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Sugar beet investigation in 1899-01-01

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WEST VIRGINIA
AGRICULTURAL EXPERIMENT STATION,
MORGANTOWN, W. VA.

BULLETIN 64.

JANUARY 1ST, 1900.

SUGAR BEET INVESTIGATION IN 1899.

BY J. H. STEWART AND B. H. HITE.

[The Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address Director of Agricultural Experiment Station, Morgantown. W. Va.]

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INTRODUCTION.

During this season the Station has continued to study the adaptability of West Virginia soil and climate to the production of sugar beets. This work has been carried on in co-operation with the U. S. Department of Agriculture, and the results of the work as summarized and condensed appear in the following pages.

About 2,000,000 tons of sugar, most of which is imported, is annually consumed by the people of the United States, and it is in an endeavor to determine in which localities sugar can be most economically produced in this country, that the growth of the sugar beet is being so carefully studied in various states of the Union.

The important factors governing the cheap production of beet sugar are: (1) soil and climate congenial to the growth of beets sufficiently rich in sugar, (2) cheap fuel, (3) an ample supply of limestone and pure water, which are used in large quantities in the process of manufacture.

This State is surpassed by none in the latter requisites, and the results of the investigation made by this Station during the past two years give strong reasons why this industry may possibly become firmly established here.

In the Spring of 1899 the Station received from the U. S. Department of Agriculture sufficient seed of approved varieties which was distributed among farmers of the State, together with detailed instructions regarding planting, culture, harvesting, etc. Blanks to be filled out were also supplied.

The analytical data concerning the composition of the beets grown in the co-operative test, which was worked out by the Chemical Department of the Station, is shown in the accompanying tables.

Some farmers who engaged in the test did not report samples

for examination. Our correspondence shows this to have been due in most cases to failure to get a satisfactory stand of beets on account of drought, insects, etc.

As a rule the disposition among farmers throughout the State to enter into this test and to do their part towards making it a success was entirely satisfactory. In fact this has always been the case when the station has sought their aid in its work.

EXPERIMENTS AT STATION FARM, MORGANTOWN.

The work during the past year with sugar beets has been confined to a study of the influence of different fertilizers and lime upon sugar content and purity of the beets ; different dates of planting and harvesting ; and varieties.

Fertilizer Test.—In the fertilizer-lime test, ten plats, each one-twentieth of an acre in size were employed. The fertilizer was applied to the whole of each plat, as shown in the table (Table I,) and an application of lime at the rate of thirty bushels of stone lime per acre, was applied to one half of each plat. The seed was sown upon those plats. May 11th, and the samples for analysis were taken October 12th. The results of this test are given in the following table :

TABLE I.

DRESSING.

Plat.		Limed.			Unlimed.		
		Average weight uncapped, oz.	Average sugar, %	Average purity, %	Average weight uncapped, oz.	Average sugar, %	Average purity, %
1	No fertilizer	16.1	15.50	83.4	19.3	13.54	82.0
2	1,000 lb Stable manure	15.3	14.37	81.3	13.5	13.74	80.2
3	8 $\frac{1}{2}$ lb Sodium nitrate, 8 $\frac{1}{2}$ lb Potassium sulphate, 8 $\frac{1}{2}$ lb Thomas slag	16.3	13.75	80.6	18.8	14.75	82.4
4	12 $\frac{1}{2}$ lb Thomas slag, 12 $\frac{1}{2}$ lb Potassium sulphate.....	16.1	14.45	80.9	17.0	15.48	84.5
5	12 $\frac{1}{2}$ lb Sodium nitrate, 12 $\frac{1}{2}$ lb Potassium sulphate	16.6	14.69	81.2	19.1	15.49	83.1
6	12 $\frac{1}{2}$ lb Sodium nitrate, 12 $\frac{1}{2}$ lb Thomas slag.....	13.1	14.75	82.8	12.5	15.38	85.1
7	25 lb Potassium sulphate.....	17.7	13.61	80.4	18.7	15.57	83.8
8	25 lb Acid phosphate.....	14.8	13.44	83.4	15.4	14.42	87.6
9	25 lb Thomas slag.....	18.5	13.95	84.7	15.7	14.42	84.4
10	25 lb Sodium nitrate	14.0	13.84	81.4	13.5	14.36	82.2
	Average	14.23		81.8		14.71	83.5

Owing to the excessively wet weather shortly after the beets were planted the stand was poor, and it is preferred to draw very few conclusions from the results obtained. However, it may be stated,

(1) That there was practically no difference in the stand of beets on the limed and unlimed plats.

(2) That lime resulted in a slight improvement in the sugar content and purity when used alone, but

(3) When used with the other fertilizers mentioned it had the opposite effect, except in the case of stable manure, which, for this crop, stands next to no fertilizer at all. In fact

(4) Stable manure was worse than no fertilizer at all as it increases the amount of impurities in the juice.

(5) Just the reverse of this is true of a plain acid phosphate, which in all the tests that have been made at this Station has never failed to give the highest co-efficient of purity.

Test of Varieties.—The plats upon which the different varieties of beets were grown were uniformly fertilized. The beets were sown May 11th, and the samples for analysis were taken October 12th." The following table gives the names of the varieties and the analytical data concerning them.

TABLE II.

VARIETY.	No. of Samples.	Average weight, oz.		Sugar in juice %	Purity of juice %
		Capped.	Uncapped		
Vilmoran.....	2	16.2	14.1	15.55	85.8
Mangold.....	2	14.0	12.2	15.32	87.7
Zehringer	2	14.6	12.1	14.44	87.9
Kleinwanzlebener...	2	17.7	15.5	14.70	86.9

The table shows that the varieties did not vary widely in composition, and all of them are sufficiently rich in sugar for profitable sugar production.

Different Dates of Planting.—The plats in this test were uniformly fertilized and the variety known as Biendorff Kleinwanzlebener was employed. The planting began May 11th,

and was concluded June 23d. The samples were taken October 12th. The following table gives the dates of planting and the composition of the beets :

TABLE III.

Date of Planting.	No. of Samples.	Weight		Sugar in juice %	Purity of juice %
		Uncap'd oz.	capped oz.		
May 11.....	2	15.7	13.0	14.42	84.4
May 22.....	4	13.0	11.2	15.12	87.6
May 29.....	2	12.7	10.7	15.37	87.7
June 9	2	12.6	10.7	15.27	83.8
June 23.....	2	13.2	11.3	14.69	82.1

The table shows that the beets planted May 29th contained most sugar and the purest juice. The beets planted June 9th and 23d were immature when the samples for analysis were taken. This was due to a misunderstanding. All beets should have remained in the ground the same length of time.

Influence of maturity.—Two rows of the limed portions of plat No. 9 in the fertilizer test were reserved to study the influence of maturity upon the sugar content and purity of the beets. Samples were taken at different times and the results are shown below :

TABLE IV.

Harvested.	No. of Samples.	Average weight, oz.		Sugar in juice %	Purity of juice %
		Uncapped	Capped.		
September 18.....	2	13.0	10.9	14.83	82.1
September 25.....	2	15.4	13.3	12.03	80.8
October 2	2	9.4	8.2	13.06	78.6
October 9	2	19.6	16.4	12.31	80.3
October 16	2	17.2	14.5	13.36	88.5
October 23	2	25.3	22.0	13.03	84.0
October 30	3	17.0	13.0	12.41	79.6
November 7.....	2	11.2	10.1	13.40	82.5
November 7.....	2	14.3	12.8	12.07	77.6

The table shows that within the limits of the test the date of

harvest had very little influence upon the composition of the beets.

Table V contains the result of the co-operative work on sugar beets in this State for the year 1899.

Averages in all cases are made up not upon samples or number of growers but upon the beets themselves. For example if "B's" sample No. 1 contains three beets, and shows 12% of sugar, No. 2 four beets and 13% of sugar, No. 3 five beets and 11% of sugar, we find the sum of 3×12 , 4×13 and 5×11 , and divide this quantity by 12, (the total number of beets ;) the result is the sugar in B's average sample. The same principal is followed for making up the averages for each county.

TABLE

Co-operative Sugar Beet Experiment—Analyses of samples
the Station for

Number.	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
		BARBOUR CO.				
1	W. S. Lang	Meadowville	May 10	Oct.	.....	Clay loam
2	R. D. Smith	Philippi.....	Apr. 27	Oct. 18	None	Clay loam
3	Louis Ritter.....	Arden	May 5	Oct. 26	Some	Clay loam
4	C. C. Talbot... ..	Burnersville.....	May 6	Oct. 19	None	Clay loam
		BOONE CO.				
5	G. Glesher.....	Peytona	June 1	Oct. 14	Slight	Sandy grav'l
6	A. W. Ball.....	Hewitt	May 12	Oct. 10	None	Sandy loam
		BRAXTON CO.				
7	E. B. Duffield.....	Byrne		Oct. 15		
8	J. E. Boughman...	Byrne	May 16	Oct. 18	Some	Clay loam
9	Asa Stump.....	Copen.....				
10	P. J. Johnson.....	Morley	May 15	Oct. 16	None	Clay loam
11	G. G. Lovett.....	Falls Mills.....	May 15	Oct. 16	None	Sandy
12	S. F. Griffin.....	Tat..e	June 1	Oct. 30	... ..	Sandy loam
		CABELL CO.				
13	E. A. Bennett....	Huntington.....	May 5	Oct. 18	Some	Clay loam
14	Henderson Davis ...	Hodges.	May 10	Oct. 25	Some	Clay loam
15	A. A. Bryan.....	Swanzi.....	May 10	Oct. 10	Some	Clay loam
		CALHOUN CO.				
16	B. H. Greathouse...	Big Bend.....	May 29	Oct. 9	None	Sandy loam
		CLAY CO.				
17	J. W. Gawney.....	Causade.....	May 20	Oct. 15	None	Sandy loam
18	G. W. Stearts	Causade.....				
		DODDRIDGE CO.				
19	F. F. Randolph	New Milton.....	May 15	Oct. 11	Slight	Clay loam
20	A. M. Warner..	New Milton.....	May 10	... ..	None	Sandy
21	L. M. Stalmaker	Aaron	Apr. 28	Oct. 18	None	Sandy
22	E. P. Powell.....	Flint.....	May 25	Oct. 20	None	Clay loam
		FAYETTE CO.				
23	Wm. Bell	Caperton. . .	May 15	Oct. 20	None	Sandy loam
24	W. C. Green.....	Oak Hill..	May 10	.....	None	Saady loam
25	Edwin Grafton.....	Fire Creek.....				Sandy
26	.....	.....				
		GILMER CO.				
27	C. W. Morris	Cedarville.....				
28	B. A. Brannon,	Revel.	May 6	Oct. 16	None	Sandy loam
29	C. D. Brannon.....	Revel....	May 6	Oct. 6	None	Sandy loam

V.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Percent. of stand.	Number of samples.	Average Number in samples.	Average Weight of Beet.		Percentage of sugar in the juice.	Purity co-efficient.	Number.
					Uncapped. Ounces.	Capped. Ounces.			
.....	None.	.....	1	3	37	27	12.65	78.0	1
Level	Stable man're, 500 lbs acid phos	25	3	4	18	16	11.96	75.4	2
Rolling	Stable manure.	100	2	2	24	18	12.86	80.6	3
Rolling	None.	100	2	3	29	27	11.72	75.1	4
Level	Stable manure.	50	1	5	9	5.6	5.14	61.1	5
Level	None.	90	2	3	12	9.4	10.56	68.8	6
Level	Stable manure.	100	1	2	18	14	10.60	70.5	7
Hillside	None.	95	2	1	23	17	8.01	55.9	8
.....	.....	.....	2	3	14	10	12.56	74.6	9
Rolling	Stable manure.	100	2	2	32	21	9.75	70.1	10
Level	Stable manure, in '98, '99 none	50	1	4	12	10	14.19	75.2	11
Level	Stable manure.	...	1	4	11	9	12.65	73.8	12
Rolling	None in '98; stable manure '97	0.02	2	2	16	13	11.72	72.8	13
Level	Stable manure.	95	2	3	17	14	14.94	73.0	14
Rolling	.....	.....	1	3	26	21	16.13	64.5	15
Level	Stable manure in 1898.	98	1	2	30	25	11.91	77.8	16
Rolling	None.	95	1	2	20	15	10.75	72.1	17
.....	.....	.....	1	3	12	8	10.63	74.3	18
Level	Stable manure.	90	3	3	18	13	11.57	73.7	19
Level	None.	100	1	4	17	15	10.82	75.1	20
Level	Stable manure.	.....	2	3	25	22	16.15	73.1	21
Rolling	500 complete fertilizer in 1898.	100	1	2	70	53	7.00	58.9	22
Hillside	None.	.....	1	3	19	14	14.82	74.4	23
Hillside	None.	.....	2	3	12	9	19.32	78.2	24
Hillside	Stable manure.	.....	2	6	13	10	15.67	78.1	25
.....	.....	.....	.....	.....	.....	.....	.....	.....	26
.....	.....	.....	2	3	17	14	8.77	66.3	27
Rolling	None.	.....	1	2	21	15	9.42	64.5	28
Rolling	Stable manure in '98.	95	2	2	19	15	10.68	71.3	29

TABLE V.—

Co-operative Sugar Beet Experiment—Analyses of samples
the Station for

Number.	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
GRANT CO.						
30	J. L. Babb.	Falls.....	May 22	Oct. 23	None	Muck & gra.
31	M. B. Tucker.....	Falls.	May 2	Nov. 2	None	Sanpy loam
32	M. E. Gouldizer.....	Jordon's Run ..	June 1	Oct. 25	None	Sandy loam
GREENBRIER CO.						
33	G. H. Lewis.....	Savannah.....	May 1	Oct. 1	None	Clay loam
34	J. A. Blaker.....	Blaker's Mills...	May 1	Oct. 30	None	Sandy
35	Robert Blaker.....	.....	.....	.....	.....	.....
36	F. D. Coffman.....	Richlands.....	.....	.....	.....	.....
37	S. M. Hinkle.....	Williamsburg....	June	.....	None	Sandy loam
38	F. A. Dering.....	Frankford.....	June	.....	Some	Sandy loam
39	Geo. Dering	Frankford.	June 20	.....	Some	Clay loam
40	J. A. Hinkle	Frankford.	June 1	Oct.	.....	.....
41	J. L. Anderson	Frankford.	June 1	.....	Some	Clay loam
42	Morgan Anderson....	Frankford.....	June 1	.....	Slight	Clay loam
43	Geo. M. Casebolt....	Frankford.....	June 1	.....	.....	Sandy loam
44	J. C. Patterson.....	Frankford.....	June	.....	Some	Clay loam
45	W. A. Jackson.....	Frankford. ....	.....	.....	Some	Clay loam
46	L. B. Witmore.....	Frankford.	June 1	Oct.	Some	Clay loam
HAMPSHIRE CO.						
47	David Thomas.....	Levels.	May 30	Oct. 20	Slight	Sandy loam
48	R. N. Faut.....	Purgettsville ..	.....	.....	.....	Clay
49	J. R. Riley.	Cold Stream.....	May 30	Nov.	None	Sandy
50	Simeon Bowman	Rio .....	.....	.....	.....	.....
51	A. A. Brill	Mutton Run	May 1	Oct. 17	Some	Sandy loam
HANCOCK CO.						
52	L. S. Bainbrick.....	New Cumberland	May 30	.....	None	Clay loam
53	Alex. McCloud.....	New Cumberland	May 1	Oct. 30	None	Clay loam
HARDY CO.						
54	L. V. Burch.....	Fabius	July 1	Oct. 17	None	Sandy
55	E. F. Burch.....	Fabius	May 16	Oct. 14	None	Clay
56	L. M. Burch.....	Fabius.....	.....	.....	.....	.....
57	H. Hisghman	Hanging R. Mills	May 24	Oct. 14	None	Clay loam
58	Levi Baughman.....	Hanging R. Mills	May 15	Oct. 13	Some	Sandy loam
59	Grant Glenn.....	Capon Iron W'ks	May 6	Oct. 13	Some	Sandy loam
60	A. M. Boughman	Hanging R. Mills	.....	.....	.....	.....
61	A. D. Wood.....	Moorefield.....	May 1	Oct. 23	None	Loam

Continued.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Percent. of stand	Number of samples.		Average Number in samples.		Average weight of Beet.		Percentage of sugar in the juice.	Purity of co-efficient.	Number.
							Uncapped. Ounces.	Capped. Ounces.			
Level	Complete fertilizer.	25	2	2			15	13	14.90	77.3	30
Level	.....	100	1	2			28	23	12.91	81.7	31
Level	Stable manure '98; none in '99	50	1	8			6	5	13.85	75.6	32
Rolling	Stable manure in '96.	25	2	2			22	19	16.81	81.3	33
Rolling	Stable manure; lime in '85.		2	3			20	16	12.23	69.8	34
.....	.....	.....	3	3			15	12	12.81	72.7	35
.....	.....	.....	2	2			27	22	13.21	75.6	36
Level	None.	100	1	1			17	15	17.06	83.2	37
Hillside	.....	75	1	1			20	18	18.13	80.9	38
Rolling	.....	100	1	1			39	28	15.39	77.7	39
.....	.....	.....	1	1			14	9	14.55	72.7	40
Level	.....	90	1	1			16	13	18.65	84.7	41
Rolling	.....	100	1	2			16	14	16.76	80.0	42
Hillside	.....	90	1	..			..	..	.....	.....	43
Hillside	.....	100	1	2			17	16	18.61	84.5	44
Level	.....	85	1	..			..	..	.....	.....	45
Level	.....	90	1	2			15	12	17.82	80.2	46
Rolling	{ Wood ashes and hen man- ure, 3 to 500 lbs per acre.. }	50	4	2			21	18	15.18	81.4	47
Level	Stable manure.		1	2			20	16	14.14	70.7	48
Hillside	Stable manure.	100	3	5			8	7	14.27	76.2	49
.....	.....	.....	3	3			17	13	12.43	76.6	50
Rolling	Stable manure.	100	2	3			18	13	...	....	51
Rolling	None.	..	1	1			43	30	14.12	72.4	52
Rolling	Stable manure.	100	2	2			35	30	13.65	74.9	53
Hillside	Stable manure.	...	3	3			18	12	12.73	74.3	54
Level	None.	....	2	4			15	13	15.06	79.4	55
.....	.....	.....	2	2			16	13	14.30	74.8	56
Hillside	Stable manure in '98.	95	3	4			15	13	12.76	73.5	57
Rolling	{ Hen manure and S. C. Rock '98; stable manure '97. }	90	2	4			21	18	13.65	81.0	58
Level	None.	....	3	2			21	18	10.85	71.3	59
.....	.....	.....	2	3			18	15	12.61	77.9	60
Level	Stable manure.	95	3	2			25	18	11.08	68.9	61

TABLE V.—

Co-operative Sugar Beet Experiment—Analysis of samples
the Station for

Number.	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
		HARRISON CO.				
62	J. H. Madden.....	Lumberport.....	Apr. 2	.....	None	Clay
63	F. W. Martin ...	Lumberport..	.....	.....	.....	.....
64	J. H. Hardisty.	Enterptise.....	June 1	.....	.....	Clay
65	G. W. Coon.....	Shinnston.....	May 10	Oct. 23	Slight	Clay
		JACKSON CO.				
66	Isaac Starkey	Ravenswood. ..	May 1	Oct. 25	Some	Clay loam
67	James Bradley.....	Kenna.	May 20	Oct. 16	None	Clay loam
68	J. W. Young.....	Lockharts.....	May 20	.....	None	Clay
69	G. G. Naylor.....	Lockharts.....	.....	.....	.....	.....
70	A. D. Dawkins.....	Meadowdale..	May 2	Oct. 13	Some	Clay loam
71	D. F. Hyro.....	Ripley.....	May 25	Nov. 12	Some	Sandy loam
		JEFFERSON CO.				
72	George Dixon.....	Halltown. ....	.....	.....	.....	.....
73	Richard Henderson..	Halltown.....	.....	.....	.....	.....
		LEWIS CO.				
74	G. C. Lawson	Berlin.....	May 10	Oct. 11	None	Clay loam.
75	Ernest Rough.....	Alum Bridge. ..	June 10	Oct.	Some	Sandy loam
76	J. K. Hartley.	Alum Bridge....	May 15	Oct. 14	Some	Gravelly soil
77	E. O. Hartley.....	Camden..	May 10	Oct. 15	Some	Gravelly soil
78	A. F. White.....	Camden..	May 10	Oct. 15	Some	Sandy loam
		MCDOWELL CO.				
79	J. E. Bowling	Squire Jim.....	.....	.....	.....	.....
		MARSHALL CO.				
80	J. N. Hubbs.....	Glen Easton ..	May 15	Oct. 12	None	Clay loam.
81	W. S. Howard	Lynn Camp .....	.....	.....	.....	.....
82	W. F. Crow	Pleasant Valley..	.....	.....	.....	.....
83	F. S. Bonar.....	Glen Easton..	.....	.....	.....	.....
84	Jacob Bassett	Adaline	May 30	Nov. 6	None	Sandy loam
		MASON CO.				
85	John Sayre.	Mercer's Bottom	Apr. 17	.....	None	Clay
86	A. G. Beard	South Side.	May 25	Oct. 9	Slight	Clay loam
		MERCER CO.				
87	John Taylor.	Good Will.....	May 1	Oct. 2	None	Sandy loam
88	John Burchett.....	Good Will.....	May 8	Sept. 9	None	Sandy loam
89	F. M. Thornton.....	Ingleside.....	.....	.....	.....	.....

Continued.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Per cent. of stand.	Number of samples.		Average Number in samples.		Average Weight of Beet.		Percentage of sugar in the juice.	Purity co-efficient.	Number.
							Uncapped Ounces.	Capped Ounces.			
Level	Stable manure.	98	4	2	28	20	11.52	76.5	62		
.....	.....	.....	3	3	23	18	12.04	79.3	63		
Rolling	Stable manure.	.....	2	3	17	15	13.97	80.4	64		
Rolling	Stable manure.	sm1	5	2	15	13	12.47	75.6	65		
Level	Stable manure.	50	3	3	25	20	12.20	71.9	66		
Level	Stable manure.	100	1	2	23	20	.....	.....	67		
Hillside	None.	100	1	5	19	17	10.51	71.0	68		
.....	.....	.....	3	2	24	19	11.64	73.6	69		
Level	Stable manure.	60	3	3	18	15	12.22	77.6	70		
Level	None.	75	1	4	11	8	17.17	80.2	71		
.....	.....	.....	2	2	37	23	11.76	74.9	72		
.....	.....	.....	2	2	22	18	13.86	75.5	73		
Level	Stable manure.	100	2	2	38	30	12.05	79.4	74		
Level	None.	90	1	4	15	11	9.87	72.5	75		
Level	Stable manure.	.....	2	5	10	8	12.15	76.1	76		
Level	Ashes '99; stable manure '98.	75	4	4	14	12	11.58	78.3	77		
Level	Coal ashes '99; stable manure '98	75	4	4	10	85	12.53	80.9	78		
.....	.....	.....	1	4	10	17	10.88	66.3	79		
.....	None.	50	3	2	20	18	11.96	76.8	80		
Rolling	.....	.....	3	3	15	11	7.36	62.1	81		
.....	.....	.....	2	3	16	13	17.57	81.4	82		
.....	.....	.....	3	4	14	12	17.27	80.9	83		
.....	None.	.....	2	1	53	38	11.67	77.8	84		
Level	None.	..	4	2	30	25	12.05	74.8	85		
Level	None.	60	4	2	21	18	10.67	70.9	86		
Rolling	None.	100	5	2	20	18	15.05	82.5	87		
Level	None.	100	2	4	9	8	12.77	62.9	88		
.....	.....	.....	2	3	20	18	16.72	82.0	89		

TABLE V.—

Co-operative Sugar Beet Experiment—Analyses of samples
the Station for

Number.	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
		MINERAL CO.				
90	Jacob Sloan.....	Burlington. ....	.....	Oct. 9	... ..	Sandy loam
91	U. G. Workman. ..	Keyser.	June 6	Oct. 19	Some	Sandy loam
92	S. M. Arnold.....	Burlington .....	.....	.....	.....	.....
		MINGO CO.				
93	A. J. Spaulding.....	Spaulding.	June 1	Oct. 17	None	Clay loam
94	G. W. Spaulding.....	Spaulding.	July 1	Oct. 17	None	Sandy
95	B. C. Sammon.....	Spaulding.	May 20	Oct. 25	None	Sandy
		MONONGALIA CO.				
96	Adolphus Smith....	Morgantown. ....	.....	.....	.....	.....
97	James Gorman.....	Morgantown. ....	.....	.....	.....	.....
98	Station Farm.....	Morgantown. ..	.....	.....	.....	.....
		MORGAN CO.				
99	H. W. Bayer.....	Berkeley Springs	.....	.....	.....	.....
100	C. E. Casler.....	Berkeley Springs	June	.....	.....	Sandy loam
101	J. C. Anderson.....	Cherry Run.....	May 27	Oct. 11	Some	Sandy loam
102	T. F. Campbell.....	Orleans X Roads	May 2	Oct. 14	Slight	Sandy loam
		NICHOLAS CO.				
103	A. J. Legg.....	Albion.....	.....	.....	.....	.....
104	A. L. Mason.....	Albion.	May 7	Oct. 7	Some	Clay loam
105	Emma Grose.....	Albion.....	May 15	.....	.....	Clay loam
106	J. F. Cavendish....	Albion.....	.....	.....	None	Clay loam
		OHIO CO.				
107	S. W. Atkeson ..	Potomac.....	May 9	Oct. 4	Slight	Clay loam
		PENDLETON CO.				
108	T. H. Harrison.....	Sugar Grove.....	.....	.....	.....	.....
109	S. C. Morrel	Mouth of Seneca	May 15	Oct. 10	Some	Sandy loam
110	John McKay.....	Franklin.	May 15	Oct. 14	None	Sandy loam
111	Henry Hoover.....	Sugar Grove....	.....	.....	.....	.....
112	Adam Waggy.....	Sugar Grove.....	.....	.....	.....	.....
113	William Waggy. ...	Sugar Grove.....	.....	.....	.....	.....
		PLEASANTS CO.				
114	Horus Ewers	Grape Island	May 15	Oct. 15	Some	Sandy loam
115	S. Sheets	Saloma	May 21	Oct. 16	None	Clay loam
116	J. W. Morris.....	Willow.....	May 15	Oct. 13	Some	Clay loam
117	R. H. Brown	Grape Island ....	.....	Oct. 16	None	Sandy loam
118	Solomon Wells.....	Josiah.....	.....	.....	.....	.....

Continued.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Percent. of stand.	Number of samples.	Average Number in samples.	Average Weight of Beet.		Percentage of sugar in the juice.	Purity of co-efficient.	Number.
					Uncapped. Ounces.	Capped. Ounces.			
Level	None.	75	2	2	17	16	14.13	78.3	90
Level	Stable manure in '96 and '97.	75	2	3	16	14	11.65	74.9	91
.....	.....	.....	4	2	20	17	13.08	79.8	92
Rolling	None.	....	3	3	10	9	10.31	70.2	93
Level	None.	50	3	2	9	7	11.30	70.2	94
Level	None.	100	2	4	9	7	9.88	66.3	95
.....	.....	.....	2	3	17	11	10.63	71.8	96
.....	.....	.....	2	3	8	7	14.98	78.6	97
.....	.....	.....	83	3.5	16	14	14.49	83.9	98
.....	.....	.....	3	3	15	13	13.33	78.7	99
Level	None.	90	1	3	17	15	10.98	71.7	100
Hillside	Stable manure.	50	3	3	18	15	11.65	73.2	101
Level	None.	12	3	2	23	18	12.62	74.6	102
.....	.....	.....	1	7	5	4	8.04	66.4	103
Rolling	None.	100	2	3	14	12	10.98	70.4	104
Level	None.	...	1	2	8	7	9.03	66.9	105
Rolling	None.	....	2	2	20	16	11.11	72.1	106
Level	None.	75	2	3	19	16	13.83	75.9	107
.....	.....	.....	2	3	18	15	11.76	74.2	108
Level	Stable manure.	...	3	2	17	13	10.90	72.0	109
Level	Stable manure.	100	2	3	22	16	8.67	60.0	110
.....	.....	.....	1	1	14	11	11.21	67.1	111
.....	.....	.....	2	2	23	19	8.35	70.0	112
.....	.....	.....	1	4	13	10	10.17	60.1	113
Level	None.	100	4	2	28	22	10.42	73.6	114
Level	Stable manure.	75	2	2	25	21	11.46	72.6	115
Level	Ashes and stable manure.	80	2	2	24	19	9.56	69.4	116
Level	Stable manure.	100	2	2	17	14	9.32	63.9	117
.....	.....	.....	2	1	44	27	8.16	59.7	118

TABLE VI.—

Co-operative Sugar Beet Experiment—Analyses of samples
the Station for

Number.	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
		POCAHONTAS CO.				
119	G. W. McKeever	Buckeye	May 1	Oct. 20	Some	Clay
120	W. C. Mann	Edray	May 16	Nov. 2	None	Sandy loam
121	W. J. Killingsworth.	Marlington				Sandy loam
		PRESTON CO.				
122	Wm. Ringer	Terra Alta	June 15	Oct. 12	None	Sandy loam
123	C. C. Muss	Terra Alta				
124	J. P. Allbright.	Terra Alta.	May 12	Oct. 20	None	Clay loam
125	M. F. Stuck	Terra Alta	May 12	Oct. 14	Some	Sandy loam
126	M. B. Browning	Terra Alta.	June 1	Oct. 24		Clay loam
		RALEIGH CO.				
127	J. R. Dunbar	Clear Creek	May 20	Oct. 24	None	Sandy loam
		RANDOLPH CO.				
128	E. Pauli	Helvetia				Gravelly
129	Andrew Riffe	Huttonsville ...	May 15	Oct. 21	None	Clay loam
130	Wm. Haugher.	Huttonsville	May 15	Oct. 20	None	Clay loam
131	D. Ward Hutton	Huttousville				
132	Mary J. Sharples ...	Kerens				
133	Geo. Critt	Adolph				
		RITOHIE CO.				
134	C. H. Davis	Mole Hill ...	May 16	Oct. 17	None	Sandy loam
135	J. V. Warner	Smithville.				
		TAYLOR CO.				
136	Perry Gothrop	Pruntytown	May 5	Oct. 17	Slight	Clay loam
137	Columbus Ford	Pruntytown. ...	May 18	Oct. 16	Slight	Sandy loam
138	Jas. H. Miller.	Cloud	May 10	Oct. 16	Slight	Clay loam
139	W. S. Scott	Cloud.				
		TUCKER CO.				
140	J. H. Swisher	Lead Mine.	May 5	Oct. 14		Clay loam
141	C. L. Parsons	St. George	Apr 28	Oct. 16		Clay loam
		UPSHUR CO.				
142	Granville Teter. . .	Dell	May 7	Oct. 16	None	Clay loam
143	C. Nicholas	Rock Cove.	May 25	Oct. 14		Sandy loam
144	Mrs. S. E. Lazier ..	Swamp Run	May 7	Oct. 16	Some	Sandy loam
		WAYNE CO.				
145	D. H. Wellman	Ft. Gay	May 1	Oct. 16	Some	Sandy loam
146	David Wilson	Ft. Gay				Sandy loam

Continued.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Per cent. of stand.	Number of samples.		Average Number in samples.	Average Weight of Beet.		Percentage of sugar in the juice.	Purity co-efficient.	Number.
						Uncapped Ounces.	Capped Ounces.			
Hillside	Stable manure.	100	2	3		21	18	12.32	75.2	119
Level	None.	100	2	2		25	21	15.95	81.6	120
Level	.....	....	1	6		6	5	15.10	78.2	121
Hillside	Coal ashes and hen manure....	....	2	4		13	10	12.42	78.3	122
.....	.....	....	2	2		8	7	15.45	83.4	123
Rolling	Stable manure.	100	1	3		26	23	13.90	78.4	124
Rolling	Stable manure.	...	2	2		19	17	17.38	85.3	125
Rolling	Stable manure and lime.	....	2	2		26	23	14.11	78.9	126
Level	Stable manure.	95	2	2		23	17	11.04	68.0	127
Rolling	Stable manure.	50	1	2		11	9	15.42	82.4	128
Level	Stable manure.	75	2	3		14	12	11.61	75.6	129
Level	Stable manure.	100								130
.....	.....	....	1	4		14	12	12.04	77.6	131
.....	.....	....	1	3		17	12	11.65	69.7	132
.....	.....	....	2	3		11	9	13.71	71.8	133
Hillside	Stable and hen manure.	....	..	..		..	..	.....	....	134
.....	.....	95	2	5		18	13	11.70	72.9	135
Rolling	Stable manure.	100	2	4		28	23	10.83	75.2	136
Level	Stable manure.	90	2	2		36	29	11.02	71.9	137
Rolling	Stable manure.	100	3	3		22	18	7.85	66.2	138
.....	.....	....	3	3		26	19	9.90	64.5	139
Level	Stable manure.	25	4	4		15	14	14.15	71.5	140
Rolling	Stable manure.	100	3	4		14	11	13.27	75.9	141
.....	.....	..	2	4		16	13	10.23	78.2	142
Rolling	Stable manure.	100	1	2		12	10	10.83	71.2	143
Level	Stable manure.	...	2	3		24	21	13.30	81.5	144
Rolling	Stable manure.	....	1	2		27	21	8.12	71.8	145
Rolling	.....	....	1	2		29	23	8.60	71.2	146

TABLE V.—

Co-operative Sugar Beet Experiment—Analysis of samples
the Station for

Number	GROWER.	Postoffice.	Date of planting.	Date of harvesting.	Secondary growth.	Character of soil.
		WEBSTER CO.				
147	N. R. Boggs	Bois.....	May 30	Oct. 20	Some	Sandy loam
148	Benj. Hamrick	Addison.....	Apr. 15	Oct. 18	Some	Grav'ly clay
149	Sidney Smith.....	Upper Glade ...	.....	.....	.....	.....
150	R. J. Berry.....	Bois... ..	May 15	Oct. 16	Some	Sandy loam
		WETZEL CO.				
151	R. D. Sine.....	Hundred.....	May 30	Oct. 21	None	Clay loam.
152	Sam'l Frankhouser..	New Martinsville .....	.....	.....	.....	Clay loam
		WIRT CO.				
153	W. J. Ransom... ..	Elizabeth.....	May 16	Oct. 13	None	Clay
154	Hite Shepherd.....	Zackville.....	.....	.....	.....	.....
		WOOD CO.				
155	J. Woofter.....	Parkersburg ...	.....	.....	Slight	Clay loam

Continued.

grown by farmers in various parts of the State and sent to Analysis in 1899.

Surface.	Fertilization.	Percent. of stand.	Number of samples.		Average Number in samples.	Average Weight of Beet.		Percentage of sugar in the juice.	Purity co-efficient.	Number.
						Uncapped. Ounces.	Capped. Ounces.			
Level	Stable manure.	50	1	2		10	8	9.78	67.9	147
Rolling	Stable manure.	100	3	3		10	7	10.26	67.0	148
.....	.....	..	2	5		6	5	6.94	61.7	149
Level	.....	100	2	3		13	10	10.31	74.6	150
Rolling	None.	...	3	4		5	4	15.62	81.3	151
Rolling	Stable manure.	....	2	1		53	40	7.49	58.1	152
Rolling	Stable manure.	90	2	3		17	13	12.14	75.4	153
.....	.....	...	2	3		13	9	15.36	73.8	154
Level	.....	75	2	2		26	20	10.79	70.8	155

TABLE VI.

Giving the average Analysis of the beets from the Counties represented in the co-operative work.

NAME OF COUNTY.	Number of growers.	Number of Samples.	Average weight of Beets.		Sugar in juice %	Purity of juice %
			Uncap'd oz	Capped oz.		
Barbour	4	8	24	20	12.21	76.8
Boone	2	3	11	8	8.35	66.2
Braxton	6	9	20	14	10.89	68.9
Cabell	3	5	18	15	12.69	71.2
Calhoun.....	1	1	30	25	11.91	77.8
Clay.....	2	2	16	11	10.69	73.2
Doddridge.....	4	7	27	21	12.11	71.6
Fayette.....	3	5	14	10	17.16	77.4
Gilmer	3	5	18	14	9.66	67.9
Grant.....	3	4	16	13	14.14	77.9
Greenbrier.....	14	17	19	16	15.29	77.3
Hampshire	5	13	16	13	14.08	77.7
Hancock.....	2	3	37	30	13.80	74.0
Hardy.....	8	20	18	15	12.67	74.5
Harrison.....	4	14	20	16	12.32	70.2
Jackson	6	12	21	17	12.34	74.7
Jefferson.....	2	4	29	20	12.81	75.2
Lewis.....	5	12	16	13	11.90	78.5
McDowell.....	1	1	10	7	10.88	66.3
Marshall.....	5	13	22	17	14.61	80.7
Mason.....	2	8	25	22	11.37	72.8
Mercer	3	9	17	15	14.91	78.0
Mineral.....	3	8	18	16	12.98	78.2
Mingo	3	7	9	8	10.42	69.0
Monongahela.....	3	87	15	13	14.42	82.7
Morgan.....	4	10	18	15	12.14	74.5
Nicholas.....	4	6	13	11	10.20	69.7

TABLE VI.—CONTINUED.

Giving the average analysis of the beets from the counties represented in the co-operative work.

NAME OF COUNTY.	Number of samples.	Number of growers.	Average weight of Beets.		Sugar in juice %	Purity of juice %
			Uncap'd oz	Capped oz.		
Ohio.....	1	2	19	16	13.83	75.9
Pendleton.....	6	11	18	14	9.90	68.3
Pleasants.....	15	12	27	20	9.90	68.6
Pocahontas.....	3	5	17	14	14.45	78.3
Preston.....	5	7	18	16	14.45	81.0
Saliegh.....	1	2	23	17	11.04	68.0
Randolph.....	6	7	11	9	12.95	82.4
Ritchie.....	1	2	18	13	11.70	72.9
Taylor.....	4	10	27	21	9.69	68.6
Tucker.....	2	7	14	13	13.74	76.8
Upshur.....	3	5	17	14	11.57	78.0
Wayne	2	2	28	22	8.36	72.0
Webster	4	8	9	7	9.30	67.7
Wetzel.....	2	5	24	18	12.37	72.0
Wirt.....	2	4	15	11	13.85	74.6
Wood.....	1	2	26	20	10.79	70.8
Totals and averages.....	153	386	18.0	14.9	12.77	76.15

The results recorded in the above tables leave little room to doubt that West Virginia soil and climate may be relied upon to produce a suitable sugar beet. It shows also that in the production of such beets in this state, the character of the soil, the cultivation and the fertilizer used, will probably be the principal factors (see map on last pages of this bulletin.) It is to be regretted that practically the only fertilizer used in this co-operative test was stable manure, by no means the best fer-

tilizer for this crop, for while it may often aid in getting a stand of beets, and in increasing the yield of tons per acre, it is so likely to do this at the expense of the purity if not the sugar content, the two items of greatest importance in this test. If no fertilizer at all had been used we are confident that the results would have made a very much better showing. In this section the application of a plain acid phosphate, (which, after all, is much cheaper) invariably resulted in very much better beets.

In next year's work we shall give special attention to this matter of fertilizers, and not only will the seeds be furnished, as in the past, but also the requisite amount of a suitable fertilizer. The supply of seed is limited and it will, consequently, be impossible to furnish seed to more than a limited number of farmers.

It is considered desirable also to study the effect of lime on this crop in the various parts of the state, and this will be made a feature of the work for the coming season.

The plan of the work for next season, together with complete instructions, will be mailed on application.

NOTICE.

Application for bulletins of this Station should be addressed to the Director of the West Virginia Agricultural Experiment Station, Morgantown, W. Va.

(The bulletins named below are available for distribution.)

- No. 4. The Creamery Industry; Its Adaptability to West Virginia.
- No. 5. The Selection of Milch Cows.
- No. 6. Six Month's Experience in Running a Creamery; Improved Process of Handling Cream and Churning.
- No. 12. The Canada Thistle.
- No. 14. Farm and Garden Insects and Experiments with Remedies; Notes of the Season.
- No. 15. Raspberry Gouty-Gall Beetle.
- No. 16. Yellow Locust, Insect Ravages upon.
- No. 17. Black Spruce, Insect Ravages.
- No. 19. Your Weeds and Your Neighbor's, Part 1. Weeds as Fertilizers.
- No. 20. Potato Culture and Fertilization. Tests of Some Varieties of Tomatoes.
- No. 21. Injurious Insects and Plant Diseases.
- No. 25. Plat Experiments with Commercial Fertilizers on Wheat.
- No. 26. Inspection of Commercial Fertilizers.
- No. 27. Notes on Pruning.
- No. 28. Plat Experiments with Commercial Fertilizers on Corn.
- No. 29. Experiments with Potatoes at the Station. Experiments on Corn at the Out-Stations.
- No. 30. Address and Notes on Sheep.
- No. 33. Sub-Irrigation in the Green house.
- No. 38. Potato Blight, Potato Scab.
- No. 40. Commercial Fertilizers.
- No. 42. Vegetables.
- No. 43. When, Why, What and How to Spray.
- No. 44. Practical Entomology.

Special Bulletin No. 2. Proceedings connected with the celebration upon the completion of the Station Building and the organization of the Sheepbreeders and Wool-Growers' Association and the State Horticultural Society.

Third Annual Report, 1890.

No. 51. Commercial Fertilizers, Jan., '98.

No. 52. Strawberries.

No. 53. Commercial Fertilizers, Dec. '98.

No. 54. Nursery Hints.

No. 55. Sugar Beets.

No. 56. Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine From 1880-1893

No. 57. Commercial Fertilizers.

No. 58. The Effect of Pressure in the Preservation of Milk.

No. 59. Whole Corn Compared with Corn Meal for Fattening Hogs.

No. 60. Poultry Experiments.

No. 61. Sheep Feeding Experiments.

No. 62. A Study of the Effect of Incandescent Gas-light on Plant Growth.