Organic Grain Systems Trial

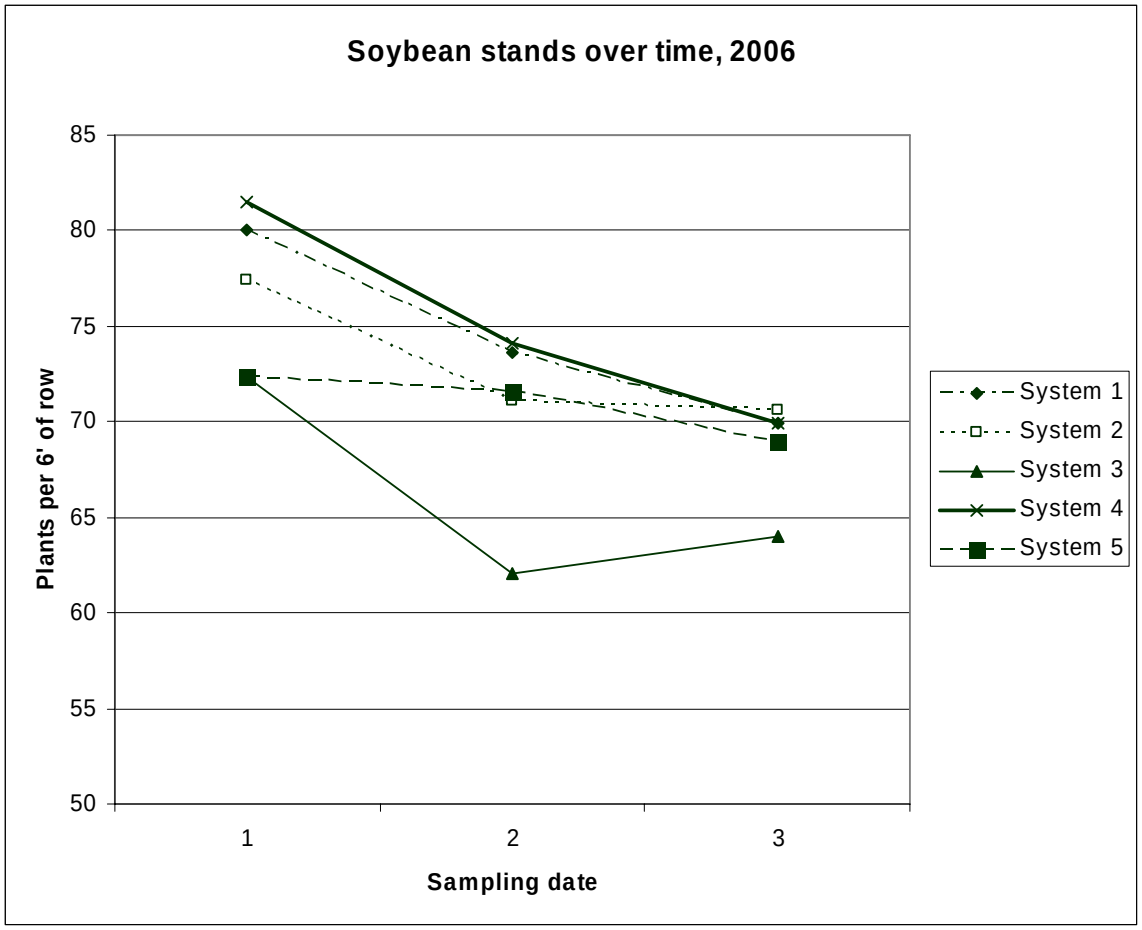
Soybeans 2006

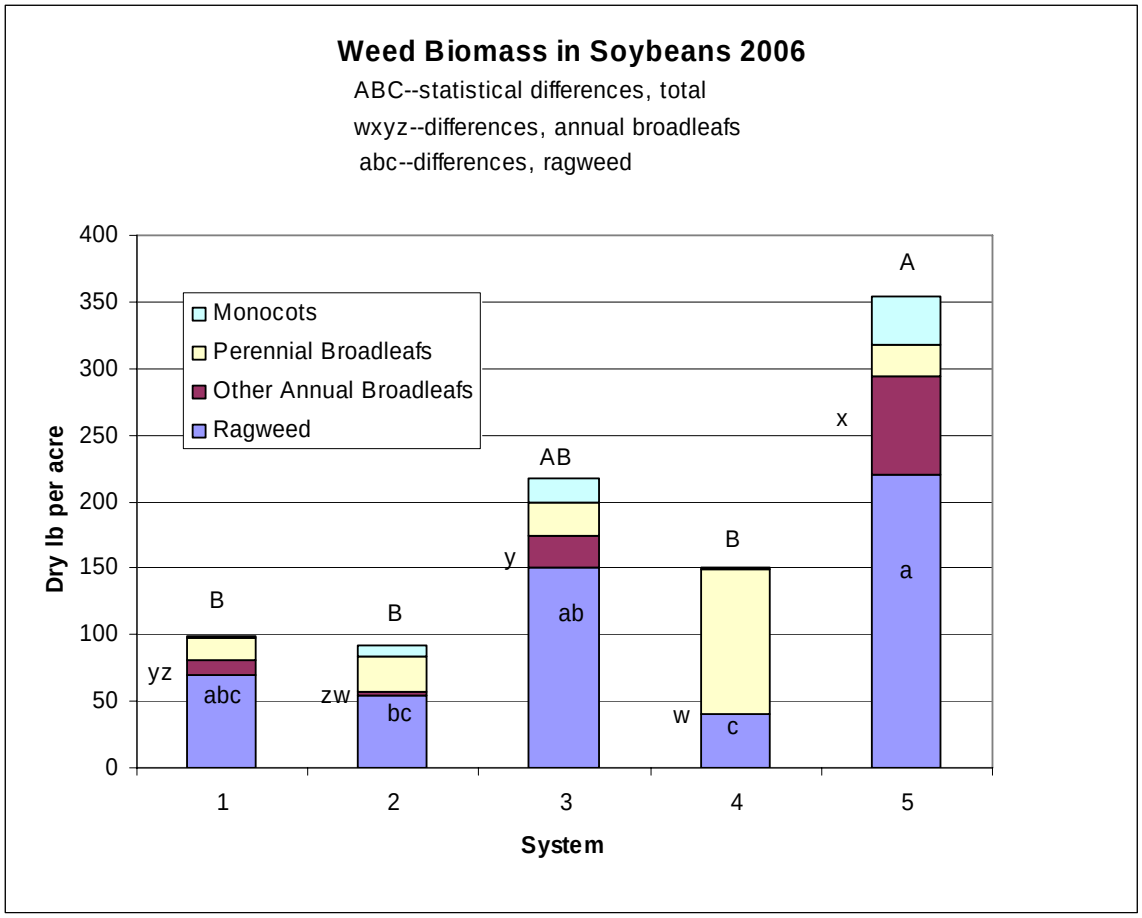
[Spelt results start on page 7]

Soybeans in 2006 followed corn grown the previous year. A mixture of rye and spelt had been undersown in the corn in systems 1, 3, and 4 in late September. Other systems had only corn stubble over the winter. The winter covers were bushhogged on 21 April and gypsum spread on system 1 and 3 plots on 3 May. All systems except 4 were moldboard plowed on 3 May. System 3 plots were chisel plowed to a depth of 13 inches on 18 May to further disturb perennial weeds. All plots except system 4 were disced on 19 May and harrowed on 22 May.

On 23 May, the system 4 plots were planted to soybeans with a Kinze no-till planter set up with ridge scrapers. On 24 May, the rest of the plots were harrowed again and then seeded. The seed rate was about 190,000 per acre and the seed was dry inoculated before planting. System 5 received 153 lb/A of 8-22-22 fertilizer. The seed used was a group 0 maturity variety, Blue River 0F41. The plantings came up well.

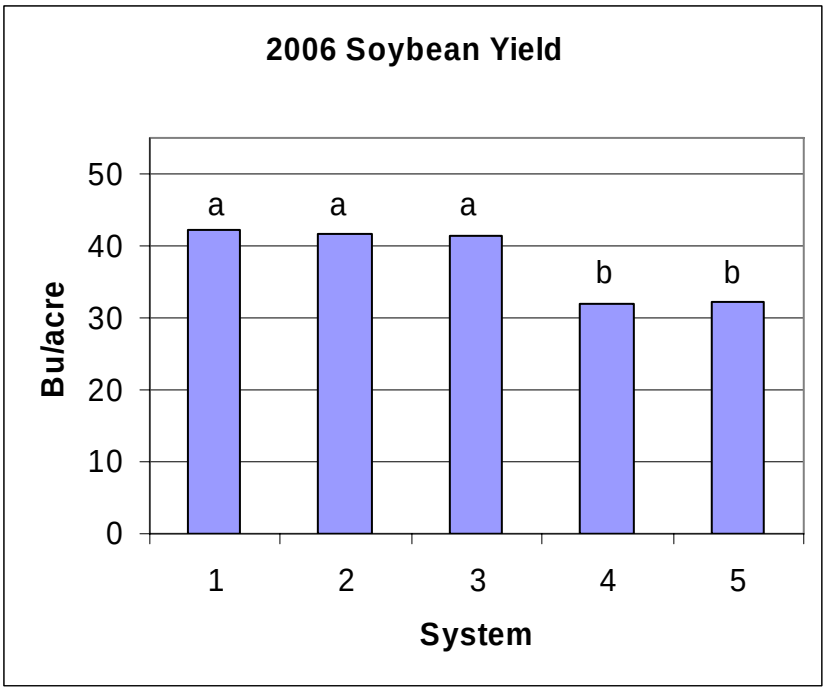
Because of wet soil, we were not able to tineweed the plots at the optimum times or apply pre-emergence herbicide in System 5. Systems 1-3 were tineweeded aggressively on 15 June when the beans were 3-4” tall. System 3 plots received a second pass of the tineweeder in the opposite direction. The following day, system 4 plots were cultivated with a Brillion high residue cultivator with hilling discs set to lightly move soil away from the rows. Systems 1 and 2 were cultivated with a JD row-crop cultivator with 5 sweeps per inter-row on 19 June but then it rained. System 3 was cultivated with the same setup 2 days later. The final cultivation was done to systems 1 and 2 on 7/6 and the following day on system 4 using a Brillion cultivator with 3 sweeps per inter-row and disk hillers set to throw soil into the row. System 3 received its final cultivation on 7/18 with a belly-mounted cultivator plus the Brillion with hilling discs removed. The cultivator shovels next to the row were tipped strongly downward and cocked toward the row in an attempt to disturb weeds in the row. They ran about 4” deep, close to the row. The soybean plants were 18" to 22" tall at this time and barely allowed for the tractor tires. In system 5, we applied on 3 July a tank mix of Classic (9.4 g/A, Harmony GT (2.4 g /A), and Fusilade DX (0.19 qtl/A) with 0.25% v/v of Induce adjuvant.

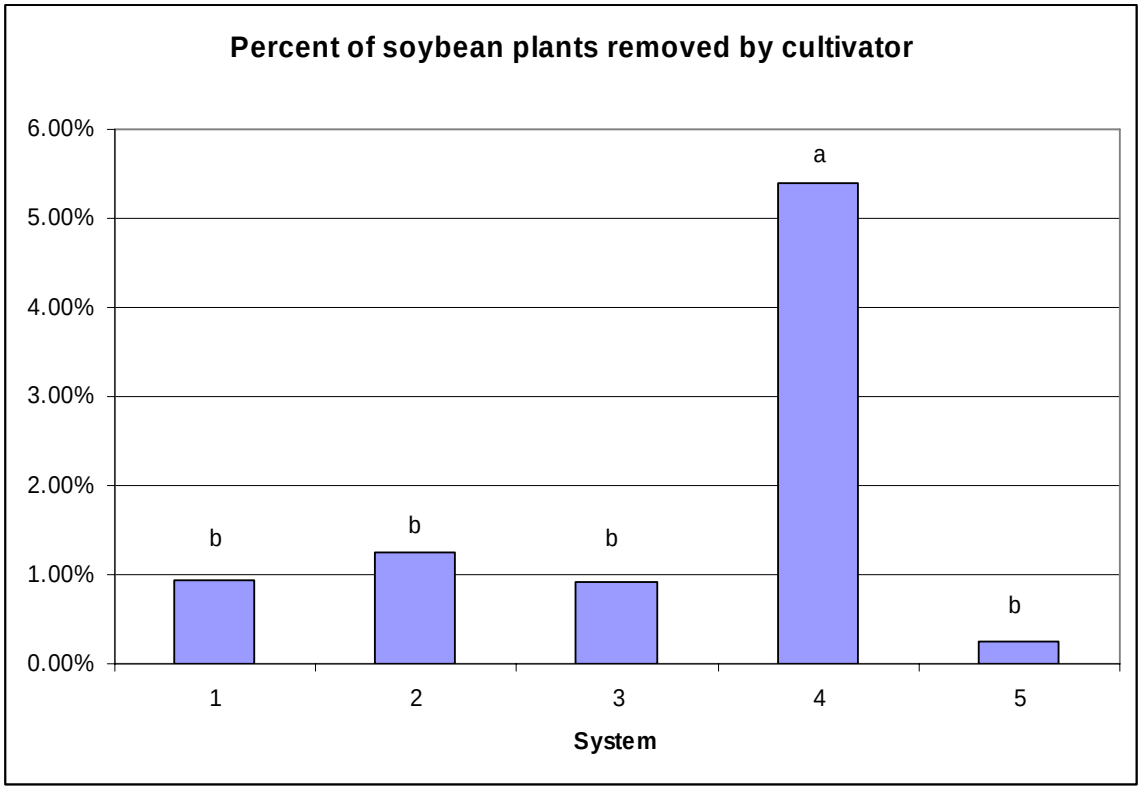

Soybean stands over time, 2006
Plants per 6' of row
85
80
75
70
65
60
55
50
1
2
3
Sampling date
System 1
System 2
System 3
System 4
System 5



The group 0 plants dropped their leaves by early September. Harvest was on 22 Sep due to wet fields.

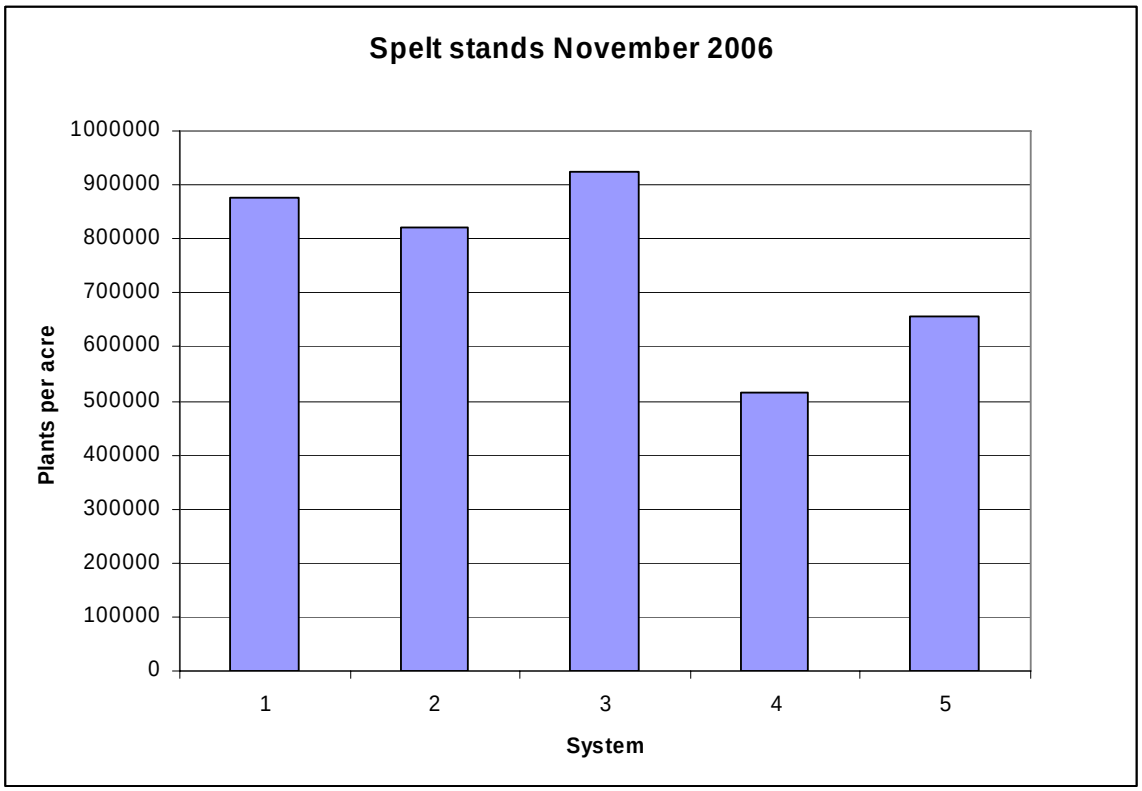
Systems 1, 2 and 3 gave similar yields of about 41-42 bushels per acre. Systems 4 and 5 were lower at around 32 bu/acre. System 4 had a larger percentage of plants taken out with the cultivator (equivalent to about 1.6 bu/acre) and also, there were more low beans left on the plants after harvest. This occurred because the 2-row combine we used to harvest System 4 had wheels that rode on the side of the ridges and maintaining a level cutting bar was difficult. System 5 plants appeared less thrifty than the others through most of the season and may have been damaged by the late postemergence herbicide application they received. System 5 also had more weed biomass than the others. In the adjoining field, no till group 1 Roundup Ready soybeans yielded 51.9 bushels per acre.





On 26 Sep the system 4 plots were scraped with ridge scrapers mounted on a separate toolbar. System 5 plots received a broadcast application of 198 lb/acre of 10-20-20 fertilizer. System 1 and 3 plots were moldboard plowed on 9/27, then system 1 plots received 197 lb/acre of an organic fertilizer with a 4.0-5.2-2.4 analysis.

All plots except system 4 were disced and harrowed on 9 Oct. and System 2 and 5 plots which had not been plowed were disced twice. Then dehulled spelt was drilled at 120 lb/A. System 4 plots were re-ridged with a JD no-till cultivator, then planted at the same rate with the grain drill set about 4" higher than normal. A cultipacker was then run over the system 4 plots. System 3 plots were drilled with an additional 60 lb/A of spelt seed the next day



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A preliminary financial analysis was done of the soybean crop in the various systems based on NYCO estimates for various field operations and other expenses. Also included were comparisons with the nearby Roundup Ready field and a higher yield figure for system 5, as if it had yielded at the same rate as the neighboring field. Since this year of the trial represents the second transition season, conventional prices were used. This shows a net loss for all systems, except system 2 which barely broke even. The biggest loss was in conventional soybeans at a 32 bu/acre yield. If the conventional beans had yielded up to what may have been their potential, they would have been profitable.

However, these financial losses may be well worth while, as under organic prices all organic systems were more profitable than the best conventional scenario. It should be noted that these relative profit values have some meaning, but that they may not apply to a real farm operation.

System	1	2	3	4	5	Conventional Field	Roundup Ready
Yield (bu)	42.3	41.7	41.4	32.0	32.2	51.9	51.9
Labor Hours	7.0	6.0	7.9	4.6	5.0	5.0	3.5
Income	270.72	266.88	264.96	204.60	206.08	332.16	332.16
Growing Expenses	139.00	102.00	147.80	71.20	115.00	115.00	72.00
Harvest & Delivery	93.00	93.00	93.00	93.00	93.00	93.00	93.00
Overhead	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Operator Labor	35.00	30.00	39.50	23.00	25.00	25.00	17.50
Net Income	-26.28	1.88	-36.34	-36.40	-76.92	49.16	84.66

Soybean Economic Data, per Acre Basis. Soybean Price, $6.40/bu.

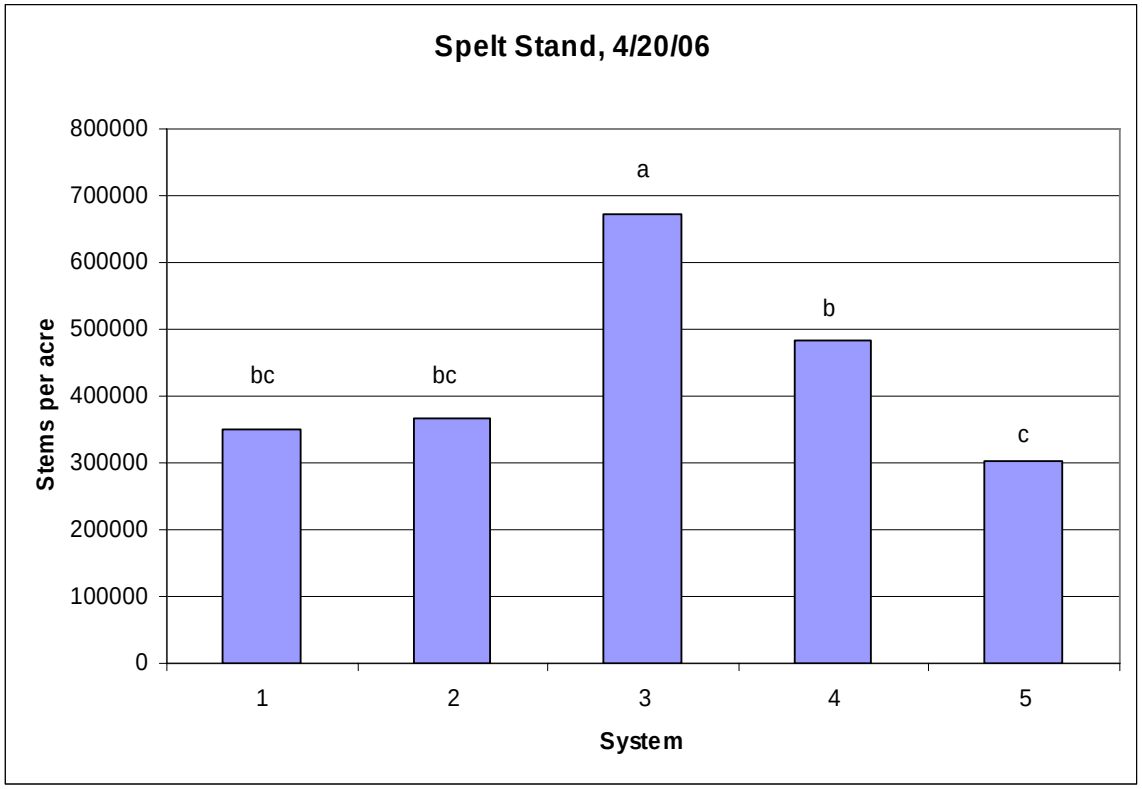
System	1	2	3	4
Yield (bu)	42.3	41.7	41.4	32.0
Labor Hours	7.0	6.0	7.9	4.6
Income	475.88	469.13	465.75	360.00
Growing Expenses	139.00	102.00	147.80	71.20
Harvest & Delivery	93.00	93.00	93.00	93.00
Overhead	100.00	100.00	100.00	100.00
Operator Labor	35.00	30.00	39.50	23.00
Net Income	178.88	204.13	164.45	118.80

Soybean Economic Data, per Acre Basis. Soybean Organic Price, $11.25/bu.

Spelt 2005-06

It was very difficult to establish spelt on this site in the fall of 2005. After soybeans were harvested in late September, it rained for about a month (on 18 of 31 days in October), and the soil became saturated. At the very end of October, without any more tillage, we dribbled Oberkulmer spelt seed on the soil surface with the grain drill @ 145 lb/acre. System 3 spelt was seeded at a heavier rate (205 lb/acre) with the idea that weeds would be better suppressed that way. Fertilizer was spread on the day of planting and likewise left on the surface to leach in. Fertilizer was applied to system 5 at approximately 10-20-20 lb/acre N-P2O5-K2O, and with an approved organic fertilizer on system 1 at 35-45-21 lb/acre.

In spite of snow cover in December, during an extended thaw in January the spelt had visibly grown to 3" tall. However, by spring it appeared that a significant proportion of the spelt plants had died over winter. The living spelt was mostly in strips where it was protected by soil ridges left from cultivation. The poorest stand was the conventional, where the soil had not been cultivated and was nearly flat. System 3 had the best stand, due to both ridges left after previous soybean cultivation and a higher seeding rate.

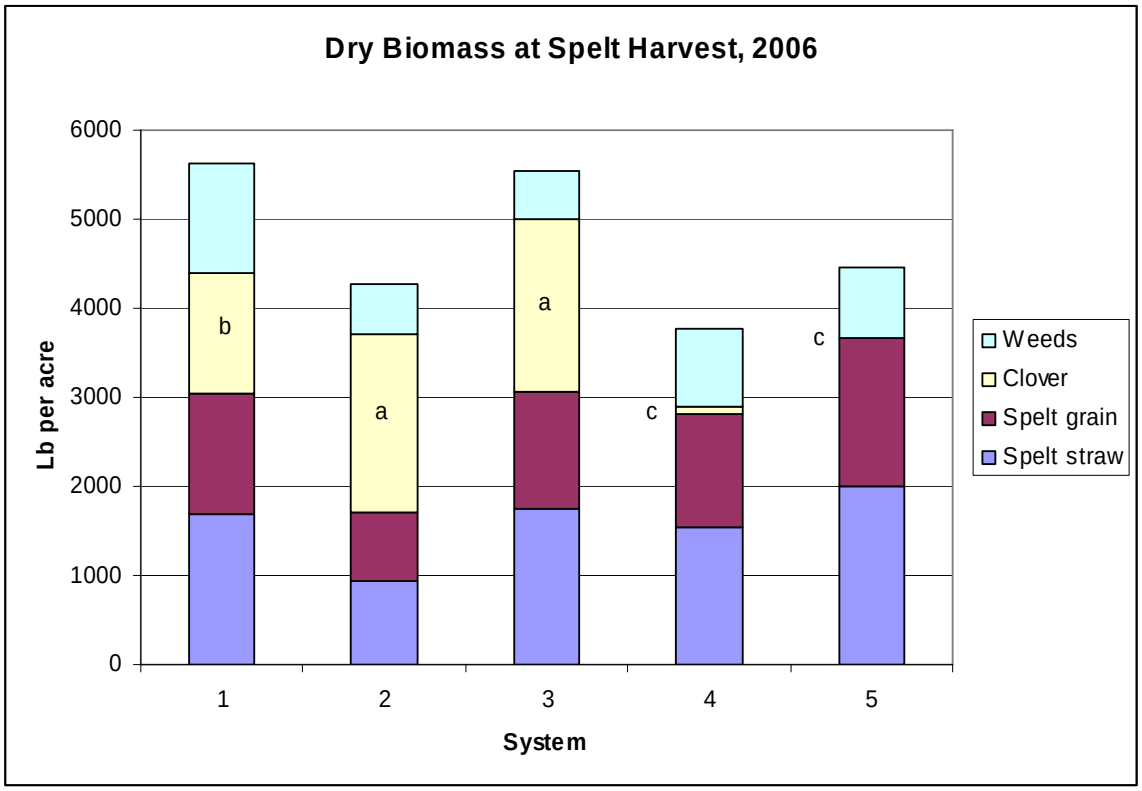


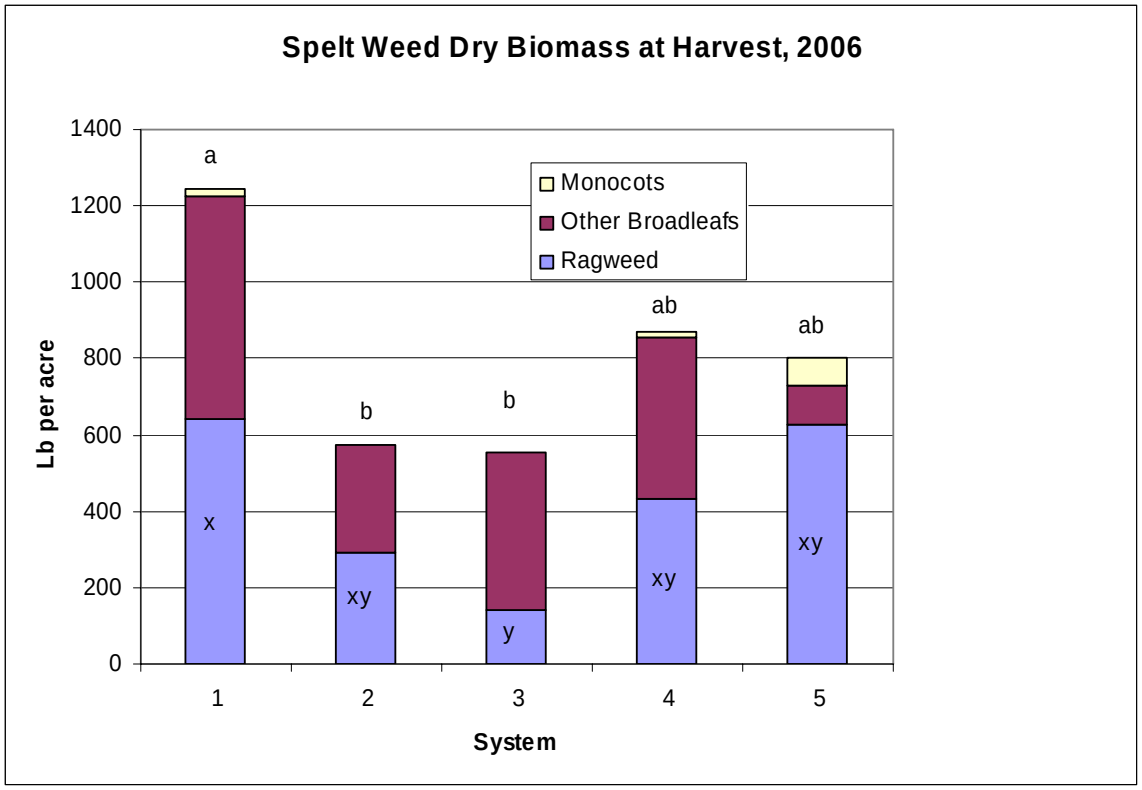
Systems 1 and 5 were topdressed on April 26-28, 2006. System 1 received an approved potassium sulfate product at a rate of about 43 lb/acre K2O plus 23.5 lb/acre N as Chilean nitrate. System 5 received about 28 lb/acre N as ammonium nitrate. Total nutrients applied to system 1 in both fall and spring were 58.5-45-64 and to system 5, 38-20-20.

Medium red clover was frost seeded in systems 1, 2, and 3 on March 31 and made a very good stand. It grew while the spelt was maturing. Common knowledge holds that undersown clover has little, if any, effect on small grain yield. Crimson clover was broadcast over system 4 on April 19 and performed poorly. It germinated in reasonable numbers, but almost completely died over the summer. Crimson clover is said to be impeded by wet soils and high pH, both of which it experienced in the summer of 2006 on this site.

Overall, the spelt became significantly weedy by the end of the season in all systems. System 5 was sprayed with 2, 4 D (Weedar 64, 0.75 pt/acre) against broadleaf weeds on May 1. However, ragweed still produced considerable biomass. Perennial broadleaf weeds were minor in this system.

Ragweed was also the dominant weed species in the organic plots, but perennial broadleafs such as Canada thistle and perennial sowthistle were also important.





Maturity was somewhat delayed due to the late planting date. At harvest on August 6, systems 1, 3, and 4, and 5 were significantly higher than system 2 by roughly a factor of 2. Fertilizer and stand count seemed to have a big effect on yield. However, unfertilized system 4 yielded almost as well as the fertilized system 1 even though it had a similar stand. Yields in the better systems were about a third lower than what local organic farmers usually get. Because of the weedy fields, high amounts of weed matter in the harvested spelt raised the moisture content and would have required extra cleaning and drying for a commercial farmer.

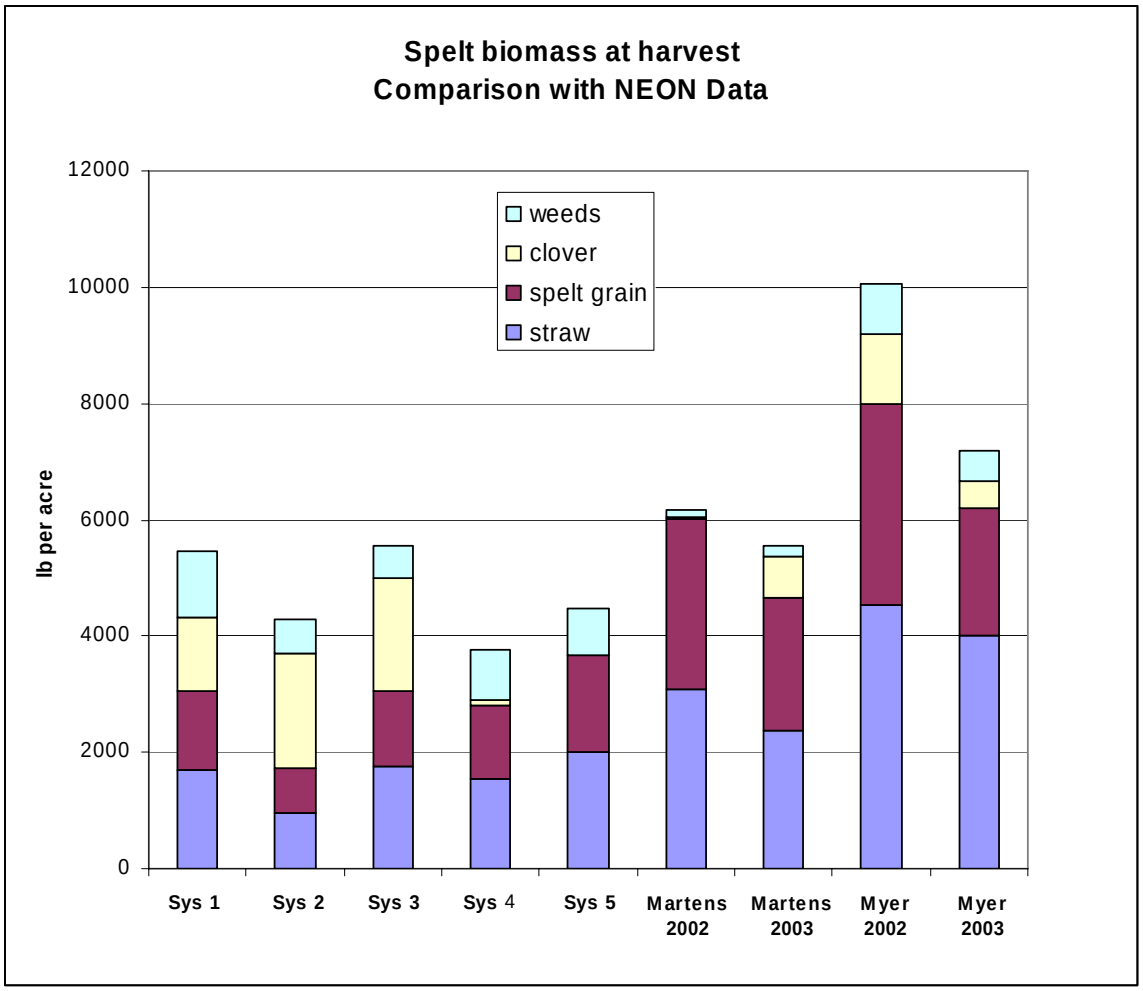
System	Spring 2006 Stand Count (stems per acre)	Yield (lb/acre)	Weed biomass (lb/acre)	Clover Biomass (lb/acre)
1	**350000**	1365a	1119	1278
2	**370000**	770b	573	1991
3	**670000**	1320a	555	1930
4	**480000**	1280a	863	9
5	**300000**	1660a	731	0

Table 1. Spelt stand and harvest data

Analysis of the components of the spelt heads allows for insights into these yield numbers. Stems from systems 1, 4 and 5 had larger heads, with more spikelets and a larger total number of grains than those from system 3. Head size in system 2 was

intermediate. Fertilizer added to systems 1 and 5 appeared to allow them to compensate for their lower stands.

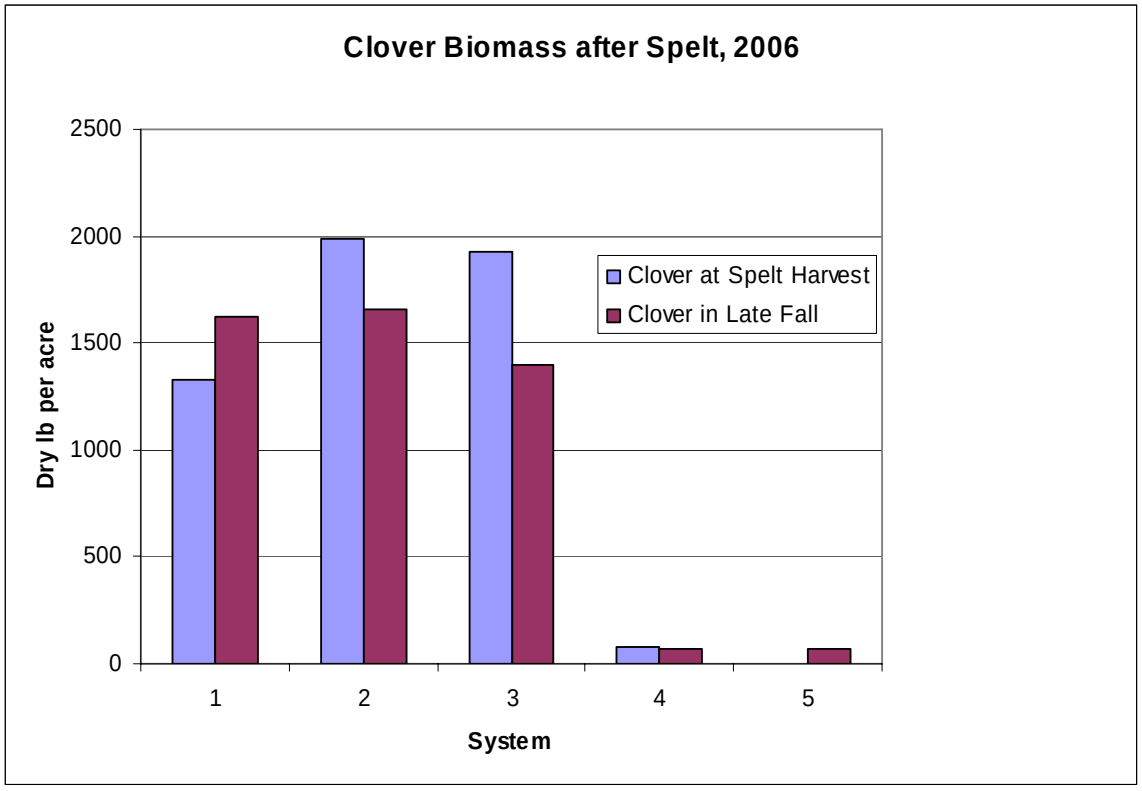
Even though system 3 had the highest stand count and 1and 5 the lowest, yields were similar. System 2 with a low stand and low fertility had intermediate-sized heads and yielded lowest. System 4, which did not receive extra fertilizer, yielded with the top systems perhaps partially because it had the second highest stand. It is worth noting that both system 4 and system 5 had no clover competition which may have helped a bit, contrary to usual experience.



It is useful to compare 2006 Systems Trial performance with data collected from outstanding organic farms in past years. The NEON Project tracked several spelt fields on two central NY organic farms in 2002 and 2003 (averages given here). These farms were chosen as exemplary representatives by NEON researchers with the advice of NOFA-NY. Grain and straw production were higher in these NEON farms in both years, while clover biomass at harvest was less. Weeds were similar on one farm and lower on the other in both years. 2002 was an excellent year for spelt in NY, while 2003 was

average. Total dry biomass production of 6,000-10,000 lb per acre over roughly two thirds of the growing season shows a high level of productivity.

We mowed the red clover and/or weeds in all systems on September 8, setting the mower at about 5 inches. The object was top any ragweed and to set the perennial weeds back but not hurt the clover too much, setting it up for strong regrowth. The clover did not grow well in the fall, however, and nodulation on a few sampled plants was weak. Clover biomass by late fall was similar to what it had been at the time of spelt harvest, 3 months earlier. Note: clover in system 4 is crimson clover; that in system 5 is volunteer red and white clover.



Take home lessons:

- We had fair yields from most systems even though the spelt was planted under poor conditions
- Medium red clover established well
- Crimson clover did poorly
- Added fertility increased yields
- A higher stand without added fertility also resulted in improved yield
- Ragweed was a key weed in all systems. Perennial weeds were minor in system 5 but important in the organic systems
- Clover regrew weakly after mowing; reasons for this are unclear