three point hitch mounted broadcast spreader (2 bushels per acre). Two of the strips were disced once before broadcasting while the other three had no preparation. It rained the next day and the seed germinated the day after the rain. Within

four weeks the strips were covered 100% by the herbage and will provide excellent erosion control and some early spring grazing.

Sorghum/Soybean Measurements

After the strips were opened up with the mower, representative areas were sampled to determine yields of the crop. On August 22, 1994 four sample areas were chosen for each strip. At each site an area 28" by 9' 4" (1/2000 of an acre) was harvested by hand and weighed on a hanging spring scale (see page 12). A fresh forage sample was taken at this time to determine the moisture level of the unwilted forage to be used in determining the actual dry matter yield and two wilted samples were taken before being blown into the silo to determine moisture after wilting and quality of the forage as it was being ensiled.

Cultural Practices of Corn Crop

We used the corn grown by two of our neighbors for our comparison since we did not grow any corn ourselves this year. Each neighbor has a different philosophy on corn growing which can be noticed by the different level of inputs involved. The farmers will be identified as "Farmer 1" and "Farmer 2" in the text.

Both Farmer 1 and Farmer 2 spread 20 to 30 Tons of manure per acre during the winter, used moldboard plows in the spring, disced each field twice, and used spring tooth harrows before planting with a four row planter.

- Farmer 1 planted Dekalb 522 (100 day maturity) on June 6, 1994 at 37,000 seeds per acre with 100 pounds of 19-19-19 fertilizer through the planter followed by one cultivation the second week of July, 1994. Farmer 1 harvested his corn on October 30, 1994.
- Farmer 2 planted Dekalb 524 (100 day maturity) on May 31, 1994 at 29,000 seeds per acre with 350 pounds of 10-20-20 fertilizer through the planter followed by spraying with .4 gallons/acre of Aatrex 4L and .2 gallons/acre of Dual 8E on June 9, 1994. Farmer 2 followed this with 210 pounds/acre of urea through a sidedresser that cultivates and incorporates the urea at a depth of 4" on July 4, 1994. Farmer 2 harvested his corn on October 23, 1994.

Corn Crop Measurements

On the day that farmer 1 and farmer 2 were chopping the fields that were selected for this project I measured the yields by cutting three samples (17' 5" long by 30" row spacing; 1/1000 of an acre) from each strip, weighing and averaging them to arrive at the tonnage

of chopped material per acre (see page12). A fresh forage sample was taken before being blown into the silo and sent to the CH Mitchell Forage Lab to determine nutrient analysis and arrive at the moisture content of the material. The number of plants in the sample area was counted and used to determine the population per acre.

All of the machinery work was figured based on using my tractors and equipment to keep the fuel consumption and relative costs for both crops on an equal basis. The purpose of this paper was not to compare the relative efficiencies between Case, Ford, and International tractors. The three tractors used in this study were a 1975 Case 970 (401 Cubic Inch, 6 cylinder diesel, 95 Horsepower) with a 12 speed powershift transmission, a 1978 Case/ David Brown 1410 (219 Cubic Inch, 4 cylinder turbocharged diesel, 85 Horsepower) with a 12 speed synchromesh transmission, and a 1968 David Brown 1200 (219 Cubic Inch, 4 cylinder diesel, 65 horsepower). The Case 970 is used for all tillage operations and chopping the forage. The David Brown 1200 is used at the blower. The Case 1410 is used for all other operations.

The equipment used for this project is listed on page 11 and is all older equipment. Moldboard plowing was done with International 4 bottom 18" spring reset plows to a depth of 8". Chisel Plowing was done with a set of Massey Ferguson 9 shank chisel plows with straight shanks to a depth of 6". Implements were pulled at speeds as close to capacity as possible without damaging the piece of equipment or the tractor. Mowing of the Sorghum/Soybean forage was not done at capacity of the 9' mower because I was trying to reduce the volume of forage that would be fed into the throat of the chopper. The chopper used was a NH 770 with a six foot pickup head and a two row corn head. A field efficiency of 70% was used to account for tire slippage, turning of the implements at the end of the strips, and overlap of the previous path of the implement. The costs per ton of forage were figured up until the time the forage was chopped into the wagons in the field. The chart does not include hauling the wagons to the silo and blowing the forage into the silo since the number of wagon loads per acre was the same for each crop and the Sorghum/Soybean forage blows just as easily as corn.

Observations on the Harvest of Sorghum/Soybean Forage

This crop exhibits very fast growth under the warm wet conditions we had this year. It crowded out any weeds in the strips and there were plenty elsewhere. The strip next to 14D had a new seeding of alfalfa/timothy with a companion crop of Field Peas and Oats. This seeding was the weediest seeding I have seen in years with Redroot Pigweed and

Lambsquarters 3' tall throughout the seeding. It was hard to tell what crop was under the weeds and yet the Sorghum/Soybeans in 14D appeared weed free.

We have planted Sorghum/Soybean mixtures for three years now (1992, 1993, 1994) on a small scale (6 to 12 acres) and have had mixed results. In 1992 we planted about 10 acres to Sorghum/Soybeans during the second week of July after first cutting hay was baled in June. This was a very cool, wet year and the crop grew very slowly reaching a height of about three feet by the first frost in the fall. Forage quality was excellent but the yield of DM was very disappointing. In 1993 we planted about 6 acres in mid-June to try to increase the yield potential of the crop. We had a severe thunderstorm in early August that flattened almost the entire 6 acres in less than fifteen minutes. To salvage the crop it was mowed with a NH 495 haybine which has a pair of offset reels that effectively lifted the crop off the ground enough to mow it but since this is a twelve foot mower my chopper could not handle the crop so a larger chopper had to be borrowed to finish the job. The yield was much better in this year and the forage quality was satisfactory.

In this year's study we were very surprised when we noticed that the Sorghum was beginning to head out on August 8, 1994 since the advertising associated with this product claims a 60-100 day harvest window and the forage quality is supposed to be highest if harvested before heading! This was only 55 days from germination and 63 days from planting. The crop also began to lodge at this time. Areas as large as 50' by 100' would be flat to the ground and the mower was completely unable to pick up any of the lodged crop. The prediction of a "tropical storm" coming along with the tendency of this crop to lodge was what prompted me to begin mowing on August 16, 1994. I mowed strip 14D because it was the only one beginning to head out and it was the tallest. The other strips only had minor areas that lodged during the storm but by having strip 14D laying in swaths on the ground it soaked up a lot of water and was not chopped until September 3, 1994 after 18 days of "wilting". Upon removing the forage from strip 14D from the silo in early March, 1995 the forage has a musty smell and is a dark brown instead of the ordinary sweet smelling light greenish-brown appearance of the rest of the crop.

Wilting of this crop appears to be very slow in late August and early September. I began chopping the first strip after 4 days of wilting and the crop seemed very wet. The next day I sent a fresh chopped forage sample to the CH Mitchell Lab and it came back at 79% moisture. The last strip I chopped had wilted for 9 days and its moisture level was still at 76% when I sent a sample in. This was without any rain showers on the strips but there

was a heavy dew each day that did not burn off until close to noon. As a comparison, after I finished the Sorghum/Soybean chopping, I went on to chopping my second cutting haylage. Alfalfa/grass that was mowed in the morning could be chopped the following afternoon (about 26-28 hours of wilting) and obtain a moisture content in the forage of 62% to 64%. Silage effluent "ran" out of the silo for a period of 5 weeks after ensiling the Sorghum/Soybean forage.

I own a 12' Haybine for harvesting my alfalfa and grass haylage but I realized that I would not be able to feed a twelve foot swath of a crop that was 90" tall through the throat of my chopper so I borrowed a 9' International disc mower. I broke this mower on the second day after mowing 1½ strips by hitting a stone and it had to be sent out for repairs. To finish the mowing I borrowed a 9' NH Haybine and didn't break even a knife section on the rest of the mowing. The NH Haybine took far less horsepower to operate and laid the crop in a much more even swath than the disc mower. This was evident when I went to chop the strips because I was unable to chop the 1½ strips mowed with the disc mower with my forage chopper. Every time I would move into the crop mowed by the disc mower my chopper would plug and break its shear bolts in these strips. To solve this problem I borrowed a larger chopper with a larger throat from my neighbor which was able to chop the material using the lowest gear that his tractor had. It appears that the disc mower had left small bunches of material in the swath at intervals of about twenty feet and every time my chopper hit one of these it would plug up the throat and break a shear bolt. When the larger chopper hit one of these bunches it had enough reserve capacity that it did not plug but it would slow the tractor engine down from 2100 RPM to1700 RPM. On the strips mowed by the NH 489, even after being careful to only mow 7' in each swath, the forage chopped very hard. It was all my tractor and chopper could do to chop in first gear and I was able to fill a 14' silage wagon in one trip around the strip. If there had been any hills involved the tractor would not have had enough horsepower to chop the forage and climb the hill at the same time. This would be a very important consideration for any one with equipment equal to or smaller than mine.

Another major concern with Sorghum/Soybeans is the variability of the forage quality (forage analysis included on page 13). In previous years we have had very good levels of Crude Protein and TDN with acceptable levels of ADF and NDF but this year's samples were very low on Crude Protein and had very high levels of ADF and NDF. These levels were so poor that instead of using it as a lactation feed, as was intended, we will be feeding it mostly to dry ewes. The levels of Potassium must also be watched carefully.

Last year we had a case that appeared to be milk fever in a ewe that was two weeks pre-lambing that was probably caused by the mineral imbalance when the Potassium level reached 3.09%. The possibility of more cases like this was averted by a quick call to our veterinarian and feed company nutritionist to make a new mineral mix to balance this problem. This year's Potassium levels are more in line with those of corn silage but are still high enough to cause some concern in late gestation animals.

By using the corn silage of my two neighbors as controls we have demonstrated a premise that was not even considered in the scope of this grant proposal. Lowering inputs while maintaining yields can have a very large effect on the cost of the product (see pages 14, 15, and 16). The yields of DM, TDN, and CP were very close between each crop sampled but the low input corn of Farmer 1 yielded the highest tonnage of DM and TDN and was second highest in tons of CP per acre. By keeping his costs down while maintaining yields he also had the lowest cost per ton of DM, TDN, and CP. In contrast, the corn of Farmer 2 was twice as expensive as the corn of Farmer 1 for DM, TDN, and CP. The costs per ton of Sorghum/Soybean silage were very comparable to the corn of Farmer 1 but the possibility of low palatability of the Sorghum/Soybean silage due to the high NDF and ADF values concerns me. With the establishment of a cover crop on the Sorghum/Soybean strips there is an added benefit of reduced erosion and early spring grazing that will not be obtained on the corn strips.

In summary, we realized most of the goals we were seeking in this project. The Sorghum/Soybean crop yielded DM tonnage comparable to corn silage at a reasonable cost, without the use of herbicides, and was harvested early enough to easily be followed by a cover crop to further reduce erosion. On the negative side, the quality of the forage was not what we had hoped for and for a farmer with rocky soil types it is a lot harder to pick all of the stone on your acres planted to annual crops well enough to mow with a mower than it is to prepare a field to be harvested by a high running row crop head.

When people talk to me about Sorghum/Soybeans the question "will you grow it again next year?" always comes up. The answer is yes, with some changes. We will harvest it at a shorter height to try to improve forage quality and sacrifice some of the potential yield. This will also make it easier to chop. Less fertilizer will be applied (especially nitrogen) to try to slow down the fast growth of the crop. Lower seeding rates will be experimented with to see of we can reduce the cost per acre without reducing yields.

Soil Test Results

of the Five Strips Planted to Sorghum/Soybeans

Strip ID #	12A	12C	12E	12G	14D
pH	6.4	6.1	6.4	6.4	6.7
P (#/A)	5	10	15	18	62
K (#/A)	70	135	165	195	415
Mg (#/A)	260	350	460	510	585
Ca (#/A)	3530	2650	3230	2870	3700
Al (#/A)	52	62	30	33	16
Fe (#/A)	1	1	1	1	1
Mn (#/A)	21	34	26	29	36
Zn (#/A)	0.6	1	1	1.1	3
ORGANIC MATTER %	3.4	3.2	3.6	3.8	4.2
NITRATE (#/A)	21	19	20	24	31

Soil samples were taken on April 24, 1994.

Sorghum/Soybean Tillage and Planting Dates

	12A	12C	12E	12G	14D
Fertilize	6/3/94	6/3/94	6/3/94	6/3/94	6/3/94
Chisel Plow	6/3/94	6/3/94	6/3/94	6/3/94	6/3/94
Disc	6/4/94	6/4/94	6/4/94	6/4/94	6/4/94
Pick Stones	6/8/94	6/8/94	6/21/94	6/21/94	6/6/94
Disc	6/8/94	6/8/94	6/21/94	6/21/94	6/6/94
Drill	6/8/94	6/8/94	6/21/94	6/21/94	6/6/94
Pack	6/9/94	6/9/94	6/21/94	6/21/94	6/6/94
Germinate	6/16/94	6/16/94	6/22/94	6/22/94	6/14/94

Sorghum/Soybean Overall Height Measurements

	12A	12C	12E	12G	14D
July 13, 1994	20 inches	20 inches	6 inches	6 inches	30 inches
July 27, 1994	66 inches	68 inches	36 inches	37 inches	76 inches
August 15, 1994	85 inches	88 inches	67 inches	69 inches	90 inches
Started Heading	8/16/94	8/16/94	8/24/94	8/24/94	8/8/94

Plant height was measured at three locations per strip and averaged.

Soybean height was 3 inches less than sorghum on July 13.

Soybean height was 28 inches less than sorghum on July 27.

Soybean height was 36 inches less than sorghum on August 15.

The difference in height of soybeans in strips 12E and 12G was 0", 6" less than sorghum, and 24" less.

Machinery Size and Efficiency

IMPLEMENT	Width feet	Ground Speed MPH	Fuel Consumption Gal./Hour	Acres/Hour	Acres/Hour at 70% efficiency	Gallons/Acre	$/Acre
Moldboard Plow	6	3.2	3.6	2.33	1.63	2.21	$2.06
Chisel Plow	10	5.3	3.2	6.42	4.50	0.71	$0.66
Disc Harrow	13	5.3	3.2	8.35	5.85	0.55	$0.51
Springtooth Harrow	18	6.5	3.2	14.18	9.93	0.32	$0.30
Grain Drill	9	3.5	1	3.82	2.67	0.37	$0.35
Roller - Packer	10	6.5	1	7.88	5.52	0.18	$0.17
Mower	7	2.5	1	2.12	1.48	0.67	$0.63
Corn Planter	10	3.5	1	4.24	2.97	0.34	$0.31
Side Dresser	10	3.5	1	4.24	2.97	0.34	$0.31
Cultivator	10	3.5	1	4.24	2.97	0.34	$0.31
Sprayer	30	3.5	1	12.73	8.91	0.11	$0.10
Two Row Chopper	5	2.6	3.2	1.58	1.10	2.90	$2.70
Pickup Head Chopper	7	1.9	3.2	1.61	1.13	2.84	$2.64

Fuel Consumption is based on which tractor was used to pull the implement.

Acres/Hour is based on Ground Speed and operating Width of the implement.

Acres/Hour at 70% efficiency accounts for wheel slip, turning at headlands, and overlap of each pass.

Gallons/Acre is determined by dividing Fuel Consumption per Hour by Acres/Hour at 70% efficiency.

$/Acre is determined by multiplying $.93 per gallon of diesel fuel by Gallons/Acre.

Diesel Fuel Use in Dollars per Acre for Each Crop

	$/Acre	SS Silage		Farmer #1 Corn Silage		Farmer #2 Corn Silage	
		Passes	Value	Passes	Value	Passes	Value
Moldboard Plow	$2.06	0	$0.00	1	$2.06	1	$2.06
Chisel Plow	$0.66	1	$0.66	0	$0.00	0	$0.00
Disc Harrow	$0.51	2	$1.02	2	$1.02	2	$1.02
Springtooth Harrow	$0.30	0	$0.00	2	$0.60	1	$0.30
Grain Drill	$0.35	1	$0.35	0	$0.00	0	$0.00
Packer - Roller	$0.17	1	$0.17	0	$0.00	0	$0.00
Mower	$0.63	1	$0.63	0	$0.00	0	$0.00
Corn Planter	$0.31	0	$0.00	1	$0.31	1	$0.31
Side Dresser	$0.31	0	$0.00	0	$0.00	1	$0.31
Cultivator	$0.31	0	$0.00	1	$0.31	0	$0.00
Sprayer	$0.10	0	$0.00	0	$0.00	1	$0.10
Two Row Chopper	$2.70	0	$0.00	1	$2.70	1	$2.70
Pickup Head Chopper	$2.64	1	$2.64	0	$0.00	0	$0.00
		Total=	$5.46	Total=	$7.00	Total=	$6.80

"Passes" is the number of times that particular operation was performed for that particular crop.

"Value" is the value of the diesel fuel used for that particular operation based on the number of "passes" performed.

"Total" is the total value of diesel fuel used for that crop.

Yields of Corn and Sorghum/Soybeans

	Farmer 1 Strip 1		Farmer 1 Strip 2		Farmer 2 Strip 3		SS Strip 12A	SS Strip 12C	SS Strip 12E	SS Strip 12G	SS Strip 14D
Sample #	Weight pounds	# of Plants	Weight pounds	# of Plants	Weight pounds	# of Plants	Weight pounds	Weight pounds	Weight pounds	Weight pounds	Weight pounds
1	35	29	31	28	39	24	24	43	39	31	34
2	36	30	32	32	32	23	29	28	43	24	32
3	39	35	33	34	36	24	27	23	28	37	35
4	37	31	32	33	36	25	35	29	35	30	34
Avg. Weight	36.75		32		35.75		28.75	30.75	36.25	30.5	33.75
Corn Population		31,250		31,750		24,000					
Tons/Acre	18.38		16.00		17.88		28.75	30.75	36.25	30.50	33.75
% DM	43.3		43.3		39.0		20.7	20.7	20.7	20.7	20.7
DM Tons/Acre	7.96		6.93		6.97		5.95	6.37	7.50	6.31	6.99
TDN Tons/Acre	5.35		4.66		5.01		3.74	4.00	4.71	3.96	4.39
CP Tons/Acre	0.66		0.58		0.64		0.46	0.49	0.58	0.49	0.54

Four samples were harvested by hand for each strip and then an average weight determined.

Sample size for the corn strips was 1/1000 of an acre so Tons/Acre is equal to Avg. Weight divided by 2.

Sample size for the Sorghum/Soybean strips was 1/2000 of an acre so Tons/Acre is equal to Avg.Weight.

% DM was determined by forage analysis at the time of chopping.

DM Tons/Acre is equal to Tons/Acre multiplied by % DM.

Forage Analysis

	SS 8/25/94	SS 8/30/94	SS 9/6/94	CORN Farmer 1	CORN Farmer 2	SS 11/25/92	SS 12/17/93	SS 1/14/94
MOISTURE	81.7	79.3	76.2	56.7	61.0	66.9	74.0	69.9
DRY MATTER	18.3	20.7	23.8	43.3	39.0	33.1	26.0	30.1
CRUDE PROTEIN	7.4	6.9	8.8	8.3	9.2	18.4	17.8	10.3
HEAT DAM. PROTEIN	0.9	1.1	1.2	0.5	0.2	0.9	1.5	1.1
AVAILABLE PROTEIN	7.2	6.2	8.3	8.3	9.2	17.5	17.8	10.2
% PROTEIN SOLUBILITY				13.4	21.4	60.4		
NSC	17.3	17.2	7.8	20.8	33.7	25.6	16.4	12.2
ADF	39.9	43.3	46.3	33.0	22.3	30.2	39.0	42.9
NDF	64.1	64.8	72.3	62.0	48.2	45.8	54.7	66.4
NE/L, MCAL/LB	0.66	0.64	0.63	0.68	0.76	0.69	0.66	0.65
TDN EST.	63.8	62.8	61.9	67.3	71.8	66.8	64.1	62.9
ENE EST., THERMS/CWT	54.20	53.20	52.40	55.83	62.91	57.0	54.5	53.4
RELATIVE FEED VALUE	83.8	79.2	68.0			132.6	99.5	77.7
CALCIUM	0.43	0.60	0.52	0.33	0.28	0.96	0.95	0.51
PHOSPHOROUS	0.26	0.19	0.22	0.24	0.28	0.28	0.28	0.23
MAGNESIUM	0.22	0.27	0.28	0.24	0.20	0.29	0.29	0.25
POTASSIUM	1.52	1.69	1.87	1.14	1.09	2.30	3.09	2.08

Historical forage analysis of Sorghum/Soybeans were included from previous years to demonstrate crop potential.

Variable Costs per Acre

		SS High 130# Seed		SS Low 100 # Seed		Farmer 1		Farmer 2
Fertilizer	110# 18-18-18	$14.37	110# 18-18-18	$14.37	100# 19-19-19	$14.75	350# 10-20-20	$56.00
Urea	none	$0.00	none	$0.00	none	$0.00	210# urea	$26.25
Seed	130#	$45.50	110#	$35.00	37,000 seeds	$41.63	29,000 seeds	$32.63
Spray	none	$0.00	none	$0.00	none	$0.00		$22.00
Diesel Fuel		$5.46		$5.46		$7.00		$6.80
Labor	3.68 Hours	$18.40	3.68 Hours	$18.40	2.74 Hours	$13.70	3.75 Hours	$18.75
TOTAL VARIABLE COST		$83.73		$73.23		$77.08		$162.43

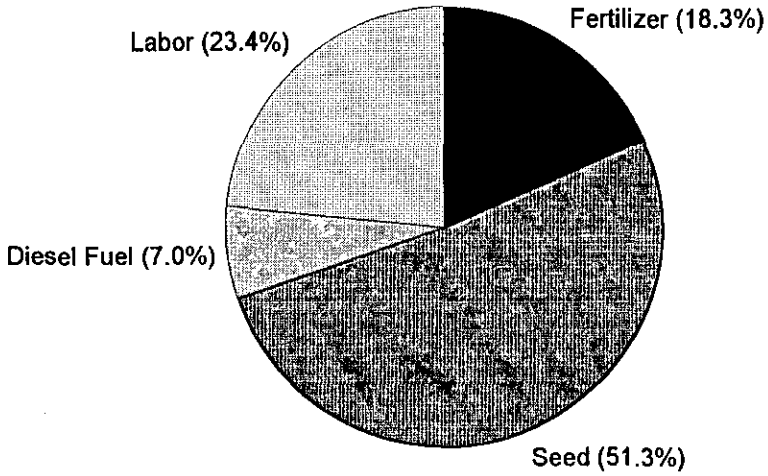
Diesel Fuel figure obtained from chart on previous page.

Labor figure based on number of hours of tractor use plus stone picking time multiplied by $5 per hour.

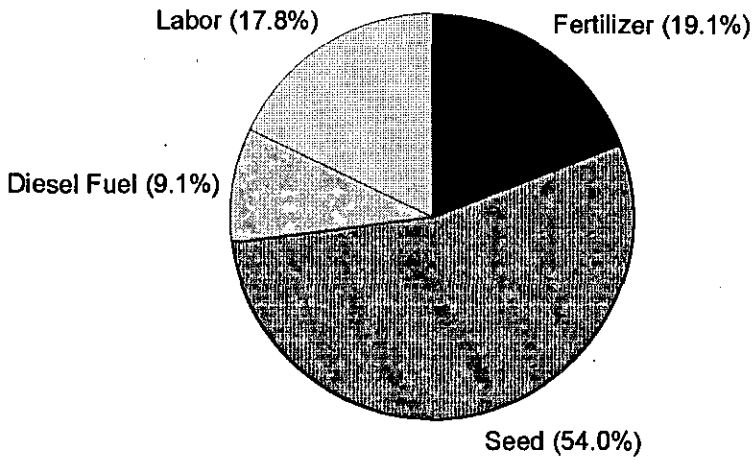
Variable Costs per Ton of DM, TDN, and CP

	Farmer 1 Strip 1	Farmer 1 Strip 2	Farmer 1 AVERAGE	Farmer 2 Strip 3	SS Strip 12A	SS Strip 12C	SS Strip 12E	SS Strip 12G	SS Strip 14D	SS AVERAGE
Cost per Acre	$77.08	$77.08	$77.08	$162.43	$83.73	$73.23	$83.73	$83.73	$83.73	$78.48
DM Tons/Acre	7.96	6.93	7.44	6.97	5.95	6.37	7.50	6.31	6.99	6.62
Cost/Ton DM	$9.69	$11.13	$10.36	$23.30	$14.07	$11.50	$11.16	$13.26	$11.98	$11.85
TDN Tons/Acre	5.35	4.66	5.01	5.01	3.74	4.00	4.71	3.96	4.39	4.16
Cost/Ton TDN	$14.39	$16.53	$15.39	$32.45	$22.40	$18.32	$17.77	$21.12	$19.08	$18.87
CP Tons/Acre	0.66	0.58	0.62	0.64	0.46	0.49	0.58	0.49	0.54	0.51
Cost/ Ton CP	$116.72	$134.05	$124.79	$253.26	$182.72	$149.41	$144.91	$172.23	$155.65	$153.87

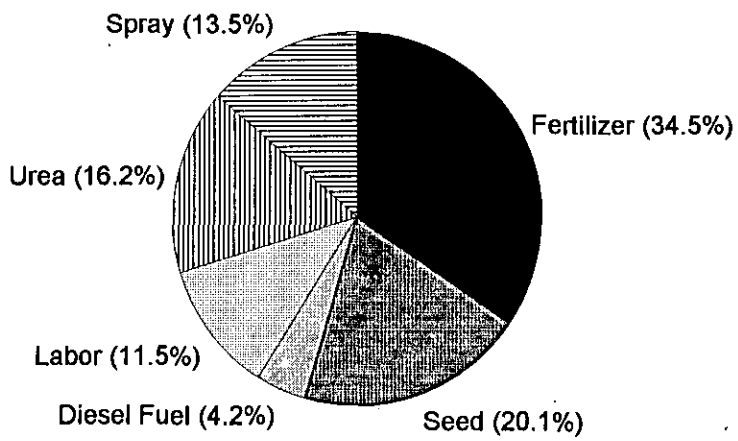
SS Average

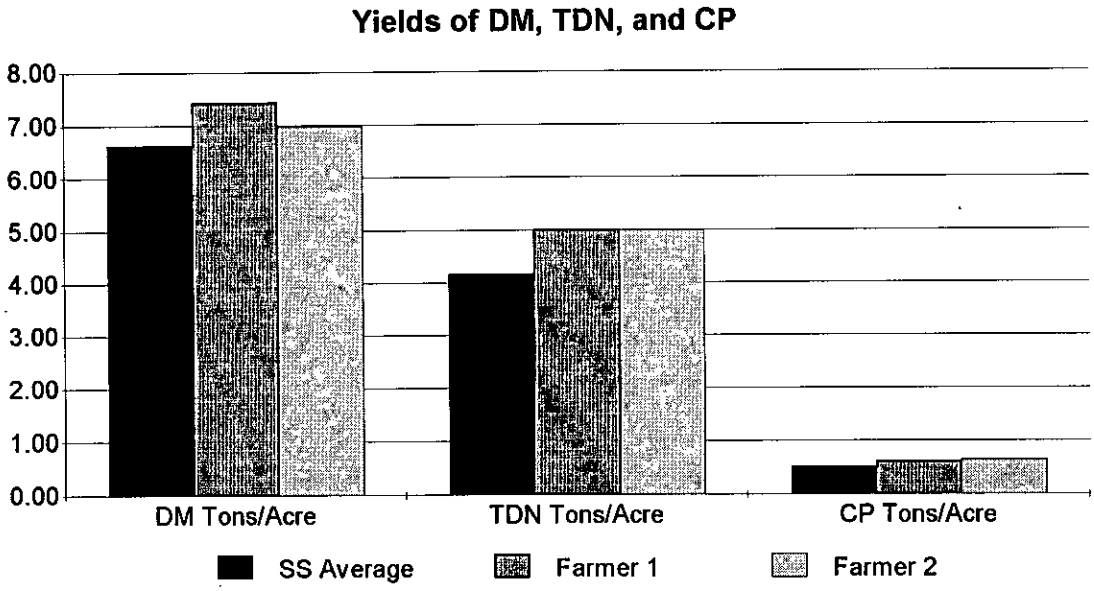


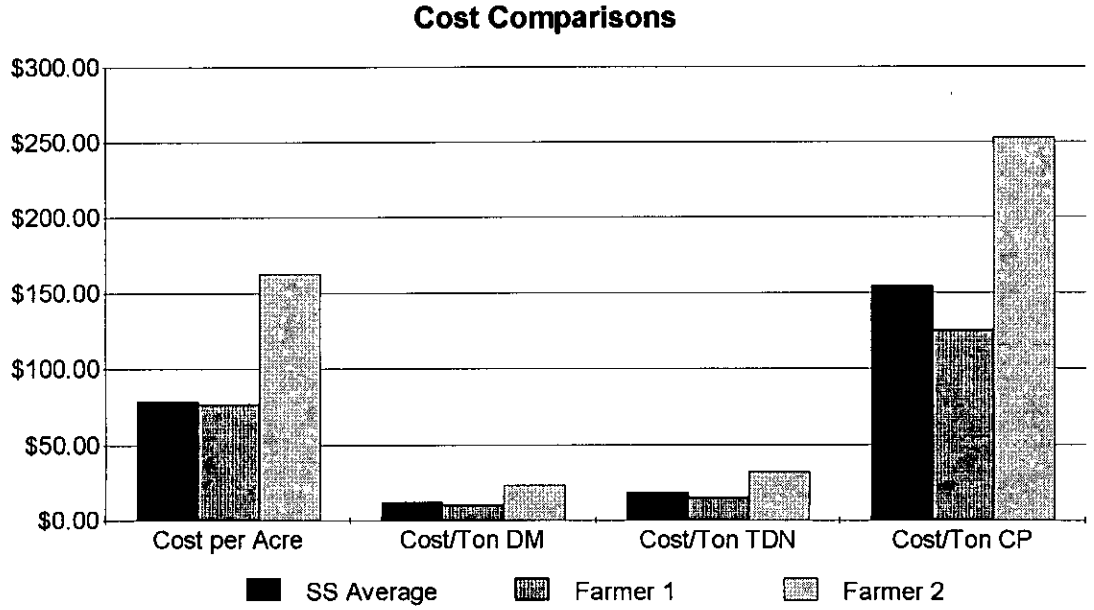
Farmer 1



Farmer 2




Yields of DM, TDN, and CP
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
DM Tons/Acre
TDN Tons/Acre
CP Tons/Acre
SS Average
Farmer 1
Farmer 2


Cost Comparisons
$300.00
$250.00
$200.00
$150.00
$100.00
$50.00
$0.00
Cost per Acre
Cost/Ton DM
Cost/Ton TDN
Cost/Ton CP
SS Average
Farmer 1
Farmer 2