MISSOURI

Agricultural College Experiment Station.

BULLETIN NO. 21.

FIELD EXPERIMENTS WITH WHEAT

COLUMBIA, MISSOURI.

APRIL, 1893.

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INTRODUCTORY.

In carrying out the objects of the organization of an "Agricultural Experiment Station," we cordially invite the co-operation of all persons interested in its success. Suggestions as to lines of experimental work, problems to be solved, inquiries relating to agriculture, horticulture, stock, and the dairy will be cheerfully received and answered as far as possible; but no work will be undertaken unless of public value, and the results of which we are at liberty to use for the public good.

Specimens of grains and grasses; seeds of fruit and forest trees; vegetables, plants and flowers that are true to name; varieties of beneficial and injurious insects; samples of mineral waters and ores, and whatever may illustrate any department of agriculture will be gladly received and due acknowledgments made in annual reports. Directions for collecting, packing and shipping such specimens will be furnished on application.

Bulletins will be issued at least quarterly, giving the results of experimental work as fast as completed, together with such suggestions and information as may be thought valuable to the farmers of Missouri.

The bulletins and reports of this Station are sent free to every citizen of Missouri who applies for them. Copies are sent as soon as issued to every newspaper in the State, to every Grange, Farmers' Alliance or other agricultural organization whose address can be obtained. Bulletins and reports are also sent to the leading agricultural papers of the country, and will be sent to any paper that may desire to exchange.

Letters relating to any special line of work should be directed to the officer in charge of that division, but all general correspondence relating to the work of the Station should be addressed to

EDWARD D. PORTER,
Director of Experiment Station.

COLUMBIA, BOONE COUNTY, MISSOURI.

NOTE—This Bulletin was in course of preparation by Dr. Porter at the beginning of his fatal illness, and it has been thought best to publish it according to his original plan. Mr. Connor had charge of the details of this work from 1893 to 1895.

JANUARY 1, 1896.

H. J. WATERS,
Director.

FIELD EXPERIMENTS WITH WHEAT

BY C. M. CONNER, Assistant in Agriculture.

SUMMARY OF RESULTS.

(1.) The varieties producing the highest average yield for four or more years were as follows, and in the order named: Fultz, Extra Early Red, Currell's Prolific, Hindostan, Jones' Winter Fife, American Bronze and Missouri Blue Stem; all of which had an average yield of more than 30 bushels per acre.

The varieties producing the highest average yield for three years were as follows, and in the order named: Wharton's Favorite, Everitt's High Grade, Michigan Amber, Red Chaff and Hybrid Mediterranean, all of which gave an average yield of more than 32 bushels.

The varieties producing the highest average yield for two years only were Extra Early Oakley, Coryell and Democrat, all of which had an average yield above 35 bushels.

The varieties producing the highest yield for one year only were Rudy, Valley, Oregon, Swamp and Longberry, all of which produced more than 36 bushels per acre.

(2.) The yield and quality of a crop of wheat may be increased by the use of superior seed.

(3.) A mixture of varieties has resulted in an increased yield over the average of the same varieties grown separately.

A comparative test of varieties of wheat has been carried on at this station for a period of six years, being a continuation of the work reported in Bulletin No. 15.

While the tests were made on different plots of ground each year the soil did not vary in character to any great extent, being an upland limestone clay loam of average fertility.

No manure was applied directly to the wheat, except in 1892 when the plots received a light dressing of stable manure at the rate of 10 loads per acre.

A brief statement of the previous cropping, together with the meteorological conditions will better enable the reader to understand all the conditions under which the crop was grown each year.

In 1889 the test was made on land which had been in corn and sorghum the year before. The seed bed was prepared in the usual way by plowing about 7 inches deep and harrowing till a firm seed bed was obtained. The seeding was done September 28th, 1888, with a Buckeye force-feed hoe drill set to sow seven pecks per acre. The season was favorable from seeding time until harvest.

In 1891 the test was made on oat stubble. The oats were sown on clover sod of two years standing. The seed bed was prepared as mentioned above and the seeding was done with the same drill set to sow six pecks per acre. The season was favorable and all the varieties made a very vigorous growth and stood up well until harvest.

In 1892 the test was made on wheat stubble, the land having been in clover two years before. Stable manure at the rate of 10 loads per acre was applied before plowing in August 1891. The land was plowed about six inches deep, rolled, disked and harrowed until a firm seed bed was secured. The seeding was done October 10th, with a force-feed drill as before at the rate of six pecks per acre. The fall was dry, followed by a mild, open winter. Long continued heavy rains late in the spring caused many

of varieties to lodge badly, and the grain of those lodged varieties was of very inferior quality, being light and shrivelled.

In 1893 the test was on oat stubble, the land having been in potatoes the year before and in corn the year previous to that. The preparation of the seed bed, method and time of seeding were practically the same as for 1892. The fall and winter months were very dry, in consequence of which very little growth was made until spring. A blizzard swept over the country on April 14th and 15th, doing much damage to all the varieties, from which none of them fully recovered.

In 1894 the test was on wheat stubble, the previous cropping being oats preceded by corn. The ground was prepared and seeding done in about the same way as in 1892. The entire season was very dry, the rain fall from October 1893 to July 1894, amounting to but 17.54 inches as compared with 26.2 inches for a similar period in 1891 which was considered a favorable season.

In 1895 the test was made on duplicate plots. One set had been in barely the preceding year and in corn for six years prior to the barley. Stable manure at the rate of 30 loads per acre was applied before sowing the barley. The land upon which the other set was grown had been in potatoes the year before and in clover for three years previous to that. Before planting the potatoes commercial fertilizer made up of a mixture of 200 pounds of nitrate of soda containing 14.8 per cent of nitrogen, 400 pounds of dissolved boneblack containing 22.9 per cent of phosphoric acid, 200 pounds of sulphate of potash containing 50 per cent of potash, 200 pounds common salt and 300 pounds of land plaster, per acre, were applied in the row. As the season was dry a large proportion of the valuable ingredients of the fertilizers used was left in the soil to be utilized by the wheat which was sown immediately after the potatoes were dug. The land was broken about 7 or 8 inches deep and prepared as mentioned above, but the land on which the potatoes were grown was in much better tilth

on account of the ground being worked over in digging the potatoes. The seeding was done at the same time as in 1892. There was very little difference in the yield between those plots receiving stable manure and those receiving the commercial feriilizer, although the wheat stood up much better on the land receiving commercial fertilizer than it did on the land having the barn yard manure. The average of the two plots of each variety is given in the table of yields.

THE RAINFALL BY MONTHS.

YEAR.	Jan Inch	Feb Inch	Mar Inch	Apr Inch	May Inch	June Inch	July Inch	Aug Inch	Sept Inch	Oct Inch	Nov Inch	Dec Inch	Total Inch
1890	4.02	2.34	2.80	2.17	3.92	3.40	4.97	5.47	3.97	2 10	2.34	0.38	37.88
1891	0.97	2.63	3 43	4.97	4.20	4 69	3.74	5.52	0 46	1 51	3.10	1.04	37.15
1892	2 27	6 80	3.50	5.60	10.58	3.60	7 63	3 56	4.50	1.87	2.44	2.28	54.63
1893 ..	0 39	1.97	2.82	11.30	6.00	6.83	6.63	0.94	3.45	0.59	1.16	0.55	42.63
1894	2 46	1.35	1.84	2.02	4.33	3.04	1.20	1.29	7.57	0.98	1.69	1.20	28.88
1895	1.23	0.31	3.41	1 04	6.69	5.78	4.93	2.30	.....	.....	.....	.....	.....
Av. 5 yrs.	1.89	2.56	2.96	4 51	5.85	4.55	4.85	3.18					

The test made in 1892 was the most extensive, there being 94 different varieties. Doubtless some were duplicates, being the same variety under different names. Fultz, the standard wheat of this section, was used as a check and all other varieties are compared with it. Seven of the most promising varieties were selected from those tested in 1892 and reserved for further trial.

The following tables show the yield of grain and straw per acre for all the years covered by the trial, together with the average yield of those varieties which have been grown for two or more years.

WHEAT—Comparative Test of Varieties for a Series of Years. Yield of Grain Per Acre, Bushels.

	NAME.	Yield in 1889 Bu's.	Yield in 1891 Bu's.	Yield in 1892 Bu's.	Yield in 1893 Bu's.	Yield in 1894 Bu's.	Yield in 1895 Bu's.	Av. for 2 or more Years Bu's.	Bearded or Smooth.
1	Fultz	37.7	33.8	35 1	29 6	26.6	53.2	36.0	S
2	Extra Early Red	.....	36.4	30.3	18.1	35.6	52.6	34.6	S
3	Currells Prolific	.....	.....	31.4	21.2	24.3	52.9	32.4	S
4	Hindostan	.....	.....	47 0	16.7	24.3	39.2	31.8	B
5	Jones' Winter Fife	.....	.....	31.4	21.7	24.3	47 0	31.1	S
6	American Bronze	....	.....	34.1	14.1	22.0	53.3	30.8	S
7	Missouri Blue Stem	....	.....	34.5	16.2	23.8	46.3	30.2	B
8	Wharton's Favorite	34.5	31.6	33.4	.....	....	....	33.1	S
9	Everitt's High Grade	35.5	34.0	29.1	.....	....	...	32.8	S
10	Michigan Amber	31.8	29.2	37.2	....	.....	.....	32.7	S
11	Red Chaff	39 3	31.6	27.1	.....	.....	...	32.6	S
12	Hybrid Mediterranean	36.3	32.6	28.3	.....	.....	.....	32.4	B
13	Velvet Chaff	34 2	29.1	30.6	.....	....	.....	31.3	B
14	Golden Cross	32.2	31.9	27.0	...	.....	.....	30.3	B
15	Fulcaster	33 2	32.4	23 6	....	.....	.....	29 7	B
16	Dietz Longberry Red	31.2	32.4	24.4	.....	.....	.....	29.3	B
17	Lancrethis	31.5	28.3	26.0	.....	.....	.....	28.6	S
18	German Emperor	23.5	22.1	31.4	...	.....	.....	25.6	S
19	Extra Early Oakley	.....	42.5	36.1	....	....	.....	39.3	B
20	Coryell	.....	36.9	39 2	....	.....	....	38.0	S
21	Democrat	.....	28.3	44.6	.....	.....	.....	36.4	B
22	Early Red Clawson	.....	32 6	37.5	.....	.....	....	35.0	S
23	Arnold's Hybrid	.....	34 6	34.9	.....	....	.....	34.7	S
24	Red Russian	.....	32.8	35.7	...	.....	.....	34.2	S
25	Johnson	.....	34 1	33.7	.....	.....	....	33.9	B
26	Reliable	.....	32.6	35 3	....	....	.....	33 9	B
27	Willitts	.....	39.0	28.7	....	....	.....	33.8	S
28	Red May	.....	33 0	34 5	....	.....	.....	33.7	S
29	McCregan	.....	31 6	35 3	....	....	....	33.4	S
30	Buckeye	.....	34.5	32.0	...	....	.....	33.2	S
31	Badger	.....	30.9	34.5	...	.....	.....	32.7	S
32	Beal	....	31.2	31.0	.....	.....	.....	31.1	B
33	Nigger	.....	31.7	30.6	....	....	.....	31.1	B
34	Zimmerman	... ..	25.5	32 3	...	.....	...	28.9	S
35	Roberts	.....	31.2	26.0	....	....	.....	28.6	B
36	Ontario Wonder	.....	25.0	31.0	....	....	....	28.0	S
37	Genesee	.....	30.7	25.2	....	.....	.....	27.9	B
38	Golden Drop	.....	28.7	26.4	....	.....	.....	27.5	S
39	Bailey	....	33.6	18 2	....	.....	.....	25 9	B
40	Tasmanian Red	.....	29.4	21 3	...	.....	.....	25.3	B
41	Stewarts	.....	31.2	16.6	....	... .	. ..	23.9	B
42	New Monarch	...	24.4	21.7	....	.....	....	23.0	S
43	Tuscan Island	. .	32.3	12.0	....	.....	....	22.1	B
44	Rudy	.....	.....	36 5	.....	.....	.....	.....	B
45	Valley	.....	.....	36.5	.....	....	.....	.....	B
46	Oregon Swamp	.....	.. ..	36.5	.....	.....	....	.....	S
47	Longberry	.....	.....	36 3	.....	..	.....	.....	S
48	Egyptian	.....	... .	34.9	....	.....	....	.....	B
49	Crate	.....	.....	34.9	....	.....	....	.....	B
50	Mealy	.....	.....	34.9	.....	.....	....	.....	S
51	Red Cross	.....	....	34.9	....	....	....	.....	B
52	Strayers Longberry	.....	.....	34.9	....	....	.....	.....	B
53	Seneca Chief	.....	....	34.5	....	....	.....	.....	B
54	New Australian	.....	.....	34.1	....	....	.....	.....	B
55	Finley	.....	.....	33 4	...	....	.....	.....	S
56	Bearded Monarch	.....	.....	33.0	..	....	.....	.....	B
57	Golden Prolific	.....	.....	33 0	....	....	.....	.....	B
58	Lehigh	.....	.....	33.0	.....	.....	.....	.. ..	B
59	Hicks	.....	.....	33.0	.....	....	.....	.....	S
60	McQuays	....	.....	33.0	....	...	.....	.....	S

WHEAT—Comparative Test of Varieties for a Series of Years. Yield of Grain Per Acre, Bushels. (Continued.)

	NAME.	Yield in 1889 Bu's.	Yield in 1891 Bu's.	Yield in 1892 Bu's.	Yield in 1893 Bu's.	Yield in 1894 Bu's.	Yield in 1895 Bu's.	Av. for 2 or more Years Bu's.	Bearded or Smooth.
61	Rumsey			33.0					S
62	Pugh			33.0					S
63	Red Fultz			32 6					S
64	Genoa			31.8					B
65	Strayers Egyptian			31.8					B
66	Lebanon			31.0					B
67	Patagonia			31.0					S
68	Purple Stem Red			30.6					S
69	Royal Australian			30.3					S
70	Mediterranean			29 9					B
71	Hungarian			29.9					B
72	Farquaar			29.9					S
73	Rieti			29.5					B
74	Millers			29.5					S
75	Square Head			29.1					S
76	Martins Amber			28.7					S
77	Theiss			28.7					B
78	Big English			27.9					S
79	Wyandotte Red			27 1					S
80	Oregon			27.1					S
81	Pool			26.0					S
82	Sibley's New Golden			24.4					B
83	Turkey			24.4					B
84	Elersale			23.6					B
85	Improved Rice			23.6					S
86	Wilter			22.9					S
87	White Track			22.9					S
88	Surprise			22 7					S
89	Rocky Mountain			20 2					S
90	Gypsy			19.8					B
91	Millers Prolific			19.4					S
92	Red French			18 2					B
93	Sheriff			18.2					S
94	Dakota Ironclad			15 0					S

WHEAT—Yield of Straw Per Acre, Pounds.

	NAME.	Yield in 1889 Lbs.	Yield in 1891 Lbs.	Yield in 1892 Lbs.	Yield in 1893 Lbs.	Yield in 1894 Lbs.	Yield in 1895 Lbs.	Av. for 2 or more Years Lbs.	Lbs. of Straw Per Bu. of Wheat
1	Fultz	3356	4999	3654	3870	2255	4455	3764	104.5
2	Extra Early Red	....	4549	4215	2824	2020	5240	3769	108.9
3	Currells Prolific	.....	.....	4802	2344	1610	7100	3964	122.1
4	Hindostan	.....	.....	5464	1440	2150	5890	3736	117.4
5	Jones Winter Fife	.....	....	5013	2250	1940	5475	3669	117.9
6	American Bronze	.....	....	3417	1500	1820	6750	3371	109.2
7	Missouri Blue Stem	.....		3172	2160	2250	5820	3350	110.9
8	Wharton's Favorite	4280	4804	3888	.....	...	.....	4324	130.3
9	Everitt's High Grade	3630	6864	3804	.....	.....	.....	4766	145.0
10	Michigan Amber	3640	5184	4502	.. ..	....	....	4442	135.7
11	Red Chaff	3960	6670	4461	.....	.....	.....	5030	153.9
12	Hybrid Mediterranean	4220	5681	3786	.....	.....	.....	4562	140.8
13	Velvet Chaff	3640	6426	5341	.....	.....	.....	5135	164.0
14	Golden Cross	3300	6253	4297	.....	..	.....	4616	152.0
15	Fulcaster	4490	6630	3908	.....	.....	.....	5009	168.4
16	Dietz Longberry Red	2790	5844	3784	.....	.....	.....	4139	141.1
17	Landreths	3250	5487	3540	.....	.....	.....	4092	143.0
18	German Emperor	3150	4549	4727	....	.....	.....	4142	161.3
19	Extra Early Oakley	.....	3906	3254	....	.....	.....	3580	94.0
20	Coryell	....	6364	3918	.....	.....	.....	5141	135.1
21	Democrat	.....	6834	2721	....	.....	.....	4777	131.0
22	Early Red Clawson	.....	5184	3832	....	.....	.....	4508	128.6
23	Arnolds Hybrid	.....	5202	3151	.....	.....	.....	4176	120.1
24	Red Russian	...	6375	4748	.....	.....	.....	5561	162.3
25	Johnson	.....	4712	5075	.....	.....	.....	4893	144.3
26	Reliable	.....	7436	4523	.....	....	.....	5979	176.1
27	Willitts	....	4810	4961	.....	....	.....	4885	144.3
28	Red May	.....	7599	2118	.....	.....	.....	4858	143.9
29	McCregan	.....	4151	4195	.....	.. ..	.....	4173	124 7
30	Buckeye	....	6181	3804	.....	.....	.....	4992	150.1
31	Badger	...	4906	3820	.....	.....	.....	4363	133 4
32	Beal	.....	4875	5075	....	.....	... ..	4975	159.9
33	Nigger	.....	6344	4113	.....	.....	.....	5228	167.8
34	Zimmerman	.....	5927	2395	.....	.....	.....	4161	143.9
35	Roberts	.....	4615	5560	.....	.....	.....	5087	177 8
36	Ontario Wonder	.....	6154	4829	.....	. . .	.....	5491	196.0
37	Genesee	.....	7508	3417	.....	.. ...	.....	5462	195.4
38	Golden Drop	.....	7099	4420	...	.....	.....	5759	209.0
39	Bailey	.....	6703	4031	.....	.....	.....	5367	207.2
40	Tasmanian Red	...	5508	3949	.....	.....	.....	4728	186.5
41	Stewarts	....	4875	4113	.. .	.....	.....	4494	188.0
42	New Monarch	.....	4920	3847	.....	.....	... ..	4383	190.1
43	Tuscan Island	.....	5089	1921	.....	. ...	.....	3505	158.2
44	Rudy	.....	....	4543	.....	.....	....	.....	124.4
45	Valley	.....	....	3724	.....	.....	.....	.....	102.0
46	Oregon Swamp	. ....	.....	5034	.....	.....	.....	.....	137.9
47	Longberry	.....	.....	4086	.. ..	.....	.....	....	129.0
48	Egyptian	....	....	4543	.....	.....	.....	.....	130.1
49	Crate	.....	.....	2885	.....	.....	.....	.....	82.6
50	Mealy	.....	.....	4768	.....	.....	.....	.....	136.6
51	Red Cross	.....	....	3945	.....	.....	.....	.....	113 0
52	Strayers Longberry	.....	.....	3243	.....	.....	.....	.....	92 9
53	Seneca Chief	.....	.....	3663	.....	.....	.....	....	106.1
54	New Australian	.....	....	4584	... ..	.....	.....	....	134.4
55	Finley	.....	.....	3888	.....	.....	.....	....	116.4
56	Bearded Monarch	.....	.....	4645	.....	.....	.....	....	140.7
57	Golden Prolific	.....	.....	4025	.....	.....	.....	... .	140 1
58	Lehigh	.....	...	4470	.....	.....	.....	.....	133.3
59	Hicks	.....	....	4215	.....	.....	.....	.....	127.7
60	McQuays	.....	.....	3970	.....	.....	.....	.....	120.3

WHEAT—Yield of Straw Per Acre, Pounds. (Continued.)

	NAME.	Yield in 1889 Lbs.	Yield in 1891 Lbs	Yield in 1892 Lbs.	Yield in 1893 Lbs.	Yield in 1894 Lbs.	Yield in 1895 Lbs.	Av. for 2 or more Years Lbs.	Lbs. of Straw Per Bu. of Wheat
61	Rumsey			3560					107.8
62	Pugh			4461					135.1
63	Red Fultz			3274					100.4
64	Genoa			3970					124.8
65	Strayers Egyptian			3233					101.6
66	Lebanon			3110					100.3
67	Patagonia			2865					92.4
68	Purple Stem Red			3817					125.7
69	Royal Australian			2333					76.9
70	Mediterranean			3417					114.2
71	Hungarian			3499					117.0
72	Farquaar			3990					133.4
73	Rieti			5906					201.2
74	Millers			4584					155.3
75	Square Head			3540					121.6
76	Martins Amber			4625					161.1
77	Theiss			4215					146.8
78	Big English			4420					158.4
79	Wyandotte Red			3724					137.4
80	Oregon			2660					98.1
81	Pool			2824					108.6
82	Sibleys New Golden			3540					145 0
83	Turkey			3868					158.5
84	Elersale			2353					99.7
85	Improved Rice			3650					154.6
86	Wilter			2394					104.5
87	White Track			3019					131.8
88	Surprise			2619					115.3
89	Rocky Mountain			3520					174.2
90	Gypsy			2640					133.3
91	Millers Prolific			2333					120.2
92	Red French			2803					154.0
93	Sheriff			2947					161.9
94	Dakota Ironclad			6200					413.3

Fultz is the only variety tested every year during the period. The average yield for six years is 36.0 bushels of grain and 3764 pounds of straw per acre.

Fultz tested for five years gives an average yield of 35.6 bushels of grain and 3846 pounds of straw per acre. Extra Early Red gives an average yield of 34.6 bushels of grain and 3769 pounds of straw per acre for the corresponding period.

Of those tested only four years, Currell's Prolific stands first, with an average yield of 32.4 bushels of grain and 3964 pounds of straw per acre. The next best is Hindostan, with an average yield of 31.8 bushels of grain and 3736 pounds of straw. The average yield of Fultz for a corresponding period is 36.1 bushels of grain and 3558 pounds of straw.

Of those tested only three years, Wharton's Favorite stands first, with an average yield of 33.1 bushels of grain and 4324 pounds of straw per acre, followed by Everitt's High Grade 32.8 bushels of grain and 4766 pounds of straw. Michigan Amber 32.7 bushels of grain and 4442 pounds of straw. Red Chaff 32.6 bushels of grain and 5030 of straw and Hybrid Mediterranean 32.4 bushels of grain and 4562 pounds of straw per acre. Fultz, for a corresponding period, gives an average yield of 35.5 bushels of grain and 4003 pounds of straw per acre.

Extra Early Oakley tested for two years, gives an average yield of 39.3 bushels of grain and 3580 pounds of straw per acre. This is the highest average yield made by any variety. Fultz for the same period, gives an average yield of 34.4 bushels of grain and 4326 pounds of straw. Four other varieties give a higher average than Fultz and are as follows: Coryell 38.0 bushels of grain and 5141 pounds of straw; Democrat 36.4 bushels of grain and 4777 pounds of straw; Early Red Clawson 35.0 bushels of grain and 4508 pounds of straw, and Arnold's Hybrid 34.7 bushels of grain and 4176 pounds of straw per acre.

Four of those varieties tested only one year give a higher

average yield than Fultz, and are as follows: Rudy 36.5 bushels of grain and 4543 pounds of straw; Valley 36.5 bushels of grain and 3724 pounds of straw; Oregon Swamp 36.5 bushels of grain and 5034 pounds of straw and Longberry 36.3 bushels of grain and 4686 pounds of straw per acre. The yield of Fultz for this year is 35.1 bushels of grain and 3654 pounds of straw.

Twenty-nine varieties tested for two or more years and twenty-six tested for one year, gave an average yield of more than 30.0 bushels per acre.

BEARDED VS. SMOOTH VARIETIES.

It is claimed by many that the bearded sorts are more vigorous than the smooth varieties. The average yield of five bearded varieties, in 1889, is 33.4 bushels and the average of nine smooth varieties is 33.3 bushels. In 1891 the average of twenty bearded varieties is 31.9 bushels and of twenty-four smooth varieties is 30.8 bushels. In 1892 forty-two bearded varieties gave an average yield of 29.7 bushels and fifty-two smooth varieties gave an average yield of 29.9 bushels per acre. It will be seen that in no case is the difference in yield great enough to warrant us in saying that either bearded or smooth varieties are the more vigorous and productive.

EFFECT OF SIZE OF SEED UPON YIELD.

A number of experiments have been made with Indian corn to determine the effect of size of seed on subsequent crops. So far as data have been obtained, they seem to show that there is little or no difference in yield, whether the seed was taken from the small end, middle or butt of the ear. The same may be said of wheat, except that the small grains from shriveled heads must be included in the "small seed," as there is no way to separate them from those from the small end of the perfectly formed heads. The location of the large and small grains of wheat on the head is very similar to the arrangement of the large and

small grains of corn on the ear—the largest being in the middle and the smaller at the ends; more especially at the tip end.

The following experiments were conducted to determine the influence of large and small seed upon the yield and character of crop, both when the same quantity of seed by weight was used and when the same approximate *number* of seed is used per acre.

The character of soil, previous cropping, preparation of seed bed and time of sowing were the same as for the variety tests in 1892.

Three varieties were used in this test, but it is regretted that more duplicate plots were not made.

What is known in the following table as "standard" is such seed as we use for general farm sowing. The large, medium and small grades were obtained by running the wheat through a fanning mill and then through a grader which separated the seed into the three grades named.

The number of grains per acre was obtained by counting the number in one pound of several samples of each grade and calculating the number sown per acre.

WHEAT—Size of Seed.

VARIETY AND QUANTITY PER ACRE.	No. of grains sown per acre.	Yield per acre.	
		Grain bu's.	Straw lbs.
Fultz, standard, 6 pecks per acre	1,306,755	29.3	4160
Fultz, large, 6 pecks per acre	1,027,930	30.4	4240
Fultz, medium, 6 pecks per acre	1,564,579	29.9	3720
Fultz, small, 6 pecks per acre	1,933,392	29.0	4160
Extra Early Red, large, 6 pecks per acre	971.595	25 3	4080
Extra Early Red, small, 6 pecks per acre	1,490.050	22.8	3000
Coryell, large, 6 pecks per acre	1,151,216	26.6	4080
Coryell, small, 6 pecks per acre	1.730,808	27 6	3840
Fultz, small, 6 pecks per acre	1.933.392	27.7	3680
Fultz, large, 12 pecks per acre	2,0?5,860	29.0	3440
Fultz, large, 6 pecks per acre	1,027,930	26.0	3400
Fultz, small, 3 pecks per acre	966.696	29.6	4120
Extra Early Red, large, 6 pecks per acre	971.595	29.4	3420
Extra Early Red, small, 3½ pecks per acre	869.293	27.3	3080
Coryell, large, 6 pecks per acre	1,151.216	31.6	4240
Coryell, small, 4 pecks per acre	1,153,939	26.7	3200

The average yield of the large seed of three varieties, where the same weight of seed per acre was used, is 27.4 bushels, and the average yield of the small seed is 26.4 bushels per acre. [The standard seed of the Fultz yields 29.3 bushels and the medium 29.9 bushels per acre, but as there was only one plot of each they are not comparable with the average of the other grades].

The average yield of the large seed of the three varieties where the same *number* of grains per acre was used, is 29.0 bushels and the small grains give 27.8 bushels per acre. A gain of 1.2 bushels in favor of the large seed.

The Kansas Experiment Station has obtained results similar to those mentioned above, except that they used only one variety, but had a number of duplicate plots.

The results of two years trial with Currell's Prolific variety show a yield from heavy seed of 31.9 bushels per acre, from light seed, 30.03 bushels while the common seed yields 31.13 bushels per acre. Thus the difference in no case is great, yet it shows that superior seed will affect the yield of crop.

It is believed that if the experiment was continued through a series of years the difference would increase.

MIXTURE OF VARIETIES.

The object of this experiment was to determine whether or not the strength of straw would be increased by mixing a small quantity of seed of an especially strong, stiff strawed variety with the seed of a productive, but weak-strawed variety. Also to ascertain whether by mixing seed, the yield will exceed the average of the varieties sown separately.

The experiment was made on upland clay loam of average fertility. The previous cropping being Meadow Fescue grass two years. Both crops were removed for hay. Stable manure, at the rate of 25 loads per acre was applied before breaking for the wheat.

The seed bed was prepared in a similar way to

that mentioned in the variety tests and the seeding was done October 17th with the Buckeye drill at the rate of six pecks per acre.

The following characteristics of varieties, noted in 1891, are taken as basis on which the mixtures are made: Zimmerman was the weakest strawed variety grown; Badger was the only variety that stood up perfectly; Coryell was among the first down—very weak; McCregan had a very strong straw, practically all stood up. Fultz, Extra Early Oakley and Early Red Clawson were among the heaviest yielders.

The following table shows the yield, of the mixtures, and of the same varieties grown separately.

WHEAT—Mixture of Varieties.

VARIETIES USED.	Yield per acre.	
	Grain bu's.	Straw lbs.
Equal parts of Zimmerman, Badger, McCregan and Coryell	23.5	2825
Zimmerman	22.9	2325
Badger	23.1	2750
McCregan	18.8	3025
Coryell	24.5	2425
Equal parts of Fultz, Extra Early Oakley and Early Red Clawson	23.1	2500
Fultz	22.1	1975
Extra Early Oakley	19.7	2800
Early Red Clawson	22.5	2850
Equal parts of Zimmerman and Coryell	25.1	3000
Equal parts of Zimmerman and Badger	23.9	2925
Three parts of Zimmerman and one part of Badger	24.0	2750
Equal parts of Zimmerman and Fultz	24.3	2950
Equal parts of Zimmerman, Badger, McCregan, Coryell, Fultz, Extra Earley Oakley and Early Red Clawson	27.1	2975

As all the plots stood up well, nothing definite was obtained as to relative strength of straw.

By a close study of the above table it will be seen that the mixture has resulted in an increased yield in every case. The average yield of Zimmerman, Badger, McCregan and Coryell grown separately is 22.3 bushels, but the mixture gives 23.5 bushels; a gain of 1.2 bushels.

The average yield of Fultz, Extra Early Oakley and

Early Red Clawson grown separately is 21.4 bushels; the mixture gives 23.1 bushels; a gain of 1.7 bushels.

The average yield of Zimmerman and Coryell grown seperately is 23.7 bushels and the mixture gives 25.1; a gain of 1.4 bushels.

The average of Zimmerman and Badger grown separately is 23.0 bushels and the mixture gives 23.9 bushels; a gain of .9 of a bushel.

The average yield of three-fourths Zimmerman and one-fourth Badger is 22.9 bushels, and the mixture in that proportion gives 24.0 bushels; a gain of 1.1 bushels.

The average yield of Zimmerman and Fultz grown separately is 22.5 bushels and a mixture of these varieties gives 24.3 bushels; a gain of 1.8 bushels.

The average of all the varieties grown separately is 21.9 bushels and the mixture of equal parts of all varieties gives 27.1 bushels; being a gain of 5.2 bushels per acre in favor of the mixture.

While the grain was small in every case except the last mentioned, yet some value can be given the figures. The Kansas Experiment Station has gotten similar results. In Bulletin No. 20 of that station the following results are reported: "The average of Zimmerman and Buckeye grown singly is 38:41 bushels per acre, but grown together the yield is 43.00 bushels. The average of Zimmerman and Red May grown singly is 39.25 bushels, but the mixture of the two yields 43.00 bushels. The average of Buckeye and Red May grown singly is 42.66 bushels, while the mixture of the two is 47.00 bushels. And lastly the average of all three grown singly is 40.11 bushels, while the yield of the mixture of the three is but 39.33."

The mixtures resulted in a gain in ever case save one, and then the difference was small.

The data thus far collected indicate that a proper mixture of varieties is likely to result in a slightly increased yield.