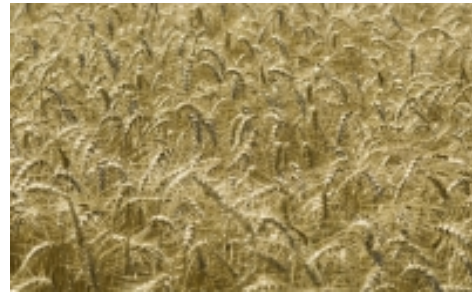


2013 KBS LTER Agronomic Report



Results of 2013 Agricultural Field Operations

**Long-term Ecological Research Site
W. K. Kellogg Biological Station
Michigan State University**

This report is designed to provide a brief summary of the field operations and agricultural data collected during 2013 on the Long-term Ecological Research Site (LTER) at the W.K. Kellogg Biological Station (KBS). It is not designed to provide an in-depth analysis of the experiments and the underlying factors leading to the data. All results are preliminary and not citable. For final data please see the KBS LTER data catalog (lter.kbs.msu.edu).

Joe Simmons
LTER/GLBRC Farm Manager

Justin Mezo
Brandon Mezo
Terry Tilley

Comments and questions about this report should be sent to:
Joe Simmons, Farm Manager, 3700 East Gull Lake Drive Hickory Corners MI, 49060, (269) 671-2528

Additional thanks to Justin Mezo for his assistance in the preparation of this report.

Front page photo credit: J.E. Doll/KBS-MSU and KBS staff.

2013 KBS LTER Agronomic Report

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Summary:

ILTER Main Site Treatments T1, T2, T3, and T4

Yields of winter wheat grown under agricultural different management practices:

- T1** Conventionally tilled field with fertilizer and/or herbicides as necessary;
- T2** No-tilled with the addition of fertilizer and/or herbicides as necessary;
- T3** Tilled field with reduced levels of fertilizer and/or herbicides; Medium red Clover was frost seeded into the winter wheat on March 28, 2013. Due to aggressive weed pressure it was decided to use a herbicide on the T3 treatment knowing that the clover would not survive as an effect. Actions were taken after wheat harvest to replant medium red clover.
- T4** Tilled Biologically-based (Organic) with no additions of fertilizers or herbicides; On March 27, 2013 medium red clover was frost seeded into the winter wheat, and then flail mowed September 10, 2013.

Results

Yields varied by treatment in 2013 with T1 yielding the highest followed by T3 (reduced N application), T2 (no-till), and T4 yielded the lowest.

For yield comparison the 2013 winter wheat LTER scale-up fields located at KBS had following yields: T1 61.29 bu/A; T3 45.14 bu/A; and T4 28.98 bu/A.

2013 ILTER Winter Wheat	Treatment Grain Yield (bu/A)			
	T1	T2	T3	T4
Replicate1	53.92	41.80	48.81	28.28
Replicate2	59.36	46.96	54.03	26.87
Replicate3	53.75	50.37	52.74	27.87
Replicate4	54.50	40.15	49.24	27.01
Replicate5	54.91	42.68	41.74	25.38
Replicate6	55.22	48.75	49.74	22.50
Average	55.28	45.12	49.38	26.32

Based on data from the U.S. Department of Agriculture National Agricultural Statistics Service all LTER main site yields were below the 2013 State of Michigan average yield of 75.0 bu/A. However LTER yields were around the United States average winter wheat yield for 2013 of 47.4 bu/A.

The late planting date and a delayed nitrogen fertilizer application date may have contributed to the lower than expected 2013 winter wheat yields. Above average rainfall in October of 2012 was the main factor in the late planting date. Soybeans needed to be harvested in the plot area in October 2012 before winter wheat could be planted. More than twice the normal rainfall during April 2013 reduced the chance for a timely nitrogen fertilizer application in the spring of 2013. Equipment breakdowns in April 2013 also played a factor in the later than optimal nitrogen fertilizer application date.

Data from the Resource Gradient study (see page 4) indicate that additional moisture could have increased the 2013 KBS main site winter wheat yields.

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Crop:	Soft Red Winter Wheat (T1)	Soft Red Winter Wheat (T2)	Soft Red Winter Wheat (T3)	Soft Red Winter Wheat (T4)
Variety:	Pioneer 25R39 Treated	Pioneer 25R39 Treated	Pioneer 25R39 Treated	Pioneer 25R39 (Untreated seed)
Planting date:	November 7, 2012	October 29, 2012	November 7, 2012	November 8, 2012
Irrigation:	None	None	None	None
Tillage:	Tilled: November 5, 2012 Soil finish November 6, 2012 Soil finish	No-till	Tilled: October 29, 2012 Soil finish November 6, 2012 Soil finish	Tilled: October 29, 2012 Soil finish November 7, 2012 Soil finish
Row Spacing:	7.5 inches	7.5 inches	7.5 inches	7.5 inches
Population at Harvest (seeds/A):				
Harvest date:	July 24, 2013	July 24, 2013	July 19, 2013	July 19, 2013
Fertilization:	May 2, 2013 Applied 28-0-0 80 lbs N/A	May 2, 2013 Applied 28-0-0 80 lbs N/A	May 3, 2013 Applied 28-0-0 48 lbs N/A	None
Cover Crop	None	None	Medium Red Clover	Organic Medium Red Clover
Herbicide Burndown:	None	None	None	None
Herbicide Postemergence:	April 29, 2013 Affinity BroadSpec .8 oz/A Osprey 4.75 oz/A Preference Nonionic Surfcatant .25% v/v Ammonium Sulfate 2 lbs/A	April 22, 2013 Harmony Extra SG .8 oz/A Preference Nonionic Surfactant .25% v/v May 17, 2013 (Spot-Spray) Osprey 4.75 oz/A Preference Nonionic Surfactant .5% v/v Ammonium Sulfate 3.0 lbs/A	May 1, 2013 Affinity BroadSpec 1 oz/A Preference Nonionic Surfactant .25% v/v	None
Insecticide:	None	None	None	None
Rotary Hoe:	None	None	None	None
Row Cultivation:	None	None	None	None

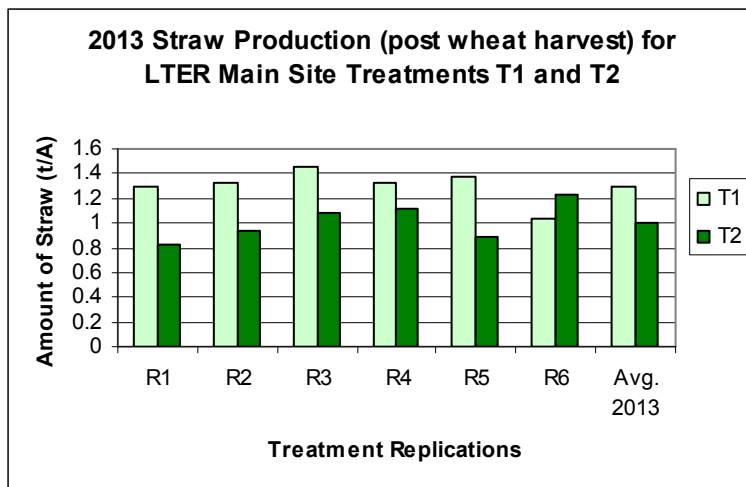
LTER Main Site Treatments T1 and T2 Straw Production Following Wheat Harvest

Compare the amount of baled wheat straw from soft red winter wheat grown under different management practices:

T1 Traditionally tilled with fertilizer and/or herbicides.

T2 No-tilled with fertilizer and/or herbicides.

T3 and T4 plots had the straw chopped and returned to plot area at harvest time.



Post-harvest Straw Yield (t/A)		
Treatment/Replicates	T1	T2
Replicate1	1.29	.83
Replicate2	1.33	.94
Replicate3	1.45	1.09
Replicate4	1.32	1.11
Replicate5	1.37	.89
Replicate6	1.03	1.23
Average	1.30	1.01

Results:

Straw was baled in round bales on 7/25/2013, one day after the grain harvest. Round bales were then taken off site and weighed.

Treatments T1 and T2 were different in their straw production; however, there was little differences between replicates.

Differences in straw production paralleled the differences in grain yield.

LTER Resource Gradient (former Nitrogen Rate) Study Comparison of Non-Irrigated versus Irrigated Yields

Purpose

Compare grain yields under different levels of nitrogen fertilization with non-irrigated (dryland) and irrigated winter wheat.

Rotational sequence: - Winter Wheat (2013, 2016) - Corn (2014, 2017) - Soybean (2012, 2015).

Fertilizer was applied in the form of 28% (28-0-0) sprayed across each plot and each treatment according to specific treatments.

Fertilizer Lbs N/A	Non-Irrigated Avg Yield (bu/A)	Irrigated Avg Yield (bu/A)
0	36.66	39.12
20	43.15	60.33
40	49.03	71.32
60	48.69	73.10
80	48.80	70.57
100	55.17	69.20
120	58.64	66.19
140	55.15	59.59
160	48.77	63.29

Crop:	Soft Red Winter Wheat
Variety:	Pioneer 25R39 Treated
Planting date:	November 9, 2012
Irrigation:	None vs. Irrigated (6 times) for a total of 5.45 inches of H ₂ O applied.
Tillage:	No-Till
Row Spacing:	7.5 inches
Population:	1,801,250 seeds/A
Harvest date:	July 19, 2013
Fertilization:	Only Fertilizer applied was N in the form of 28% (28-0-0) Applied May 8, 2013 according to specific treatment amounts.
Herbicide Postemergence:	April 26, 2013 Affinity BroadSpec .8 oz/A Preference Nonionic Surfactant .25% v/v

Results

The addition of nitrogen to winter wheat increased wheat yields. Irrigation increased wheat yields.

No direct comparison between the non-irrigated and the irrigated areas are statistically valid due to the experimental design.

The N-rate non-irrigated yields were higher than the LTER main site T2 (no-till) yields and lower than T1 (tilled) yields, except for one treatment had a higher yield.

2013 LTER Resource Gradient (former Nitrogen Rate) Study Comparison of Winter Wheat Grain Yields Under Different Nitrogen Fertilization Levels

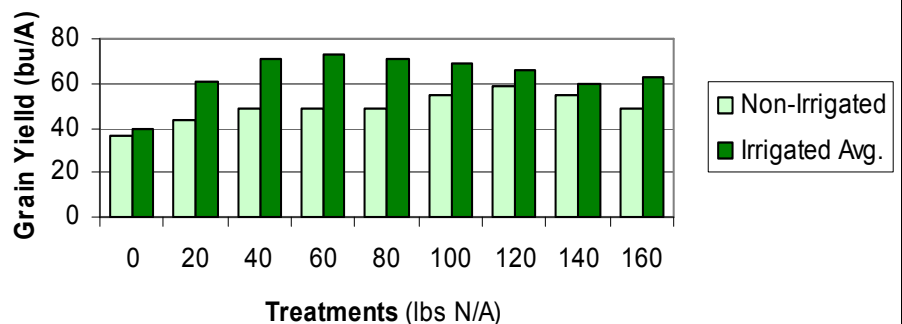


Chart 1. Precipitation (inches) on the KBS-LTER Main Site at the W.K. Kellogg Biological Station, Michigan State University.

Precipitation data is reported beginning 10/1/12 through 11/30/13 to reflect growing condition for winter wheat.

Day	October	November	December	January	February	March	April	May	June	July	August	September	October	November
1	0.00	0.00	0.01	0.00	2.14	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.22
2	0.02	0.00	0.40	0.00	0.03	0.00	0.00	0.00	0.05	0.41	0.17	0.00	0.00	0.08
3	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.28	0.00	0.05	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00
5	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.01
6	0.02	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.18	0.66
7	0.04	0.00	0.08	0.00	0.26	0.00	0.00	0.00	0.00	0.00	1.44	0.00	0.09	0.14
8	0.00	0.00	0.17	0.00	0.08	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.07
9	0.01	0.00	0.11	0.02	0.00	0.00	0.12	0.13	0.00	0.01	0.00	0.34	0.00	0.00
10	0.23	0.00	0.01	0.22	0.09	0.11	0.26	0.27	0.41	0.00	0.00	0.00	0.00	0.00
11	0.01	0.00	0.00	0.74	0.03	0.31	1.64	0.03	0.00	0.00	0.00	0.00	0.00	0.24
12	0.10	0.39	0.00	0.24	0.00	0.15	0.23	0.00	0.29	0.00	1.94	0.00	0.17	0.01
13	1.40	0.00	0.00	0.50	0.00	0.04	0.01	0.00	0.50	0.00	0.00	0.00	0.00	0.00
14	0.93	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.08	0.00	0.00	0.12	0.00	0.00	0.01	0.00	0.00	0.17	0.15	0.00
16	0.00	0.00	0.08	0.00	0.06	0.09	0.00	0.00	0.93	0.00	0.00	0.00	0.01	0.14
17	0.13	0.00	0.00	0.00	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.15	1.09
18	0.47	0.00	0.02	0.00	0.12	0.14	0.89	0.00	0.00	0.00	0.00	0.00	0.01	0.00
19	0.73	0.00	0.00	0.00	0.22	0.01	0.66	0.00	0.00	0.99	0.00	0.09	0.19	0.00
20	0.00	0.01	0.80	0.00	0.04	0.02	0.00	0.01	0.00	0.54	0.00	0.04	0.02	0.00
21	0.00	0.00	0.06	0.13	0.00	0.00	0.00	0.64	0.00	0.24	0.00	0.00	0.23	0.20
22	0.77	0.05	0.00	0.05	0.26	0.00	0.00	0.97	0.00	0.17	0.78	0.00	0.00	0.00
23	0.06	0.05	0.00	0.00	0.01	0.00	0.51	0.12	0.00	0.02	0.00	0.00	0.08	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.08	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	1.61	0.00	0.00	0.00	0.00	0.00
26	0.17	0.00	0.12	0.00	0.42	0.12	0.00	0.00	0.20	0.05	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.16	0.31	0.00	0.00	0.12	0.00	0.00	0.03	0.00	0.00	0.00
28	0.00	0.00	0.03	0.21	0.01	0.01	0.01	2.11	0.00	0.45	0.13	0.00	0.00	0.02
29	0.00	0.00	0.02	0.41	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.12	0.00	0.00
30	0.17	0.00	0.01	1.13	0.00	0.00	0.47	0.00	0.11	0.00	0.00	0.00	0.25	0.00
31	0.04	0.00	0.00	3.20	0.04	0.04	0.00	0.11	0.37	0.00	0.00	0.00	2.01	0.00
Monthly Totals 2012/2013	5.63	0.50	2.05	7.04	4.23	1.16	6.71	4.67	4.25	3.25	4.61	0.76	4.18	2.88
Monthly Average Rainfall	3.2	2.6	2.2	1.9	1.6	2.3	3.2	3.4	4.0	2.8	4.1	3.9	3.2	2.6

Average rainfall based on the average of 31 complete years between 1931 and 1995 from the National Climatic Data Center Cooperative Station at Gull Lake Biological Station, Kalamazoo County, Michigan

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