

**STAND AND SPACING TEST
COLLEGE FARM, FORT COLLINS, COLORADO
1938**

Location:

West center of middle third of Mants tract, College Farm.

Plan of Test:

The nine treatments of the test were arranged as a Latin square. Plots were eight rows, fifty feet long. Rows twenty inches.

Treatments:

Area of test planted uniformly with Great Western commercial seed. Designated plots thinned to as near perfect stands as possible of the three spacings; 8, 12 and 16 inches. Subsequent to thinning the plots for which stands of forty and seventy had been planned were cut down to the desired percentage stand by removing plants previously determined by drawing numbers for each row of each of these plots. The treatments, calculated number of beets per acre and the harvested beets per acre are given below. Harvested beets per acre were calculated from the means of the nine plots of each treatment.

<u>Treatment</u>	<u>Beets per A. Calculated</u>	<u>Beets per A. Harvested</u>	<u>Harv. Beets per 100' row</u>
8 inch spacing: 40% stand	15,682	15,943	61.0
8 inch spacing: 70% stand	27,443	27,007	103.3
8 inch spacing: 100% stand	39,204	36,765	140.7
12 inch spacing: 40% stand	10,454	10,542	40.3
12 inch spacing: 70% stand	18,295	18,208	69.7
12 inch spacing: 100% stand	26,136	25,178	96.3
16 inch spacing: 40% stand	7,841	7,841	30.0
16 inch spacing: 70% stand	13,721	13,591	52.0
16 inch spacing: 100% stand	19,602	19,166	73.3

Culture:

Planted April 14. Emergence approximately April 28. Thinned May 27 - 28. Stands reduced on 40 and 70 percent treatments June 2 - 3. Cultivation, irrigation and hoeing conformed to good practice for the region.

Harvest:

October 25 - 26. Six inside rows each plot (300 feet of row per plot) lifted with beet puller. Two samples taken for analysis and balance washed and weighed.

Plot and general summaries follow.

**SPACE-STAND TEST
1938
PLOT SUMMARIES**

<u>Treat- ment</u>	<u>Plot No.</u>	<u>No. of Beets</u>	<u>T. Beets Per A.</u>	<u>S Suqr.</u>	<u>Avg. Coef. of Purity</u>	<u>Lbs. Suc. Per A. Gross</u>	<u>Ind. Av.</u>
8" 40%	155	180	15.64	13.20	89.60	4130	3700
	166	182	15.33	13.70	88.00	4200	3696
	170	181	13.20	13.35	89.55	3525	3157
	176	184	14.97	13.85	92.35	4147	3830
	189	184	14.22	13.60	89.35	3867	3455
	196	183	14.95	13.80	92.65	4126	3823
	204	182	13.29	13.55	90.80	3600	3269
	219	186	14.84	12.70	90.85	3768	3423
	226	183	15.71	13.65	87.75	4289	3764
	Mean		183	14.68	13.49	90.10	3961	3569
8" 70%	190	313	19.39	14.55	92.00	5642	5191
	164	311	17.21	13.75	89.05	4733	4215
	167	315	17.01	14.50	92.55	4934	4566
	179	305	17.88	14.40	89.25	5150	4596
	192	308	16.13	14.30	91.30	4613	4212
	199	315	16.28	13.35	88.15	4346	3831
	205	309	17.28	13.80	91.50	4769	4364
	220	312	16.43	14.15	89.25	4650	4150
	225	303	17.65	14.75	91.55	5208	4768
	Mean		310	17.25	14.17	90.51	4894	4433
8" 100%	151	422	19.14	14.95	93.35	5722	5341
	161	426	18.18	13.95	93.00	5072	4717
	174	428	16.89	13.75	87.85	4644	4080
	180	430	17.35	14.65	90.50	5084	4601
	186	422	16.75	13.60	94.00	4556	4283
	202	437	17.88	14.65	90.00	5218	4714
	209	412	16.12	13.80	91.15	4648	4094
	217	406	16.44	14.35	89.65	4719	4231
	221	418	17.59	12.30	91.50	4327	3959
Mean		422	17.37	14.00	91.22	4868	4442

<u>Treat- ment</u>	<u>Plot No.</u>	<u>No. of Beets</u>	<u>T. Beets Per A.</u>	<u>% Sugr.</u>	<u>App. Coef. of Purity</u>	<u>Lbs. Sug. Per A.</u>	
						<u>Gross</u>	<u>Ind. Av.</u>
12" 40%	154	121	13.63	13.00	88.70	3545	3144
	162	124	13.57	13.25	90.15	3597	3243
	175	122	12.65	13.30	91.55	3365	3081
	178	124	13.90	13.30	91.75	3699	3394
	191	122	12.66	12.90	87.80	3267	2868
	197	120	12.62	13.40	88.60	3383	2997
	210	120	11.06	12.80	88.20	2831	2497
	212	119	13.97	12.25	90.40	3423	3094
	222	120	15.20	12.70	91.10	3860	3516
	Mean		121	13.25	12.99	89.81	3441	3093
12" 70%	156	211	18.04	13.70	88.10	4042	4354
	159	209	16.35	13.55	92.80	4432	4113
	172	214	17.00	13.40	87.85	4555	4002
	184	214	15.68	14.55	91.10	4563	4157
	187	207	17.18	14.05	92.60	4828	4471
	194	203	16.00	14.05	92.40	4497	4155
	207	208	15.63	14.15	89.40	4423	3954
	218	208	16.74	12.65	89.10	4235	3773
	224	210	16.97	13.30	89.60	4581	4105
	Mean		209	16.62	13.73	90.33	4562	4120
12" 100%	152	284	17.37	13.75	89.15	4777	4259
	163	299	19.06	14.05	88.65	5356	4748
	168	290	18.01	14.10	92.60	5078	4702
	183	295	18.73	14.05	89.15	5262	4691
	193	287	15.93	14.25	89.85	4539	4078
	198	288	17.40	14.45	89.15	5028	4482
	203	278	17.65	14.70	92.25	5188	4786
	214	287	17.62	14.45	92.55	5092	4713
	227	292	17.72	14.50	88.30	5138	4547
	Mean		289	17.72	14.26	90.21	5051	4556

<u>Treat- ment</u>	<u>Plot No.</u>	<u>No. of Heats</u>	<u>T. Heats Per A.</u>	<u>\$ Suor.</u>	<u>App. Coef. of Purity</u>	<u>Lb. Suor. Per A. Gross</u>	<u>Ind. Av.</u>
16" 40%	153	87	10.92	12.90	89.20	2817	2513
	158	95	13.27	13.35	91.00	3544	3225
	169	88	10.82	12.90	91.60	2792	2557
	182	92	11.54	12.75	87.50	2942	2574
	190	90	11.32	12.10	87.45	2739	2395
	201	92	11.12	12.70	88.95	2825	2513
	206	90	10.65	13.35	90.90	2842	2583
	213	87	11.93	12.65	86.35	3017	2605
	229	89	11.60	11.95	89.85	2773	2492
	Mean		90	11.46	12.74	89.20	2921	2606
16" 70%	149	151	16.61	13.85	92.35	4600	4248
	160	159	15.87	13.70	91.55	4348	3981
	173	155	15.26	13.70	91.20	4182	3814
	181	154	14.20	13.60	90.50	3834	3470
	188	158	15.26	14.00	92.25	4273	3942
	195	161	14.78	13.75	92.90	4064	3775
	211	156	12.62	12.90	92.10	3256	2999
	216	153	13.67	13.40	89.65	3664	3285
	228	155	15.99	13.25	87.20	4238	3696
	Mean		156	14.92	13.57	91.08	4051	3690
16" 100%	157	218	17.09	13.30	93.15	4947	4236
	165	224	18.20	14.00	91.20	5096	4648
	171	223	16.87	14.65	91.50	4943	4523
	177	225	16.27	13.95	91.85	4539	4169
	185	219	17.89	13.80	92.95	4936	4588
	200	215	16.55	13.80	88.75	4569	4055
	208	223	17.18	14.05	89.50	4826	4319
	215	217	16.24	14.15	88.35	4597	4061
	223	220	19.74	14.35	91.50	5665	5183
	Mean		220	17.34	14.01	90.97	4858	4420

SPACE - STAND TEST
1938
GENERAL SUMMARIES

<u>Treat- ment</u>	<u>Beets Harvested</u>	<u>T. Beets Per A.</u>	<u>% Sucr.</u>	<u>App. Coef. of Purity</u>	<u>Lbs. Sug. per A.</u>	
					<u>Gross</u>	<u>Ind. Av.</u>
8" 40%	183	14.68	13.49	90.10	3961	3569
70%	310	17.25	14.17	90.51	4894	4433
100%	422	17.37	14.00	91.22	4868	4442
12" 40%	121	13.25	12.99	89.81	3441	3093
70%	209	16.62	13.73	90.33	4562	4120
100%	289	17.72	14.26	90.21	5051	4556
16" 40%	90	11.46	12.74	89.20	2921	2606
70%	156	14.92	13.57	91.08	4051	3690
100%	220	17.34	14.01	90.97	4858	4420
Mean		15.62	13.66	90.38	4290	3881
±		2.1847	1.2420	.4160	2.0634	2.0635
5% Point		.	.	.	.	.
1% Point		.	.	.	.	.
S.E. of Mean		.246	.151	.43	94.55	87.60
S.E. of Mean in % of Mean		1.57%	1.11%	.48%	2.20%	2.26%
Dif. for Sig.		.70%	.43%	1.22%	267 lb	248 lb

Discussion:

The average stand of beets harvested for the Great Western Sugar Company on all acreage delivered has in the past approximated slightly below seventy beets per hundred feet of row in most years. This test was designed to compare the yield and quality of beets from full stands of a close, medium and slightly wide spacing and from reduced stands based on these three spacings. For the reduced stands seventy percent was selected as approximating the average stand harvested from large districts; and forty percent as approximating the poorest stand that a farmer would save rather than to replant. Stands were reduced at random. The following diagrams are representative. X represents a beet; a space represents a blank.

Plot 184. 12 inch spacing 70% stand.

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XXXX  X X X XXXXX XX X XX X XXXXXXXXXXXXXXXX XX
XXXX XX  XX XX XX XX XX X XX  XXXX XXXXXXXX X
XX XX  XXXXXXXX XX X XXX XX X XXX XXXXXXXX
XXXX XXXXX XXXX XXXX X XX  XXXXXX X XX X XXX
X X  XXXXXX XX X XXXXXXXX XXXXX X X XX XXX X
X XXXX XXXX XXXX XXXXX XXX  XX XXXX X X XXX
XX XXXX XXXXXX X X XXX XXXXX XXX XXX X XXX X
XXXX XXXXX X X X XXXX XXXXXX XX XXXX XXXX
  
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Plot 210. 12 inch spacing, 40% stand.

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X XX XX  X  XX X X XXX  X XX X XXX  X
X  XX  XXXX X X  XXX X XX  X XX  X
  X X XX X  X  XX XXX  X XXXXXX  XX
X  X  X  X X X XX  XX X XX  X  XX  XX
X XXXXXX  XXXX X  XX  XX XX  XX
  X X  XX  XXX XX  XX X X XX XX X  X X
XXX X  XX X  X  XX  XXXXXXXX  X  X
  XX  XX X XX X  XX X XXXX  X XX
  
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Incidentally an examination of the above diagrams will reveal the futility of attempting to harvest poor stands on the competitive beet basis. The six inside rows of plot 184 contain only ten beets not adjacent to at least one corner blank and forty seven "competitive" beets if corner blanks are disregarded. The six inside rows of plot 210 contain no beets not adjacent to corner blanks and only six beets with another beet adjacent on all four sides (corner blanks disregarded). Even if the effect of corner blanks is negligible; which may or may not be true; it is obvious that samples as small as these will lead to serious sampling errors.

Quality:

In this test percent sucrose and to a slightly lesser degree apparent coefficient of purity tend to increase as the density of stand increased.

Quality: (Continued)

A number of the differences shown considerably exceed the indicated difference necessary for significance and one may conclude that in this test the beets from the denser stands were superior in quality.

Yield:

In this test as stands increased from about 19,000 to about 36,700 beets per acre there was no corresponding increase in yield of roots or of sugar per acre; the yields from these four stands being of approximately the same magnitude and none of the differences reaching the level of probable significance. As stands were reduced below 19,000 beets per acre there was a reduction in yields. A number of the differences exceed the indicated difference required for significance.

The yield of Great Western planted May 17th in the adjacent date of planting test was 12.47 tons of roots and 3637 gross pounds of sugar per acre. These yields were from a stand of approximately 36,100 beets per acre. It would appear from these tests that it would be more profitable to save a stand of about 10,000 beets per acre from a planting made at a normal date than to replant as late as mid May.