

SUMMARY OF FERTILIZER WORK IN 1946

AND RECOMMENDATIONS FOR 1947

Ronald Johnson(1 and Dion Tolman(2

The farmers growing sugar beets in the five states in which the Utah-Idaho Sugar Company operates spend annually in excess of one million dollars for commercial fertilizer. The use of fertilizer materials to supplement the natural food supplies of the soil and thereby maintain a proper balance and level of soil fertility, is of great importance. Without certain elements such as nitrogen, potassium, phosphorus, calcium, magnesium, and several others, plants cannot live. With an unbalanced relationship between these elements or with inadequate amounts of these elements plants are undernourished and fail to grow and produce normally.

It should be emphasized however, that the use of commercial fertilizer is only one of a number of means of maintaining soil fertility and crop production at a high level. Proper drainage, proper irrigation, maintenance of soil organic matter, prevention of soil erosion, proper care and use of manure, and the utilization of green manures and crop residues are all necessary to continued productive farming. The greatest benefit from the use of commercial fertilizers results when these other controllable factors are taken care of.

Commercial fertilizers should not be used indiscriminately. Evaluation of the fertility of a soil and the quantity and quality of fertilizer required for most profitable yields is indispensable to economic fertilizer usage and essential to efficient crop production.

With the importance of such considerations in mind, the Utah-Idaho Sugar Company is conducting an extensive research program on the use of commercial fertilizers. This work has included tests on kinds and amounts of fertilizers needed, and when they should be applied for most efficient use.

EXPERIMENTAL PLAN USED

Fertilizer tests for 1946 included varying rates of nitrogen, phosphorus and potash, both alone and in various combinations. The amounts used and the combinations tested are shown in the tables. In addition to the above "major elements" a mixture of "minor elements" was applied, on one set of plots in each test, in conjunction with the heaviest application of the three "major elements".

There were fifty of these tests distributed throughout the various factory districts. Each test consisted of 10 fertilizer treatments and these were run in duplicate on each farm. The plots were 8 rows wide and from 400 to 600 feet long. All beets from the entire 8 row strips were hauled to the scales by truck and the weight of beets from each treatment was obtained in this manner.

(1 Director of Agriculture Research
(2 Assistant, Utah-Idaho Sugar Company

PHOSPHATE AND NITROGEN INCREASED YIELDS

There was response from both nitrogen and phosphate fertilizers in all the areas in which fertilizer tests were located. When nitrogen and phosphorus were used alone, the response from nitrogen was greater than was the response from phosphorus. In a great many of the tests phosphate fertilizer used alone gave little or no response. In almost every area, 300 pounds of 16-20-0 mixed fertilizer gave greater response than did 300 pounds of either ammonium nitrate or treble-superphosphate when used alone. It can be seen from the data in Table I that there was some indication of a small response from potash, but that in most instances the addition of potash to the nitrogen and phosphorus fertilizers was not profitable.

The addition of minor elements, which included 20 pounds of borax, 20 pounds of iron sulfate, 20 pounds of copper sulfate, 20 pounds of magnesium sulfate and 20 pounds of manganese sulfate, did not increase yields or sucrose content of the beets.

Experimental work on fertilizers would not be complete without tests to determine the best time to apply them. In all time-of-application plots four dates of application were compared: At planting time, at thinning time, at the last cultivation and on the fourth series, the fertilizer application was split--one third of the total being applied at each of the other periods. The complete set of treatments including the amount applied, the kind applied, and the time it was applied is shown in Table II.

When 600 pounds of mixed fertilizer were applied, highest yields resulted when the fertilizer was applied prior to thinning. When only 300 pounds were applied it seemed better to delay its use until after thinning. There was no indication of split applications being any more efficient than was the application of all the fertilizer at one time. Applications of nitrogen fertilizer late in the season decreased sucrose percentages more than did equivalent amounts applied earlier.

RECOMMENDATIONS FOR 1947

1. From the results of these tests it would appear that farmers should purchase those fertilizers which will supply both nitrogen and phosphorus, or that they should purchase both nitrogen and phosphate fertilizers and either do their own mixing or apply them in separate operations.

2. Do not broadcast fertilizer. Band applications have proven to be more effective and efficient.

3. Apply fertilizer early. Fertilizer applied early gave greater response than that applied late and late applications decreased sucrose content excessively. If phosphate and nitrogen fertilizers are applied in separate operations the phosphate should be applied before or at planting time and the nitrogen should be side-dressed soon after thinning.

4. Three hundred pounds of mixed fertilizer per acre gave a greater increase in yield than did 300 pounds of either nitrogen or phosphate fertilizer used alone.

5. Application of all the fertilizer in a single early application has proven as effective as light applications distributed throughout the growing season.

6. Place the fertilizer 4 to 5 inches deep, 6 to 7 inches from the beet row. This is easily accomplished with a side-dressing machine if it is used early before the soil gets too hard.

7. Give your fertilized beets ample moisture. Fertilizer is unavailable to plants when the soil is dry.

8. Keep your beets cultivated and clean from weeds. Weeds use large amounts of fertilizer and rob the beets of plant food needed for maximum growth.

TABLE I
COMBINED SUMMARY OF FERTILIZER PLOTS FOR 1946

Average Yields from Commercial Fertilizer Test Plots which Received varying Amounts and Combinations of Fertilizer

Fertilizer Applied per Acre	LOCATION OF TEST PLOTS							Average ¹ Response from all Tests	Average Sucrose Content
	Salt Lake and Utah Co.	Unn- ison	Box #1- der Co.	Idaho	Montana	South Dakota	Wash- ington		
1. Unfertilized Check	13.98	15.75	14.15	13.46	13.97	10.83	19.89	14.52	15.81
2. 150# Treble-Superphosphate	14.89	16.46	15.08	13.95	13.31	11.59	19.82	14.97	15.74
3. 300# Treble-Superphosphate	16.53	16.84	15.64	13.98	13.96	12.42	20.11	15.60	15.80
4. 150# Ammonium Nitrate	15.71	16.46	17.09	14.72	14.27	11.83	22.03	15.99	15.50
5. 300# Ammonium Nitrate	16.03	16.45	17.47	15.05	14.89	12.16	20.99	16.43	15.46
6. 200# Potassium Chloride	15.14	16.28	14.60	13.72	13.26	11.38	20.15	14.91	15.65
7. 600# 16-20-0 Mixed Fert.	17.06	17.45	18.49	15.65	15.29	12.86	24.15	17.27	15.07
8. 300# 16-20-0 Mixed Fert.	16.30	17.19	16.88	15.33	15.14	12.30	23.34	16.63	15.58
9. 600# 16-20-20-Complete Fert.	16.42	16.41	17.43	15.55	16.00	13.00	24.94	17.15	15.09
10. 600# 16-20-20- Minor Elements	17.33	17.17	17.18	15.19	15.89	12.60	25.32	17.26	15.11
No. of Test Plots Averaged	8	5	6	9	6	8	8	50	18

¹/ Weighted Averages representative of the average response from all 50 tests.

TABLE II

SUMMARY OF TIME OF FERTILIZER APPLICATION TESTS-1946

Yield of Beets Resulting from the Application of Commercial Fertilizer at
Different Periods of Plant Development

Time and Amount of Fertilizer <u>1/</u> Applied	LOCATION OF TEST				Combined Averages
	Toppenish	Utah County	Salt Lake County	South Dakota	
Planting Time					
300 Pounds <u>1/</u>	27.95	16.74	15.01	12.86	18.84
600 Pounds <u>1/</u>	32.05	17.52	16.76	13.03	19.84
Average	29.99	17.13	15.89	12.95	18.99
Thinning Time					
300 Pounds <u>1/</u>	30.08	16.92	14.74	12.16	18.47
600 Pounds <u>1/</u>	31.56	18.70	14.35	12.55	19.29
Average	30.82	17.81	14.55	12.35	18.88
Last Cultivation					
300 Pounds <u>1/</u>	29.99	16.30	15.33	12.06	18.42
600 Pounds <u>1/</u>	30.75	17.66	15.44	12.52	19.09
Average	30.37	16.98	15.33	12.29	18.74
Split Application					
300 Pounds <u>1/</u>	29.89	16.54	13.18	12.62	18.06
600 Pounds <u>1/</u>	29.10	18.45	14.38	13.56	18.87
Average	29.50	17.49	13.78	13.09	18.46
Combined Average	30.17	17.35	14.90	12.67	18.77
Yield of Check Plots	25.18	13.81	13.78	11.95	

1/ Fertilizer applied was a mixture of 100 lbs. of Ammonium Nitrate plus 100 lbs. of Treble-Superphosphate, which approximates a 16-20-0 mixed fertilizer.