

# **Nutrient Removal Values for Major Agronomic Crops in Missouri Report for 2006-2007**

Manjula V. Nathan and Yichang Sun, and David Dunn

## **Introduction:**

Currently the soil Fertility Group is working on revising the University of Missouri (MU) Fertilizer and Lime Recommendations for Missouri. At this time, there is no research based values for nutrient removal available for major agronomic crops in Missouri. Since the source of nutrient removal values currently used by the MU fertilizer and Lime Recommendations is unknown, it was suggested that we replace the existing values in MU recommendations with data on nutrient removal values from the National Beef Research Council and National Dairy Research council. Since the crop nutrient removal values vary depending on yields, variety grown, and environmental conditions, it would be more appropriate to use nutrient uptake values from Missouri rather than using the national values reported by the National Beef and Dairy Research Councils.

## **Objective:**

- To obtain nutrient removal values for major agronomic crops in Missouri and use them in refining University of Missouri Fertilizer Recommendations.

## **Current Status:**

Table 1 provides a comparison of the current removal rates used in MU fertilizer recommendations, the proposed removal rates based on National Beef Research Council and National Dairy Research Council, and the rates recommended by the Potash and Phosphate Institute (PPI, 2002).

Preliminary work was done in year 2006 by collecting grain and forage samples for major agronomic crops in the state of Missouri. The samples were collected throughout the state of Missouri by working in collaboration with Missouri Department of Agriculture Grain Inspection Service Centers, MFA grain elevators, Agricultural Experiment Station Research Center and Farms and researchers. Three hundred and twenty six grain samples from major grain crops (corn, soybeans, wheat and sorghum) and 76 forage samples from the state of Missouri were collected during the 2006 growing season. The grain and forage samples were analyzed for N, P, K, and the moisture content was estimated. Based on grain nutrient percentages, the nutrient removal values were calculated. The mean values and other statistics for grain samples collected in 2006 are provided on Table 2 and Table 3. Since the grain nutrient removal values depend on the soil, environment, management practices and other factors effecting growth, and the values obtained in 2006 were significantly different from the proposed values (National Beef Research Council and National Dairy Research Council), it was decided that we continue this studies for two more years to get truly representative values for Missouri to be included into the MU fertilizer recommendations.

In 2007, to-date we have collected 377 grain samples and all the samples have been analyzed for nutrient content and the nutrient removal values have been estimated. The mean values and other statistics for grain samples collected during 2007 growing season are reported in Tables 2 and 3. The nutrient content and nutrient removal values for all the grain samples

collected up to now are presented in Table 4. We are in the process of collecting some more grain and forage samples for year 2007.

The N, P and K nutrient removal values for grain crops in Missouri for year 2006 and 2007 were different for both years, and didn't match with the nutrient values provided by the National Beef and Dairy Research Council (Table 5). The values used by the Beef and Dairy Research Councils are from a national data base and do not truly represent the Missouri conditions. The discrepancy between the two years of grain nutrient survey data and proposed values from National Beef and Dairy Research Council strongly suggests the need for additional years of data collection for grain nutrient removal values for major agronomic crops in Missouri to come up with the most appropriate values and truly representative grain nutrient removal values to refine MU fertilizer recommendations.

Table 6 provides the forage analysis results from the 2006 samples which were analyzed in early 2007, thus was not included in the 2006 grant report.

### **Need for Future Research:**

The success or failure of soil test recommendations are evidenced by crop yields and ability to maintain critical soil test levels of P & K. Fertilizer recommendations for P & K are largely dependent on crop removal. Crop nutrient removal values vary with weather conditions, yields, management and soil type. Multiple years of data are needed to develop appropriate and realistic nutrient removal values for growing conditions in Missouri. Paul Tracy, MFA Inc (personal communication, 2006) has indicated that the average soil test values from the same fields have been testing progressively lower in P with time. As these fields have been fertilized as to soil test recommendations this indicates that more P is being removed than supplied. The soil test summary from 1996-2006 clearly indicates majority (41%) of the soils tested by University of Missouri soil testing labs are low in phosphorus and 25% had medium levels of soil test P (Nathan et al., 2007). The soil fertility summary report for North America by Fixen, et al., (2005) showed the similar trends in soil test P levels in Missouri. Adequate phosphorus is critical for maximum crop yields. By reducing the crop removal values from 0.46 lbs P<sub>2</sub>O<sub>5</sub> to 0.32 lbs P<sub>2</sub>O<sub>5</sub>/bu for corn we will be under recommending P fertilizer. With time this will deplete the soil P levels in Missouri and end up with significant yield losses to the producers. Additional grain nutrient removal data from Missouri is needed before making any changes for nutrient removal values for agronomic crops. Other states use the data collected from their states to establish appropriate values for nutrient removal that represent the growing conditions in their state.

### **References:**

1. Fixen, P.E., Bruulsema, T.W., Johnson, A. M., Mikkelsen, R. I., Murrell, T. S., Snyder, C. S., and W. M. Stewart. 2005. Soil Test Levels in North America, 2005. Summary Update. PPI/PPIC/FAR Technical Bulletin 2005-1.
2. Nathan, M. V., Sun, Y., Abernathy, S., and D. Dunn. 2007. Summary of Soil Fertility Status in Missouri by County, Soil Regions and Cropping Systems 1996 – 2006. Annual Meetings Abstract. ASA, SSSA, CSSA Madison, WI.
3. Nathan, M., Sun, Y., and D. Dunn 2007. Nutrient Removal Values for Major Agronomic Crops in Missouri. *In*: Missouri Soil Fertility and Fertilizers Research Update 2006. Agronomy Miscellaneous Publ. #07-01, College of Agriculture, Food and Natural Resources, University of Missouri. P 100-107

**Table 1: Comparison of Current University of Missouri, Proposed (National Research Council), and International Plant Nutrition Institute's Recommended Nutrient Removal Values for Agronomic Crops.**

Crop	Yield Unit	N removal			P <sub>2</sub> O <sub>5</sub> removal			K <sub>2</sub> O removal		
		Current	NRC	IPNI	Current	NRC	IPNI	Current	NRC	IPNI
Barley	bushel	0.96	0.87	1.1	0.38	0.33	0.4	0.24	0.29	0.35
Corn Grain	bushel	0.9	0.74	0.75	0.45	0.32	0.44	0.30	0.25	0.29
Corn Silage	ton	9.0	9.9	8.3	3.6	4.1	3.6	9.0	10	8.3
Oats	bushel	0.64	0.6	0.8	0.26	0.26	0.25	0.19	0.17	0.2
Rice	pound	0.013	-	-	0.0065	-	-	0.004	-	-
Sorghum grain	pound	0.014	0.018	0.015	0.0093	0.0067	0.0075	0.006	0.0047	0.0038
Sorghum silage	ton	13.0	10	-	4.6	3.5	-	10	15	-
Soybean	bushel	-	3.4	4.0	0.84	0.80	0.80	1.44	1.30	1.40
Wheat	bushel	1.26	1.18	1.5	0.60	0.50	0.5	0.30	0.30	0.35
Alfalfa-grass hay	ton	-	54	50	10.0	11	14	45	53	54
Bermuda grass hay	ton	50	30	41	9.0	11	11	34	40	45
Clover-grass hay	ton	-	55	45	8.2	13	14	38	57	54
Cool season grass hay	ton	40	38	34	9.0	12	16	34	47	47
Lespedeza-grass hay	ton	-	-	-	8.8	-	-	20	-	-
Sudan grass hay	ton	40	27	36	6.9	8	14	19	52	52
Warm season grass hay	ton	-	-	-	2.0	-	-	14.6	-	-

**Table 2. Yearly Variation in Grain Nutrient Percentage for Grain Crops in Missouri ( 2006 - 2007)**

Crops		Nutrient Percentage %					
		N		P		K	
		2006	2007	2006	2007	2006	2007
<b>Corn</b>	<b>Mean</b>	1.434	1.491	0.445	0.310	0.602	0.473
	<b>STD</b>	0.209	0.221	0.075	0.035	0.085	0.083
	<b>N</b>	141	214	141	214	141	214
	<b>Min</b>	1.079	0.968	0.260	0.211	0.364	0.234
	<b>Max</b>	2.129	2.100	0.646	0.404	0.837	0.738
	<b>Mean ± 2.5 STD</b>	0.911 - 1.956	0.939 - 2.043	0.258 - 0.633	0.223 - 0.398	0.388 - 0.815	0.265 - 0.681
<b>Soybeans</b>	<b>Mean</b>	4.878	5.779	0.443	0.623	1.598	1.872
	<b>STD</b>	0.499	0.394	0.034	0.050	0.143	0.245
	<b>N</b>	87	83	87	83	87	83
	<b>Min</b>	3.499	4.901	0.356	0.484	1.215	1.254
	<b>Max</b>	6.301	6.423	0.550	0.744	1.952	2.982
	<b>Mean ± 2.5 STD</b>	3.631 - 6.125	4.794 - 6.764	0.357 - 0.529	0.497 - 0.729	1.240 - 1.956	1.259 - 2.485
<b>Wheat</b>	<b>Mean</b>	1.828	2.218	0.336	0.425	0.467	0.557
	<b>STD</b>	0.324	0.308	0.044	0.037	0.078	0.123
	<b>N</b>	52	71	52	71	52	71
	<b>Min</b>	1.380	1.836	0.245	0.351	0.308	0.389
	<b>Max</b>	2.838	3.248	0.454	0.545	0.646	0.922
	<b>Mean ± 2.5 STD</b>	1.017 - 2.638	1.448 - 2.988	0.226 - 0.447	0.333 - 0.517	0.271 - 0.663	0.250 - 0.863
<b>Sorghum</b>	<b>Mean</b>	1.699	1.522	0.814	0.306	0.952	0.499
	<b>STD</b>	0.171	0.167	0.084	0.029	0.106	0.089
	<b>N</b>	17	19	17	19	17	19
	<b>Min</b>	1.469	1.252	0.629	0.251	0.729	0.369
	<b>Max</b>	2.166	1.846	0.948	0.378	1.106	0.699
	<b>Mean ± 2.5 STD</b>	1.271 - 2.127	1.105 - 1.938	0.604 - 1.023	0.234 - 0.378	0.687 - 1.217	0.277 - 0.720

**Table 3. Yearly Variation in Nutrient Removal Values for Grain Crops in Missouri ( 2006 - 2007)**

Crops		Nutrient Removal Values lbs/bu					
		N		P <sub>2</sub> O <sub>5</sub>		K <sub>2</sub> O	
		2006	2007	2006	2007	2006	2007
Corn	Mean	0.678	0.705	0.479	0.334	0.343	0.270
	STD	0.099	0.105	0.081	0.038	0.049	0.047
	N	141	214	141	214	141	214
	Min	0.511	0.458	0.279	0.227	0.208	0.133
	Max	1.007	0.994	0.695	0.435	0.477	0.421
	Mean ± 2.5 STD	0.431 - 0.926	0.444 - 0.967	0.278 - 0.681	0.239 - 0.428	0.221 - 0.465	0.151 - 0.388
Soybeans	Mean	2.546	3.017	0.526	0.739	1.005	1.177
	STD	0.260	0.206	0.041	0.060	0.090	0.154
	N	87	83	87	83	87	83
	Min	1.826	2.558	0.422	0.574	0.764	0.789
	Max	3.289	3.353	0.653	0.883	1.228	1.876
	Mean ± 2.5 STD	1.896 - 3.197	2.502 - 3.531	0.424 - 0.627	0.589 - 0.889	0.780 - 1.230	0.792 - 1.563
Wheat	Mean	0.948	1.151	0.397	0.501	0.292	0.348
	STD	0.168	0.160	0.052	0.044	0.049	0.077
	N	52	71	52	71	52	71
	Min	0.716	0.953	0.289	0.414	0.192	0.243
	Max	1.473	1.686	0.536	0.643	0.404	0.576
	Mean ± 2.5 STD	0.528 - 1.369	0.751 - 1.551	0.267 - 0.527	0.392 - 0.610	0.170 - 0.414	0.156 - 0.540
Sorghum	Mean	0.828	0.741	0.901	0.339	0.559	0.293
	STD	0.083	0.081	0.093	0.032	0.062	0.052
	N	17	19	17	19	17	19
	Min	0.716	0.610	0.697	0.278	0.428	0.217
	Max	1.055	0.899	1.050	0.419	0.649	0.410
	Mean ± 2.5 STD	0.619 - 1.036	0.538 - 0.944	0.669 - 1.133	0.259 - 0.419	0.403 - 0.714	0.163 - 0.423

**Table 4: Survey Report of the Grain Nutrient Removal Values for Major Agronomic Crops in Missouri – Year 2007**

<u>CORN</u>	N	P	K	Nutrient	Removal	Values
County	%	%	%	lbs N/bu	lbs P <sub>2</sub> O <sub>5</sub> /bu	lbs K <sub>2</sub> O/bu
Audrain	1.449	0.317	0.670	0.686	0.341	0.382
Audrain	1.516	0.303	0.738	0.717	0.326	0.421
Audrain	1.485	0.306	0.712	0.703	0.329	0.406
Barton	1.383	0.304	0.506	0.655	0.327	0.288
Barton	1.390	0.318	0.469	0.658	0.342	0.267
Barton	1.404	0.299	0.346	0.664	0.322	0.198
Boone	1.195	0.307	0.402	0.566	0.331	0.229
Chariton	1.247	0.298	0.549	0.590	0.321	0.313
Chariton	1.269	0.291	0.527	0.601	0.313	0.301
Chariton	1.376	0.296	0.541	0.651	0.318	0.308
Clark	1.464	0.314	0.710	0.693	0.338	0.405
Clay	1.419	0.287	0.461	0.672	0.309	0.263
Clay	1.367	0.263	0.470	0.647	0.283	0.268
DeKalb	1.447	0.295	0.340	0.685	0.317	0.194
Dunklin	1.108	0.270	0.529	0.524	0.290	0.302
Dunklin	1.404	0.309	0.482	0.664	0.332	0.275
Dunklin	1.615	0.358	0.494	0.764	0.384	0.282
Dunklin	1.931	0.325	0.537	0.914	0.350	0.306
Dunklin	1.568	0.281	0.496	0.742	0.302	0.283
Dunklin	1.640	0.309	0.514	0.776	0.332	0.293
Dunklin	1.459	0.345	0.516	0.690	0.371	0.294
Dunklin	1.245	0.281	0.530	0.589	0.302	0.302
Dunklin	1.771	0.391	0.569	0.838	0.421	0.325
Dunklin	1.408	0.213	0.523	0.666	0.230	0.298
Dunklin	1.647	0.304	0.502	0.779	0.327	0.286
Dunklin	1.585	0.345	0.503	0.750	0.371	0.287
Dunklin	1.751	0.308	0.435	0.828	0.331	0.248
Dunklin	1.642	0.339	0.516	0.777	0.365	0.294
Dunklin	1.800	0.340	0.519	0.852	0.366	0.296
Dunklin	1.474	0.295	0.503	0.698	0.317	0.287
Dunklin	1.572	0.303	0.502	0.744	0.326	0.286
Dunklin	1.262	0.290	0.509	0.597	0.311	0.290
Grundy	1.529	0.367	0.355	0.724	0.395	0.202
Grundy	1.400	0.321	0.368	0.663	0.345	0.210
Howard	1.482	0.305	0.484	0.701	0.328	0.276
Howard	1.475	0.286	0.509	0.698	0.308	0.290
Howard	1.398	0.292	0.530	0.662	0.314	0.302
Jackson	1.599	0.287	0.464	0.757	0.309	0.264
Lafayette	1.337	0.290	0.677	0.633	0.312	0.386
Lafayette	1.323	0.296	0.645	0.626	0.318	0.368
Lafayette	1.336	0.293	0.669	0.632	0.316	0.381
Lewis	1.478	0.283	0.663	0.700	0.305	0.378

Lewis	1.359	0.308	0.390	0.643	0.332	0.223
Mississippi	1.432	0.274	0.460	0.678	0.294	0.262
Mississippi	1.605	0.333	0.462	0.760	0.358	0.263
Mississippi	1.490	0.307	0.507	0.705	0.330	0.289
Mississippi	1.792	0.392	0.484	0.848	0.422	0.276
Mississippi	1.304	0.226	0.371	0.617	0.243	0.212
Mississippi	1.593	0.281	0.523	0.754	0.302	0.298
Mississippi	1.678	0.249	0.428	0.794	0.268	0.244
Mississippi	1.521	0.284	0.519	0.720	0.306	0.296
Mississippi	1.491	0.251	0.433	0.705	0.270	0.247
Mississippi	1.732	0.287	0.587	0.819	0.309	0.335
Mississippi	1.429	0.305	0.510	0.676	0.328	0.291
Mississippi	1.620	0.226	0.550	0.767	0.243	0.314
Mississippi	2.027	0.314	0.449	0.959	0.338	0.256
Mississippi	1.231	0.324	0.529	0.583	0.349	0.302
Mississippi	1.168	0.286	0.574	0.553	0.308	0.327
Mississippi	1.272	0.323	0.460	0.602	0.347	0.262
Mississippi	1.866	0.404	0.460	0.883	0.435	0.262
Mississippi	1.861	0.341	0.412	0.880	0.366	0.235
Mississippi	1.574	0.326	0.408	0.745	0.351	0.233
Mississippi	1.673	0.290	0.371	0.792	0.312	0.212
Mississippi	1.192	0.322	0.474	0.564	0.346	0.270
Mississippi	1.666	0.340	0.491	0.788	0.366	0.280
Mississippi	1.556	0.305	0.436	0.736	0.328	0.249
Mississippi	1.200	0.324	0.572	0.568	0.348	0.326
Mississippi	1.744	0.327	0.642	0.825	0.352	0.366
Mississippi	1.333	0.291	0.619	0.631	0.313	0.353
Mississippi	1.440	0.277	0.476	0.681	0.298	0.272
Mississippi	1.338	0.240	0.470	0.633	0.259	0.268
Mississippi	1.374	0.300	0.297	0.650	0.322	0.169
New Madrid	1.622	0.266	0.499	0.767	0.287	0.285
New Madrid	1.670	0.308	0.540	0.790	0.332	0.308
New Madrid	1.610	0.325	0.560	0.762	0.350	0.319
New Madrid	1.693	0.312	0.517	0.801	0.336	0.295
New Madrid	1.280	0.289	0.433	0.605	0.311	0.247
New Madrid	1.492	0.259	0.526	0.706	0.279	0.300
New Madrid	1.833	0.304	0.489	0.867	0.327	0.279
New Madrid	1.834	0.371	0.519	0.868	0.399	0.296
New Madrid	1.534	0.374	0.503	0.726	0.402	0.287
New Madrid	1.823	0.308	0.515	0.862	0.331	0.294
New Madrid	1.926	0.357	0.548	0.911	0.384	0.312
New Madrid	1.773	0.332	0.513	0.839	0.357	0.292
New Madrid	1.037	0.308	0.568	0.491	0.332	0.324
New Madrid	1.069	0.235	0.498	0.506	0.253	0.284
New Madrid	1.309	0.304	0.472	0.619	0.327	0.269
New Madrid	1.633	0.307	0.537	0.773	0.331	0.306
New Madrid	1.179	0.283	0.559	0.558	0.304	0.319
New Madrid	1.650	0.315	0.529	0.781	0.339	0.301

New Madrid	1.471	0.289	0.504	0.696	0.311	0.287
New Madrid	1.418	0.251	0.466	0.671	0.270	0.266
New Madrid	1.769	0.374	0.487	0.837	0.403	0.277
New Madrid	1.434	0.304	0.547	0.679	0.327	0.312
New Madrid	1.340	0.279	0.495	0.634	0.300	0.282
New Madrid	1.626	0.324	0.542	0.769	0.348	0.309
New Madrid	1.896	0.354	0.468	0.897	0.380	0.267
New Madrid	1.612	0.297	0.523	0.763	0.320	0.298
New Madrid	1.625	0.351	0.554	0.769	0.377	0.316
New Madrid	1.430	0.351	0.455	0.677	0.378	0.259
New Madrid	1.325	0.328	0.447	0.627	0.352	0.255
New Madrid	1.837	0.323	0.513	0.869	0.347	0.292
New Madrid	1.279	0.339	0.523	0.605	0.365	0.298
New Madrid	1.681	0.334	0.493	0.796	0.359	0.281
New Madrid	1.386	0.290	0.507	0.656	0.312	0.289
New Madrid	1.620	0.298	0.504	0.766	0.321	0.287
New Madrid	1.613	0.318	0.461	0.763	0.341	0.263
New Madrid	1.691	0.359	0.507	0.800	0.386	0.289
New Madrid	1.059	0.367	0.566	0.501	0.395	0.322
New Madrid	1.302	0.281	0.443	0.616	0.302	0.252
New Madrid	1.807	0.359	0.476	0.855	0.386	0.272
New Madrid	1.352	0.343	0.557	0.640	0.369	0.317
New Madrid	1.759	0.355	0.469	0.832	0.382	0.267
New Madrid	1.049	0.301	0.554	0.496	0.323	0.316
New Madrid	1.328	0.303	0.386	0.628	0.325	0.220
New Madrid	1.645	0.343	0.304	0.778	0.369	0.173
New Madrid	1.453	0.305	0.377	0.687	0.328	0.215
New Madrid	2.026	0.363	0.402	0.959	0.390	0.229
New Madrid	1.392	0.323	0.442	0.659	0.347	0.252
New Madrid	1.312	0.283	0.359	0.621	0.305	0.205
New Madrid	1.600	0.317	0.422	0.757	0.341	0.241
New Madrid	1.132	0.276	0.507	0.536	0.297	0.289
New Madrid	1.814	0.350	0.501	0.858	0.376	0.286
New Madrid	1.856	0.358	0.480	0.878	0.385	0.273
New Madrid	1.547	0.316	0.468	0.732	0.340	0.267
New Madrid	1.391	0.291	0.494	0.658	0.313	0.282
New Madrid	1.596	0.349	0.489	0.755	0.375	0.279
New Madrid	1.094	0.339	0.600	0.518	0.364	0.342
New Madrid	1.730	0.343	0.485	0.819	0.369	0.276
New Madrid	2.097	0.304	0.409	0.992	0.327	0.233
New Madrid	1.023	0.314	0.537	0.484	0.338	0.306
New Madrid	1.195	0.285	0.460	0.565	0.307	0.262
New Madrid	1.323	0.299	0.408	0.626	0.322	0.233
Nodaway	1.555	0.345	0.396	0.736	0.371	0.226
Nodaway	1.564	0.337	0.401	0.740	0.362	0.228
NW MO	1.447	0.282	0.341	0.685	0.303	0.194
NW MO	1.470	0.287	0.360	0.695	0.308	0.205
NW MO	1.366	0.267	0.345	0.646	0.287	0.196



NW MO	1.249	0.249	0.352	0.591	0.268	0.201
Pemiscot	1.093	0.300	0.465	0.517	0.322	0.265
Pemiscot	1.921	0.351	0.513	0.909	0.377	0.292
Pemiscot	1.652	0.349	0.441	0.782	0.375	0.251
Pemiscot	1.608	0.379	0.480	0.761	0.408	0.273
Pemiscot	1.351	0.296	0.412	0.639	0.319	0.235
Pemiscot	1.672	0.298	0.426	0.791	0.320	0.243
Pemiscot	1.360	0.289	0.400	0.644	0.310	0.228
Pemiscot	1.706	0.345	0.504	0.807	0.371	0.287
Pemiscot	1.389	0.323	0.484	0.657	0.347	0.276
Pemiscot	1.747	0.342	0.436	0.827	0.368	0.248
Pemiscot	1.636	0.356	0.442	0.774	0.383	0.252
Pemiscot	1.677	0.384	0.435	0.794	0.413	0.248
Pemiscot	1.287	0.279	0.429	0.609	0.300	0.245
Pemiscot	1.232	0.340	0.494	0.583	0.366	0.282
Pemiscot	1.602	0.347	0.451	0.758	0.373	0.257
Pemiscot	1.630	0.343	0.421	0.772	0.368	0.240
Pemiscot	1.030	0.344	0.511	0.488	0.370	0.291
Pemiscot	1.204	0.297	0.488	0.570	0.319	0.278
Pemiscot	1.452	0.334	0.463	0.687	0.359	0.264
Pemiscot	1.289	0.340	0.484	0.610	0.366	0.276
Pemiscot	1.567	0.356	0.450	0.742	0.383	0.257
Pemiscot	1.380	0.355	0.507	0.653	0.381	0.289
Pemiscot	1.657	0.341	0.443	0.784	0.367	0.252
Pemiscot	1.475	0.312	0.392	0.698	0.335	0.224
Pemiscot	1.121	0.302	0.509	0.531	0.325	0.290
Pemiscot	1.460	0.289	0.500	0.691	0.311	0.285
Pemiscot	1.416	0.319	0.456	0.670	0.343	0.260
Pemiscot	1.543	0.286	0.439	0.730	0.308	0.250
Pemiscot	1.297	0.220	0.400	0.614	0.237	0.228
Pemiscot	1.650	0.349	0.390	0.781	0.375	0.223
Pemiscot	1.346	0.364	0.437	0.637	0.391	0.249
Pemiscot	1.561	0.352	0.466	0.739	0.379	0.266
Pemiscot	1.478	0.297	0.503	0.700	0.319	0.287
Ray	1.399	0.261	0.565	0.662	0.281	0.322
Ray	1.443	0.286	0.553	0.683	0.307	0.315
Ray	1.405	0.304	0.580	0.665	0.327	0.330
Ray	1.425	0.299	0.340	0.675	0.321	0.194
Scott	1.731	0.303	0.583	0.819	0.326	0.333
Scott	1.626	0.338	0.517	0.769	0.363	0.295
Scott	1.558	0.335	0.476	0.737	0.361	0.271
Scott	1.462	0.338	0.520	0.692	0.363	0.296
Scott	1.259	0.335	0.500	0.596	0.360	0.285
Scott	0.968	0.323	0.615	0.458	0.347	0.351
Scott	1.457	0.327	0.560	0.690	0.352	0.319
Scott	1.567	0.286	0.458	0.741	0.308	0.261
Scott	1.532	0.282	0.457	0.725	0.304	0.261
Scott	1.161	0.287	0.446	0.550	0.308	0.254

Scott	1.716	0.304	0.441	0.812	0.327	0.252
Scott	1.130	0.211	0.384	0.535	0.227	0.219
Scott	1.458	0.284	0.367	0.690	0.306	0.209
Scott	1.602	0.314	0.328	0.758	0.337	0.187
Scott	1.594	0.302	0.422	0.754	0.325	0.241
Scott	1.751	0.352	0.415	0.828	0.379	0.237
Scott	1.798	0.312	0.439	0.851	0.336	0.250
Scott	1.314	0.324	0.468	0.622	0.349	0.267
Scott	2.100	0.379	0.301	0.994	0.408	0.172
Scott	1.474	0.378	0.360	0.698	0.406	0.205
Scott	2.049	0.362	0.489	0.969	0.389	0.279
Scott	1.354	0.272	0.521	0.641	0.293	0.297
Scott	1.429	0.302	0.475	0.676	0.325	0.271
Scott	1.421	0.256	0.354	0.672	0.275	0.202
Scott	1.419	0.299	0.364	0.671	0.322	0.207
Scott	1.472	0.273	0.402	0.697	0.294	0.229
Scott	1.582	0.276	0.409	0.749	0.297	0.233
Scott	1.588	0.290	0.321	0.752	0.312	0.183
Scott	1.519	0.299	0.283	0.719	0.321	0.162
Scott	1.401	0.317	0.277	0.663	0.340	0.158
Scott	1.479	0.259	0.234	0.700	0.279	0.133
Scott	1.421	0.248	0.286	0.672	0.267	0.163
Scott	1.444	0.306	0.372	0.683	0.329	0.212
Stoddard	1.384	0.271	0.400	0.655	0.292	0.228
Stoddard	1.286	0.272	0.337	0.608	0.292	0.192
Stoddard	1.245	0.289	0.320	0.589	0.311	0.182
Stoddard	1.260	0.275	0.360	0.596	0.296	0.205
Stoddard	1.105	0.277	0.431	0.523	0.298	0.246
<b>Mean</b>	<b>1.491</b>	<b>0.310</b>	<b>0.473</b>	<b>0.705</b>	<b>0.334</b>	<b>0.270</b>
<b>STD</b>	<b>0.221</b>	<b>0.035</b>	<b>0.083</b>	<b>0.105</b>	<b>0.038</b>	<b>0.047</b>
<b>N</b>	<b>214</b>	<b>214</b>	<b>214</b>	<b>214</b>	<b>214</b>	<b>214</b>
<b>Min</b>	<b>0.968</b>	<b>0.211</b>	<b>0.234</b>	<b>0.458</b>	<b>0.227</b>	<b>0.133</b>
<b>Max</b>	<b>2.100</b>	<b>0.404</b>	<b>0.738</b>	<b>0.994</b>	<b>0.435</b>	<b>0.421</b>
<b>Mean ± 2.5 STD</b>	<b>0.939 - 2.043</b>	<b>0.223 - 0.398</b>	<b>0.265 - 0.681</b>	<b>0.444 - 0.967</b>	<b>0.239 - 0.428</b>	<b>0.151 - 0.388</b>
<b><u>Soybean</u></b>	<b>N</b>	<b>P</b>	<b>K</b>	<b>Nutrient</b>	<b>Removal</b>	<b>Values</b>
<b>County</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>lbs N/bu</b>	<b>lbs P<sub>2</sub>O<sub>5</sub>/bu</b>	<b>lbs K<sub>2</sub>O/bu</b>
Atchison	6.209	0.717	1.861	3.241	0.851	1.171
Atchison	5.942	0.658	1.983	3.102	0.781	1.247
Audrain	5.765	0.562	2.982	3.009	0.667	1.876
Audrain	5.851	0.579	2.869	3.054	0.687	1.804
Audrain	5.730	0.611	2.787	2.991	0.725	1.753
Barton	5.287	0.552	1.596	2.760	0.654	1.004
Bates	5.766	0.499	1.993	3.010	0.592	1.253
Bates	6.167	0.547	1.802	3.219	0.649	1.134
Bates	6.132	0.549	1.814	3.201	0.652	1.141
Benton	6.352	0.601	1.970	3.316	0.713	1.239
Boone	5.351	0.650	1.924	2.793	0.771	1.210
Cass	5.967	0.533	1.952	3.115	0.633	1.228

Cass	6.301	0.653	1.941	3.289	0.775	1.221
Clay	5.671	0.658	1.894	2.960	0.780	1.191
Clay	5.653	0.558	1.959	2.951	0.662	1.232
Clinton	6.075	0.557	1.939	3.171	0.661	1.219
Clinton	6.152	0.593	1.854	3.211	0.703	1.166
Clinton	6.030	0.637	1.888	3.147	0.755	1.187
Davies	5.983	0.646	1.891	3.123	0.767	1.189
Davies	6.194	0.591	1.858	3.233	0.702	1.169
Gentry	5.856	0.635	1.736	3.057	0.754	1.092
Gentry	5.306	0.646	1.254	2.770	0.766	0.789
Grundy	6.148	0.647	1.886	3.209	0.768	1.186
Harrison	5.796	0.668	1.857	3.025	0.792	1.168
Harrison	5.976	0.629	1.914	3.119	0.747	1.204
Henry	6.032	0.647	1.834	3.149	0.768	1.154
Henry	5.267	0.648	1.832	2.750	0.768	1.152
Holt	5.860	0.615	1.889	3.059	0.729	1.188
Holt	5.961	0.585	1.863	3.111	0.695	1.172
Holt	5.980	0.598	1.913	3.122	0.710	1.203
Johnson	6.043	0.585	1.722	3.154	0.694	1.083
Lafayette	5.625	0.568	1.963	2.936	0.673	1.235
Lafayette	5.522	0.579	1.906	2.882	0.687	1.198
Lafayette	6.005	0.623	1.913	3.135	0.739	1.203
Linn	6.029	0.605	1.857	3.147	0.717	1.168
Livingston	6.176	0.680	1.944	3.224	0.807	1.223
Livingston	6.192	0.679	1.928	3.232	0.806	1.212
Livingston	6.423	0.701	1.930	3.353	0.832	1.214
Macon	5.229	0.587	1.580	2.730	0.697	0.994
New Madrid	5.900	0.710	1.904	3.080	0.843	1.198
New Madrid	6.230	0.649	1.549	3.252	0.770	0.974
New Madrid	5.985	0.617	1.811	3.124	0.732	1.139
New Madrid	6.136	0.667	1.713	3.203	0.791	1.077
New Madrid	6.008	0.654	1.839	3.136	0.775	1.157
New Madrid	5.802	0.698	1.737	3.028	0.828	1.093
New Madrid	5.995	0.687	1.884	3.129	0.815	1.185
New Madrid	6.111	0.684	1.810	3.190	0.811	1.138
New Madrid	5.326	0.639	1.746	2.780	0.758	1.098
New Madrid	6.041	0.694	2.083	3.154	0.823	1.310
New Madrid	5.116	0.609	1.741	2.671	0.723	1.095
New Madrid	5.179	0.596	1.511	2.704	0.707	0.950
Nodaway	6.255	0.601	1.981	3.265	0.713	1.246
Nodaway	6.081	0.642	1.999	3.174	0.761	1.258
Nodaway	5.746	0.562	1.908	2.999	0.666	1.200
Nodaway	5.954	0.603	1.885	3.108	0.715	1.186
Nodaway	6.040	0.600	1.897	3.153	0.712	1.193
Nodaway	6.212	0.627	1.671	3.243	0.744	1.051
Nodaway	6.028	0.678	1.773	3.147	0.804	1.115
Pemiscot	5.926	0.613	2.133	3.093	0.728	1.341
Pemiscot	5.286	0.604	1.865	2.760	0.717	1.173
Pemiscot	6.019	0.646	1.874	3.142	0.766	1.179
Pemiscot	6.013	0.673	1.927	3.139	0.798	1.212

Pemiscot	6.045	0.668	1.887	3.155	0.792	1.187
Pemiscot	6.082	0.625	1.987	3.175	0.741	1.250
Pemiscot	5.915	0.695	1.959	3.087	0.824	1.232
Pemiscot	4.901	0.639	1.676	2.558	0.758	1.054
Pemiscot	5.103	0.672	1.494	2.664	0.797	0.940
Pemiscot	5.255	0.602	1.606	2.743	0.714	1.010
Pemiscot	5.272	0.662	1.716	2.752	0.785	1.079
Pemiscot	5.114	0.599	1.619	2.670	0.711	1.018
Pemiscot	5.063	0.588	1.770	2.643	0.698	1.113
Pike	5.251	0.612	1.794	2.741	0.726	1.128
Platte	5.998	0.644	2.041	3.131	0.764	1.284
Platte	5.993	0.613	1.747	3.128	0.727	1.098
Platte	6.026	0.631	2.019	3.145	0.749	1.270
Ray	5.896	0.570	1.736	3.078	0.676	1.092
Scott	5.312	0.580	1.820	2.773	0.688	1.145
Scott	5.168	0.524	1.674	2.698	0.621	1.053
Scott	5.204	0.629	1.836	2.716	0.746	1.155
Scott	5.028	0.484	1.789	2.624	0.574	1.125
Scott	5.135	0.693	1.886	2.680	0.823	1.186
Vernon	5.306	0.605	2.053	2.770	0.718	1.291
Vernon	5.202	0.744	1.535	2.715	0.883	0.965
<b>Mean</b>	<b>5.779</b>	<b>0.623</b>	<b>1.872</b>	<b>3.017</b>	<b>0.739</b>	<b>1.177</b>
<b>STD</b>	<b>0.394</b>	<b>0.050</b>	<b>0.245</b>	<b>0.206</b>	<b>0.060</b>	<b>0.154</b>
<b>N</b>	<b>83</b>	<b>83</b>	<b>83</b>	<b>83</b>	<b>83</b>	<b>83</b>
<b>Min</b>	<b>4.901</b>	<b>0.484</b>	<b>1.254</b>	<b>2.558</b>	<b>0.574</b>	<b>0.789</b>
<b>Max</b>	<b>6.423</b>	<b>0.744</b>	<b>2.982</b>	<b>3.353</b>	<b>0.883</b>	<b>1.876</b>
<b>Mean ± 2.5 STD</b>	<b>4.794 - 6.764</b>	<b>0.497 - 0.729</b>	<b>1.259 - 2.485</b>	<b>2.502 - 3.531</b>	<b>0.589 - 0.889</b>	<b>0.792 - 1.563</b>
<b>Wheat</b>	<b>N</b>	<b>P</b>	<b>K</b>	<b>Nutrient</b>	<b>Removal</b>	<b>Values</b>
<b>County</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>lbs N/bu</b>	<b>Lbs P<sub>2</sub>O<sub>5</sub>/bu</b>	<b>lbs K<sub>2</sub>O/bu</b>
Audrain	1.846	0.392	0.872	0.958	0.463	0.545
Barton	2.148	0.439	0.575	1.115	0.518	0.359
Barton	2.306	0.463	0.613	1.197	0.546	0.383
Barton	2.314	0.545	0.586	1.201	0.643	0.366
Barton	2.309	0.451	0.500	1.198	0.532	0.312
Bates	2.308	0.485	0.551	1.198	0.572	0.345
Bates	2.200	0.452	0.585	1.142	0.533	0.366
Bates	2.173	0.433	0.556	1.128	0.511	0.348
Boone	2.312	0.446	0.539	1.200	0.527	0.337
Cape Girardeau	2.347	0.388	0.578	1.218	0.457	0.362
Cape Girardeau	2.811	0.461	0.617	1.459	0.543	0.386
Cape Girardeau	3.248	0.502	0.691	1.686	0.592	0.432
Cape Girardeau	3.213	0.437	0.735	1.668	0.515	0.459
Carroll	2.104	0.446	0.678	1.092	0.526	0.424
Carroll	1.944	0.419	0.662	1.009	0.494	0.414
Cass	2.139	0.449	0.572	1.110	0.530	0.358
Chariton	1.881	0.369	0.512	0.976	0.435	0.320
Chariton	2.102	0.409	0.643	1.091	0.482	0.402
Chariton	2.013	0.389	0.661	1.045	0.459	0.413
Clay	2.352	0.469	0.641	1.221	0.553	0.401
Grundy	2.101	0.390	0.609	1.091	0.460	0.381

Howard	2.050	0.408	0.696	1.064	0.481	0.435
Howard	1.968	0.398	0.548	1.021	0.470	0.343
Jackson	2.096	0.431	0.530	1.088	0.509	0.332
Jackson	2.134	0.381	0.539	1.108	0.450	0.337
Lewis	1.856	0.374	0.808	0.963	0.441	0.505
Lewis	1.872	0.391	0.729	0.972	0.462	0.456
Livingston	1.997	0.370	0.573	1.036	0.436	0.358
Mississippi	1.978	0.432	0.545	1.027	0.510	0.341
Montgomery	1.954	0.393	0.857	1.014	0.464	0.536
New Madrid	2.230	0.443	0.580	1.158	0.523	0.363
Pemiscot	2.248	0.418	0.561	1.167	0.493	0.351
Pemiscot	2.286	0.418	0.554	1.187	0.493	0.347
Pike	2.020	0.392	0.922	1.048	0.463	0.576
Randolph	2.034	0.385	0.564	1.056	0.454	0.353
Randolph	2.061	0.392	0.613	1.070	0.462	0.383
Randolph	2.006	0.376	0.804	1.041	0.444	0.503
Ray	2.218	0.426	0.725	1.151	0.503	0.453
Ray	1.983	0.386	0.610	1.029	0.455	0.381
Ray	1.997	0.384	0.615	1.037	0.454	0.385
Scott	2.374	0.491	0.653	1.232	0.580	0.408
Boone	2.538	0.439	0.479	1.317	0.518	0.299
Boone	2.865	0.485	0.544	1.487	0.572	0.340
Boone	2.500	0.446	0.484	1.298	0.526	0.302
Boone	2.342	0.433	0.440	1.215	0.510	0.275
Boone	2.604	0.477	0.437	1.351	0.562	0.273
Boone	2.534	0.432	0.412	1.315	0.510	0.258
Boone	2.852	0.432	0.561	1.480	0.509	0.351
Boone	2.476	0.457	0.462	1.285	0.539	0.289
Boone	2.503	0.447	0.420	1.299	0.528	0.262
Boone	2.532	0.432	0.503	1.314	0.510	0.314
Boone	2.567	0.456	0.512	1.332	0.538	0.320
Boone	2.280	0.422	0.472	1.183	0.498	0.295
Boone	2.602	0.432	0.472	1.350	0.509	0.295
Boone	2.504	0.460	0.489	1.299	0.542	0.306
Boone	2.495	0.425	0.454	1.295	0.501	0.284
Knox	2.030	0.436	0.426	1.053	0.514	0.266
Knox	2.126	0.401	0.475	1.104	0.473	0.297
Knox	1.870	0.370	0.412	0.971	0.437	0.257
Knox	1.959	0.438	0.461	1.017	0.517	0.288
Knox	2.026	0.443	0.411	1.051	0.523	0.257
Knox	2.013	0.372	0.409	1.045	0.439	0.256
Knox	1.930	0.415	0.452	1.002	0.490	0.283
Knox	1.926	0.412	0.420	1.000	0.486	0.262
Knox	2.231	0.487	0.394	1.158	0.574	0.246
Knox	1.965	0.404	0.422	1.020	0.476	0.264
Knox	2.075	0.419	0.413	1.077	0.494	0.258
Knox	1.836	0.351	0.450	0.953	0.414	0.282
Knox	1.939	0.439	0.422	1.006	0.518	0.264
Knox	1.940	0.408	0.430	1.007	0.482	0.269
Knox	1.880	0.381	0.389	0.976	0.450	0.243

<b>Mean</b>	<b>2.218</b>	<b>0.425</b>	<b>0.557</b>	<b>1.151</b>	<b>0.501</b>	<b>0.348</b>
<b>STD</b>	<b>0.308</b>	<b>0.037</b>	<b>0.123</b>	<b>0.160</b>	<b>0.044</b>	<b>0.077</b>
<b>N</b>	<b>71</b>	<b>71</b>	<b>71</b>	<b>71</b>	<b>71</b>	<b>71</b>
<b>Min</b>	<b>1.836</b>	<b>0.351</b>	<b>0.389</b>	<b>0.953</b>	<b>0.414</b>	<b>0.243</b>
<b>Max</b>	<b>3.248</b>	<b>0.545</b>	<b>0.922</b>	<b>1.686</b>	<b>0.643</b>	<b>0.576</b>
<b>Mean ± 2.5 STD</b>	<b>1.448 - 2.988</b>	<b>0.333 - 0.517</b>	<b>0.250 - 0.863</b>	<b>0.751 - 1.551</b>	<b>0.392 - 0.610</b>	<b>0.156 - 0.540</b>
<b><u>Sorghum</u></b>	<b>N</b>	<b>P</b>	<b>K</b>	<b>Nutrient</b>	<b>Removal</b>	<b>Values</b>
<b>County</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>lbs N/bu</b>	<b>Lbs P<sub>2</sub>O<sub>5</sub>/bu</b>	<b>lbs K<sub>2</sub>O/bu</b>
Audrain	1.600	0.308	0.633	0.780	0.341	0.371
Livingston	1.359	0.251	0.369	0.662	0.278	0.217
Livingston	1.354	0.275	0.371	0.660	0.305	0.218
New Madrid	1.487	0.283	0.497	0.725	0.314	0.292
New Madrid	1.571	0.297	0.486	0.765	0.329	0.285
New Madrid	1.846	0.378	0.377	0.899	0.419	0.221
New Madrid	1.410	0.361	0.604	0.687	0.399	0.355
New Madrid	1.495	0.304	0.447	0.728	0.337	0.263
Pemiscot	1.525	0.283	0.475	0.743	0.313	0.279
Pemiscot	1.469	0.298	0.449	0.716	0.330	0.263
Pemiscot	1.340	0.295	0.413	0.653	0.327	0.242
Pike	1.700	0.297	0.699	0.828	0.329	0.410
Scott	1.737	0.329	0.571	0.846	0.364	0.335
Scott	1.580	0.318	0.524	0.770	0.352	0.308
Scott	1.252	0.288	0.511	0.610	0.319	0.300
Scott	1.834	0.306	0.480	0.894	0.339	0.281
Scott	1.475	0.305	0.541	0.719	0.337	0.318
Scott	1.358	0.327	0.550	0.662	0.362	0.323
Scott	1.516	0.310	0.482	0.739	0.343	0.283
<b>Mean</b>	<b>1.522</b>	<b>0.306</b>	<b>0.499</b>	<b>0.741</b>	<b>0.339</b>	<b>0.293</b>
<b>STD</b>	<b>0.167</b>	<b>0.029</b>	<b>0.089</b>	<b>0.081</b>	<b>0.032</b>	<b>0.052</b>
<b>N</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>
<b>Min</b>	<b>1.252</b>	<b>0.251</b>	<b>0.369</b>	<b>0.610</b>	<b>0.278</b>	<b>0.217</b>
<b>Max</b>	<b>1.846</b>	<b>0.378</b>	<b>0.699</b>	<b>0.899</b>	<b>0.419</b>	<b>0.410</b>
<b>Mean ± 2.5 STD</b>	<b>1.105 - 1.938</b>	<b>0.234 - 0.378</b>	<b>0.277 - 0.720</b>	<b>0.538 - 0.944</b>	<b>0.259 - 0.419</b>	<b>0.163 - 0.423</b>

**Table 5: Comparison of Current University of Missouri, Proposed (National Research Council), Phosphate Potash Institute, and Measured Missouri Nutrient Removal Values for 2006 and 2007 for Major Agronomic Crops.**

Crop	Yield Unit	N removal					P <sub>2</sub> O <sub>5</sub> removal					K <sub>2</sub> O removal				
		Current	NRC	MO Values		IPNI	Current	NRC	MO Values		IPNI	Current	NRC	MO Values		IPNI
				2006	2007				2006	2007				2006	2007	
Corn	bushel	0.9	0.74	0.68	0.71	0.75	0.45	0.32	0.48	0.33	0.44	0.3	0.25	0.34	0.27	0.29
Sorghum	pound	0.014	0.018	0.014	0.012	0.015	0.0093	0.0067	0.015	0.006	0.0075	0.006	0.0047	0.0093	0.0048	0.0038
Soybean	bushel	-	3.4	2.55	3.02	4	0.84	0.8	0.53	0.74	0.8	1.44	1.3	1.01	1.18	1.4
Wheat	bushel	1.26	1.18	0.95	1.15	1.5	0.6	0.5	0.4	0.5	0.5	0.3	0.3	0.29	0.35	0.35

**Table 6: Survey Report of the Forage Nutrient Percentages for Major Grass in Missouri – Year 2006**

<u>Species</u>	<u>N</u> %	<u>P</u> %	<u>K</u> %
7028	1.904	0.232	2.220
8028	1.748	0.232	2.031
Alfalfa	4.467	0.394	1.740
Alfalfa	3.210	0.313	1.910
Alfalfa	4.194	0.243	1.334
Alfalfa	6.146	0.494	1.981
Alfalfa	4.141	0.367	1.764
Alfalfa	3.955	0.381	1.699
Alfalfa	3.590	0.339	1.484
Alfalfa	4.097	0.388	1.604
Alfalfa	4.491	0.443	3.058
Alfalfa	3.511	0.333	2.738
Alfalfa	3.549	0.351	2.863
Alfalfa	3.259	0.325	2.668
Alfalfa	3.622	0.367	2.865
Alfalfa	3.866	0.363	2.486
Alfalfa	3.181	0.341	2.546
Alfalfa	3.267	0.323	2.255
Alfalfa	3.135	0.298	2.446
Alfalfa	3.420	0.329	2.150
Ann. Ryegrass	3.257	0.361	3.465
Ann. Ryegrass	2.666	0.403	3.594
Ann. Ryegrass	1.705	0.346	2.438
Ann. Ryegrass	1.854	0.386	2.408
Ann. Ryegrass	3.437	0.302	2.570
Ann. Ryegrass	3.004	0.369	2.940
Ann. Ryegrass	1.980	0.502	1.985
Ann. Ryegrass	1.609	0.389	1.624
Bermuda	1.100	0.248	0.875
Caucasian Bluestem	1.708	0.357	2.193
Caucasian Bluestem	1.907	0.371	2.012
Caucasian Bluestem	1.553	0.184	1.691
Caucasian Bluestem	1.449	0.169	1.908
Caucasian Bluestem	1.772	0.196	1.184
Caucasian Bluestem	1.965	0.228	1.587
Caucasian Bluestem	1.854	0.230	1.970
Caucasian Bluestem	1.450	0.158	1.292
Caucasian Bluestem	1.403	0.156	1.149
Early Cut Fescue	1.549	0.229	1.399
Late Cut Fescue	1.356	0.157	1.711
Lespedeza	1.799	0.270	1.886
Lespedeza	1.155	0.374	2.581
Orchard Grass	1.545	0.217	1.737
Red Clover	2.506	0.219	1.390
Red Clover	3.497	0.282	1.953



Red Clover	1.741	0.429	3.535
Red Clover	1.875	0.450	1.983
Sorghum/Sudan	0.954	0.129	0.958
Sorghum/Sudan	1.538	0.211	1.240
Sorghum/Sudan	2.667	0.383	2.555
Sorghum/Sudan	2.314	0.314	2.176
Sorghum/Sudan	1.307	0.305	1.347
Spring Alfalfa	2.930	0.419	2.563
Spring Fescue	1.685	0.274	1.578
Spring Wheat	1.550	0.254	1.837
Tall Fescue	1.699	0.240	1.801
Tall Fescue	1.565	0.252	1.169
Tall Fescue	1.167	0.221	1.917
Tall Fescue	1.632	0.398	2.133
Tall Fescue Spring N	1.138	0.252	1.777
Tall Fescue Spring N	1.549	0.517	2.397
Tall Fescue Spring N	1.474	0.514	2.213
<b>Mean</b>	<b>2.429</b>	<b>0.315</b>	<b>2.041</b>
<b>STD</b>	<b>1.116</b>	<b>0.095</b>	<b>0.612</b>
<b>N</b>	<b>62</b>	<b>62</b>	<b>62</b>
<b>Min</b>	<b>0.954</b>	<b>0.129</b>	<b>0.875</b>
<b>Max</b>	<b>6.146</b>	<b>0.517</b>	<b>3.594</b>
<b>Mean ± 2.5 STD</b>	<b>0 - 5.219</b>	<b>0.078 - 0.553</b>	<b>0.511 - 3.571</b>

**Budget - 2008**

<b>CATEGORIES</b>	<b>YEAR 2008</b>
<b>A. Salaries</b>	
Senior Lab Technician (15%)	\$3,900
Student Labor 120 hrs at \$7.50 per hour	\$900
<b>B. Fringe Benefits</b>	
Fringe for Lab Technician (30%)	\$1,170
<b>TOTAL SALARIES AND FRINGE BENEFITS</b>	<b>\$ 5,970</b>
<b>C. Travel</b>	
Travel to field sites for sample collection	\$650
To present research findings at the State, Regional & National Meetings	\$600
<b>TOTAL TRAVEL COSTS</b>	<b>\$1,250</b>
<b>D. Equipment</b>	<b>\$0</b>
<b>TOTAL EQUIPMENT COSTS</b>	<b>\$0</b>
<b>E. Other Direct Costs</b>	
Laboratory reagents and supplies	\$1,500
Sample analysis (500 samples at the rate of \$20 per sample for N, P, K, Moisture and sample processing)	\$10,000
Field supplies	\$250
<b>TOTAL OTHER DIRECT COSTS</b>	<b>\$11,750</b>
<b>TOTAL</b>	<b>\$18,970</b>

12/14/2007 12:31 PM