

Vegetable Yields across Tillage Systems after Grazing

**K.S. Balkcom, D.W. Reeves, J.M. Kemble, R.A. Dawkins
USDA-ARS and Auburn University**

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Stocker Grazing in Alabama

- ✓ **400,000 acres of winter annuals grazed in Alabama, prior to summer crops – Ball, 1988.**
- ✓ **Bransby et al. (1999) reported profits of \$70 to \$224/ac. on ryegrass pastures during the winter months.**
- ✓ **Siri-Prieto et al. (2007) reported \$80/ac. profit for cattle grazing ryegrass or oats pastures.**

Gross returns of AL crops

Production value/acres harvested

**34 Major Vegetables
(varies by season)**

>\$2000/acre

Major Row Crops

Corn - \$298/acre

Cotton - \$363/acre

Peanut - \$454/acre

Soybean - \$196/acre

Total - \$1311/acre

Soil Compaction

Winter grazing contributes to compaction and negatively affects yields.

- ✓ **Soil type**
- ✓ **Moist or wet soils**
- ✓ **Increased loads**
- ✓ **Repeated loadings**

Raper, 2005

Touchton et al., 1989; Miller et al., 1997; Mullins and Burmester, 1997)

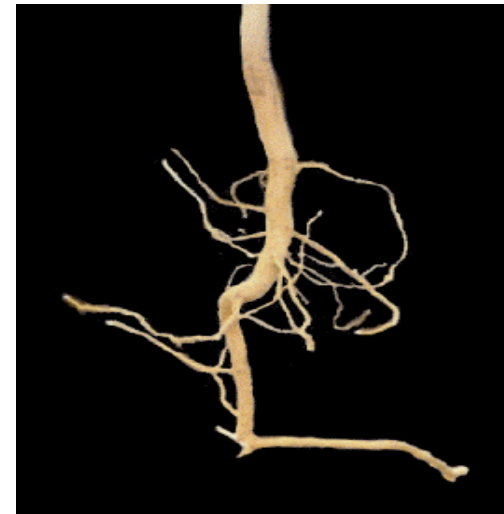
Soil Compaction



Photos courtesy of G. Siri-Prieto

Negative Impacts of Compaction

- ✓ Increased soil strength
- ✓ Reduced soil aeration
- ✓ Reduced available moisture
- ✓ Shallow root depth



Vegetable Rooting Depth

12 – 18 inches



Sweet corn

?? inches



Field pea

24 inches plus

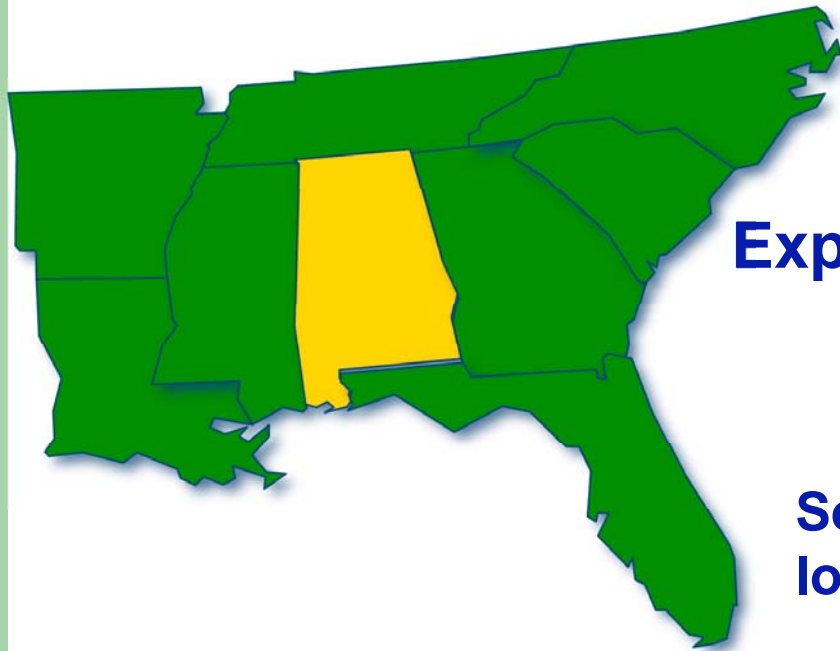


Watermelon

Objective

Compare vegetable yields in a sweet corn-watermelon-field pea rotation among various surface and deep tillage combinations following winter annual grazing of stocker cattle.

Site Location



Experimental dates: 2001 - 2003

Soil type: Wynnville fine sandy loam (Glossic Fragiudults)



**Sand Mountain Substation,
Crossville, AL.**

Winter Grazing



✓ Ryegrass cv. 'Marshall' planted in the beginning of September, 25-30 lb ac⁻¹



✓ Grazing was continuous beginning from late November to early December until mid-April, ~ 2.7 head acre⁻¹

Experimental Design

Factorial treatments in RCBD - 4 reps

3 surface tillage systems

x

3 deep tillage systems

1. Chisel +
disk/level



1. KMC



2. Disk/level



2. Paratill



3. No surface
tillage



3. No deep
tillage



Materials and Methods....

✓ Beef cattle performances were measured by weighing each animal prior to grazing and immediately after removal from grazing.



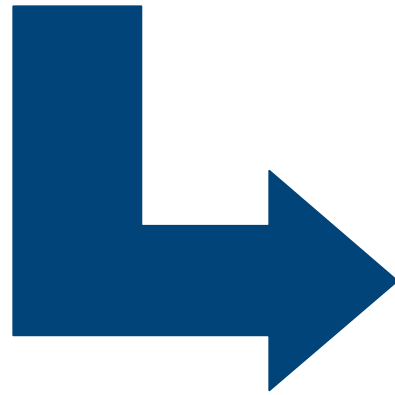
✓ Biomass samples were collected at the end of the grazing period (~132-d) and prior to chemical termination.



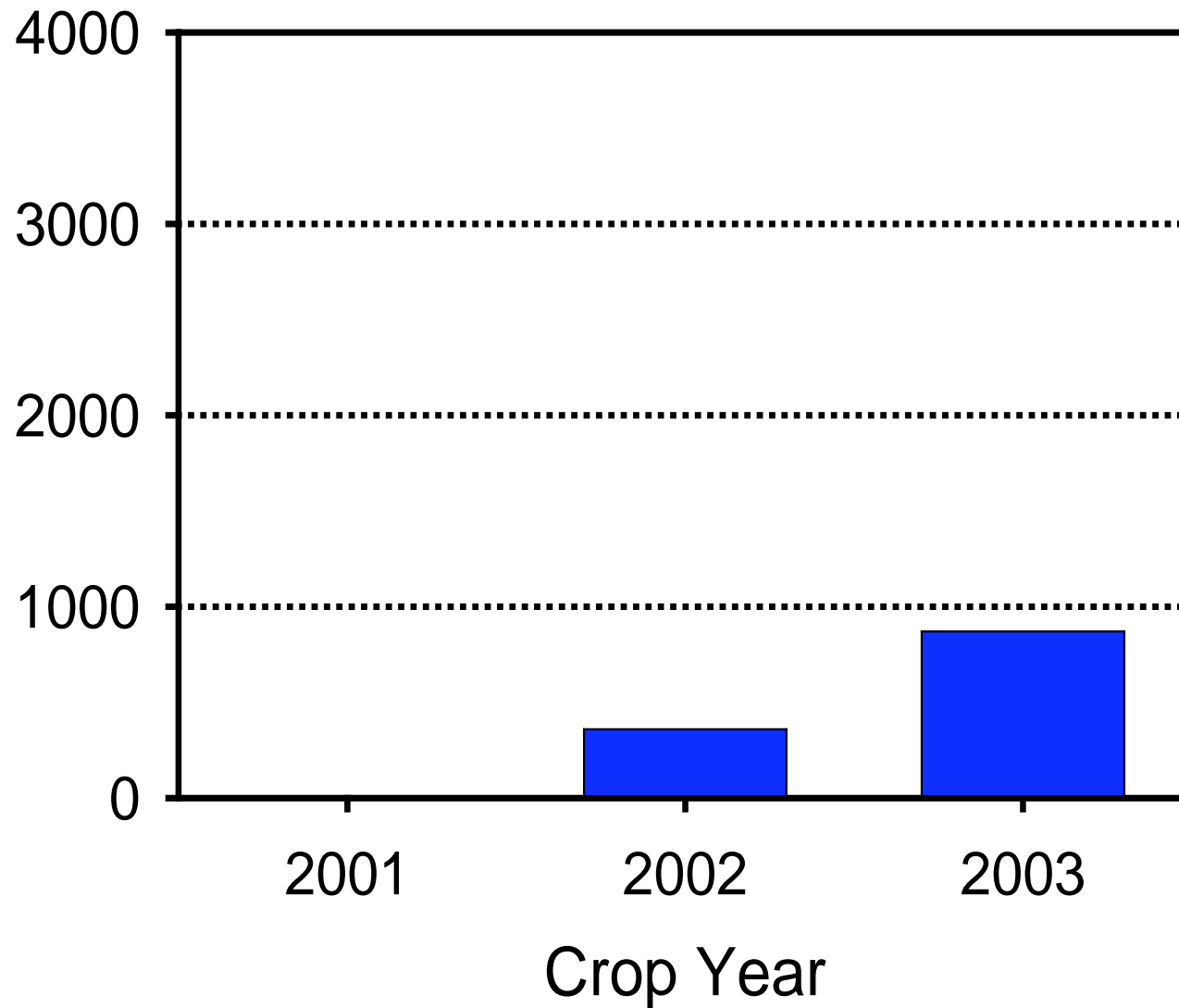
Winter Cover Crop



Winter cover benefits
VS
Cattle weight gain



Ryegrass Biomass Production



Cattle Performance

	2001	2002	2003	Mean
Days of grazing	129	129	138	132
Average daily gain, lb day ⁻¹	2.5	2.9	2.4	2.6
Total gain, lb ac ⁻¹ †	871	1010	894	925
Gross income, \$ ac ⁻¹ ‡	313.56	363.60	321.84	333.00
Net returns, \$ ac ⁻¹ §	149.56	199.60	157.84	169.00

† Stocking rate of 2.7 cattle ac⁻¹

‡ Contract price of \$0.36 lb⁻¹

§ Average variable cost \$164 acre⁻¹

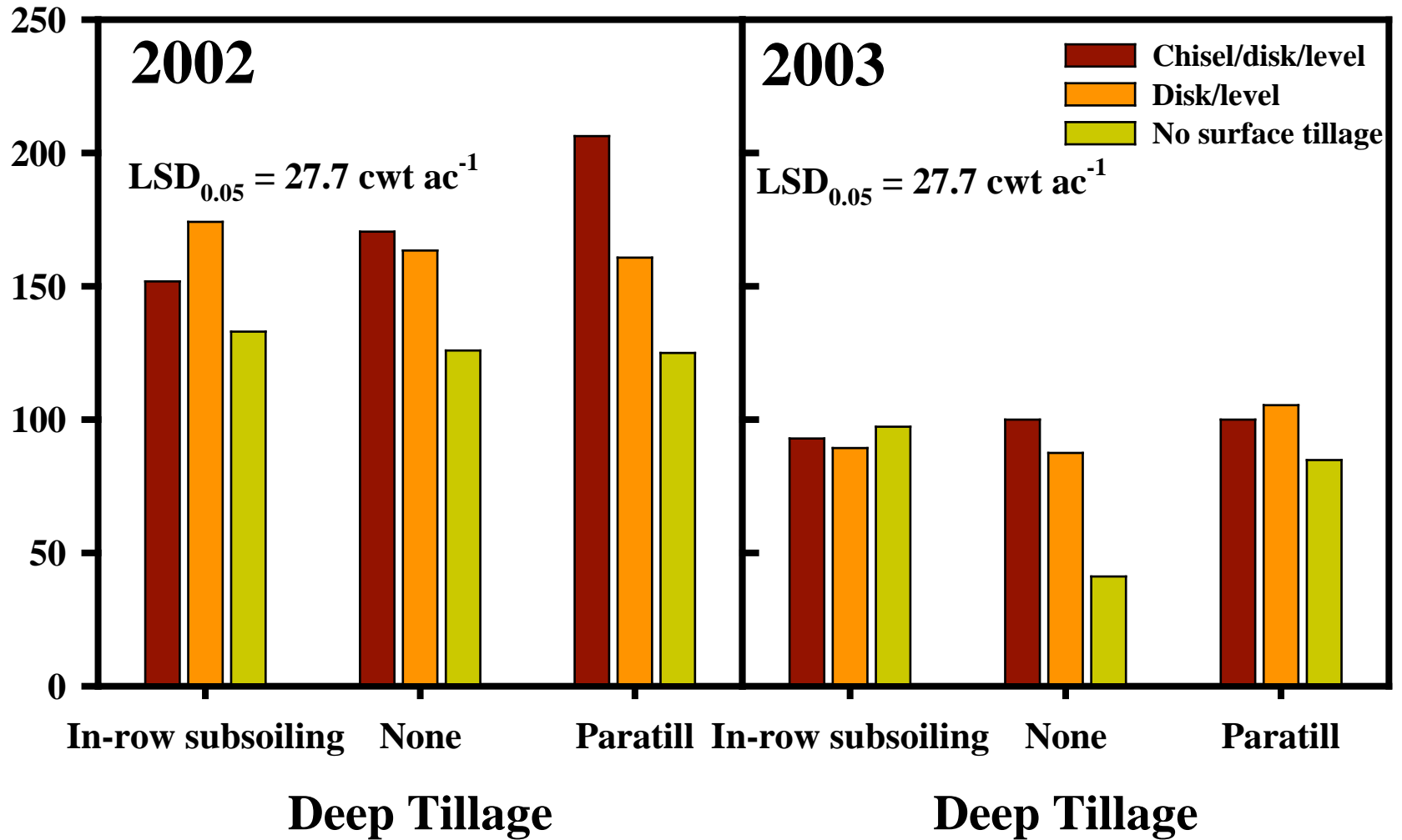
Cultural Practices

Crop	Planting Date	Cultivar	Seeding rate	Harvest Dates		
				2001	2002	2003
			Plants ac ⁻¹			
Sweet corn	4-26-2001	Silver	26,000	7-19	7-12	7-25
	4-18-2002	Queen		7-26	7-19	7-28
	4-15-2003			8-6	7-24	7-31
Southern field pea	5-16-2001	Pinkeye	2600	7-24	7-26	8-1
	5-15-2002	Purplehull		7-29	7-30	8-4
	5-29-2003			8-2	8-2	8-6
				8-7	8-7	
Watermelon	5-16-2001	AU	870	8-24	8-16	8-29
	5-15-2002	Producer		8-30	8-23	9-5
	5-29-2003					

Sweet Corn

Tillage system	2001	2002	2003
Surface tillage	-----cwt ac ⁻¹ -----		
Chisel/disk/level			
Disk/level	195.5	175.9	97.3
None	185.7	166.1	93.8
	92.9	127.7	74.1
LSD _{0.05}	25.0	16.1	15.2
Deep tillage			
In-row subsoil			
None	175.0	152.7	93.8
	144.6	153.6	75.9
Paratill™	154.5	163.4	96.4
LSD _{0.05}	25.0	Not significant	15.2
Surface tillage	<0.0001	<0.0001	0.0090
Deep tillage	0.0564	0.3024	0.0241
Surface X Deep	0.3843	0.0135	0.0152

Sweet Corn



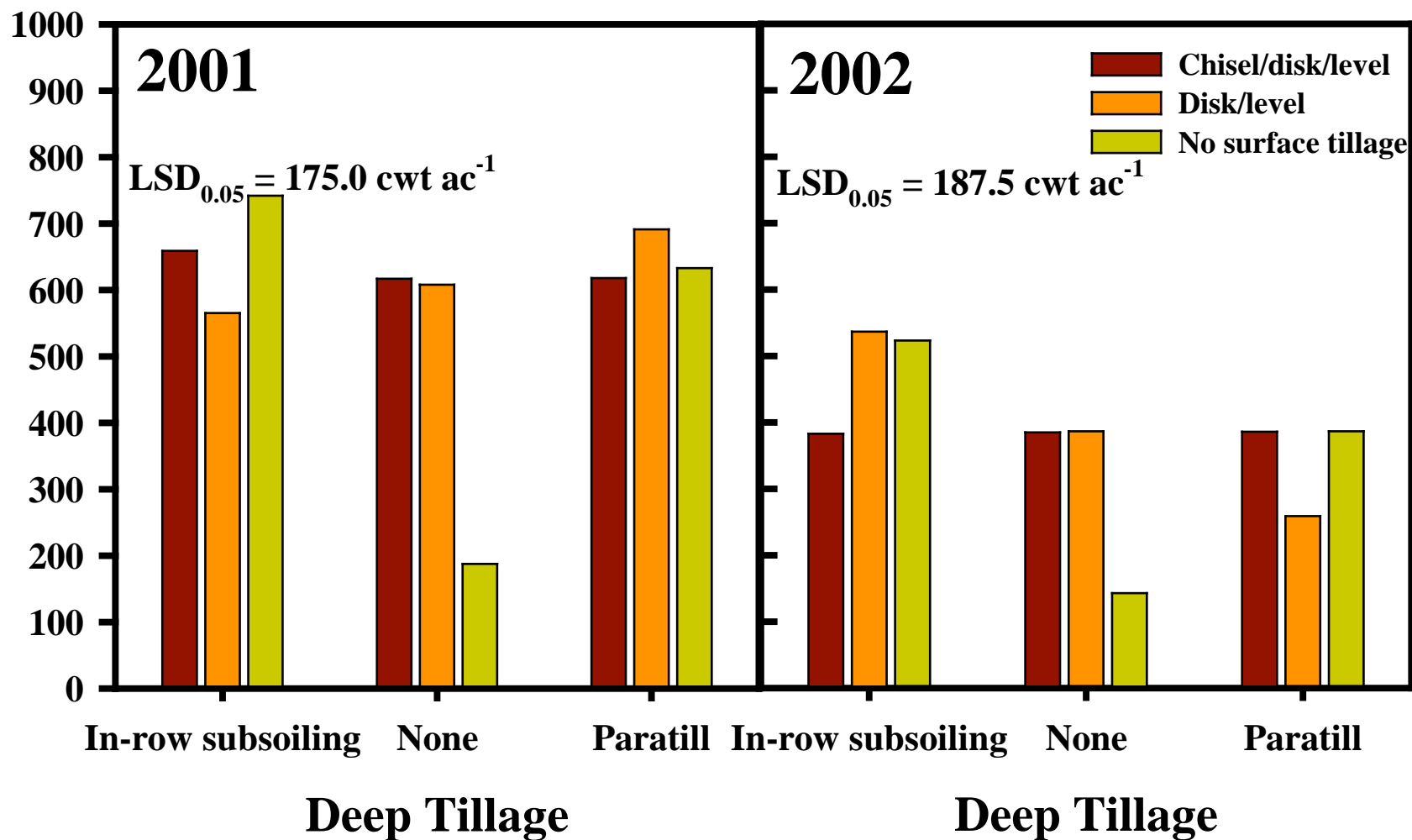
Southern Field Pea

Tillage system	2001	2002	2003
-----cwt ac ⁻¹ -----			
Surface tillage			
Chisel/disk level			
Disk/level	60.7	36.6	52.7
None	57.1	36.6	55.4
	48.2	39.3	44.6
LSD _{0.05}	6.3	Not significant	7.1
Deep tillage			
In-row subsoil			
None	55.4	39.3	51.8
	53.6	36.6	51.8
Paratill™	58.0	36.6	49.1
LSD _{0.05}	Not significant	Not significant	Not significant
Surface tillage	0.0011	0.5597	0.0145
Deep tillage	0.4154	0.6530	0.7230
Surface X Deep	0.1208	0.9858	0.5202

Watermelon

Tillage system	2001	2002	2003
Surface tillage			
Chisel/disk level	-----cwt ac ⁻¹ -----		
Disk/level	631.3	384.8	357.1
None	621.4	393.8	407.1
	520.5	350.9	326.8
LSD _{0.05}	Not significant	Not significant	Not significant
Deep tillage			
In-row subsoil			
None	655.4	480.4	360.7
	470.5	304.5	364.3
Paratill™	647.3	343.8	365.2
LSD _{0.05}	100.9	108.0	Not significant
Surface tillage	0.0626	0.6905	0.1702
Deep tillage	0.0010	0.0068	0.9922
Surface X Deep	0.0002	0.0172	0.1252

Watermelon



Conclusions

- ✓ **Sweet corn yields responded to a combination of surface and deep tillage.**
- ✓ **Southern field pea only responded to surface tillage. Disking alone was comparable to chisel and disking.**

Conclusions

- ✓ **Watermelon yields were maximized with only deep tillage.**
- ✓ **Vegetable growers should be aware of potential soil compaction following grazing, but the tillage system required to correct the problem varies with the vegetable crop.**